UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
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F/SER31: PO

MAY 04 2017

Irene F. Sadowski
Chief, Cocoa Permits Section
Department of the Army
Jacksonville District Corps of Engineers
400 High Point Drive, Suite 600
Cocoa, FL 32926

Dear Ms. Sadowski:

The enclosed Biological Opinion ("Opinion") responds to your request for consultation with us, the National Marine Fisheries Service (NMFS), pursuant to Section 7 of the Endangered Species Act for the permitting of a public fishing pier in the Indian River at Riverside Park, in Vero Beach, Florida (SER-2016-18008).

The Opinion considers the effects of the permitting of the pier that will be constructed by your applicant on the following listed species: North Atlantic green sea turtle Distinct Population Segment (DPS), South Atlantic green sea turtle DPS, hawksbill sea turtle, leatherback sea turtle, Northwest Atlantic loggerhead sea turtle DPS, Kemp's ridley sea turtle, smalltooth sawfish U.S. DPS, and Johnson's seagrass. NMFS concludes that the proposed action is not likely to adversely affect the leatherback sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, and Johnson's seagrass. NMFS also concludes that the proposed action is not likely to jeopardize the continued existence of the North Atlantic green sea turtle DPS, South Atlantic green sea turtle DPS, Northwest Atlantic loggerhead sea turtle DPS, and the smalltooth sawfish U.S. DPS.

NMFS is providing an Incidental Take Statement (ITS) with the Opinion. The ITS describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The ITS also specifies nondiscretionary terms and conditions, including monitoring and reporting requirements with which the Corps of Engineers must comply to carry out the reasonable and prudent measures.

We look forward to further cooperation with you on other projects to ensure the conservation of our threatened and endangered marine species and designated critical habitat. If you have any questions on this consultation, please contact Patrick Opay, Consultation Biologist, by phone at 727-551-5789, or by email at Patrick.Opay@noaa.gov.

Sincerely,

For Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure
File: SER-2016-18008

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency:	U.S. Army Corps of Engineers (Corps)
Activity:	Endangered Species Act (ESA) Section 7 Consultation on the Corps Proposed Permit (SAJ-2016-00890) to The City Of Vero Beach To Construct A Public Fishing Pier In The Indian River at Riverside Park, Vero Beach, Florida (SER-2016-18008)
Consulting Agency:	NOAA, NMFS, SERO, Protected Resources Division (F/SER3)

Date Issued: May 4, 2017

Approved By: [signature]

FOR Roy E. Crabtree, Ph.D.
Regional Administrator

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List of Frequently Used Acronyms

BMP	Best management practice
CFR	Code of Federal Regulations
CPUE	Catch Per Unit Effort
cSEL	Cumulative Sound Exposure Level
DPS	Distinct Population Segment
DWH	Deepwater Horizon
DTRU	Dry Tortugas Recovery Unit
ESA	Endangered Species Act
FDEP	Florida Department of Environmental Protection
FP	Fibropapillomatosis disease
FWRI	Fish and Wildlife Research Institute
GCRU	Greater Caribbean Recovery Unit
IMMS	Institute of Marine Mammal Studies
ITS	Incidental Take Statement
NA	North Atlantic
NMFS	National Marine Fisheries Service
NCWRC	North Carolina Wildlife Resources Commission
NGMRU	Northern Gulf of Mexico Recovery Unit
NOAA	National Oceanic and Atmospheric Association
NRU	Northern Recovery Unit
NWA	Northwest Atlantic
PCB	Polychlorinated biphenyls
PRM	Post-release mortality
RC	Restoration Center
RPMs	Reasonable and Prudent Measures
SA	South Atlantic
SAV	Submerged aquatic vegetation
SCL	Straight carapace length
SEFSC	Southeast Fisheries Science Center
STSSN	Sea Turtle Stranding and Salvage Network
TEDs	Turtle Exclusion Devices
TEWG	Turtle Expert Working Group
USFWS	U.S. Fish and Wildlife Service

Units of Measurement

°C	Degrees Celsius
°F	Degrees Fahrenheit
cm	Centimeter(s)
ft	Feet
ft^2	Square feet
in	Inch(es)
g	Grams
kg	Kilograms
lb	Pound(s)
mi	Mile(s)
mi^2	Square mile(s)

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Introduction

Section 7(a)(2) of the ESA of 1973, as amended (16 U.S.C. § 1531 et seq.), requires each federal agency to ensure that any action that it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of any critical habitat of such species. To fulfill this obligation, Section 7(a)(2) requires federal agencies to consult with the appropriate Secretary on any action they propose that "may affect" listed species or designated critical habitat. NMFS and the U.S. Fish and Wildlife Service (USFWS) share responsibilities for administering the ESA.

Consultations on most listed marine species and their designated critical habitat are conducted between the action agency and NMFS. The consultation is concluded after NMFS concurs with an action agency that its action is not likely to adversely affect listed species or critical habitat or issues a Biological Opinion ("Opinion") that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify its critical habitat. If jeopardy or destruction or adverse modification is found to be likely, the Opinion identifies reasonable and prudent alternatives (RPAs) to the action as proposed, if any, that can avoid jeopardizing listed species or resulting in the destruction/adverse modification of critical habitat. The Opinion states the amount or extent of incidental take of the listed species that may occur, specifies reasonable and prudent measures (RPMs) that are required to minimize the impacts of incidental take and monitoring to validate the expected effects of the action, and recommends conservation measures to further conserve the species.

This document represents NMFS's Opinion on the effects of the United States Army Corps of Engineers (Corps) proposal to authorize construction of a pier on the Indian River in Vero Beach, Florida on threatened and endangered species, in accordance with Section 7 of the ESA. This Opinion has been prepared in accordance with Section 7 of the ESA and regulations promulgated to implement that section of the ESA. It is based on information provided in the Corps "NMFS Endangered Species Act Section 7 Checklist" and subsequent emails with the Corps, as well as information provided in recovery plans, past research and monitoring data, and other relevant published and unpublished scientific and commercial data cited in the Literature Cited section of this document. During this consultation, we conducted electronic searches of the general scientific literature. We also contacted subject matter experts (e.g., NMFS science center staff) for informaton. These searches specifically tried to identify data or other information that supports a particular conclusion (for example, a study that suggests a species will respond to a stimulus in a certain way) as well as data that does not support our conclusion. When data are equivocal, or in the face of substantial uncertainty, our decisions are designed to avoid the risks of inaccurately concluding that an action is not likely to have an adverse effect on listed species.

1.0 Consultation History

The Corps submitted a request to the NMFS Southeast Regional Office (SERO) on June 15, 2016 (NMFS Consultation Number SER-2016-18008) to initiate informal consultation, or for SERO to provide a date when formal consultation would commence. SERO reviewed the information and determined that, due to possible take (e.g., hook/entangle) of ESA-listed sea turtles that could result from fishing after the proposed pier was completed, formal consultation was necessary. Due to SERO staffing issues and existing requests received before the instant request for consultation, consultation was delayed. On February 21, 2017, SERO initiated formal consultation. Requests to clarify information originally supplied were sent on February 24, 2017, and March 8, 2017.

2.0 Description of the Proposed Action and Action Area

2.1 Proposed Action

The Corps proposes to issue a permit to the City of Vero Beach (Applicant) to construct the Riverside Park Public Fishing Pier. The applicant would construct a new public fishing pier on the Indian River. The elevated fishing pier structure would consist of a 100 ft long by 8 ft wide access pier connected to a "T" shaped 50 ft long by 8 ft wide terminal pier platform (Figure 2.1). Spacing between the deck boards would be 0.5 in, and the deck would be 5.0 ft above mean high water (MHW).

A total of 32 concrete piles (12" by 12") would be installed by jetting them into the substrate, and then using an impact hammer for the final two-feet of penetration into the substrate. The applicant will only hammer no more than 8 piles per day. The jetting process would use a water jet to create pilot holes. No demolition would occur (there is no existing structure). Equipment and materials would be stored in the uplands. A small shallow draft barge may be used to install the piles in the Indian River at the points where the water depths are greater than 3 feet up to 8 feet deep. If the water is shallower, a land-based crane would be used to assist the hand installation of the piles. The Applicant anticipates construction over water would occur for 30 to 45 days. All work would occur during daylight hours only.

It is expected that up to 10 people would fish from the pier daily. A fish cleaning station would be located next to the pier. A trash receptacle with a lid would be placed on the pier.

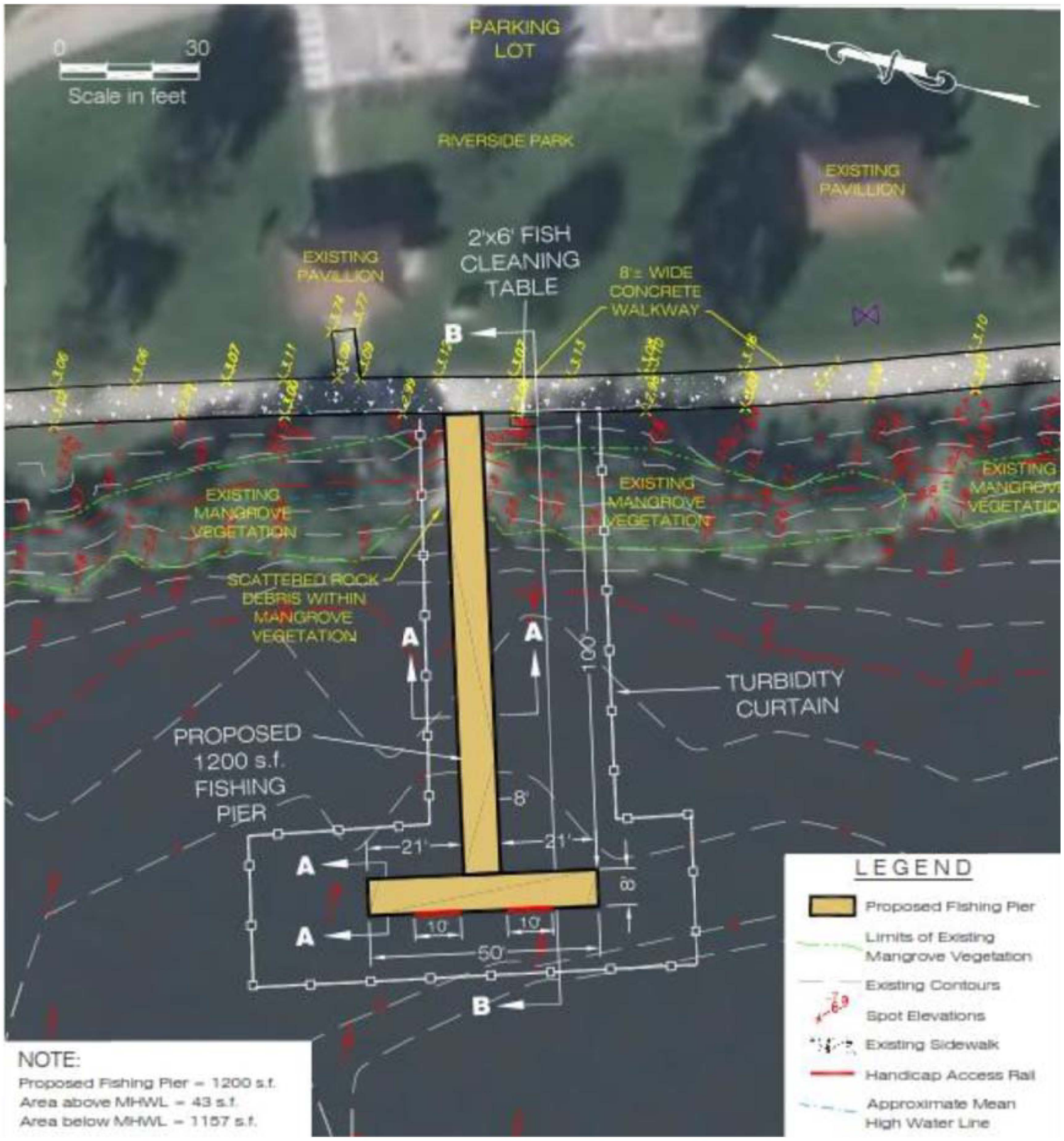

Figure 2.1 Proposed Fishing Pier, from Corps Initiation Package

Actions to Reduce the Impacts of the Proposed Action

a. The applicant would adhere to Sea Turtle & Smalltooth Sawfish Construction Conditions, contained in Appendix A.

b. All work would occur only during daylight hours.

d. The structure would be constructed in an area void of mangroves and void of submerged aquatic vegetation.

e. A turbidity curtain would be used during in-water work.

f. The applicant would install permanently the NMFS-approved *Save Sea Turtles, Sawfish, and Dolphins* educational signs, available on our website at http://sero.nmfs.noaa.gov/protected_resources/section_7/protected_species_educational_signs/index.html, on a kiosk at the project site. The sign instructs fishers to adhere to NOAA's

guidelines with regard to what to do if sea turtles or smalltooth sawfish are caught on fishing line at the fishing pier, as well as promoting responsible fishing practices (e.g., not discarding fishing line into the marine environment). The sign is included in Appendix B.
g. The applicant would install monofilament recycling bins on the pier structure.
h. Less than 10 piles would be installed per day.

2.2 Action Area

The proposed action would occur in Riverside Park in Vero Beach in Section 31, Township 32 South, Range 40 East in Indian River County, Florida, Latitude: 27.65045° Longitude: -80.37011°. The pier would be constructed on the Indian River, 16 miles south from the Sebastian Inlet and approximately 16.0 miles north of Fort Pierce Inlet. For purposes of this consultation, the action area extends to a radius of 705 feet from the pier footprint, which, based on our noise calculations discussed below, is the maximum distance that any potential acoustic effects pile driving to ESA-listed species may occur (i.e., the distance to which ESA-listed fish have the potential to experience behavioral effects) (Figure 2.2).

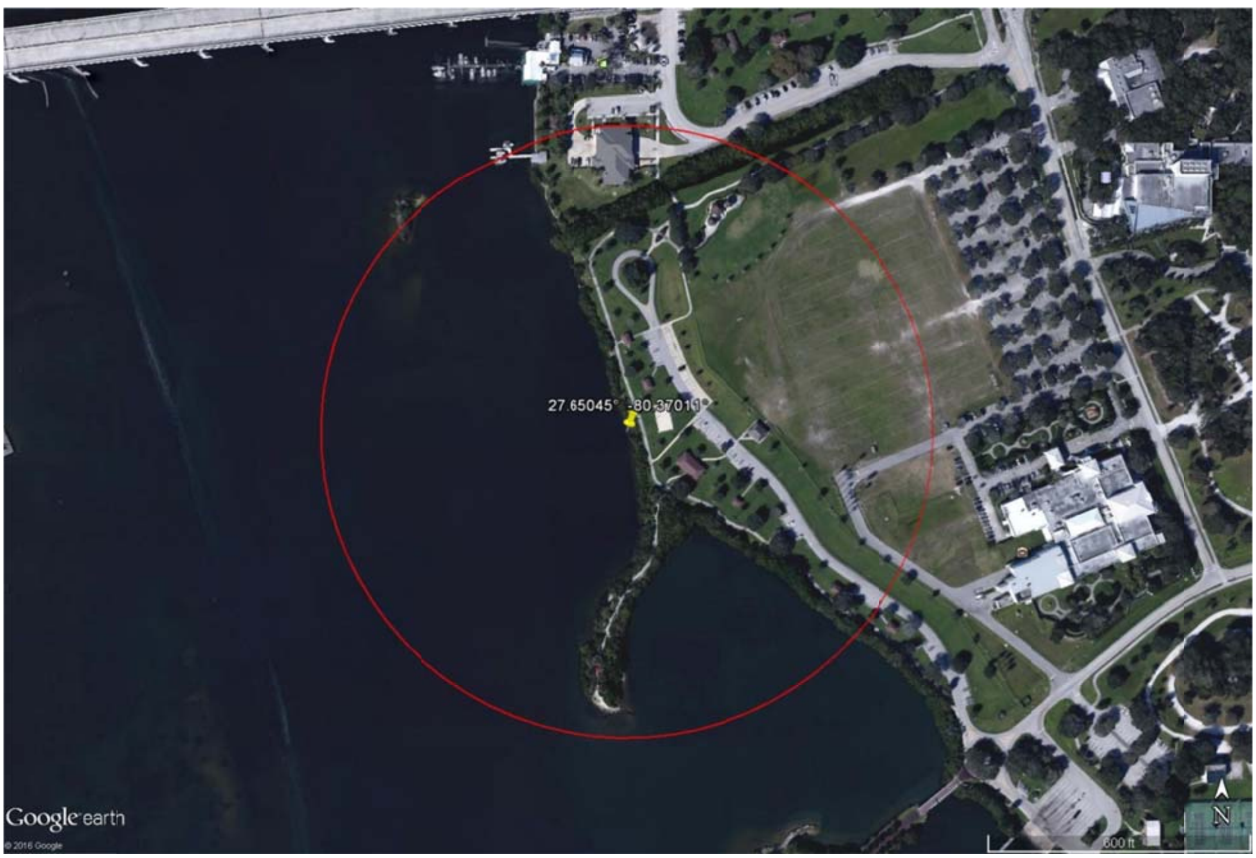

Figure 2.2. Project action area for Riverside Park Fishing Pier

The applicant conducted a habitat survey and found that substrate in the area of the proposed action varies, but exhibits consistent characteristics with depth and distance from shore. Along the shore, substrate is primarily sand with shells and rocks (when barren) or red/black mangroves (when vegetated). Within approximately 10 feet of shore, substrate was a mucky/sand mixture with large rocks interspersed. Oysters were observed on some rocks. Beyond 10 feet from shore and at depths of less than 2.5 feet, substrate consists of a mucky/sand/shell mixture, sometimes with oysters interspersed. Once depths reach approximately 3 feet, substrate is very loose, unconsolidated, dark mucky material with no vegetation, shells, rocks, or vegetation, including macroalgae and seagrasses. This loose, unconsolidated substrate continues past 5 foot depths.

3.0 Status of Listed Species and Critical Habitat

The following endangered and threatened species under the jurisdiction of NMFS may occur in or near the action area (Table 3.1). The project is not located in designated critical habitat, and there are no potential routes of effect to any designated critical habitat.

Table 3.1. ESA-Listed Species Assessed in this Consultation

Sea Turtles	Scientific Name	Status
Green sea turtle North Atlantic DPS	*Chelonia mydas*	Threatened
Green sea turtle South Atlantic DPS	*Chelonia mydas*	Threatened
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle Northwest Atlantic DPS	*Caretta caretta*	Threatened
Kemp's ridley sea turtle	*Lepidochelys kempii*	Threatened
Fish	Scientific Name	Status
Smalltooth sawfish U.S. DPS	*Pristis pectinata*	Endangered
Plants	Scientific Name	Status
Johnson's seagrass	*Halophila johnsonii*	Threatened

3.1 Analysis of Species Not Likely to be Adversely Affected

We have determined that the proposed action being considered in this Opinion is not likely to adversely affect the following listed species under the ESA: hawksbill sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, and Johnson's seagrass. The following discussion summarizes our rationale for these determinations.

3.1.1 Sea Turtles

Leatherback, Hawksbill, and Kemp's Ridley Sea Turtles
Fishing from the proposed pier would occur in the Indian River Lagoon located between the barrier island and peninsular mainland (Figure 2.2). Inlets (e.g., Sebastian Inlet) provide access for sea turtles from the ocean to the lagoon, however the pier is located approximately 12 to 16 miles from the closest inlets to the north and south. Unlike other sea turtle species, the hawksbill and leatherback sea turtles are very unlikely to be present in the vicinity of the pier in the lagoon, and not likely to be interested in the fishing bait used during fishing from the proposed pier. The Kemp's ridley sea turtle is also unlikely to be encountered at the pier.

Sea turtle researchers from the University of Central Florida have been sampling in the Indian River Lagoon, approximately 12 miles north of the proposed pier location or approximately 3 miles from the inlet to the ocean, since the 1980s (research site and methodology is explained in Ehrhart et al. (2007)). Briefly, the research was conducted with standard in-water research techniques using "tangle" nets (a type of gill net). The researchers conducted their research with this widely used netting methodology to specifically sample for sea turtles. The netting allowed them to determine which species occur (animals were captured, identified, tagged, and released).

Any animals observed during netting (but not captured) were also recorded. This research was authorized through an ESA section 10 scientific research permit. From July 2, 1982, through 2006, the researchers captured one hawksbill sea turtle. That only one hawksbill was captured during this time suggests the species is rare in the action area. Additionally, this species does not feed on the type of bait that would be used by fishers from the pier (NMFS and USFWS 1993), thus they would not be expected to be attracted to or attempt to interact with fishers' gear. Based on the expected rarity of hawksbills in the action area and the food preference for this species, NMFS expects that interactions with this species would be extremely unlikely to occur and therefore the effect on species from interaction with fishing gear is discountable.

Leatherback sea turtles more commonly occupy pelagic or oceanic habitat than riverine or lagoon environments. While they can potentially move to inshore habitat in pursuit of jellyfish food resources, they prefer to forage in ocean offshore habitat, not the inner lagoon ecosystem. As noted above, sea turtle researchers from the University of Central Florida have been sampling in the Indian River, approximately 12 miles north of the proposed pier, since the 1980s (Ehrhart et al. (2007)). From July 2, 1982, through 2006, one leatherback was captured, and one observed during this sampling. Additionally, this species feeds primarily on jellyfish, not any type of bait that would be used by fishers from the pier (Eckert et al. 2012), thus they would not be expected to attempt to interact with fishers' gear. Based on the expected rarity of leatherbacks in the action area and the habitat and food preference for this species, NMFS expects that interactions with this species would be extremely unlikely to occur and therefore the effect on species from interaction with fishing gear discountable.

Kemp's ridley sea turtles are also uncommon in the Indian River Lagoon, and as in the study described above, from July 2, 1982, through February 3, 2006, the researchers from the University of Central Florida captured only 3 Kemp's ridley sea turtles. Additionally, no Kemp's ridley sea turtles have been recorded in available fishing interaction data from our stranding network records for the Indian River Lagoon (Sea Turtle Stranding and Salvage Network (STSSN)). Based on the expected rarity of the Kemp's ridley sea turtle in the action area (only 3 animals were captured in the Indian River Lagoon in over 23 years by gear used with the specific purpose of catching sea turtles), and the unlikelihood of this species interacting with gear at the pier (there are no fishery interaction reports for the Indian River Lagoon from the STSSN), NMFS expects that interactions with this species would be extremely unlikely to occur and therefore the effect on Kemp's ridley sea turtles from interactions with fishing gear is discountable.

3.1.2 Johnson's Seagrass

No seagrasses were observed along the transect area where the pier would be constructed, T2 (Figure 3.1), the primary accessway location, nor along T1 or T3 transects on either side of the area the proposed pier would be located, that together comprised a 50-foot radius of the proposed fishing pier. Johnson's seagrass was observed in a small (~5' by 5') patch approximately 20 feet north of T4 and approximately 14 feet waterward of Mean High Water Line (MHWL), in depths of 1.6 feet. A second shore-parallel patch (~20' long, ~5' wide) was found just south of T4, approximately 16 feet from MHWL.

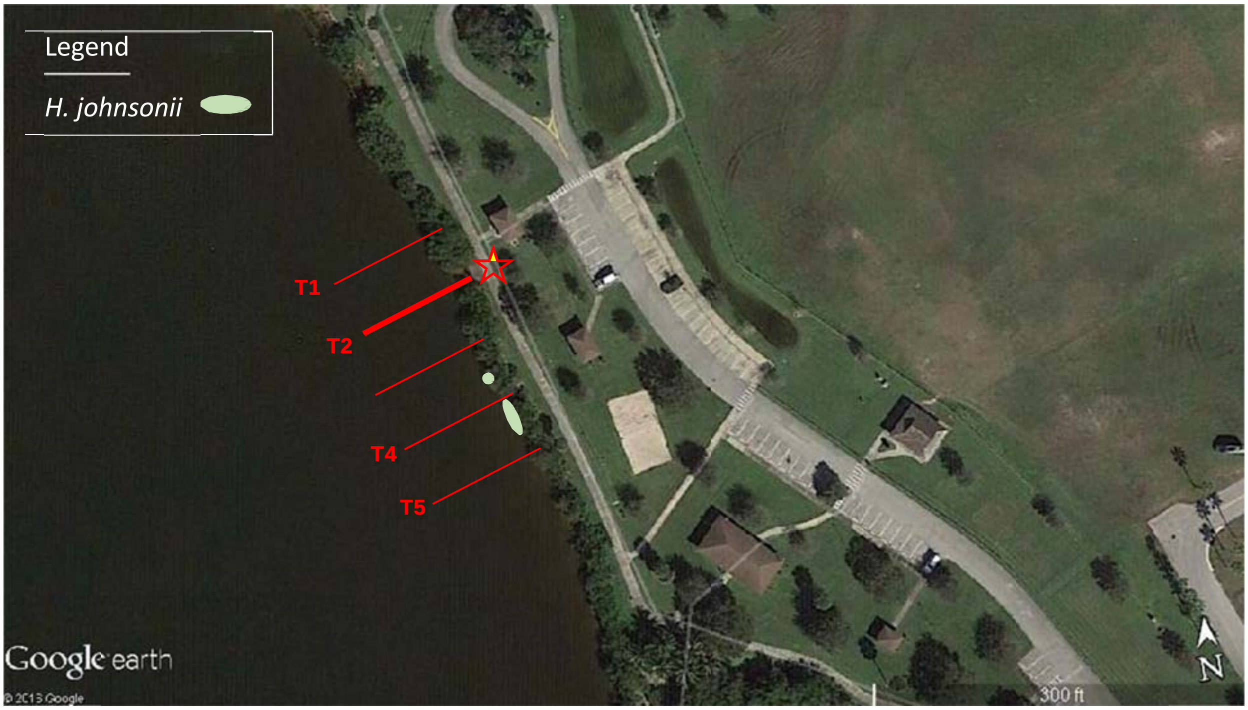

Figure 3.1. April 13, 2016, SAV survey transects with results. Transects spaced approximately 50 feet apart (not to scale). T2 transect is proposed fishing pier location; there was a secondary possible location at T4, which was eliminated due to presence of Johnson's seagrass (Corps consultation package).

The proposed project would not occur in or over Johnson's seagrass. The only potential impact from the project would come from sedimentation. However, the project would use turbidity curtains which would minimize the sedimentation and the potential effects from project construction to any protected species near the project, including seagrass. Based on the careful siting of the project to avoid seagrass, and the best management practices (turbidity curtains), NMFS expects that any small amount of sedimentation that may escape the turbidity curtain would not result in any measurable effect on Johnson's seagrass, and therefore would have insignificant effects on this species.

3.1.3 Proposed Aspects of the Action that are Not Likely to Adversely Affect Loggerhead Sea Turtles, Green Sea Turtles, or Smalltooth Sawfish

Although loggerhead (NWA Atlantic DPS) and green sea turtles (NA and SA DPS) as well as smalltooth sawfish are likely to be adversely affected by the proposed action, there are some components of the proposed action that are not likely to adversely affect these species. They are discussed here. Section 3.2 and the remainder of this Opinion will then focus on those aspects of the proposed action that are likely to adversely affect these species.

Construction Operations
The vessel and mechanical equipment used during construction of the proposed action are not likely to adversely affect loggerhead and green sea turtles, or smalltooth sawfish. Operation vessels and mechanical construction equipment could potentially result in interactions with

species (e.g., vessel strike, interaction with mechanical equipment) or disturbance (from noise or the presence of vessels and machinery). However, pier construction would occur in accordance with the Sea Turtle & Smalltooth Sawfish Construction Conditions found in Appendix A. Vessels associated with construction would observe for these species to avoid them, move very slowly or remain idle (e.g., "no wake/idle" speeds), thereby greatly reducing the probability of a vessel strike. The project would also be required to cease operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish, and operation of any mechanical construction equipment would also cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities would not resume until the protected species has departed the project area of its own volition. These precautions reduce the probability of a strike, and minimize the effects of disturbance. Given the best management practices that would be employed, we believe that adverse effects from vessel operations or disturbance are extremely unlikely to occur and are discountable.

During construction, sea turtles and smalltooth sawfish may be affected by being temporarily unable to use the site for foraging or refuge due to avoidance of construction activities and related noise. We believe these effects will be insignificant as this is an open-water area with similar surrounding habitat. The site does not provide substantial forage and refuge resources. Any temporary effects to sea turtles and smalltooth sawfish will be so small as to be unmeasurable. We do not anticipate any permanent habitat effects that would affect sea turtles or smalltooth sawfish.

Noise from Pile Installation

Effects to listed species as a result of noise created by construction activities can physically injure animals in the affected areas or change animal behavior in the affected areas. Physical 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, physical effects can result from prolonged exposure to noise levels that exceed the daily cumulative exposure threshold for the animals, and these can constitute adverse effects if animals are exposed to the noise levels for sufficient periods. Behavioral effects can be adverse if such effects interfere with the 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.[1] The noise analysis in this consultation evaluates effects to smalltooth sawfish, the NA and SA DPSs of green sea turtles, and loggerhead sea turtles.

The applicant proposes to use a combination of jetting and impact hammer to install the piles. Based on our noise calculations, the use of a water jet to create pilot holes or install 32 concrete 12" by 12" piles all but the remaining 2 ft into place will not result in physically injurious noise effects or behavioral noise effects.

Based on our noise calculations, installation of 32 concrete 12" by 12" piles by impact hammer will not cause single-strike or peak-pressure injurious noise effects. However, the cumulative sound exposure level of multiple pile strikes (the applicant will hammer no more than 8 piles per

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

day) over the course of a day may cause injury to ESA-listed fishes and sea turtles up to 72 ft (22 m) away from the pile. Due to the mobility of sea turtles and smalltooth sawfish, and because the project occurs in an area that we consider to be "open water" for our noise analysis (as opposed to a confined space), we expect them to move away from noise disturbances. Because we anticipate the animals will move away, we believe that an animal's suffering physical injury from noise is extremely unlikely to occur and is therefore the effect of cumulative exposure to the noise is discountable. An animal's movement away from the injurious sound radius is a behavioral response, with the same effects discussed below.

The installation of piles using an impact hammer could also result in behavioral effects at radii 705 ft (215 m) for ESA-listed fishes and 151 ft (46 m) for sea turtles. Due to the mobility of sea turtles and ESA-listed fish species, we expect them to move away from noise disturbances in this open-water environment. 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.

Turbidity
Fishing pier construction will require installation of new piles to support the pier that will cause increased turbidity that could potentially adversely affect listed species. However, the applicant will use turbidity curtains installed prior to and throughout all in-water construction. Elevated turbidity during construction will be temporary and for a short duration and will be contained by turbidity controls, which cannot be removed until the turbidity subsides to normal background levels post construction. Therefore, NMFS believes turbidity effects to sea turtles and smalltooth sawfish are insignificant.

3.2 Species Likely to be Adversely Affected

Green sea turtles (NA and SA DPSs), loggerhead sea turtles (Northwest Atlantic DPS), and smalltooth sawfish are all likely to be adversely affected by the proposed action. A fishing pier can facilitate recreational fishing that could injure or kill sea turtles and smalltooth sawfish via accidental hooking and entanglement. We evaluated the threats posed by the proposed project to these species based on their abundance in the area and their habitat/feeding preferences.

The remaining sections of this Opinion will focus solely on these species.

The following subsections are synopses of the best available information on the status of the species that are likely to be adversely affected by one or more components of the proposed action, including information on the distribution, population structure, life history, abundance, and population trends of each species and threats to each species. The biology and ecology of these species as well as their status and trends inform the effects analysis for this opinion. Additional background information on the status of sea turtle species can be found in a number of published documents, including: recovery plans for the Atlantic green sea turtle (NMFS and USFWS 1991), and loggerhead sea turtle (NMFS and USFWS 2008); and sea turtle status reviews, stock assessments, and biological reports (Conant et al. 2009b; NMFS-SEFSC 2001;

NMFS-SEFSC 2009b; NMFS and USFWS 1995; NMFS and USFWS 2007a; NMFS and USFWS 2007b; NMFS and USFWS 2007d; NMFS and USFWS 2007e; NMFS and USFWS 2007f; TEWG 1998b; TEWG 2000b; TEWG 2009b). Sources of background information on smalltooth sawfish include the proposed and final listing rules (66 FR 19414 and 68 FR 15674), recovery plan (NMFS 2009) , and 5 year review (NMFS 2010).

3.2.1 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 listed sea turtle species, those identified in this section are discussed in a general sense for all sea turtles. Threat information specific to a particular species are then discussed in the corresponding status sections where appropriate.

Fisheries

Incidental bycatch in commercial fisheries is identified as a major contributor to past declines, and threat to future recovery, for all of the sea turtle species (NMFS and USFWS 1991; 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 United States 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. Appendix C lists the some of the key U.S. federal fisheries that have and/or are affecting sea turtles in the U.S. South Atlantic, and provides take associated with each of the fisheries. The Southeast U.S. shrimp fisheries have historically been the largest fishery threat to benthic sea turtles in the southeastern United States, 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 United States, 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 the *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 2015). Following the spill, juvenile Kemp's ridley, green, and loggerhead sea turtles were found in *Sargassum* algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil and/or had ingested oil. The spill resulted in the direct mortality of many sea turtles and may have had 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. 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 2007c). In sea turtles, sex is determined by the ambient sand temperature (during the middle third of incubation) with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007c).

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 2007g). Sea level rise from global climate change is also a potential problem for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Baker et al. 2006; Daniels et al. 1993; Fish et al. 2005). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as an increase in the frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006; Baker et al. 2006).

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

Other Threats

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

Diseases, toxic blooms from algae and other microorganisms, and cold stunning events are additional sources of mortality that can range from local and limited to wide-scale and impacting hundreds or thousands of animals.

3.2.2 Loggerhead Sea Turtles- Northwest Atlantic DPS

The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. In 2011, 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) Northwest Atlantic Ocean (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 Northwest Atlantic (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 straight carapace length (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 costal scutes, 5 vertebral scutes, 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 1998a).

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 2000a); 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 (Florida/Georgia border north through southern Virginia), (2) the Peninsular Florida Recovery Unit (Florida/Georgia border through Pinellas County, Florida), (3) the Dry Tortugas Recovery Unit (islands located west of Key West, Florida), (4) the Northern Gulf of Mexico Recovery Unit (Franklin County, Florida, through Texas), and (5) the Greater Caribbean Recovery Unit (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[2]), (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

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

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. 2009a; 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).

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. 2009a).

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. 2009a).

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, unpublished data; South Carolina Department of Natural Resources, 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 United States, 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. 2009a; Heppell et al. 2003; NMFS-SEFSC 2009a; NMFS 2001; NMFS and USFWS 2008; TEWG 1998a; TEWG 2000a; TEWG 2009a) 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.

<u>Peninsular Florida Recovery Unit</u>
The Peninsular Florida Recovery Unit (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 2013 was 77,975 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 3.1). FWRI performed a detailed analysis of the long-term loggerhead index nesting data (1989-2016; 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 represents 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 (http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trend/).

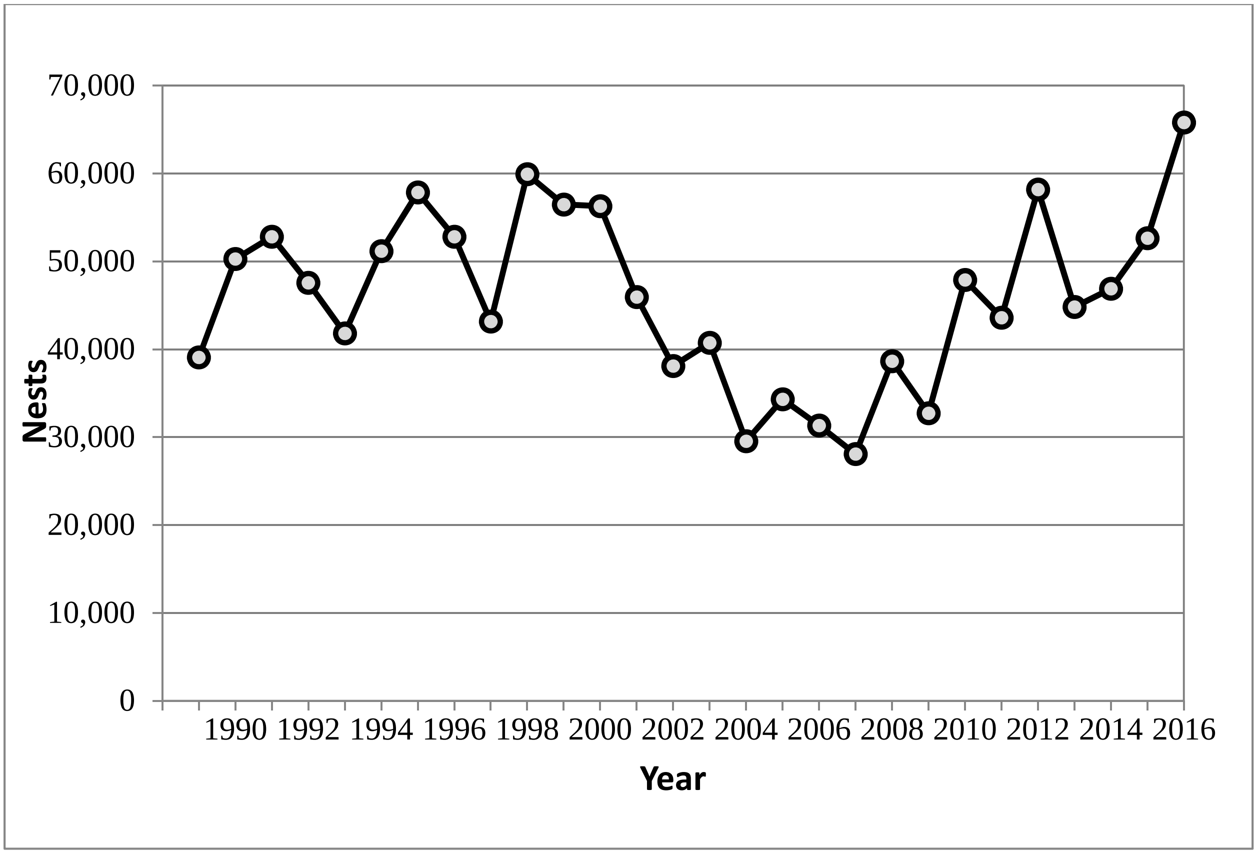

Figure 3.2. Loggerhead sea turtle nesting at Florida index beaches since 1989

Northern Recovery Unit

Annual nest totals from beaches within the Northern Recovery Unit (NRU) averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (Georgia Department of Natural Resources [GADNR] unpublished data, North Carolina Wildlife Resources Commission [NCWRC] unpublished data, South Carolina Department of Natural Resources [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 3.2) 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 improve. 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.

Table 3.2. Total Number of Northern Recovery Units Loggerhead Nests (GADNR, SCDNR, and NCWRC nesting datasets compiled at Seaturtle.org)

Nests Recorded	2008	2009	2010	2011	2012	2013	2014	2015	2016
Georgia	1,649	998	1,760	1,992	2,241	2,289	1,196	2,319	3,265
South Carolina	4,500	2,182	3,141	4,015	4,615	5,193	2,083	5,104	6,443
North Carolina	841	302	856	950	1,074	1,260	542	1,254	1,612
Total	**6,990**	**3,472**	**5,757**	**6,957**	**7,930**	**8,742**	**3,821**	**8,677**	**11,320**

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 2009-2012, and 2012 shows the highest index nesting total since the start of the program (Figure 3.3).

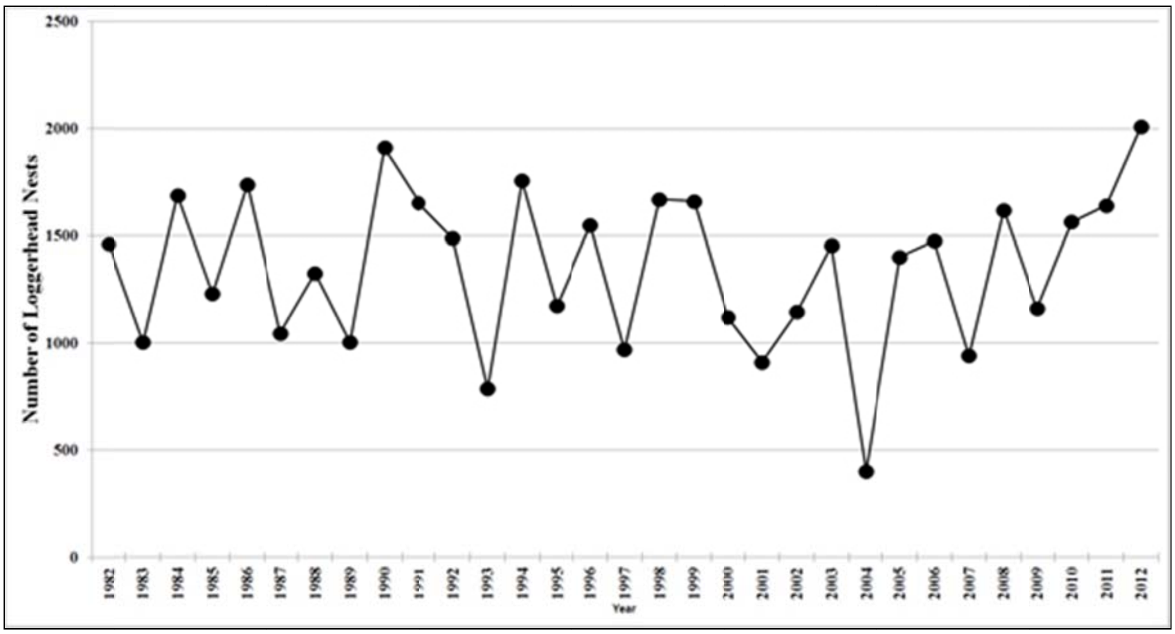

Figure 3.3. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website: http://www.dnr.sc.gov/seaturtle/nest.htm)

<u>Other Northwest Atlantic DPS Recovery Units</u>

The remaining 3 recovery units—Dry Tortugas (DTRU), Northern Gulf of Mexico (NGMRU), and Greater Caribbean (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 2009a). Past in-water studies throughout the eastern United States, however, indicated a substantial decrease in the abundance of the smallest oceanic/neritic juvenile loggerheads, a pattern corroborated by stranding data (TEWG 2009a), but newer analysis is needed to determine if this pattern still applies.

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 2009a). 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 2009a). 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 2009a). 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 3.2.1. 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. 2009a).

Regarding the impacts of pollution, loggerheads may be particularly affected by organochlorine contaminants; they have the highest organochlorine concentrations (Storelli et al. 2008a) and metal loads (D'Ilio et al. 2011) in sampled tissues among the sea turtle species. It is thought that food choices were likely to be the main differentiating factor among sea turtle species. Storelli et al. (2008a) 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. 1991b).

While oil spill impacts are discussed generally for all species in Section 3.2.1, 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 2015). 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.

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 NGMRU), 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 NGMRU 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 locations 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).

3.2.3 Green Sea Turtles

Information Relevant to All 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 distinct population segments (DPSs) (81 FR 20057). The Mediterranean, Central West Pacific, and Central South Pacific DPSs were listed as endangered. The North Atlantic, South Atlantic, Southwest Indian, North Indian, East Indian-West Pacific, Southwest Pacific, Central North Pacific, and East Pacific were listed as threatened. For the purposes of this consultation, only the South Atlantic DPS (SA DPS) and North Atlantic DPS (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.

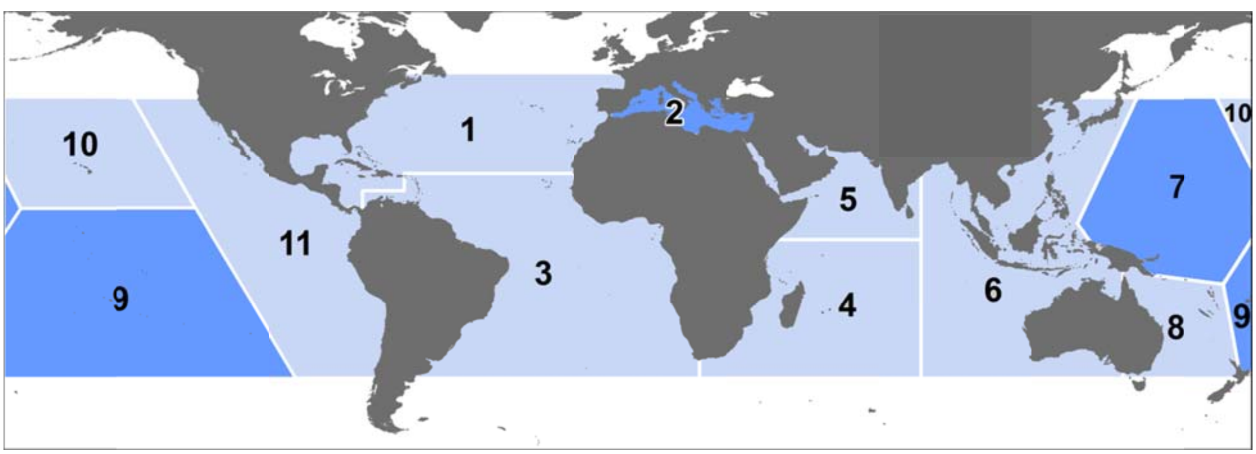

Figure 3.4. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11. East Pacific.

Species Description and Distribution
The green sea turtle is the largest of the hardshell marine turtles, growing to a weight of 350 lb (159 kg) with a straight carapace length 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 of the U.S. Caribbean foraging grounds come from which DPS.

<u>North Atlantic DPS Distribution</u>
The NA DPS boundary is illustrated in Figure 3.5. 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.A. 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 1991). 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 3.5, 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 inches (5 cm) in length and weigh approximately 0.9 ounces (25 grams). 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 inches (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 inches (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. 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.

North Atlantic DPS

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).

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 United States, green sea turtle nesting occurs along the Atlantic coast, primarily along the central and southeast coast of Florida where an estimated 200-1,100 females nest each year (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 (nesting databases maintained on www.seaturtle.org).

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 3.5). According to data collected from Florida’s index nesting beach survey from 1989-2015, green sea turtle nest counts across Florida have increased approximately ten-fold from a low of 267 in the early 1990s to a high of 27,975 in 2015. 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 3.5). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more has resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9%.

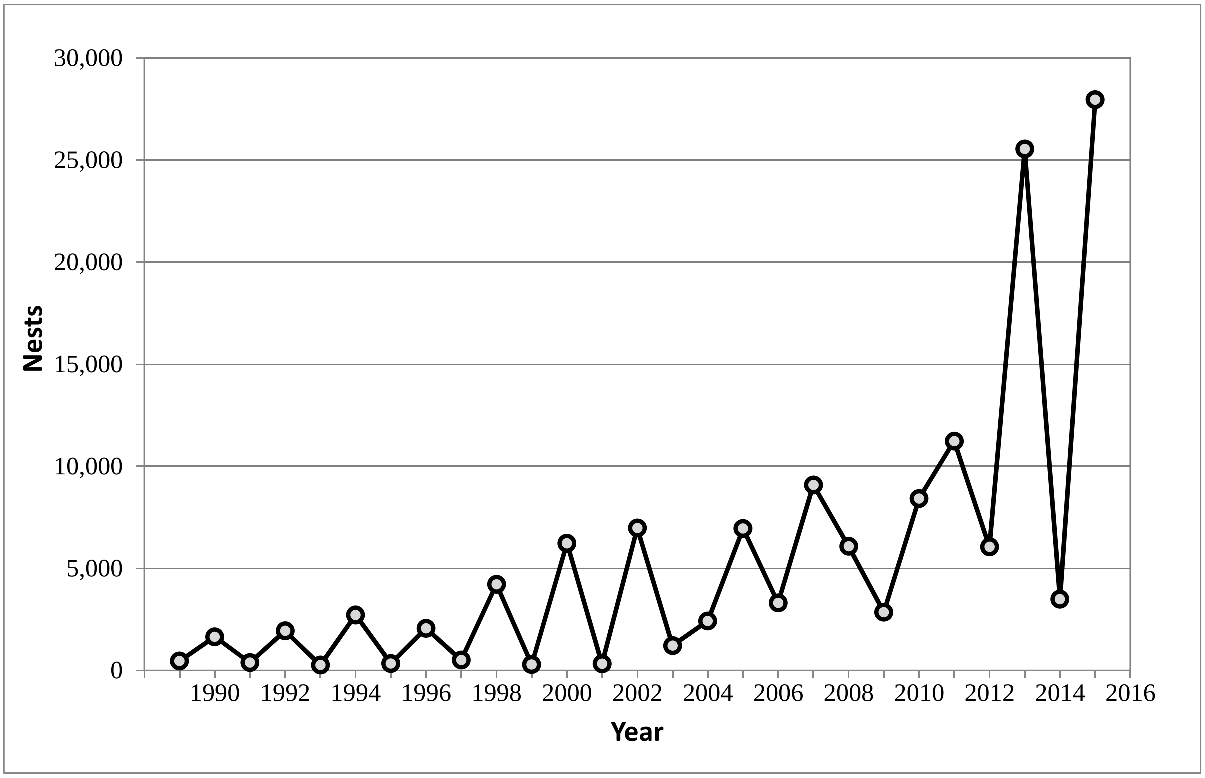

Figure 3.5. Green sea turtle nesting at Florida index beaches since 1989

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% 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, unpubl. 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, Aves Island (Venezuela), and Galibi (Suriname) appear to be increasing. Others such as Trindade (Brazil), Atol das Rocas (Brazil), and Poilão 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 United States, 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 3.2.1.

In addition to general threats, green sea turtles are susceptible to natural mortality from Fibropapillomatosis (FP) disease. 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 inches (0.1 cm) to greater than 11.81 inches (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°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 3.2.1, 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 juveniles 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 fate of which is unknown) (DWH Trustees 2015). 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 Deepwater Horizon oil spill of 2010 (DWH), 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 2015).

3.2.4 Smalltooth Sawfish U.S. DPS

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 has an extended snout with a long, narrow, flattened, rostral blade (rostrum) with a series of transverse teeth along either edge. In general, smalltooth sawfish inhabit shallow coastal waters of warm seas throughout the world and feed on a variety of small fish (e.g., mullet, jacks, and ladyfish) (Simpfendorfer 2001), and crustaceans (e.g., shrimp and crabs) (Bigelow and Schroeder 1953; Norman and Fraser 1937).

Although this species is reported to have a circumtropical distribution, NMFS identified smalltooth sawfish from the Southeast United States as a distinct population segment (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 United States, smalltooth sawfish have been captured in estuarine and coastal waters from New York southward through Texas, although peninsular Florida has historically been the region of the United States with the largest number of recorded captures (NMFS 2000). Recent records indicate there is a resident reproducing population of smalltooth sawfish in south and southwest Florida from Charlotte Harbor through the Dry Tortugas, 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 16-18°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 adults (over 10 ft) that likely represent seasonal migrants, wanderers, or colonizers from a historic Florida core population(s) to the south, rather than being members of a continuous, even-density population (Bigelow and Schroeder 1953).

Life History Information

Smalltooth sawfish fertilization is internal and females give birth to live young. The brood size, gestation period, and frequency of reproduction are unknown for smalltooth sawfish. Therefore, data from the closely related (in terms of size and body morphology) largetooth sawfish represent our best estimates of these parameters. The largetooth sawfish likely reproduces every other year, has a gestation period of approximately 5 months, and produces a mean of 7.3 offspring per brood, with a range of 1-13 offspring (Thorson 1976). Smalltooth sawfish are approximately 31 in (80 cm) at birth and may grow to a length of 18 ft (548 cm) or greater during their lifetime (Bigelow and Schroeder 1953; Simpfendorfer 2002). 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. By contrast, very little information exists on size classes other than juveniles, which make up the majority of sawfish encounters; therefore, much uncertainty remains in estimating life history parameters for smalltooth sawfish, especially as it relates to age at maturity and post-juvenile growth rates. Based on age and growth studies of the largetooth sawfish (Thorson 1982) and research by Simpfendorfer (2000), the smalltooth sawfish is likely a slow-growing (with the exception of early juveniles), late-maturing (10-20 years) species with a long lifespan (30-60 years). Juvenile growth rates presented by Simpfendorfer et al. (2008) suggest smalltooth sawfish are growing faster than previously thought and therefore may reach sexual maturity at an earlier age.

There are distinct differences in habitat use based on life history stage. Juvenile smalltooth sawfish, those up to 3 years of age or approximately 8 ft in length (Simpfendorfer et al. 2008), inhabit the shallow waters of estuaries and can be found in sheltered bays, dredged canals, along banks and sandbars, and in rivers (NMFS 2000). Juvenile smalltooth sawfish occur in euryhaline waters (i.e., waters with a wide range of salinities) and are often closely associated with muddy or sandy substrates, and shorelines containing red mangroves, *Rhizophora mangle* (Simpfendorfer 2001; Simpfendorfer 2003). Tracking data from the Caloosahatchee River in Florida indicate very shallow depths and salinity are important abiotic factors influencing juvenile smalltooth sawfish movement patterns, habitat use, and distribution (Simpfendorfer et al. 2011). Another recent acoustic tagging study in a developed region of Charlotte Harbor, Florida, identified the importance of mangroves in close proximity to shallow water habitat for juvenile smalltooth sawfish, stating that juveniles generally occur in shallow water within 328 ft (100 m) of mangrove shorelines, generally red mangroves (Simpfendorfer et al. 2010). Juvenile smalltooth sawfish spend the majority of their time in waters less than 13 ft (4 m) in depth

(Simpfendorfer et al. 2010) and are seldom found in depths greater than 32 ft (10 m) (Poulakis and Seitz 2004). Simpfendorfer et al. (2010) also indicated developmental differences in habitat use: the smallest juveniles (young-of-the-year juveniles measuring < 100 cm in length) generally used water depths less than 0.5 m (1.64 ft), had small home ranges (4,264-4,557 m^2), 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 and eventually reach sexual maturity.

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 2012; Poulakis et al. 2011). These 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. 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).

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). Even so, NMFS believes adult smalltooth sawfish use shallow estuarine habitats during parturition (when adult females return to shallow estuaries to pup) because very young juveniles still containing rostral sheaths are captured in these areas. Since very young juveniles have high site fidelities, we hypothesize that they are birthed nearby or in their nursery habitats.

Status and Populations Dynamics

Few long-term abundance data exist for the smalltooth sawfish, making it very difficult to estimate the current population size. Simpfendorfer (2001) estimated that the U.S. population may number less than 5% of historic levels, based on anecdotal data and the fact that the species' range has contracted by nearly 90%, with south and southwest Florida the only areas known to support a reproducing population. Since actual abundance data are limited, researchers have begun to compile capture and sightings data (collectively referred to as encounter data) in the International Sawfish Encounter Database (ISED) that was developed in 2000. Although this data cannot be used to assess the population because of the opportunistic nature in which they are collected (i.e., encounter data are a series of random occurrences rather than an evenly distributed search over a defined period of time), researchers can use this database to assess the spatial and temporal distribution of smalltooth sawfish. We expect that as the population grows, the geographic range of encounters will also increase. Since the conception of the ISED, over 3,000 smalltooth sawfish encounters have been reported and compiled in the encounter database (ISED 2014).

Despite the lack of scientific data on abundance, recent encounters with young-of-the-year, older juveniles, and sexually mature smalltooth sawfish indicate that the U.S. population is currently reproducing (Seitz and Poulakis 2002; Simpfendorfer 2003). The abundance of juveniles encountered, 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) indicate a slightly increasing trend in abundance within the park over the past decade (Carlson and Osborne 2012; Carlson et al. 2007). 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[3] of population increase, suggest that the species is particularly vulnerable to excessive mortality and rapid population declines, after which recovery may take decades.

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) and citations therein). 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 United States (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). 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

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

than 500 square feet in mesh area in nearshore and inshore Florida waters"[4] (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 fishers. Encounter data (ISED 2014) and past research (Caldwell 1990) document that rostrums are sometimes removed from smalltooth sawfish caught by recreational fishers, 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.

<u>Habitat Loss</u>

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 United States (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 United States, of which approximately 2,450 acres were intertidal wetlands consisting of mangroves or other estuarine shrubs (Stedman 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 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. 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.

<u>Life History Limitations</u>

The smalltooth sawfish is also limited by its life history characteristics as a slow-growing, relatively late-maturing, and long-lived species. Animals using this life history strategy are

[4] "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.

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). More recent data suggest smalltooth sawfish may mature earlier than previously thought, meaning rates of population increase could be higher and recovery times shorter than those currently reported (Simpfendorfer et al. 2008).

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 has stated that global climate change is unequivocal (IPCC 2007) and its impacts to coastal resources may be significant. 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. We know that the coastal habitats that contain red mangroves and shallow, euryhaline waters will be directly impacted by climate change through sea level rise, which is expected to exceed 1 meter globally by 2100 according to Meehl et al. (2007), Pfeffer et al. (2008), and Vermeer and Rahmstorf (2009). 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.

4.0 Environmental Baseline

This section describes the effects of past and ongoing human and natural factors contributing to the current status of the species, their habitats (including designated critical habitat), and ecosystem within the action area, without the additional effects of the proposed action. In the case of ongoing actions, this section includes the effects that may contribute to the projected future status of the species, their habitats and ecosystems. The environmental baseline describes a species' and habitat's health based on information available at the time of this consultation.

By regulation (50 CFR 402.02), environmental baselines for Biological Opinions include the past and present impacts of all state, federal, or private actions and other human activities in or having effects in, the action area. We identify the anticipated impacts of all proposed federal projects in the specific action area of the consultation at issue, that have already undergone formal or early Section 7 consultation (as defined in 50 CFR 402.11), as well as the impact of state or private actions, or the impacts of natural phenomena, which are concurrent with the consultation in process (50 CFR 402.02).

Focusing on the impacts of the activities in the action area specifically allows us to assess the prior experience and state (or condition) of the endangered and threatened individuals, and areas of designated critical habitat that occur in an action area, and that will be exposed to effects from the action under consultation. This is important because, in some states or life history stages, or areas of their ranges, listed individuals or critical habitat features will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be in other states, stages, or areas within their distributions. 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 in the Action Area

As stated in Section 2, the proposed action would occur in the Indian River Lagoon waters of the coast of Florida, in Riverside Park in Vero Beach (Section 2).

Sea Turtles

Based on the information discussed above, and their habitat and eating preferences, and research conducted by Ehrhart et al. (2007), loggerhead and green sea turtles may be located in the action area and may be affected by the recreational fishing activities. All of these species are migratory, traveling for forage grounds or reproduction purposes. The nearshore waters of and around the Vero Beach area, in the Indian River Lagoon, may be used by these sea turtles as post-hatchling developmental habitat or foraging habitat. These same individuals may eventually migrate into offshore waters, as well as other areas of the Gulf of Mexico, Caribbean Sea, and North Atlantic Ocean at certain times of the year, and thus may be impacted by activities occurring there; therefore, turtles in the action area are exposed to threats discussed in Section 3.3. Sea turtle nesting also occurs along the eastern ocean coast of Florida, but not in the lagoon coastal habitat. The status of the species of sea turtles (including the DPSs where applicable) in the action area, as well as the threats to these species, are best reflected in their range-wide statuses and supported by the species accounts in Section 3 (Status of Species).

Smalltooth Sawfish
Based on data from the International Sawfish Encounter Database, juvenile to large smalltooth sawfish are most likely to be found in the action area, although at least one very small individual has also been recorded. Historically, the Indian River Lagoon (the body of water in which the pier is proposed to be built) was an area of smalltooth sawfish abundance. Goode (1884) reported that in "the Indian River and its tributaries the Sawfish is said to be very common" and Evermann and Bean (1898) noted the sawfish was "an abundant species," with a single commercial fisher having captured 300 smalltooth sawfish in a single fishing season. However, based on the International Sawfish Encounter Database, current records from the east coast of Florida remain relatively scarce (particularly compared to the west coast, Florida Bay, and the Florida Keys). Most of the encounter records for the east coast are for larger sized animals occurring along the beaches and at offshore reefs, but more recently a few smaller juvenile-sized individuals have been reported inside the Indian River Lagoon system (Simpfendorfer and Wiley 2005); Simpfendorfer unpublished; Poulakis and Seitz unpublished data). Many life stages and associated behaviors potentially occur in the action area (or adjacent to it) and are subject to threats which have caused the species endangered listing status. The status of smalltooth sawfish in the action area, as well as the threats to this species, is supported by the species account in Section 3.

4.2 Factors Affecting Sea Turtles and Smalltooth Sawfish in the Action Area

The following analysis examines actions that may affect these species or their environments specifically within the action area. Sea turtles found in the immediate project area may travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea, and individuals found in the action area can potentially be affected by activities anywhere within this wide range. Smalltooth sawfish may move up and down the Florida coast and may also be affected by activities within that range. These impacts outside of the action area are discussed and incorporated as part of the overall status of the species as detailed in Status of Species section, above. The activities that shape the environmental baseline for sea turtles and smalltooth sawfish in the action area (which is relatively small) of this consultation are primarily state authorized fishing, vessel operations, stochastic events, marine pollution, and climate change.

Federal Actions

A search of NMFS records, found no projects in the action area that have undergone Section 7 consultation.

Other fishing piers (outside of the action area) that also require federal permits have been subject to formal consultation, resulting in Biological Opinions and measures to minimize the impact of associated take. Those consultations generally found fishing piers adversely affect sea turtles and smalltooth sawfish via incidental hooking and entanglement by actively fished lines, discarded remnant, or broken-off fishing lines, and/or other debris.

State or Private Actions

State Authorized Fishing

Recreational fishing as regulated by the state of Florida can affect protected species or their habitats within the action area. Pressure from recreational fishing around the action area is likely to continue even without the proposed pier and at levels that are hard to quantify.

Commercial state fisheries are located in the nearshore habitat areas, though outside of the action area for this project.

Recreational fishing from private vessels may occur in the area. Observations of state recreational fisheries have shown that loggerhead and green sea turtles are known to bite baited hooks and frequently ingest the hooks. Hooked turtles and sawfish have been reported 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. Additionally, lost fishing gear such as line cut after snagging on rocks, or discarded hooks and line, can also pose an entanglement threat to species in the area. A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the Southeast Fisheries Science Center (SEFSC) Turtle Expert Working Group (TEWG) reports (TEWG 1998a; TEWG 2000a).

Private and Commercial Vessel Operations

Private and commercial vessels, including fishing vessels, operating in or on the edge of the action area of this consultation also have the potential to interact with ESA-listed species. Vero Beach City Marina is located just north of the action area. The effects of fishing vessels, recreational vessels, or other types of commercial vessels on listed species may involve disturbance or injury/mortality due to collisions or entanglement in anchor lines. Watercraft are the greatest contributors to overall noise in the sea and have the potential to interact with sea turtles though direct impacts or propellers. Sound levels and tones produced are generally related to vessel size and speed. Larger vessels generally emit more sound than smaller vessels, and vessels underway with a full load, or those pushing or towing a load, are noisier than unladen vessels. Vessels operating at high speeds have the potential to strike sea turtles. The Sea Turtle Stranding and Salvage Network (STSSN) includes many records of vessel interaction (propeller injury) with sea turtles in coastal states such as Florida, where there are high levels of vessel traffic. The extent of the problem is difficult to assess because of not knowing whether the majority of sea turtles are struck pre- or post-mortem. It is important to note that although minor vessel collisions may not kill an animal directly, they may weaken or otherwise affect an animal, which makes it more likely to become vulnerable to effects such as entanglements.

Other Potential Sources of Impacts in the Environmental Baseline

Stochastic events

Stochastic (i.e., random) events, such as hurricanes, occur in Florida and can affect sea turtles and smalltooth sawfish in the action area. These events are by nature unpredictable, and their effect on the recovery of the 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. Other stochastic events, such as cold snaps like the one that occurred in January 2010, can kill smalltooth sawfish (Poulakis et al. 2011) and also sea turtles.

Marine Pollution

Coastal runoff, marina and dock construction, dredging, aquaculture, and other activities can degrade marine habitats used by sea turtles (Colburn et al. 1996) and smalltooth sawfish, and affect the species via these impacts to their habitats. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. Although these contaminant concentrations are unknown in the action area, the species of sea turtles and smalltooth sawfish analyzed in this Opinion travel throughout the Indian River Lagoon and may be exposed to and accumulate these contaminants during their life cycles.

Some sources of marine pollution that indirectly affect sea turtles in the action area are difficult to attribute to a specific federal, state, local or private action. Sources of pollutants include atmospheric loading of pollutants such as PCBs and storm water runoff from coastal towns and cities into rivers and canals emptying into bays and the ocean. There are studies on organic contaminants and trace metal accumulation in green, leatherback, and loggerhead sea turtles (Aguirre et al. 1994; Caurant et al. 1999; Corsolini et al. 2000). McKenzie et al. (1999) measured concentrations of chlorobiphenyls and organochlorine pesticides in sea turtles tissues collected from the Mediterranean (Cyprus, Greece) and European Atlantic waters (Scotland) between 1994 and 1996. Omnivorous loggerhead turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles (Storelli et al. 2008b). It is thought that dietary preferences were likely to be the main differentiating factor among species. Decreasing lipid contaminant burdens with sea turtle size were observed in green turtles, most likely attributable to a change in diet with age. (Sakai et al. 1995) documented the presence of metal residues occurring in loggerhead sea turtle organs and eggs. Storelli et al. (1998) analyzed tissues from 12 loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that characteristically, 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. 1991a). No information on detrimental threshold concentrations is available and little is known about the consequences of exposure of organochlorine compounds to sea turtles. Research is needed into how chlorobiphenyl, organochlorine, and heavy-metal accumulation effect the short- and long-term health of sea turtles and what effect those chemicals have on the number of eggs laid by females. More information is needed to understand the potential impacts of marine pollution in the action area.

Nutrient loading from land-based sources, such as coastal communities, stimulate plankton blooms in closed or semi-closed estuarine systems. For example, oxygen depletion, referred to as hypoxia, can negatively impact sea turtles' habitats, prey availability, and survival and reproductive fitness.

Climate Change

As discussed earlier in this Opinion, there is a large and growing body of literature on past, present, and future impacts of global climate change. Potential effects commonly mentioned include changes in sea temperatures and salinity (due to melting ice and increased rainfall), ocean currents, storm frequency and weather patterns, and ocean acidification. These changes have the potential to affect species behavior and ecology including migration, foraging, reproduction (e.g., success), and distribution. For example, sea turtles currently range from temperate to tropical waters. A change in water temperature could result in a shift or modification of range. Climate change may also affect marine forage species, either negatively or positively (the exact effects for the marine food web upon which sea turtles rely is unclear, and may vary between species). It may also affect migratory behavior (e.g., timing, length of stay at certain locations). These types of changes could have implications for sea turtle and sawfish recovery.

Additional discussion of climate change can be found in the Status of the Species. However, to summarize with regards to the action area, global climate change may affect the timing and extent of population movements and their range, distribution, species composition of prey, and the range and abundance of competitors and predators. Changes in distribution including displacement from ideal habitats, decline in fitness of individuals, population size due to the potential loss of foraging opportunities, abundance, migration, community structure, susceptibility to disease and contaminants, and reproductive success are all possible impacts that may occur as the result of climate change. Still, more information is needed to better determine the full and entire suite of impacts of climate change on sea turtles and sawfish and specific predictions regarding impacts in the action area are not currently possible.

Conservation and Recovery Actions Shaping the Environmental Baseline
NMFS and cooperating states have established an extensive network of STSSN participants along the Atlantic and Gulf of Mexico coasts that not only collect data on dead sea turtles, but also rescue and rehabilitate any live stranded sea turtles. Similarly, the Florida Program for Shark Research at the Florida Museum of Natural History operates and maintains a sawfish encounter database that monitors the population of smalltooth sawfish in the southeastern United States.

NMFS has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles from commercial fisheries near the action area. These include sea turtle release gear requirements for the South Atlantic snapper-grouper fishery and TED requirements for the Southeast shrimp trawl fisheries. In addition to regulations, outreach programs have been established and data on sea turtle interactions with recreational fisheries has been collected through the Marine Recreational Fishery Statistical Survey/Marine Recreational Information Program.

NMFS published a Final Rule (66 FR 67495, December 31, 2001) detailing handling and resuscitation techniques for sea turtles that are incidentally caught during scientific research or fishing activities. Persons participating in fishing activities or scientific research are required to handle and resuscitate (as necessary) sea turtles as prescribed in the Final Rule. These measures help to prevent mortality of hardshell turtles caught in fishing or scientific research gear.

A Final Rule (70 FR 42508) published on July 25, 2005, allows any agent or employee of NMFS, the USFWS, the USCG, or any other federal land or water management agency, or any agent or employee of a state agency responsible for fish and wildlife, when acting in the course of his or her official duties, to take endangered sea turtles encountered in the marine environment if such taking is necessary to aid a sick, injured, or entangled endangered sea turtle, or dispose of a dead endangered sea turtle, or salvage a dead endangered sea turtle that may be useful for scientific or educational purposes. NMFS already affords the same protection to sea turtles listed as threatened under the ESA [50 CFR 223.206(b)].

NMFS, with the Smalltooth Sawfish Recovery Team, developed guidelines to fishermen telling them how to safely handle and release any sawfish they catch. Some states have taken additional steps to protect this species. Florida, Louisiana, and Texas have prohibited the "take" of sawfish. Florida's existing ban on the use of gill nets in state waters is an important conservation tool. Three National Wildlife Refuges in Florida also protect their habitat.

5.0 Effects of the Action

Regulations implementing section 7(a)(2) of the ESA require biological opinions to evaluate the direct and indirect effects of federal actions to determine if it would be reasonable to expect them to appreciably reduce listed species' likelihood of surviving and recovering in the wild by reducing their reproduction, numbers, or distribution (16 U.S.C. 1536; 50 CFR 402.02). The term "species" includes any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature. Section 7 of the ESA and its implementing regulations also require (as applicable) biological opinions to determine if federal actions would appreciably diminish the value of critical habitat for the survival and recovery of listed species (16 U.S.C. 1536; 50 CFR 402.02).

In this section of the Opinion we assess the direct and indirect effects of the proposed action, as well as the effect of activities that are interrelated or interdependent, on green and loggerhead sea turtles and smalltooth sawfish. Indirect effects are those that are caused later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR 402.02). No interrelated or interdependent actions were identified for analysis in this Opinion.

Conservative Decisions- Providing the Benefit of the Doubt to the Species
The analysis in this section is based upon the best available commercial and scientific data on sea turtle biology, smalltooth sawfish biology, and the effects of the proposed action. However, there can be instances where there is limited information upon which to make a determination. In those cases, in keeping with the direction from the U.S. Congress to provide the "benefit of the doubt" to threatened and endangered species [House of Representatives Conference Report No. 697, 96th Congress, Second Session, 12 (1979)], we will generally make determinations which provide the most conservative (conservation oriented) outcome for listed species.

5.1 Stressors

In order to assess the effects of the proposed action, we must first identify the "stressors" or components of the action that could adversely affect the sea turtles and sawfish that are the subject of this consultation. The proposed action that would be permitted by the Corps would subject the loggerhead and green sea turtles, as well as smalltooth sawfish to the following activities that could adversely affect them: 1) capture and/or entanglement (hooks and line) in fishing gear; and 2) handling to remove animals from gear. (Details on how these stressors would affect the species are found in section 5.3.)

Please note that potential impacts from vessel and mechanical construction operations and pile installation associated with the proposed action were addressed in Section 3 and will not be repeated here.

5.2 Exposure

Exposure analyses identify the co-occurrence of ESA-listed species with the actions' stressors (and their effects) in space and time, and identify the nature of that co-occurrence. The analysis identifies, as possible, the number, age or life stage, and gender of the individuals likely to be exposed to the actions' effects and the population(s) or subpopulations(s) those individuals represent. Smalltooth sawfish of both genders and any age class could be exposed to stressors associated with the proposed action. Adult, sub-adult, and juvenile sea turtles of both genders could be exposed to the stressors. Hatchlings are not expected to be affected.

In the subsections below, we estimate the number of each species that is likely to be incidentally taken in the future. Limited information is available for fishing pier interactions for the action area. Some information is available from piers, but significant miles away. Additionally, sea turtle and sawfish reports for interactions with fishing from shore or boats in the area exist, as does information on species captured during scientific research approximately 13 miles north of the proposed action area. While a limited and likely an incomplete representation of interactions that may be occurring, this information represents the best available.

First, historical take information is presented and catch per year for each species is calculated. These numbers are then used to estimate future take.

5.2.1 Historical Recorded Endangered Species Interactions

Sea Turtles

The proposed action would construct a new pier, thus there is no historical data at the site (e.g., from an existing pier) from which to infer future take. Therefore, we sought data from reported fishing interactions from nearby locations in the Indian River Lagoon including the lagoon system inlets from the Atlantic Ocean in our stranding network records. We queried the data and found only 3 reported sea turtle interactions from 2009 to 2015 with fishing gear in the Indian River Lagoon system, including inlets of the lagoon from the Atlantic Ocean, between Sebastian Inlet and Fort Pierce Inlet. The inlets are separated by approximately 32 miles. The proposed action area lies halfway between these to these two entrances to the sea (approximately 16 miles from each). All 3 interactions were north of the proposed action area, near Sebastian Inlet. The interactions occurred just inside the inlet entering the Lagoon. Two were caught on the south side of Sebastian Inlet under the south catwalk of the bridge. The other was caught in Sebastian Inlet State Park. The next closest recorded sea turtle interaction (1 animal) to the north was at Eau Gallie Yacht Basin in the Lagoon, 37 miles from the proposed action area, and was from a pier (or right next to it). The next closest reports (2 animals) were at Cape Canaveral, approximately 56 miles north of the proposed action area. Those animals were caught from the shore of the Lagoon, but in the vicinity of a fishing pier. One additional report further north exists for an interaction on the south side of Ponce Inlet to the Lagoon, approximately 104 miles north of the proposed action area.

There are no recorded sea turtle interactions to the south of the proposed action area in the Lagoon. There are interactions past the Jupiter Inlet, however it is beyond the Indian River Lagoon system.

We sought a way to cautiously (in favor of the species) estimate the potential number of turtles that could interact with fishing from the proposed pier. The action area represents a very small portion of the entire Indian River Lagoon system. The system spans approximately 156 miles from Ponce de Leon Inlet in Mosquito Lagoon to Jupiter Inlet near West Palm Beach. The proposed pier would extend 108 ft into the Indian River Lagoon, and effects from fishing would extend the distance fishing gear would be cast or set from it, as well as any effects from discarded gear in its vicinity. Since the proposed action area is in the Indian River Lagoon, we believe that considering any fishing interactions (near a pier or not) in the entire lagoon system would reflect interactions that could potentially occur (analyzing conservatively) at the proposed pier location. We believe these interactions provide comparable data, because they are located in the same geographic vicinity of the proposed action area and the proposed action would occur in the same type of habitat. The interactions are provided in Table 5.1.

Table 5.1   Sea Turtle Interactions with Fishing Gear North of Proposed Action Area Within the Indian River Lagoon System, from closest to the proposed pier to furthest away (Each Is An Individual Reported Interaction)

Species	Year	Location
Green	2012	Sebastian Inlet
Green	2012	Sebastian Inlet
Green	2015	Sebastian Inlet
Green	2012	Eau Gallie Yacht Basin
Loggerhead	2009	Cape Canaveral
Green	2012	Cape Canaveral
Green	2014	Ponce de Leon Inlet

Source: NMFS Unpublished Database Data

Between 2009 and 2015, seven sea turtles were reported caught in fishing line gear. On average, that is 1 interaction reported per year (7 interactions/7 years = 1) in the Indian River Lagoon system.

Species Composition

The best information available regarding loggerhead and green sea turtle composition in the lagoon area where the proposed action would occur is from sea turtle in-water research conducted by the University of Central Florida (Ehrhart et al. 2007). Their research provides NMFS with scientifically based information on sea turtle species composition in the lagoon. As discussed in Section 3.1.1, researchers conducted a multiyear study that scientifically sampled turtles using the lagoon by capturing the turtles in nets and identifying them. The researchers' data allowed them to determine which species (relative percentage) are present and actively using the Lagoon system. From July 2, 1982, through February 3, 2006, 957 loggerheads and 2,543 green turtles were captured at the South Bay study site in the Indian River Lagoon, approximately 12 miles north of the location of the proposed pier. Of those, 716 of the 957 loggerhead captures (74.8%) and 2,217 of the 2,453 green turtle captures (87.2%) were initial captures (meaning they represented the first time the species was captured, before it was tagged); the remainder were turtles recaptured one or more times (as known through tagging data) (Ehrhart et al. 2007). Only initial captures are used to assess species composition (to avoid double, triple, etc. counting the same animal). The percentage of each species is provided in the following table.

Table 5.2 Loggerhead and Green Sea Turtles Captured During University of Central Florida Research

Species	Number
Loggerhead	716
Green	2,217
TOTAL	2,933

The reported fishery interaction data from the sea turtle stranding network for the Indian River Lagoon system between 2009 and 2015, previously discussed (Table 5.1), indicates that a total of 1 loggerhead (14%) and 6 green (86%) sea turtles were caught by fishing gear. This data is a good indicator of potential interactions with fishing gear at a fishing pier, as it reflects actual fishing activity. However, the University of Central Florida research study is more accurate in assessing what species composition is in the lagoon system. The study was specifically designed (using proven net technology) for turtle sampling to learn what species occur in the lagoon, and the data is robust (large sample size), thus we use the data they report to estimate species' composition and assume that approximately 75.6% of the animals taken will be green sea turtles and 24.4% loggerhead sea turtles. While the researchers also captured 3 Kemp's ridley sea turtles, we believe that it is extremely unlikely that Kemp's ridley will be encountered off the fishing pier (only 3 animals were captured in the Indian River Lagoon in over 23 years by gear used with the specific purpose of catching sea turtles). Additionally, it is very unlikely this species will interact with gear at the pier (there are no fishery interaction reports for this species in the Indian River Lagoon from the STSSN). We believe the likelihood of interaction with the Kemp's ridley is extremely low. Thus, as we concluded above, we think the pier will have a discountable effect on these species. For this reason, we have excluded these three encounters when evaluating the composition of the species likely to be encountered at the fishing pier (excluding Kemp's ridley does not significantly affect the calculations).

Smalltooth Sawfish

As just discussed in the preceding section, given that the proposed action would construct a new pier, we do not have historical data at the site from which to infer future take for smalltooth sawfish. Therefore, we sought data from reported fishing activity from nearby locations in our records. We queried the International Sawfish Encounter Database (ISED) and found 28 fishing interactions reported between 2001 and 2013 for the entire Indian River Lagoon system.

We sought a way to cautiously (in favor of the species) estimate the potential number of smalltooth sawfish that could interact with fishing from the proposed pier. The action area represents a very small portion of the entire Indian River Lagoon system. The system spans approximately 156 miles from Ponce de Leon Inlet in Mosquito Lagoon to Jupiter Inlet near West Palm Beach. Recorded interactions have occurred throughout the entire length of the system. The proposed pier would extend 108 ft into the lagoon, and effects from fishing would extend the distance fishing gear would be cast or set from it, as well as any effects from discarded gear in its vicinity. Since the proposed action area is in the Indian River Lagoon, we believe that considering any fishing interactions (near a pier or not) in the entire lagoon system would reflect interactions that could potentially (analyzing conservatively) occur at the pier location. We believe these interactions provide comparable data, because they are located in the same geographic vicinity of the proposed action area and the proposed action would occur in the same type of habitat. The interactions are provided in the following table.

Table 5.3 Smalltooth Sawfish Interactions with Fishing Gear North and South of Proposed Action Area Within the Indian River Lagoon System (Each Entry Represents One Encounter)

Approximate Location	Year
Cape Canaveral	2005
Sebastian Inlet	2010
Sebastian Inlet	2011
Sebastian Inlet	2010
Sebastian Inlet	2003
Sebastian Inlet	2003
Sebastian Inlet	2003
West of Prang Island	2013
Southeast of St. Lucie	2008
Fort Pierce Inlet	2005
Fort Pierce Inlet	2008
Fort Pierce	2009
Fort Pierce	2010
East of Indian River Estates Hutchinson Island	2010
Hutchinson Island	2010
Jensen Beach	2001
South Hutchinson Island	2010
Jensen Beach	2009
Jensen Beach	2001
Jensen Beach	2006
St Lucie River	2013
St Lucie River	2013
St. Lucie Inlet	2009
St. Lucie Inlet	2010
St. Lucie Inlet	2013
St. Lucie Inlet	2008
St. Lucie Inlet	2013
North of Corset Island	2013

Source: NMFS Unpublished Database Data

Some, but not all, of these interactions are from piers (or close to them). However, even those that are not from a pier provide useful information to conservatively estimate possible fishery interactions that could occur at the proposed pier location at Vero Beach.

Between 2001 and 2013, 28 smalltooth sawfish were caught in fishing gear. Therefore, on average, 3 reported interactions per year occur in the Indian River Lagoon (28 interactions/13 years = 2.2, rounded to 3).

5.2.2 Future Estimated Take

Sea Turtles
As very little information regarding sea turtle interactions with fishing gear from actual piers in the Indian River Lagoon is available, in order to conduct a conservative analysis (in favor of the species), we assume that fishing activity at the proposed pier could result in 1 reported interaction per year. This is based on historical information that suggests, on average, there is currently 1 sea turtle interaction reported per year in the Indian River Lagoon system. However, we also recognize the need to account for underreporting, especially in areas where education signs are not present.

In 2013, a fishing pier survey was completed at 26 fishing piers in Charlotte Harbor on the west coast of Florida (Hill 2013). During the survey, 93 fishers were asked a series of 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 had ever experienced and reported an encounter. The interviewer also noted conditions about the pier including if educational signs regarding reporting of hook-and-line captures were present at the pier. Interviewed fishers were asked open-ended questions about what they would do if they were to accidently capture a sea turtle or sawfish. Of those interviewed, 46% responded they would cut the line, while 28% would either cut the line or remove the hook depending on the situation, and 22% would try to remove the hook. It was reported that 88% did not know of requirements to report incidental captures of either sea turtles or sawfish and that only 12% stated that they would report an accidently hooked sawfish and only 8% would have reported an accidently hooked sea turtle. This demonstrates the high level of underreporting likely occurring in that area, the lack of awareness regarding reporting, and the lack of educational signs regarding reporting at the piers. We believe that the Charlotte Harbor (Hill 2013) study is an applicable study to determine underreporting in the stranding data because the Charlotte Harbor piers are located in south Florida. In addition, because the pier lacked educational signs and did not have a pier attendant, it is a good study to measure general knowledge of the reporting requirement. While not all sea turtle captures in the Indian River Lagoon were at piers, we believe that underreporting of interactions is occurring in the stranding data and that the rates reported in the Hill (2013) study approximate the general awareness and likelihood of reporting interactions, and thus the approximate level of underreporting of sea turtle actions by fishers in the lagoon. Therefore, we assume 92% underreporting of sea turtle interactions (i.e., the reported interactions represent only 8% of the sea turtles that were hooked accidentally).

If we estimate an average of 1 sea turtle will be captured and reported each year at the pier, based on the 92% underreporting rate, we can assume that the 1 reported incident represents only 8% of the total interactions, which would be 12.5 sea turtles likely captured (92% underreporting of 1 turtle capture per year is (.08)(x)= 1 or 1/.08 = 12.5 total turtles). **This means that a total of 12.5 turtles are expected to be captured at the pier per year.**

Take By Species
In 5.2.1, based on published sea turtle research (Ehrhart et al. 2007), we assumed that approximately 75.6% of the animals taken will be green sea turtles, 24.4% loggerhead sea turtles. **Based on that information, approximately 9.45 green (12.5 x 0.756) and 3.05 (12.5 x 0.244) loggerhead sea turtles could be taken per year from the proposed fishing pier.**

Additionally, two different green sea turtle DPSs could be taken. As discussed in the status of the species (Section 3 of this Opinion), on April 6, 2016, the single species listing was replaced with the listing of 11 DPSs. Individuals from both the NA and SA DPSs can be found in waters where the proposed action would occur. While there are currently no in-depth studies available to determine the percent of NA and SA DPS individuals in any given location, as discussed in Section 3, a study on the foraging grounds off Hutchinson Island, Florida found that approximately 5% of the turtles sampled came from the Aves Island/Suriname nesting assemblage, which is part of the SA DPS. The remaining 95% of the turtles came from nesting areas in the NA DPS. All of the individuals in the study were benthic juveniles. This is only one study, but is recent, is from waters of eastern Florida (near the proposed action area), and represents a reasonable and the best available means of estimating relative occurrence of DPSs in the area. 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, and that any adult animals taken would be from the NA DPS. Since either adult or juveniles animals could occur in the action area, we will rely on the breakdown in the study. We assume that 95% of the animals would come from the NA DPS and 5% from the SA DPS. **Using this information, up to 8.98 (9.45 x 0.95) NA DPS and 0.47 (9.45 x 0.05) SA DPS green sea turtle would be expected to be taken per year from the proposed fishing pier.**

<u>Smalltooth Sawfish</u>
As was the case with sea turtles, minimal information regarding smalltooth sawfish interactions with fishing gear from actual piers in the Indian River Lagoon is available, so in order to conduct a conservative analysis (in favor of the species), we assume that fishing activity at the proposed pier could result in 3 reported smalltooth sawfish interactions per year. This is based on historical information (ISED data) that suggests, on average, there are currently 3 interactions reported per year in the Indian River Lagoon system. However, we also recognize the need to account for underreporting, especially in areas where education signs are not present.

We believe the Hill (2013) related to underreporting can also be applied to the sawfish calculations. Only 12% of fishers stated that they would report an accidently hooked sawfish. This demonstrates the high level of underreporting likely occurring throughout Florida and in the action area, the lack of awareness regarding reporting. We believe that the Charlotte Harbor (Hill 2013) study is an applicable study to determine underreporting, because the Charlotte Harbor piers are located in south Florida. In addition, because the pier lacked educational signs and did not have a pier attendant, it is a good study to measure general knowledge of the reporting requirement. While not all sawfish captures in the Indian River Lagoon were at piers, we believe that underreporting of interactions is occurring and that the rates reported in the Hill (2013) study approximate the general awareness and likelihood of reporting interactions, and thus the approximate level of underreporting of sawfish interactions by fishers in the Indian River Lagoon. Therefore, we assume 88% underreporting of sawfish (i.e., i.e., the reported interactions represent only 12% of the accidently hooked sawfish).

If we estimate an average of 3 smalltooth sawfish will be captured and reported each year at the pier, based on the 88% underreporting rate, then we can assume that the 3 reported incidents represent only 12% of the total interactions, which means that 25 sawfish are likely captured (88% underreporting of 3 sawfish captures per year is (.12)(x)= 3 or 3/.12 = 25 total sawfish). **This means that a total of 25 smalltooth sawfish are expected to be captured at the pier per year.**

<u>**Summary of Expected Take**</u>

Sea Turtles
12.5 turtles are expected to be captured at the pier per year. We expect that both males or females could be captured. Similarly, we expect that adults or subadults could be captured during fishing activities, but no hatchlings. **We expect 10 (rounded from 9.45) green and 4 (rounded from 3.05) loggerhead sea turtles will be taken per year from the proposed fishing pier. The green sea turtles would be composed of up to 9 (rounded from 8.98) NA DPS and 1 (rounded from 0.47) SA DPS animals.**

Smalltooth Sawfish
25 smalltooth sawfish are expected to be captured at the pier per year. We expect that both males and females could be captured. Similarly, we expect that adults, subadults, or small juveniles could be captured during fishing activities.

5.3 Response

5.3.1 Capture and/or Entanglement (Hooks And Line) In Fishing Gear

Sea turtles and smalltooth sawfish may be adversely affected by recreational fishing activity through incidental hooking or entanglement in actively fished or discarded fishing line, as described more fully below. Both groups of species have historically been captured in both recreational and commercial fisheries and are known to become entangled in fishing debris. Most sea turtle captures on rod-and-reel, as reported to the STSSN, have occurred during pier fishing. Fishing piers are suspected to attract sea turtles that learn to forage there for discarded bait and fish carcasses. Sea turtles and smalltooth sawfish are particularly prone to entanglement as a result of their body morphologies and behaviors.

<u>Sea Turtles</u>
Hook-and-line gear commonly used by recreational anglers fishing from fishing piers can adversely affect sea turtles via entanglement, hooking, and trailing line. Records of stranded or entangled sea turtles reveal that fishing gear can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. Sea turtles released alive may later succumb to injuries sustained at the time of capture or from exacerbated trauma from fishing hooks or lines that were ingested, entangled, or otherwise still attached when they were released. Of the sea

turtles hooked or entangled that do not die from their wounds, some may suffer impaired swimming or foraging abilities, altered migratory behavior, and altered breeding or reproductive patterns.

The current understanding of the effects of hook-and-line gear on sea turtles is related primarily to the effects observed in association with commercial fisheries (particularly longline fisheries); few data exist on the effects of recreational fishing on sea turtles. Dead sea turtles found stranded with hooks in their digestive tract have been reported, though it is assumed that most sea turtles hooked by recreational fishers are released alive (Thompson 1991). Little information exists on the frequency of recreational fishing captures and the status of the sea turtles after they are caught. Regardless, effects sea turtles are likely to experience as a result of interactions with recreational hook-and-line gear (i.e., entanglement, hooking, and trailing line) are expected to be the same as those that might occur in commercial fisheries. The following discussion summarizes in greater detail the available information on how individual sea turtles may be affected by interactions with hook-and-line gear.

Hooking

In addition to being entangled in hook-and-line gear, 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). Observer data (not specific to recreational fishing) indicate entanglement and foul-hooking are the primary forms of gear interactions with leatherback sea turtles, whereas internal hooking is much more prevalent in hardshell sea turtles, especially loggerheads (NMFS unpublished data). Almost all interactions with loggerheads result from the turtle taking the bait and hook; only a very small percentage of loggerheads are foul-hooked externally or entangled.

Swallowed hooks are of the greatest concern. 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 a hook does not lodge into, or pierce, a sea turtle’s digestive organs, it can pass through the sea turtle 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.

Trailing Line
Trailing line (i.e., line left on a sea turtle after it has been captured and released), particularly line trailing from a swallowed hook, 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 likely to entangle the sea turtle, eventually, leading to impaired movement, constriction wounds, and potentially death. If an individual sea turtle is entangled when young, the fishing line can become tighter and more constricting as the individual grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage.

Expected Mortalities
The injury to sea turtles from hook-and-line captures and ultimately the post-release mortality (PRM) will depend on numerous factors including how deeply the hook is embedded, whether it was swallowed or was an external hooking, whether the sea turtle was released with trailing line, and how soon and how effectively the hooked sea turtle was de-hooked or otherwise cut loose and released.

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. If that cannot 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. We have no way of estimating how many will break free with trailing line and/or ingested or embedded hooks. Because of considerations such as the tide, weather, and the weight and size of the captured sea turtle, some will not be able to be de-hooked (when applicable), and will be cut free by fishers, and intentionally released. These sea turtles will escape with embedded or swallowed hooks, or trailing varying amounts of monofilament 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. In 2006, those criteria were revised and finalized (Ryder et al. 2006). In February 2012, the SEFSC updated the 2006 criteria by adding 3 additional hooking scenarios. Overall mortality ratios are dependent upon the type of interaction (i.e., hooking, entanglement), the location of hooking if applicable (i.e., hooked externally, hooked in the mouth), and the amount/type of gear remaining on the animal at the time of release (i.e., hook remaining, amount of line remaining, entangled or not). Therefore, the experience, ability, and willingness of anglers to remove the gear, and the availability of gear-removal equipment, are very important factors that influence PRM. The new criteria also take into account differences in PRM between hardshell sea turtles and leatherback sea turtles, with slightly higher rates of PRM assigned to leatherbacks. No specific criteria for recreational hook-and-line gear are currently available.

To anticipate future PRM for the proposed action, we used the revised NMFS and SEFSC (2012) criteria. In a previous recent section 7 consultation (NMFS 2016), we used data from hook and line captures at fishing piers in Mississippi to determine categories of injury from fishing pier interactions that is applicable to fishing piers in Florida. This information was used with the revised PRM criteria and to calculate an estimate for a post-release mortality rate for sea turtles released immediately from a pier. Since the hooking location of the injury affects the likelihood of survival and the hooking location varies greatly, it is difficult to determine which PRM rate we should use regarding anticipated future takes released immediately from a pier. In the previous section 7 consultation (NMFS 2016), we addressed this issue by calculating weighted mortality rates and an overall mortality rate of **43.2%** for piers. Since this is an unattended pier, we are assuming that all future takes will likely be released directly from the pier without being sent to rehabilitation facilities. We applied the PRM rate estimated for turtles released at piers (43.2%) to the total number of turtles anticipated to be captured to calculate **expected mortalities**.

Up to 0.432 x 9 = **3.89** NA green a year
Up to 0.432 x 1 = **0.432** SA green a year
Up to 0.432 x 4 = **1.728** loggerhead a year

Smalltooth Sawfish

NMFS's recommended method of hooked smalltooth sawfish release is to cut the line as close as possible to the sawfish's mouth or hooking site. Based on observations of stranded sawfish and anecdotal reports, this is the preferred approach of fishers to deal with hooked smalltooth sawfish. This form of release will result in the escape of sawfish with embedded hooks and varying amounts of monofilament fishing line. If an individual sawfish is entangled when young, the fishing line can become tighter and more constricting as the individual grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage. Sawfish capture may cause post-release injury or death.

Expected Mortalities

Post-release mortality is unknown at this time, but is believed to be very low based on the few stranding reports of sawfish. According to a study, only 0.6% of reported sightings to the ISED between 1998 and 2008 were reported stranded dead, suggesting a very low rate of mortality from captures (Wiley and Simpfendorfer 2010). In addition, the applicant proposes to install educational signs to inform fishers of how to handle an accidentally captured smalltooth sawfish. Therefore, we believe that the 25 estimated smalltooth sawfish captures at the proposed project will result in 0.15 (25 x 0.006 = 0.15) mortality of smalltooth sawfish per year **which is about one every 7 years.**

5.3.2 Handling to Remove from Gear

All sea turtles and sawfish captured would be exposed to handling to remove them from gear and return them to the water. Handling can result in raised levels of stressor hormones. However, NMFS does not expect that individual animals would normally experience more than short-term stresses as a result of these activities. No injury is expected from these activities, and the more gear that is removed, the lower the probability of post-release mortality.

6.0 Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area of this Opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

The action area is very small, and at this time, we are not aware of any other non-federal actions being planned or under development in the action area.

Human-induced effects from vessel interactions, ingestion of marine debris, pollution, and global climate change are likely to continue into the future. While the combination of these activities may impede or slow the recovery of populations of sea turtles and sawfish, the magnitude of these effects is currently unknown.

7.0 Jeopardy Analyses

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 and loggerhead sea turtles or smalltooth sawfish. In Section 5, 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 with the best available data. Now we assess each of these species' response to this impact, in terms of overall population effects, and whether those effects of the proposed action, when considered in the context of the status of the species (Section 3), the environmental baseline (Section 4), and the cumulative effects (Section 6), are likely to jeopardize their continued existence 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 action directly or indirectly reduces 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 Section 3. For any species listed globally, our jeopardy determination must find the proposed action will appreciably reduce the likelihood of survival and recovery at the global species range. For any species listed as DPSs a jeopardy determination must find the proposed action will appreciably reduce the likelihood of survival and recovery of that DPS. Only DPSs are considered in this Opinion.

7.1 Green Sea Turtles (NA DPS and SA DPS)

As discussed in the Exposure section this Opinion, within U.S. waters individuals from both the NA and SA DPSs can be found on foraging grounds, and we expect individuals from both DPSs to be found in waters in the action area for the proposed project. To analyze effects in a precautionary manner, we will conduct two jeopardy analyses, one for each DPS (i.e., assuming animals would be taken from both DPSs). We will analyze impacts to the NA DPS assuming that 95% of the takes would come from that DPS. Similarly, we assume 5% will be taken from the SA DPS.

7.1.1 Green Sea Turtle NA DPS

The proposed action could take up to 9 NA DPS green sea turtles per year, of which 4 (3.89 rounded to 4 for this analysis) would experience post-release mortality (lethal take). The potential nonlethal capture of green sea turtles from the NA DPS is not expected to have any measurable impact on the reproduction, numbers, or distribution of these species. The individuals suffering nonlethal injuries or stresses are expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. The captures may occur anywhere in the action area, which encompasses only a tiny portion of green sea turtles' overall range/distribution within the NA DPS. Any incidentally caught animal would be released within the general area where caught, no change in the distribution of NA DPS green sea turtles is anticipated.

The potential lethal take of 4 individuals from the NA DPS of green sea turtles per year 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. Lethal interactions would also result in a potential reduction in future reproduction, assuming some individuals would be females 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 up to an average of 136 eggs/nest, of which a small percentage is expected to survive to sexual maturity. The anticipated lethal interactions are expected to occur anywhere in the action area and only affect a small portion of the DPS, and sea turtles generally have large ranges in which they disperse; thus, no reduction in the distribution of green sea turtles within the NA DPS is expected from these captures.

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 of this Opinion, 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, this Opinion 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 impacted and continue to impact this DPS. The Cumulative Effects section of this Opinion discussed the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

Seminoff et al. (2015) estimated that there are greater than 167,000 nesting females in the NA DPS. The nesting at Tortuguero, Costa Rica, accounts for approximately 79% of that estimate (approximately 131,000 nesters), with Quintana Roo, Mexico, (approximately 18,250 nesters;

11%), and Florida, USA (approximately 8,400 nesters; 5%) also accounting for a large portion of the overall nesting (Seminoff et al. 2015).

At Tortuguero, Costa Rica, the number of nests laid per year from 1999 to 2010 increased, despite substantial human impacts to the population at the nesting beach and at foraging areas (Campell and Lagueux 2005; Troëng 1998; Troëng and Rankin 2005).

Nesting locations in Mexico along the Yucatan Peninsula also indicate the number of nests laid each year has increased (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 2007a)(NMFS and USFWS 2007a). By 2012, more than 26,000 nests were counted in Quintana Roo (J. Zurita, CIQROO, unpubl. data, 2013, in Seminoff et al. 2015)

In Florida, most nesting occurs along the Atlantic coast of eastern central Florida, where a mean of 5,055 nests were deposited each year from 2001 to 2005 (Meylan et al. 2006) and 10,377 each year from 2008 to 2012 (B. Witherington, Florida Fish and Wildlife Conservation Commission, pers. comm., 2013). As described in the Section 3.2.4, nesting has increased substantially over the last 20 years and peaked in 2015 with 27,975 nests statewide. In-water studies conducted over 24 years in the Indian River Lagoon, Florida, suggest similar increasing trends, with green sea turtle captures up 661% (Ehrhart et al. 2007). Similar in-water work at the St. Lucie Power Plant site revealed a significant increase in the annual rate of capture of immature green sea turtles over 26 years (Witherington et al. 2006).

In summary, 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 (environmental baseline) that have contributed to the current status of the species. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. Since the abundance trend information for NA DPS green sea turtles is clearly increasing, we believe the potential lethal take of 4 green sea turtles from the NA DPS per year attributed to the proposed action will not have any measurable effect on that trend. After analyzing the magnitude of the effects of the proposed action, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe the proposed action 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 1991) 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:

> *Objective: The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years.*

Objective: 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 1989-2015, green sea turtle nest counts across Florida have increased approximately ten-fold from a low of 267 in the early 1990s to a high of 27,975 in 2015 (http://myfwc.com/research/wildlife/sea-turtles/nesting/2015-nesting-trends/). (Please refer to section 3 for more details on the dynamics of the trend increase.) 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.

The potential lethal take of up to 4 NA DPS green sea turtles per year will result in a reduction in numbers when captures occur, but 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. Nonlethal captures of these sea turtles 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 lethal and nonlethal take of green sea turtles from the NA DPS associated with the proposed action are 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 Green Sea Turtle SA DPS

The proposed action may result in 1 green sea turtle capture from the SA DPS each year. Approximately 0.432 of the animals would experience post-release mortality (lethal take). For purposes of analysis, we conservatively estimate 1 PRM every 2 year period. The potential nonlethal captures of SA DPS green sea turtles are not expected to have any measurable impact on the reproduction, numbers, or distribution of these species. The individuals suffering nonlethal injuries or stresses are expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. The captures may occur anywhere in the action area and the action area encompasses a tiny portion of green sea turtles' overall range/distribution within the SA DPS. Since any incidentally caught animal would be released within the general area where caught, no change in the distribution of SA DPS green sea turtles is anticipated.

The potential lethal take of 1 SA DPS green sea turtle every 2 year period would reduce the number of green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. Lethal interactions would also result in a potential reduction in future reproduction, assuming the individuals caught would at least in some years be 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 up to an average of 136 eggs/nest, of which a small percentage is expected to survive to sexual maturity. The anticipated lethal interactions are expected to occur anywhere in the action area and sea turtles generally have large ranges in which they disperse; thus, no reduction in the distribution of green sea turtles within the SA DPS is expected from these captures.

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 of this Opinion, 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, this Opinion considered 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 impacted and continue to impact this DPS. The Cumulative Effects section of this Opinion considered the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In Section 3, we summarized available information on number of nesters and nesting trends at SA DPS beaches. Seminoff et al. (2015) estimated that there are greater than 63,000 nesting females in the SA DPS, though they noted the adult female nesting abundance from 37 beaches could not be quantified. The nesting at Poilão, Guinea-Bissau, accounted for approximately 46% of that estimate (approximately 30,000 nesters), with Ascension Island, United Kingdom, (approximately 13,400 nesters; 21%), and the Galibi Reserve, Suriname (approximately 9,400 nesters; 15%) also accounting for a large portion of the overall nesting (Seminoff et al. 2015).

Seminoff et al. (2015) reported that while trends cannot be estimated for many nesting populations due to the lack of data, they could discuss possible trends at some of the primary nesting sites. Seminoff et al. (2015) indicated that the nesting concentration at Ascension Island (United Kingdom) is one of the largest in the SA DPS and the population has increased substantially over the last 3 decades (Broderick et al. 2006; Glen et al. 2006). Mortimer and Carr (1987) counted 5,257 nests in 1977 (about 1,500 females), and 10,764 nests in 1978 (about 3,000 females) whereas from 1999–2004, a total of about 3,500 females nested each year (Broderick et al. 2006). Since 1977, numbers of nests on 1 of the 2 major nesting beaches, Long Beach, have increased exponentially from around 1,000 to almost 10,000 (Seminoff et al. 2015). From 2010 to 2012, an average of 23,000 nests per year was laid on Ascension (Seminoff et al. 2015). Seminoff et al. (2015), caution that while these data are suggestive of an increase, historic data from additional years are needed to fully substantiate this possibility.

Seminoff et al. (2015) reported that the nesting concentration at Galibi Reserve and Matapica in Suriname was stable from the 1970s through the 1980s. From 1975–1979, 1,657 females were counted (Schulz 1982), a number that increased to a mean of 1,740 females from 1983–1987 (Ogren 1989), and to 1,803 females in 1995 (Weijerman et al. 1998). Since 2000, there appears to be a rapid increase in nest numbers (Seminoff et al. 2015).

In the Bijagos Archipelago (Poilão, Guinea-Bissau), Parris and Agardy (1993 as cited in Fretey 2001) reported approximately 2,000 nesting females per season from 1990 to 1992, and Catry et al. (2002) reported approximately 2,500 females nesting during the 2000 season. Given the typical large annual variability in green sea turtle nesting, Catry et al. (2009) suggested it was premature to consider there to be a positive trend in Poilão nesting, though others have made such a conclusion (Broderick et al. 2006). Despite the seeming increase in nesting, interviews along the coastal areas of Guinea-Bissau generally resulted in the view that sea turtles overall have decreased noticeably in numbers over the past two decades (Catry et al. 2009). In 2011, a record estimated 50,000 green sea turtle clutches were laid throughout the Bijagos Archipelago (Seminoff et al. 2015).

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 (environmental baseline) that have contributed to the current status of the species. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. Since the abundance trend information for green sea turtles is clearly increasing, we believe the potential lethal take of 1 green sea turtle from the SA DPS every 2 years attributed to the proposed action will not have any measurable effect on that trend. After analyzing the magnitude of the effects of the proposed action, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the green sea turtle SA DPS in the wild.

<u>*Recovery*</u>

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 1991) 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:

> *Objective: The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years.*

> *Objective: A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.*

The nesting recovery objective 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 has 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 clear increases in nesting and in-water abundance, however, it is likely that numbers on foraging grounds have increased.

The potential lethal take of up to 1 SA DPS green sea turtle every 2 year period will result in a reduction in numbers when capture occurs, but 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. Nonlethal capture of a sea turtle 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 the SA DPS of green sea turtles' recovery in the wild.

Conclusion

The lethal and nonlethal captures of green sea turtles associated with the proposed action are 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 Loggerhead Sea Turtle NWA DPS

The proposed action may result in 4 loggerhead sea turtle captures from the NWA DPS each year. Approximately 1.728 of the animals would experience post release mortality (lethal take). For purposes of analysis, we conservatively estimate the captures would result in 2 PRMs (1.728 rounded to 2) per year. The potential nonlethal capture and release of loggerhead sea turtles is not expected to have a measurable impact on the reproduction, numbers, or distribution of this species. The individuals suffering nonlethal injuries are expected to fully recover such that no reductions in reproduction or numbers of loggerhead sea turtles are anticipated. The captures may occur anywhere in the action area, and the action area encompasses a tiny portion of the overall range/distribution of the NWA DPS of loggerhead sea turtles. Any incidentally caught animal would be released within the general area where caught, no change in the distribution of loggerhead sea turtles is anticipated.

The lethal take of 2 loggerhead sea turtles per year associated with the proposed action represents a reduction in numbers. These lethal captures could also result in a future reduction in reproduction as a result of lost reproductive potential, as some of these individuals may be females who would have survived other threats and reproduced in the future, thus eliminating each female individual's contribution to future generations. For example, an adult female loggerhead sea turtle can lay 3 or 4 clutches of eggs every 2-4 years, with 100-130 eggs per clutch. Thus the loss of adult female sea turtles could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. A reduction in the distribution of loggerhead sea turtles is not expected from lethal takes attributed to the proposed action. Because all the potential interactions are expected to occur at random throughout the proposed action area, which accounts for a tiny fraction of the species' overall range, the distribution of loggerhead sea turtles is expected to be unaffected.

Whether or not the reductions in loggerhead sea turtle numbers and reproduction attributed to the proposed action would appreciably reduce the likelihood of survival for loggerheads depends on what effect these reductions in numbers and reproduction would have on overall population sizes and trends, i.e., whether the estimated reductions, when viewed within the context of the environmental baseline, status of the species, and cumulative effects are of such an extent that adverse effects on population dynamics are appreciable. In the Status of Species of this Opinion, we considered 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, this Opinion considered 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 impacted and continue to impact this DPS. The Cumulative Effects section of this Opinion considered the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

Loggerhead sea turtles are a slow growing, late-maturing species. Because of their longevity, loggerhead sea turtles require high survival rates throughout their life to maintain a population. In other words, late-maturing species cannot tolerate much anthropogenic mortality without going into decline. Conant et al. (2009a) concluded that because loggerhead natural growth rates are small, natural survival needs to be high, and even low to moderate mortality can drive the population into decline. Because recruitment to the adult population takes many years, population modeling studies suggest even small increased mortality rates in adults and subadults could substantially impact population numbers and viability (Chaloupka and Musick 1997; Crouse et al. 1987; Crowder et al. 1994).

NMFS-SEFSC (2009b) estimated the minimum adult female population size for the NW Atlantic DPS in the 2004-2008 timeframe to likely be between approximately 20,000-40,000 individuals (median 30,050), with a low likelihood of being as many as 70,000 individuals. Another estimate for the entire western North Atlantic population was a mean of 38,334 adult females using data from 2001-2010 (Richards et al. 2011). A much less robust estimate for total benthic females in the western North Atlantic was also obtained, with a likely range of approximately 30,000-300,000 individuals, up to less than 1 million.

NMFS-NEFSC (2011) preliminarily estimated the loggerhead population in the Northwestern Atlantic Ocean along the continental shelf of the Eastern Seaboard during the summer of 2010 at 588,439 individuals (estimate ranged from 381,941 to 817,023) based on positively identified individuals. The NMFS-NEFSC's point estimate increased to approximately 801,000 individuals when including data on unidentified sea turtles that were likely loggerheads. The NMFS-NEFSC (2011) underestimates the total population of loggerheads since it did not include Florida's east coast south of Cape Canaveral or the Gulf of Mexico, which are areas where large numbers of loggerheads are also expected. In other words, it provides an estimate of a subset of the entire population.

Florida accounts for more than 90% of U.S. loggerhead nesting. The Florida Fish and Wildlife Conservation Commission conducted a detailed analysis of Florida's long-term loggerhead nesting data (1989-2016). They indicated that following a 24% increase in nesting between 1989 and 1998, nest counts declined sharply from 1999 to 2007. However, annual nest counts showed a strong increase (71%) from 2008 to 2016. Examining only the period between the high-count nesting season in 1998 and the most recent nesting season (2016), researchers found a slight but nonsignificant increase, indicating a reversal of the post-1998 decline. The overall change in counts from 1989 to 2016 was significantly positive; however, it should be noted that wide confidence intervals are associated with this complex data set (http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/).

Abundance estimates accounting for only a subset of the entire loggerhead sea turtle population in the western North Atlantic indicate the population is large (i.e., several hundred thousand individuals). Nesting trends have been significantly increasing over several years against the background of the past and ongoing human and natural factors (environmental baseline) that have contributed to the current status of the species. Additionally, our estimate of future captures is not a new source of impacts on the species. The same or a similar level of captures has occurred in the past, yet we have still seen positive trends in the status of this species.

The proposed action could lethally take up to 2 individuals every year. These lethal takes represent approximately 0.00053% per year (2/381,941) of the low end of the NMFS (2011) estimate that reflects a subset of the entire loggerhead population in the western North Atlantic Ocean. While the loss of 2 individuals per year is an impact to 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 of the proposed action, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the loggerhead sea turtle DPS in the wild.

Recovery

The loggerhead recovery plan defines the recovery goal as "…ensur[ing] that each recovery unit meets its Recovery Criteria alleviating threats to the species so that protection under the ESA is no longer necessary" (NMFS and USFWS 2008). The plan then identifies 13 recovery objectives needed to achieve that goal. We do not believe the proposed action impedes the progress of the recovery program or achieving the overall recovery strategy.

The recovery plan for the Northwest Atlantic population of loggerhead sea turtles (NMFS and USFWS 2009) lists the following recovery objectives that are relevant to the effects of the proposed action:

> *Objective*: 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

> *Objective*: 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 action 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. As noted previously, we believe the future takes predicted will be similar to the levels of take that has occurred in the past and those past takes did not impede the positive trends we are currently seeing in nesting during that time. We also indicated that the lethal take of 2 loggerhead sea turtles per year 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 inwater populations. For these reasons, we do not believe the proposed action will impede achieving the recovery objectives or overall recovery strategy.

Conclusion

The lethal and nonlethal take of loggerhead sea turtles associated with the proposed action are 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 Smalltooth Sawfish U.S. DPS

The proposed action may result in 25 smalltooth sawfish captures each year. However, we anticipate 0.15 post release mortalities per year (or 1 approximately every 7 years). The nonlethal captures of smalltooth sawfish are not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. The individuals are expected to fully recover such that no reductions in reproduction or numbers of smalltooth sawfish are anticipated. The captures may occur anywhere in the action area and the action area encompasses a tiny portion of the smalltooth sawfish's overall range/distribution. Since any incidentally caught animals would be released within the general area where caught, no change in the distribution of the smalltooth sawfish is anticipated.

The loss of 1 smalltooth sawfish approximately every 7 years (0.15 annually) will reduce the number of smalltooth sawfish as compared to the number of smalltooth sawfish that would have been present in the absence of the proposed action assuming all other variables remained the same. These lethal takes could also result in the loss of reproduction value as compared to the reproductive value in the absence of the proposed action, if a female taken. An adult female smalltooth sawfish may have a litter of approximately 10 pups probably every 2 years. While we have no reason to believe the proposed action will disproportionately affect females, the loss of an adult female smalltooth sawfish could preclude the production of approximately up to 35 pups every 7 years, on average. Because smalltooth sawfish produce relatively well-developed young it is likely that some portion of these pups would have survived. Thus, the death of a female eliminates an individual's contribution to future generations, and the proposed action would result in a reduction in future smalltooth sawfish reproduction. Because we anticipate the potential lethal take of smalltooth sawfish could occur anywhere within the species' range, we believe the proposed action will not affect the distribution of the species.

While there is currently no accurate smalltooth sawfish population estimate, a trend analysis of their abundance in the Everglades National Park, considered within the species core range, shows a slightly increasing population abundance trend since 1972 (Carlson et al. 2007). A second analysis that considered data from 1989-2004, indicates smalltooth sawfish relative abundance has increased 5% annually over that 20-year period (Carlson and Osborne 2012; NMFS 2010). These trends in abundance are in spite of threats such as fishing activities and habitat loss during much of that 20 year period.

Even with the threats such as fishing activities and habitat loss the smalltooth sawfish population still remains stable or increasing (Carlson and Osborne 2012). Although the anticipated mortality of 1 smalltooth sawfish approximately every 7 years (0.15 annually) would result in an instantaneous reduction in absolute population number, we do not believe this mortality will have any measurable effect on the increasing population trends. Therefore, we believe a lethal or nonlethal take of smalltooth sawfish associated with the proposed action is not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of the species in the wild.

Recovery

We consider the recovery objectives in the recovery plan prepared for the species that relate to population numbers or reproduction that may be affected by the predicted reductions in the numbers or reproduction of smalltooth sawfish resulting from the proposed action.

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:

- 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.

With respect to the first recovery objective, NMFS has developed safe-handling guidelines for the species. The proposed action would not preclude further development or adoption of safe-handling guidelines. Signage would be required on the proposed pier requesting fishers to take precautions to ensure that any incidentally caught smalltooth sawfish are handled quickly and safely, in keeping with NMFS's safe handling guidelines (see signage in Appendix B). This helps to minimize injuries to incidentally captured smalltooth sawfish, which is in direct support of the first recovery objective. For these reasons, we do not believe the proposed action will impede the progress toward achieving this recovery objective.

As noted previously, since the number of potential mortalities anticipated under the proposed action are so small (i.e., 1 every approximately 7 years) we believe that potential loss will have no measurable effect on the population's abundance trends or growth rate. Since we anticipate this potential loss will have no measurable effect on the population, we also believe the potential loss will have no effect on: (1) the numbers of juveniles inhabiting nursery areas, (2) the geographic area across which juveniles occur, (3) the number of adults in the Gulf of Mexico or Atlantic Ocean, (4) the distribution of adults throughout the species' historic core range, (5) the species' ability to maintain or reestablish seasonal migrations. For these reasons, we do not believe the proposed action will impede the progress toward achieving this recovery objective. Thus, the effects of the proposed action will not result in an appreciable reduction in the likelihood of smalltooth sawfish U.S. DPS recovery in the wild.

Conclusion

The captures of smalltooth sawfish U.S. DPS associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the smalltooth sawfish U.S. DPS in the wild.

8.0 Conclusion

After reviewing the current status of the species, the environmental baseline, the effects of the proposed action, and cumulative effects using the best available data, it is NMFS's biological opinion that the proposed action is not likely to jeopardize the continued existence of the NWA DPS loggerhead sea turtle, NA DPS green sea turtle, SA DPS green sea turtle, or smalltooth sawfish U.S. DPS.

9.0 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 of Incidental Take

The numbers presented herein Table 9.1 represent total anticipated takes of the species over 2-year periods. Annual take estimates of these species can have variability because of natural and anthropogenic factors. As a result, monitoring fishing at the pier using 1-year estimated take levels based on documented interactions is somewhat impractical for the proposed action. We believe 2-year time periods are appropriate for management purposes. This approach will allow us to reduce the likelihood of requiring reinitiation unnecessarily because of inherent variability in take levels, but still allow for an accurate assessment of how the proposed action is affecting these species versus our expectations.

As we explained above, we do not expect any immediate mortalities at the pier and thus the only take authorized is the total estimated captures listed below. Take will be tracked with respect to these numbers. If there are any immediate mortalities, the applicant or the action agency must inform us and reinitiation will be required. We do expect some post-release mortalities, but since these mortalities will occur after the individual is released, it is not immediately observable and will not be tracked.

Table 9.1 Summary of Anticipated Take Estimates for 2 Year Periods*

Turtle Species	Total Estimated Captures
NWA DPS Loggerhead Sea Turtle	8
NA DPS Green Sea Turtle	18
SA DPS Green Sea Turtle	2
Fish Species	
Smalltooth Sawfish U.S. DPS	50

*No immediate mortalities expected. PRM is expected but will not be observed; take is tracked by estimated captures.

9.2 Effect of the Take

NMFS has determined the level of anticipated take associated with the proposed action and specified in Section 9.1 is not likely to jeopardize the continued existence of the loggerhead NWA DPS sea turtle, green NA and SA DPS sea turtles, or the smalltooth sawfish U.S. DPS.

9.3 Reasonable and Prudent Measures (RPMs)

Section 7(b)(4) of the ESA requires NMFS to issue to any agency whose proposed action is found to comply with Section 7(a)(2) of the ESA, but may incidentally take individuals of listed species, a statement specifying the impact of that taking. It also states that RPMs necessary or appropriate to minimize the impacts of take, and terms and conditions to implement those measures, must be provided and implemented. Only incidental taking by the federal agency or applicant that complies with the specified terms and conditions is allowed.

The RPMs and terms and conditions are required, per 50 CFR 402.14(i)(1)(ii) and (iv), to minimize the impact of that take on ESA-listed species. These measures and terms and conditions are non-discretionary, and must be implemented by the Corps or applicant for the protection of Section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If it fails to adhere to or require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms of permits or other documents, and/or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse for prohibited take. To monitor the impact of the incidental take, the Corps must report the progress of the action and its impact on the species to NMFS (F/SER3), as specified in the incidental take statement [50 CFR 402.14(i)(3)].

We have determined that the following RPMs are necessary or appropriate to minimize the impacts of future sea turtle and smalltooth sawfish takes or to limit adverse effects to these species to predictable levels, and to monitor levels of incidental take during the proposed action:

1. The Corps must ensure the applicant provides take reports to the Corps regarding all interactions with protected species at this fishing pier and that they are forwarded to NMFS.

2. The Corps must ensure the applicant minimizes the likelihood of injury or mortality resulting from hook-and-line capture or entanglement by activities at this fishing pier. To this end, the Corps must make it a condition of their permit that educational signage on the possibility of sea turtle and smalltooth sawfish captures by hook-and-line and what to do in the event of a

capture be installed. The signage should be placed at both the entrance and terminal platform of the pier where the view of these signs is unobstructed.

3. The Corps must ensure that the applicant reduces the impacts to incidentally captured sea turtles.

9.4 Terms and Conditions

To be exempt from take prohibitions established by Section 9 of the ESA, the Corps must comply with or ensure compliance with the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary.

The following terms and conditions (T&Cs) implement the above RPMs:

1. To implement RPM No. 1, Corps must ensure that the applicant reports all hook-and-line captures of sea turtles and smalltooth sawfish at the proposed pier to the NMFS's Southeast Regional Office.
    a. Within 24 hours, the applicant must notify NMFS by email (takereport.nmfsser@noaa.gov) that the capture has occurred. Emails must reference this Opinion by the respective identifier number SER-2016-18008 (Vero Beach Fishing Pier) and date of issuance. The email shall also state the type of species captured, date and time of capture, location and activity resulting in capture (i.e., fishing from the pier by hook-and-line), condition of the sea turtle or sawfish (i.e., alive, dead, sent to rehabilitation [if a sea turtle]), 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. The Corps must provide NMFS reports on an annual basis. These reports shall be emailed to NMFS's Southeast Regional Office (takereport.nmfsser@noaa.gov) with the following information: the total number of sea turtle and/or smalltooth sawfish captures, entanglements, and strandings that occurred at or adjacent to the pier included in this Opinion. The report must include the same details listed in T&C above.
2. The applicant stated that informational signs will be displayed on the pier educating the public on safe fishing practices that will reduce or prevent sea turtle and sawfish injuries and who to notify in the event a dead, injured, or entangled sea turtle or sawfish is located (see Section 2.1). To implement RPM No. 2, the Corps must ensure that the applicant installs NMFS Protected Species Educational Signs including "Save the Sea Turtles, Sawfish, and Dolphins" sign at the entrance to the fishing pier before the pier is opened. Sign designs and installation methods are provided on our website at: http://sero.nmfs.noaa.gov/protected_resources/section_7/protected_species_educational_signs/index.html. The applicant shall email photographs of installed signs to the Corps. The Corps shall email them to NMFS.

3. The applicant has agreed to place monofilament recycling bins on the fishing pier (see Section 2.1). To implement RPM No. 2, the Corps must ensure that the applicant installs and maintains both monofilament recycling bins and trash receptacles at the piers to reduce the probability of trash and debris entering the water. The applicant shall email photographs of the installed bins and receptacles to the Corps, and the Corps shall forward them to NMFS.
4. The applicant shall conduct annual underwater fishing debris cleanups around fishing piers. To implement RPM No. 2, the Corps must ensure that the applicant perform the annual underwater fishing debris cleanup around this marina/fishing pier.
5. To implement RPM No. 3, Corps must make it a condition of their permit that the applicant ensures that incidentally captured sea turtles are sent to a rehabilitation facility holding an appropriate U.S. Fish and Wildlife Native Endangered and Threatened Species Recovery permit. The applicant shall submit reports on turtles taken to rehabilitation facilities to the Corps and to NMFS January 1st of every year by email (takereport.nmfsser@noaa.gov). Emails must reference this Opinion by the respective identifier number SER-2016-18008 (Vero Beach Fishing Pier) and date of issuance.

10.0 Conservation Recommendations

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

NMFS believes the following conservation recommendations further the conservation of listed species. NMFS strongly recommends that these measures be considered and implemented by the Corps and/or the applicant:

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

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

3. The Corps encourages research to develop measures to deter turtles from using fishing piers as a habitualized food source.

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 conservation recommendations.

11.0 Reinitiation of Consultation

This concludes formal consultation on the proposed action. As provided in 50 CFR 402.16, reinitiation of formal consultation is required if discretionary federal action agency involvement or control over the action has been retained, or is authorized by law, and if (1) the amount or extent of the taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the agency action that may affect listed species or designated critical habitat in a manner or to an extent not previously considered in this Opinion; (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 action.

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Appendix A Sea Turtle and Smalltooth Sawfish Construction Conditions

The permittee shall comply with the following protected species construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006

Save Sea Turtles, Sawfish, and Dolphins

While Fishing, Following These Tips:

- **Report injured, entangled, hooked, or stranded dolphins and sea turtles to the 24-hour hotline:**

1-877-942-5343

Download the Dolphin & Whale 911 app on your iPhone or Android for reporting marine mammals.

- **Never cast towards dolphins, sea turtles, or sawfish.**
- **Change location or reel in your line if a dolphin, sea turtle, or sawfish shows interest in your bait or catch.**
- **Release catch away from dolphins when and where possible without violating any state or federal fishing regulations.**
- **Do not feed or attempt to feed wild dolphins or sea turtles - it's harmful and illegal.**
- **Do not dispose of leftover bait or cleaned fish remains in water.**

- **Use circle or corrodible (non-stainless steel) hooks to reduce injury.**
- **Use recycling bins for fishing line and do not throw trash or unwanted line in the water.**
- **If you hook a SEA TURTLE, immediately call the 24-hour hotline at 1-877-942-5343 and follow response team instructions.**

If you cannot reach a response team, follow these guidelines to reduce injuries:

1) If possible, use a net or lift by the shell to bring the turtle on pier or land. Do NOT lift by hook or line.
2) Cut the line close to the hook, removing as much line as possible.
3) Release turtle.

- **If you hook a SAWFISH:**

1) Do not remove the fish from the water.
2) Cut the line close to the hook.
3) Release it as quickly as possible.
4) Report it immediately to 1-941-255-7403.

Appendix C Anticipated Incidental Take of ESA-Listed Species in Federal Fisheries

Anticipated Take of Sea Turtles

Fishery	ITS Authorization Period	Sea Turtle Species				
		Loggerhead (NWA DPS)	Leatherback	Kemp's ridley	Green (NA DPS)	Hawksbill
Batched Consultation* (gillnet) [NER]	1 Year	269-No more than 167 lethal (Takes based on a 5-yr average)	4-No more than 3 lethal	4-No more than 3 lethal	4-No more than 3 lethal	None
Batched Consultation* (bottom trawl) [NER]	1 Year	213-No more than 71 lethal (Takes based on a 4-yr average)	4-No more than 2 lethal	3-No more than 2 lethal	3-No more than 2 lethal	None
Batched Consultation* (trap/pot) [NER]	1 Year	1-Lethal or nonlethal	4-Lethal or nonlethal	None	None	None
Coastal Migratory Pelagics [SER]	3 Years	27 Total, 7 lethal	1- Lethal	8- Total, 2 lethal	31-Total, 9 lethal	1- Lethal
Dolphin-Wahoo [SER]	1 Year	12-No more than 2 lethal	12-No more than 1 lethal	3 for all species in combination-no more than 1 lethal take		
HMS-Pelagic Longline [SER]	3 Years	1,905-No more than 339 lethal	1,764-No more than 252 lethal	105-No more than 18 lethal for these species in combination		
HMS-Shark Fisheries [SER]	3 Years	126-No more than 78 lethal	18-No more than 9 lethal	36-No more than 21 lethal	57-No more than 33 lethal	18-No more than 9 lethal
Red Crab [NER]	1 Year	1-Lethal or nonlethal	1-Lethal or nonlethal	None	None	None

Anticipated Incidental Takes of Sea Turtles, continued

Fishery	ITS Authorization Period	Sea Turtle Species				
		Loggerhead	Leatherback	Kemp's ridley	Green	Hawksbill
South Atlantic Snapper-Grouper [SER]	3 Years	613-No more than 192 lethal	7-No more than 5 lethal	177-No more than 8 lethal	103 NA DPS-No more than 35 lethal; 6 SA DPS- No more than 2 lethal	7-No more than 3 lethal
Southeastern U.S. Shrimp [SER]	1 Year	Anticipated shrimp trawl effort (i.e., 132,900 days fished in the Gulf of Mexico and 14,560 trips in the south Atlantic) and fleet TED compliance (i.e., compliance resulting in overall average sea turtle catch rates in the shrimp otter trawl fleet at or below 12%) are used as surrogates for numerical sea turtle take levels.				
Atlantic Sea Scallop – Dredge [NER]	1 Year	161 – No more than 46 lethal	2 –Lethal Takes (gears combined)	3 – No more than 2 Lethal (gears combined)	2 - Lethal takes (gears combined)	None
Atlantic Sea Scallop – Trawl [NER]	1 Year	140 – No more than 66 lethal				None