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

F/SER31:SG
SERO-2022-01373

06/13/2023

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U.S. Fish & Wildlife Service
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Ref.: SAJ-2007-06077 (JED), United States Fish and Wildlife Service (USFWS), Remove and Replace the Shell Mound Fishing Pier and Boardwalk in the Lower Suwannee National Wildlife Refuge, Cedar Key, Levy County, Florida

Dear Bo Davidson and Andrew Gude,

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 of 1973, as amended (16 U.S.C. § 1531 et seq.) for the above referenced action. The Opinion has the NMFS tracking number SERO-2022-01373. Please use the NMFS tracking number in all future correspondence related to this action.

This Opinion considers the effects of the United State Army Corps of Engineers (USACE) Jacksonville District's proposal to permit the removal and replacement of an existing fishing pier and boardwalk by the USFWS in the Lower Suwannee National Wildlife Refuge at Shell Mound in Cedar Key, Levy County, Florida, on the following listed species and critical habitat: green sea turtle (North Atlantic and South Atlantic Distinct Population Segments [DPSs]), hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish (United States DPS), giant manta ray, Gulf sturgeon, and Gulf sturgeon critical habitat (Unit 14 – Suwannee Sound). USACE is the lead action agency requesting consultation and permitting the proposed action. USFWS is the joint action agency carrying out the proposed action.

The Opinion is based on information provided by the USACE, the USFWS, the Sea Turtle Stranding and Salvage Network, the Florida Fish and Wildlife Conservation Commission, the U.S. Sawfish Recovery Database, and the published literature cited within. NMFS concludes that the proposed action will have no effect on hawksbill sea turtle and leatherback sea turtle. NMFS concludes that the proposed action is not likely to adversely affect giant manta ray, Gulf sturgeon, and Gulf sturgeon critical habitat (Unit 14 Suwannee Sound). NMFS concludes that the proposed action is likely to adversely affect, but is not likely to jeopardize the continued existence of, green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS).

NMFS is providing an Incidental Take Statement with this Opinion. The Incidental Take Statement describes Reasonable and Prudent Measures that NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The Incidental Take Statement also specifies Terms and Conditions, including monitoring and reporting requirements with which the USACE 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 critical habitat. If you have any questions regarding this consultation, please contact Sarah Garvin, Consultation Biologist, by email at Sarah.Garvin@noaa.gov.

Sincerely,

BERNHART.DAVID.M.1066125889
2023.06.13 14:37:14 -04'00'

for Andrew J. Strelcheck
Regional Administrator

Enclosure:
NMFS Biological Opinion SERO-2022-01373
cc: James.E.Davidson2@usace.army.mil
Andrew_Gude@fws.gov
File: 1514-22.f.4.

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency:	United States Army Corps of Engineers Jacksonville District Permit number: SAJ-2007-06077
Applicant:	United States Fish and Wildlife Service
Activity:	Remove and Replace the Shell Mound Fishing Pier and Boardwalk in the Lower Suwannee National Wildlife Refuge
Location:	Cedar Key, Levy County, Florida
Consulting Agency:	National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida NMFS Tracking Number: SERO-2022-01373
Approved by:	for [signature] BERNHART.DAVID.M.1066125889 2023.06.13 14:37:48 -04'00' Andrew J. Strelcheck, Regional Administrator NMFS, Southeast Regional Office St. Petersburg, Florida
Date Issued:	06/13/2023

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ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

ac	acre(s)
°C	degrees Celsius
CFR	Code of Federal Regulations
cm	centimeter(s)
DPS	Distinct Population Segment
ECO	Environmental Consultation Organizer
EFH	Essential Fish Habitat
ESA	Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 et seq.)
°F	degrees Fahrenheit
ft	foot/feet
FR	Federal Register
ft^2	square foot/feet
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Florida Fish and Wildlife Research Institute
in	inch(es)
IPCC	Intergovernmental Panel on Climate Change
km	kilometer(s)
lin ft	linear foot/feet
LSNWR	Lower Suwannee National Wildlife Refuge
m	meter(s)
MHW	Mean High Water
mi	mile(s)
mi^2	square mile(s)
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MMF	Marine Megafauna Foundation
MSA	Magnuson-Stevens Fishery Conservation and Management Act
N/A	not applicable
NAD 83	North American Datum of 1983
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
Opinion	Biological Opinion, Conference Biological Opinion, or Draft Biological Opinion
PRM	post-release mortality
SERO PRD	NMFS Southeast Regional Office, Protected Resources Division
SAV	Submerged Aquatic Vegetation
STSSN	Sea Turtle Stranding and Salvage Network
U.S.	United States of America
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

1 INTRODUCTION

1.1 Overview

Section 7(a)(2) of the ESA, requires that each federal agency ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. Section 7(a)(2) requires federal agencies to consult with the appropriate Secretary in carrying out these responsibilities. The NMFS and the USFWS share responsibilities for administering the ESA. Consultations on most ESA-listed marine species and their critical habitat are conducted between the federal action agency and NMFS (hereafter, may also be referred to as we, us, or our).

Consultation is required when a federal action agency determines that a proposed action "may affect" ESA-listed species or critical habitat and can be conducted informally or formally. Informal consultation is concluded after NMFS issues a Letter of Concurrence that concludes that the action is "not likely to adversely affect" ESA-listed species or critical habitat. Formal consultation is concluded after we issue a Biological Opinion (hereafter, referred to as an/the Opinion) that identifies whether a proposed action is "likely to jeopardize the continued existence of an ESA-listed species" or "destroy or adversely modify critical habitat," in which case Reasonable and Prudent Alternatives to the action as proposed must be identified to avoid these outcomes. An Opinion often states the amount or extent of anticipated incidental take of ESA-listed species that may occur, develops Reasonable and Prudent Measures necessary to minimize the impacts, i.e., amount or extent, of the anticipated incidental take, and lists the Terms and Conditions to implement those measures. An Opinion may also develop Conservation Recommendations that help benefit ESA-listed species.

This document represents NMFS's Opinion of the effects of the USACE's proposal to permit the removal and replacement of an existing fishing pier and boardwalk by the USFWS in the LSNWR at Shell Mound in Cedar Key, Levy County, Florida, on the following listed species and critical habitat: green sea turtle (North Atlantic and South Atlantic Distinct Population Segments [DPSs]), hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish (United States DPS), giant manta ray, Gulf sturgeon, and Gulf sturgeon critical habitat (Unit 14 Suwannee Sound). Our Opinion is based on information provided by the USACE, the USFWS, the STSSN, the FWC, the U.S. Sawfish Recovery Database, and the published literature cited within.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the Opinion and Incidental Take Statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

1.2 Consultation History

The following is the consultation history for the NMFS ECO tracking number SERO-2022-01373 LSNWR Shell Mound Fishing Pier and Boardwalk.

On June 6, 2022, we received a request for consultation under Section 7 of the ESA from the USACE Jacksonville District in a letter dated June 3, 2022, to permit the removal and replacement of the existing fishing pier and boardwalk by the USFWS in LSNWR in Cedar Key, Levy County, Florida.

USACE is the lead action agency requesting consultation and permitting the proposed action. USFWS is the joint action agency carrying out the proposed action.

On September 14, 2022, we requested additional information from the USACE related to project details, mitigation measures, and best practices. We received a response on September 19, 2022.

Due to workload issues, the consultation was re-assigned to the current SERO ESA Section 7 biologist on March 3, 2023.

On March 8 and 14, 2023, we requested additional information related to the current and previous conditions of the fishing pier. We received a response on March 20, 2023, and initiated consultation that day.

2 PROPOSED ACTION

2.1 Project Details

2.1.1 Project Description

The USACE proposes to permit the USFWS to remove and replace the existing public, recreational fishing pier and boardwalk at the LSNWR in Cedar Key, Levy County, Florida (**Figure 1**).

Figure 1. The public, recreational fishing pier and boardwalk at the LSNWR in Cedar Key, Levy County, Florida.

The project will remove the existing 1,607 ft^2 fishing pier and boardwalk, which was damaged in 2015 and 2018 by storm surge and high winds during hurricane events. The replacement pier will be constructed to pre-disaster conditions in the same footprint of the existing pier and boardwalk. The construction will start from land and work water-ward to minimize impacts to existing habitat. All decking, cross members, and railings for the pier will be made of wood. Following placement of the piles, the wood cross members will be placed from the water, using a combination of small workboats and barges with heavy equipment. Once the cross members are in place the remainder of the pier will be built from shore in a top-down fashion.

Pile driving information is detailed in **Table 1**. This information is used to conduct our pile driving noise analysis in Section 3.1.2.

Table 1. Pile Driving Information

Component	Details
Pile Diameter	9-in Wood, Round
Total Number of Piles	40
Installation Method	Vibratory
Number of Seconds of Vibration per Pile	Up to 48 minutes per pile (assuming a continuous 8-hour work day)
Number of Piles Installed per Day	10
Duration of pile driving activity	25 days
Confined Space or Open Water?	Open Water
Noise Abatement	None

The USACE and USFWS offer the following additional information related to the proposed action:

- Fish cleaning stations are not currently on site and are not proposed as part of the fishing pier replacement.
- Turbidity curtains will be used and will remain in the water for 35 days. Total construction time is estimated to take no more than 6 months, during daylight hours only, with an estimated 1 month to complete the in-water work.
- All construction debris will be disposed of in an upland facility.
- Trash cans with lids are present on the property and will remain once the pier replacement is complete.
- Prior to damage, the fishing pier supported fishing line recycling receptacles. Fishing line recycling receptacles will be replaced upon the completion of the replacement pier.
- A volunteer will continue to patrol the area daily, picking up debris and garbage both in-water and on land after the replacement pier is completed.
- Lighting is not currently provided and no lighting is proposed for the replacement pier because the LSNWR is only open to the public from sun-up to sunset.
- The existing fishing pier and boardwalk are currently open to the public; however, the integrity of the structure is compromised.

2.1.2 Mitigation Measures

USACE will add the following additional conditions to the permit to be followed by the USFWS, or their designated agents, during construction:

- The applicant will comply with our *Protected Species Construction Conditions* (revised 2021) and our *Vessel Strike Avoidance Measures* (revised 2021).

- Construction will occur during daylight hours only.

- All interactions with ESA-listed species during construction will be reported immediately to NMFS SERO PRD via the NMFS SERO Endangered Species Take Report Form (https://forms.gle/85fP2da4Ds9jEL829).

- All interactions with sea turtles during construction will also be reported to the FWC Wildlife Alert Hotline: (888) 404-3922.

- All interactions with Gulf sturgeon during construction will also be reported to the LSNWR at (352) 493-0238 or the Refuge Manager at (703) 622-3896 and to the NMFS at (844) STURG911 (1-844-788-7491) or by E-mail at: NOAA.Sturg911@noaa.gov.

- All interactions with giant manta ray during construction will also be reported to the NMFS at 727-824-5312 or by E-mail at: manta.ray@noaa.gov.

- All interactions with smalltooth sawfish during construction will also be reported to the FWC at (844) 472-9347 (1-844-4SAWFISH) or by E-mail at: Sawfish@MyFWC.com.

2.1.3 Best Practices

To minimize the impacts to ESA-listed species from recreational hook-and-line fishing in the future, USACE will also add the following conditions to the permit to be followed by the USFWS, post-construction:

- An agreement shall be maintained with the Florida Sea Turtle Stranding Coordinator to call, pick up, and assist with hooked, entangled, or stranded turtles.

- All known hook-and-line captures of any ESA-listed species must be reported to NMFS SERO PRD via the NMFS SERO Endangered Species Take Report Form (https://forms.gle/85fP2da4Ds9jEL829).

- All known hook-and-line captures with sea turtles will also be reported to the FWC Wildlife Alert Hotline: (888) 404-3922.

- All known hook-and-line captures Gulf sturgeon will also be reported to the LSNWR at (352) 493-0238 or the Refuge Manager at (703) 622-3896 and to the NMFS at (844) STURG911 (1-844-788-7491) or by E-mail at: NOAA.Sturg911@noaa.gov.

- All known hook-and-line captures of giant manta ray will also be reported to the NMFS at (727) 824-5312 or by E-mail at: manta.ray@noaa.gov.

- All known hook-and-line captures of smalltooth sawfish will also be reported to the FWC at (844) 472-9347 (1-844-4SAWFISH) or by E-mail at: Sawfish@MyFWC.com.

- Trash cans with lids will be emptied regularly to ensure they do not overfill and that fishing lines are disposed of properly.

- Prior to opening the new structure for public use, fishing line recycling receptacles shall be placed along the structure to prevent fishing lines from being disposed of in the water or on the shoreline. The receptacles will be clearly marked and will be emptied regularly to ensure they do not overfill.

- Prior to opening the new structure for public use, NMFS educational signs must be posted in a visible location (at least at the entrance to the structure), alerting users of protected species in the area. The applicant will post the "Report a Sturgeon" and "Save Dolphins, Sea Turtles, Sawfish, and Manta Ray" signs, which are available for download at: https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs.

- A minimum of 2 annual in-water cleanups shall be coordinated to remove any derelict tackle or fishing line attached to the structure.

2.2 Action Area

The project site is located adjacent to the Gulf of Mexico east of Hog Island in the Suwannee Sound in the LSNWR in Cedar Key, Levy County, Florida (29.206710, -83.069286 [NAD83]) (**Figure 2**).

Figure 2. The public, recreational fishing pier and boardwalk at LSNWR in relation to Hog Island in the Suwannee Sound.

The action area is defined by regulation as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this federal action, the action area includes the pier's existing physical footprint, the area surrounded by turbidity curtains during demolition and construction, the surrounding water accessible to recreational anglers upon completion of the proposed action (i.e., casting distance or approximately 200-ft), and the equivalent of the largest radius of effects on ESA-listed species based on the proposed installation of 9-in-diameter wood piles by vibratory hammer, (i.e., 207-ft-away from the pile driving operations; see the pile driving noise analysis in Section 3.1.2) (**Figure 3**). The action area is within the boundary of Gulf sturgeon critical habitat, Unit 14 – Suwannee Sound. According to the USACE, there are no seagrass, corals, or mangroves present in the action area, and the substrate is sand and sandy clay. The approximate water depth in the action area is up to 7.5 ft at MHW.

Figure 3. The extent of the action area as defined by the largest radius of effects on ESA-listed species based on the proposed installation of 9-in-diameter wood piles by vibratory hammer.

3 EFFECTS DETERMINATIONS

Please note the following abbreviations are only used in **Table 2** and **Table 3** and are not, therefore, included in the List of Acronyms, Abbreviations, and Units of Measure: E = endangered; T = threatened; LAA = likely to adversely affect; NLAA = may affect, not likely to adversely affect; NE = no effect.

3.1 Effects Determinations for ESA-Listed Species

3.1.1 Agency Effects Determinations

We have assessed the ESA-listed species that may be present in the action area and our determination of the project's potential effects is shown in **Table 2** below.

Table 2. ESA-listed Species in the Action Area and Effect Determinations

Species (DPS)	ESA Listing Status	Listing Rule/Date	Most Recent Recovery Plan (or Outline) Date	USACE Effect Determination	NMFS Effect Determination
Sea Turtles					
Green sea turtle (North Atlantic DPS)	T	81 FR 20057/ April 6, 2016	October 1991	NLAA	LAA
Green sea turtle (South Atlantic DPS)	T	81 FR 20057/ April 6, 2016	October 1991	NLAA	LAA
Hawksbill sea turtle	E	35 FR 8491/ June 2, 1970	December 1993	NLAA	NE
Kemp's ridley sea turtle	E	35 FR 18319/ December 2, 1970	September 2011	NLAA	LAA
Leatherback sea turtle	E	35 FR 8491/ June 2, 1970	April 1992	NLAA	NE
Loggerhead sea turtle (Northwest Atlantic DPS)	T	76 FR 58868/ September 22, 2011	December 2008	NLAA	LAA
Fishes					
Giant manta ray	T	83 FR 2916/ January 22, 2018	2019 (Outline)	NE	NLAA
Gulf sturgeon (Atlantic sturgeon, Gulf subspecies)	T	56 FR 49653/ September 30, 1991	September 1995	NLAA	NLAA
Smalltooth sawfish (United States DPS)	E	68 FR 15674/ April 1, 2003	January 2009	NLAA	LAA

We believe the project will have no effect on hawksbill and leatherback sea turtles due to the species' very specific life history strategies, which are not supported in the action area. Hawksbill sea turtles typically inhabit inshore reef and hard bottom areas where they forage primarily on encrusting sponges. Hard bottom is not found in the action area. Leatherback sea turtles have pelagic, deepwater life history, where they forage primarily on jellyfish. The action area occurs inshore.

3.1.2 Effects Analysis for ESA-Listed Species Not Likely to be Adversely Affected by the Proposed Action

Gulf sturgeon and giant manta ray may be physically injured if struck by construction equipment, support vessels, or materials. We believe this is extremely unlikely to occur. Mobile species, such as these, are able to avoid slow-moving equipment, support vessels, and the placement of materials. In addition, the implementation of our *Protected Species Construction Conditions* (revised 2021) will require all construction workers to observe in-water activities for the presence of these species. Operation of any mechanical construction equipment shall cease immediately if a protected species is seen within a 150-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition or 20 minutes have passed since the animal was last seen in the area. Further, construction would be limited to daylight hours so construction workers are able to see protected species, if present, and avoid interactions with them.

The action area contains shallow-water habitat that may be used by Gulf sturgeon and giant manta ray for foraging and refuge. These species may be affected if they are temporarily unable to use the parts of the action area for forage or refuge habitat due to avoidance of construction activities, related noise, and physical exclusion from the use of turbidity curtains. Although species will be temporarily unable to access the construction area due to the placement of turbidity curtains, these effects will be insignificant given the project's limited footprint and availability of similar habitat nearby. Any disturbances to species would be temporary, limited to up to 6 months of in-water construction during daylight hours only, after which animals will be able to return to the action area.

Potential effects to Gulf sturgeon include the risk of physical injury from recreational hook-and-line capture resulting from future use of the new fishing pier after completion of the proposed action. We believe incidental capture of Gulf sturgeon is extremely unlikely to occur. Anecdotal evidence indicates sturgeon have been caught or snagged by recreational anglers (A. Kaeser, USFWS, pers. comm. to J. Reuter, NMFS SERO on June 29, 2017; C. Godwin, NCDENR, pers. comm. to J. Reuter, NMFS SERO, on July 6, 2017); however, reported and validated incidences are rare (B. Howard, NMFS HCD, pers. comm. to J. Rueter, NMFS SERO, on August 3, 2017). There is only 1 known recreational hook-and-line interaction of a sturgeon from a fishing structure; the FWC reported that a subadult Atlantic sturgeon was caught on hook-and-line from a Florida fishing pier, Jacksonville Beach Pier (C. Brown, FWC, pers. comm. to K. Shotts, NMFS SERO, on January 8, 2014). The single reported recreational catch indicates that a recreational fishing capture is extremely unlikely. In addition, as stated below, educational signage for sturgeon will be posted on the piers upon completion of repairs. While signage will not reduce the potential risk of recreational hook-and-line interaction, it will encourage anglers to report interactions and either confirm our analysis (by lack of reports) or ensure we will be able to reinitiate consultation with the USACE based on new information.

Potential effects to giant manta ray include the risk of physical injury from recreational hook-and-line capture resulting from future use of the new fishing pier after completion of the proposed action. We believe incidental capture of giant manta ray is extremely unlikely to occur. Recreational hook and line interactions from fishing structures are typically the result of foul-hooking (i.e., a method that catches a fish using hooks without having the fish take the bait in its mouth) and most-often occur at larger fishing structures that are positioned perpendicular to the shore and ocean-facing or located in or near an inlet or pass. The LSMWR fishing pier is a relatively small structure located inland in shallow water; it runs parallel to the shore. In addition, as stated below, educational signage for giant manta ray will be posted in a visible location upon completion of proposed action prior to the structure being open to the public. While signage will not reduce the potential risk of recreational hook-and-line interaction, it will encourage anglers to report interactions and either confirm our analysis (by lack of reports) or ensure we will be able to reinitiate consultation with the USACE based on new information.

The NMFS educational signs “Report a Sturgeon” and “Save Dolphins, Sea Turtles, Sawfish, and Manta Ray” signs will be installed in a visible location upon completion of the proposed action prior to the fishing pier being open to the public. We believe the placement of educational signs will further reduce the likelihood of recreational hook-and-line interactions with Gulf sturgeon and giant manta ray. The signs will provide information to the public on how to avoid and minimize encounters with these species as well as proper handling techniques. The signs will also encourage anglers to report sightings and interactions, thus providing valuable distribution and abundance data to researchers and resource managers. Accurate distribution and abundance data allows management to evaluate the status of the species and refine conservation and recovery measures.

Gulf sturgeon and giant manta ray may be injured due to entanglement in improperly discarded fishing gear resulting from future use of the fishing pier after completion of the proposed action. We believe this route of effect is extremely unlikely to occur. To the best of our knowledge, there has never been a reported entanglement with any of these species at this fishing pier. To help further reduce the risk of entanglement in improperly discarded fishing gear, the USFWS will install and maintain fishing line recycling receptacles and trashcans with lids at the pier to keep debris out of the water, and we expect that anglers will appropriately dispose of fishing gear when disposal bins are available. All receptacles will be clearly marked and will be emptied regularly to ensure they are not overfilled and that fishing lines are disposed of properly. The USFWS will also perform in-water and out-of-water fishing debris cleanups, minimizing the accumulation of fishing line on the structure over time.

Noise created by pile driving activities can physically injure animals or change animal behavior in the affected areas. Animals can be physically injured in 2 ways. First, immediate adverse effects can occur if a single noise event exceeds the threshold for direct physical injury. Second, adverse physical effects can result from prolonged exposure to noise levels that exceed the daily cumulative sound exposure level for the animals. Noise can also interfere with an animal's behavior, such as migrating, feeding, resting, or reproducing and such disturbances could constitute adverse behavioral effects.

Vibratory pile driving produces continuous, non-pulsed sounds that can be tonal or broadband. In terms of acoustics, the sound pressure wave is described by the peak sound pressure level (PK, which is the greatest value of the sound signal), the root-mean-square pressure level (RMS, which is the average intensity of the sound signal over time), and the sound exposure level (SEL, which is a measure of the energy that takes into account both received level and duration of exposure). Further, the cumulative sound exposure level (SELcum) is a measure of the energy that takes into account the received sound pressure level over a 24-hour period. Please see the following website for more information related to measuring underwater sound and the NMFS-accepted pile driving sound measurement thresholds for species in the NMFS Southeast Region: https://www.fisheries.noaa.gov/southeast/consultations/section-7-consultation-guidance.

NMFS uses the U.S. Navy Phase III criteria for all noise thresholds (U.S. Department of the Navy, 2017). As of December 2021, potential effects to ESA-listed species may occur when vibratory pile driving produces sounds that exceed certain thresholds. For vibratory pile driving, NMFS does not recognize any injurious sound thresholds resulting from peak pressure or cumulative sound exposure for ESA-listed fishes; only behavioral sound measurement thresholds exist for these species.

We use the NMFS Multi-Species Pile Driving Tool (dated May 2022) to calculate the radii of behavioral effects on ESA-listed fishes that may be located in the action area based on the NMFS-accepted pile driving sound measurement thresholds for species in the NMFS Southeast Region (150 dB RMS). The applicant proposes to install a total of forty 9-in wood piles via vibratory hammer (**Table 1**). The NMFS Multi-Species Pile Driving Tool does not have sound source levels for a 9-in wood pile installed via vibratory hammer; therefore, we used the sound source levels for the installation of generic wood piles as a proxy. Typically, wood piles are no more than 14 in in diameter. No more than 10 piles will be installed per day and, in the absence of pile-specific installation duration data, our analysis assumes a continuous 8-hour workday (i.e., approximately 48 minutes of vibratory pile driving per pile). Pile driving will occur in an open-water environment. NMFS defines an open-water environment as any area where an animal would be able to move away from the noise source without being forced to pass through the radius of noise effects.

The installation of up to ten 9-in wood piles per 8-hour workday by vibratory hammer without the use of noise abatement measures could result in behavioral noise effects to ESA-listed fishes at a radius of up to 207-ft-away from the pile driving operations. Due to the mobility of Gulf sturgeon and giant manta ray and the open-water environment, we expect these animals to move away from noise disturbances. Because there is similar habitat nearby, we believe behavioral effects will be insignificant. If an animal chooses to remain within the behavioral response zone, it could be exposed to behavioral noise effects during pile installations. Because pile installations will occur intermittently during daylight hours only, these species will be able to resume normal activities during quiet periods between pile installations and at night. As a result, we believe any behavioral noise effects to ESA-listed fishes will be temporary and therefore, insignificant.

3.1.3 ESA-Listed Species Likely to be Adversely Affected by the Proposed Action

3.1.3.1 Sea Turtles

To help determine which sea turtle species are likely to occur within the action area and be susceptible to interactions with recreational fishing that may occur at the LSNWR fishing pier, we coupled a review of the archived STSSN and FWC stranding data with what we know about the species' life history traits and habitat in and around the action area.

The LSNWR fishing pier is located in Levy County, Florida, in the inshore waters of Zone 7, a statistical subarea used when reporting commercial fishing data. Zone 7 extends from Apalachicola, Florida (Franklin County), southeast to Yankeetown, Florida (Levy County), along the Gulf of Mexico-coast of Florida. **Table 3** is the archived STSSN inshore stranding data (i.e., stranding data for all areas inside of protected waters) for Zone 7, 2007-2016.

Table 3. Summary of the Archived STSSN Inshore Data for Zone 7 (2007-2016)

Species	Number of Sea Known Turtles Stranded or Salvaged (All Activities)	Number of Known Gear Entanglements	Number of Known Recreational Hook-and-line Captures
Green sea turtle	25	2	1
Hawksbill sea turtle	1	0	0
Kemp's ridley sea turtle	65	7	32
Leatherback sea turtle	1	1	0
Loggerhead sea turtle	26	0	0
Unidentified	1	0	0
Total	**119**	**10**	**33**

The occurrence of hawksbill and leatherback sea turtles in the STSSN inshore stranding data for Zone 7, 2007-2016, is rare. The 1 hawksbill sea turtle in the dataset was found after a strong storm moved through Franklin County; the animal was taken to a rehabilitation center where it later died. The 1 leatherback sea turtle in the dataset was due to an entanglement in a crab pot; the animal was released alive immediately. There have been no reported recreational hook-and-line captures of hawksbill and leatherback sea turtles in this dataset. The lack of recreational fishing interactions in the STSSN dataset supports our belief that the recreational fishing that may occur at the LSNWR fishing pier upon completion of the proposed action will have no effect on hawksbill and leatherback sea turtles (see Section 3.1.1).

In cooperation with the STSSN, the FWC documents dead, sick, or injured sea turtles for all Florida counties (https://ocean.floridamarine.org/SeaTurtle/flstssn/). **Table 4** is a summary of the archived FWC sea turtle strandings data for Jefferson, Tayler, Dixie, Levy, Citrus, and Hernando counties, 2017-2022. We use this more recent dataset to supplement the archived STSSN data referenced above.

Table 4. FWC Archived Sea Turtle Stranding Data for Jefferson, Tayler, Dixie, Levy, Citrus, and Hernando Counties, 2017-2023

Year	Green Sea Turtle	Hawksbill Sea Turtle	Kemp's Ridley Sea Turtle	Leatherback Sea Turtle	Loggerhead Sea Turtle
2017	24	0	5	0	7
2018	12	0	5	0	4
2019	20	0	2	0	6
2020	15	0	3	0	3
2021	12	0	2	0	4
2022	14	0	4	1	2
Total	**97**	**0**	**21**	**1**	**26**

There are no recorded strandings of hawksbill sea turtles in the FWC dataset for Jefferson, Tayler, Dixie, Levy, Citrus, and Hernando counties, 2017-2022. This also supports our determination that the recreational fishing that may occur at the LSNWR fishing pier upon completion of the proposed action will have no effect on hawksbill sea turtles. There is 1 reported stranding of a leatherback sea turtle in the FWC dataset (2017-2022). The rarity of this species in the FWC dataset further supports our determination that the recreational fishing that may occur at the LSNWR fishing pier upon completion of the proposed action will have no effect on hawksbill and leatherback sea turtles.

Therefore, we have determined that green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, and loggerhead sea turtle (Northwest Atlantic DPS) are likely to be adversely affected by recreational fishing that will occur upon completion of the proposed action and thus require further analysis. Further, Levy County is positioned between Franklin and Pinellas counties, which have known medium to high density nesting beaches for green, Kemp's ridley, and loggerhead sea turtles. Additionally, there are continuous seagrass beds adjacent to and offshore of the action area. These factors lead us to suspect juvenile and adult sea turtles of these species may be present in the action area during construction and after the completion of the pier.

We provide greater detail on the potential effects to green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, and loggerhead sea turtle (Northwest Atlantic DPS) from the proposed action in the Effects of the Action (Section 6.2-6.3) and whether those effects, when considered in the context of the Status of the Species (Section 4.1.1), the Environmental Baseline (Section 5), and the Cumulative Effects (Section 7), are likely to jeopardize the continued existence of these ESA-listed species in the wild.

3.1.3.2 Smalltooth Sawfish (United Sates DPS)

To help determine if smalltooth sawfish are likely to occur within the action area and are susceptible to interactions with recreational fishing that may occur at the LSNWR fishing pier, we reviewed reported smalltooth sawfish encounter records in the U.S. Sawfish Recovery Database for Dixie, Levy, and Citrus counties, 2000-2022 (A. Brame, NOAA NMFS SERO Smalltooth Sawfish Species Coordinator, to consulting biologist on March 20, 2023) (**Table 5**).

This region encompasses approximately 100 mi of coastline from the mouth of the Steinhatchee River south to Chassahowitzka Bay and is inclusive of the action area.

Table 5. Summary of U.S. Sawfish Recovery Database Encounters for Dixie, Levy, and Citrus Counties, 2000-2022

County (North to South)	Number of Reported Encounters (All Activities)	Number of Reported Recreational Fishing Encounters
Dixie	4	4
Levy	9	4
Citrus	10	6
Total	**23**	**14**

Based on this data, we have determined that smalltooth sawfish (United States DPS) are likely to be adversely affected by recreational fishing that will occur upon completion of the proposed action and thus require further analysis.

We provide greater detail on the potential effects to smalltooth sawfish (United Stated DPS) from the proposed action in the Effects of the Action (Section 6.2 and 6.4) and whether those effects, when considered in the context of the Status of the Species (Section 4.1.2), the Environmental Baseline (Section 5), and the Cumulative Effects (Section 7), are likely to jeopardize the continued existence of these ESA-listed species in the wild.

3.2 Effects Determinations for Critical Habitat

3.2.1 Agency Effects Determinations

We have assessed the critical habitat that overlap with the action area and our determination of the project's potential effects is shown in **Table 6** below.

Table 6. Critical Habitat in the Action Area and Effect Determinations

Species (DPS)	Critical Habitat Unit in the Action Area	Critical Habitat Rule/Date	USACE Effect Determination	NMFS Effect Determination (Critical Habitat)
Fishes				
Gulf sturgeon	<u>Suwannee Sound</u>	68 FR 13370/ March 19, 2003	<u>NLAA</u>	<u>NLAA</u>

3.2.2 Effects Analysis for Critical Habitat Not Likely to be Adversely Affected by the Proposed Action

The proposed action is located within the boundary of Gulf sturgeon critical habitat, Unit 14 – Suwannee Sound. The following physical or biological features essential for the conservation of the species (PCEs) are present in Unit 14 – Suwannee Sound:

1. Abundant prey items within estuarine and marine habitats and substrates for juvenile, subadult, and adult life stages;
2. Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;
3. Sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and
4. Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., a river unobstructed by any permanent structure, or a dammed river that still allows for passage).

The installation of pile-supported structures may cover and bury bottom substrates containing sturgeon prey species (PCE 1). We believe that the effect to PCE 1 from the installation of pile-supported structures will be insignificant since the area of impact from individual piles is very small and discontinuous (typically, piles are spaced paced 4-10 ft apart). In addition, the proposed action will replace an existing pile-supported structure utilizing the existing footprint. Prey items will still be present in the surrounding sediment, allowing Gulf sturgeon to forage in the area after construction. Further, not all of the habitat covered or buried may support prey items or serve as preferred foraging habitat. Only the portions of the dock in waters deeper than 6.5 ft (2 m) occur in areas where Gulf sturgeon tend to forage.

Localized and temporary reductions in water quality (PCE 2) through increased turbidity may result from the installation, repair, replacement, or removal of pile-supported structures. We believe the effects to PCE 2 from localized and temporary increased turbidity due to pile placement will be insignificant because turbidity curtains will be used to contain turbidity and we expect any small amounts of turbidity that may escape to have an insignificant effect on the water quality PCE. Effects to temperature, salinity, pH, hardness, oxygen content, and other chemical characteristics of PCE 2 are not expected to result from the installation of pile-supported structures. Therefore, there is no effect to these aspects of PCE 2 from the installation of pile-supported structures.

We believe that the effects to sediment quality (PCE 3) from the installation of pile-supported structures will be insignificant since the area of impact from individual piles is very small and discontinuous (typically, piles are spaced 4-10 ft apart) and because the new structure will replace an existing pile-supported structure utilizing the existing footprint. The surrounding benthos is expected to maintain the sediment quality characteristics necessary for normal behavior, growth, and viability of all life stages.

We believe there is no effect to migratory pathways (PCE 4) from the installation of pile-supported structures. Noise generated during pile installation is expected to create a behavioral noise effect to ESA-listed fishes at a radius of up to 207-ft-away from the pile driving operations. The nearest opening to a spawning river is at the Suwannee River over 8.5 miles to the north of the action area.

Based on the foregoing, we believe that designated critical habitat for Gulf sturgeon, Unit 14 – Suwannee Sound, is not likely to be adversely affected by the proposed action.

4 STATUS OF ESA-LISTED SPECIES CONSIDERED FOR FURTHER ANALYSIS

4.1 Range wide Status of the Species Considered for Further Analysis

4.1.1 Sea Turtles

4.1.1.1 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. The threats identified in this section are discussed in a general sense for all sea turtles. Threat information specific to a particular species are then discussed in the corresponding status 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 1991a; NMFS and USFWS 1992; NMFS and USFWS 1993; NMFS and USFWS 2008a; NMFS et al. 2011a). 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. Refer to the Environmental Baseline section of this opinion for more specific information regarding federal and state managed fisheries affecting sea turtles within the action area). The 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. 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 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 hatchlings 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., DDT, PCBs, and PFCs), and others that may cause adverse health effects to sea turtles (Garrett 2004; Grant and Ross 2002; Hartwell 2004; Iwata et al. 1993). Acute exposure to hydrocarbons from petroleum products released into the environment via oil spills and other discharges may directly injure individuals through skin contact with oils (Geraci 1990), inhalation at the water's surface and ingesting compounds while feeding (Matkin and Saulitis 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability in the action area.

The April 20, 2010, explosion of the Deepwater Horizon oil rig affected sea turtles in the Gulf of Mexico. An assessment has been completed on the injury to Gulf of Mexico marine life, including sea turtles, resulting from the spill (DWH Trustees 2015a). Following the spill, juvenile Kemp's ridley, green, and loggerhead sea turtles were found in *Sargassum* algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil or had ingested oil or both. 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 2007b). In sea turtles, sex is determined by the ambient sand temperature (during the middle third of incubation) with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007b).

The effects from increased temperatures may be intensified on developed nesting beaches where shoreline armoring and construction have denuded vegetation. Erosion control structures could potentially result in the permanent loss of nesting beach habitat or deter nesting females (NRC 1990). These impacts will be exacerbated by sea level rise. If females nest on the seaward side of the erosion control structures, nests may be exposed to repeated tidal overwash (NMFS and USFWS 2007c). Sea level rise from global climate change is also a potential problem for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Baker et al. 2006; Daniels et al. 1993; Fish et al. 2005). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as an increase in the frequency of storms and 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, etc.) could influence the distribution and abundance of lower trophic levels (e.g., phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish, etc.) which could ultimately affect the primary foraging areas of sea turtles.

Other Threats

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

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.

4.1.1.2 Green Sea Turtle (North Atlantic DPS and South Atlantic DPS)

The green sea turtle was originally listed as threatened under the ESA on July 28, 1978, except for the Florida and Pacific coast of Mexico breeding populations, which were listed as endangered. On April 6, 2016, the original listing was replaced with the listing of 11 DPSs (81 FR 20057 2016) (**Figure 4**). 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 DPSs were listed as threatened. For the purposes of this consultation, only the South Atlantic DPS and North Atlantic DPS will be considered, as they are the only 2 DPSs with individuals occurring in the Atlantic Ocean and Gulf of Mexico waters of the United States.

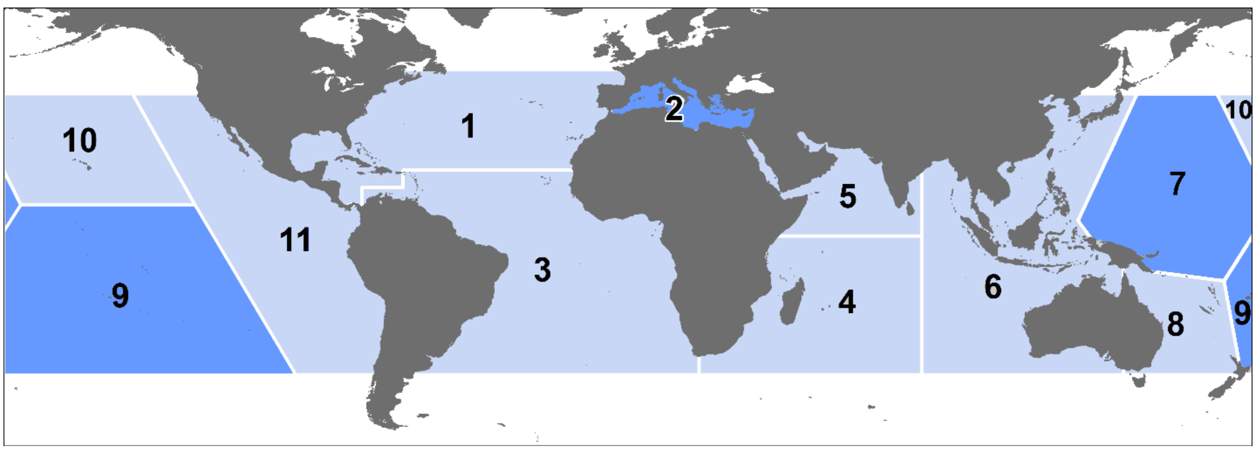

Figure 4. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11. 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 SCL of greater than 3.3 ft (1 m). Green sea turtles have a smooth carapace with 4 pairs of lateral (or costal) scutes and a single pair of elongated prefrontal scales between the eyes. They typically have a black dorsal surface and a white ventral surface, although the carapace of green sea turtles in the Atlantic Ocean has been known to change in color from solid black to a variety of shades of grey, green, or brown and black in starburst or irregular patterns (Lagueux 2001).

With the exception of post-hatchlings, green sea turtles live in nearshore tropical and subtropical waters where they generally feed on marine algae and seagrasses. They have specific foraging grounds and may make large migrations between these forage sites and natal beaches for nesting (Hays et al. 2001). Green sea turtles nest on sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands in more than 80 countries worldwide (Hirth 1997). The 2 largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica (part of the North Atlantic 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 North Atlantic DPS and South Atlantic DPS can be found on foraging grounds. While there are currently no in-depth studies available to determine the percent of North Atlantic DPS and South Atlantic 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 South Atlantic 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 South Atlantic 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 North Atlantic DPS, the U.S. Caribbean nesting assemblages are split between the North Atlantic DPS and South Atlantic DPS. Nesters in Puerto Rico are part of the North Atlantic DPS, while those in the U.S. Virgin Islands are part of the South Atlantic DPS. We do not currently have information on what percent of individuals on the U.S. Caribbean foraging grounds come from which DPS.

North Atlantic DPS Distribution

The North Atlantic DPS boundary is illustrated in **Figure 4**. Four regions support nesting concentrations of particular interest in the North Atlantic DPS: Costa Rica (Tortuguero), Mexico (Campeche, Yucatan, and Quintana Roo), United States (Florida), and Cuba. By far the most important nesting concentration for green turtles in this DPS is Tortuguero, Costa Rica. Nesting also occurs in the Bahamas, Belize, Cayman Islands, Dominican Republic, Haiti, Honduras, Jamaica, Nicaragua, Panama, Puerto Rico, Turks and Caicos Islands, and North Carolina, South Carolina, Georgia, and Texas, U.S. In the eastern North Atlantic, nesting has been reported in Mauritania (Fretey 2001).

The complete nesting range of North Atlantic DPS green sea turtles within the southeastern United States includes sandy beaches between Texas and North Carolina, as well as Puerto Rico (Dow et al. 2007; NMFS and USFWS 1991a). The vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Johnson and Ehrhart 1994; Meylan et al.

1995). Principal U.S. nesting areas for green sea turtles are in eastern Florida, predominantly Brevard south through Broward counties.

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

South Atlantic DPS Distribution

The South Atlantic DPS boundary is shown in **Figure 4**, and includes the U.S. Virgin Islands in the Caribbean. The South Atlantic 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 South Atlantic DPS is widespread. In the eastern South Atlantic, significant sea turtle habitats have been identified, including green turtle feeding grounds in Corisco Bay, Equatorial Guinea/Gabon (Formia 1999); Congo; Mussulo Bay, Angola (Carr and Carr 1991); as well as Principe Island. Juvenile and adult green turtles utilize foraging areas throughout the Caribbean areas of the South Atlantic, often resulting in interactions with fisheries occurring in those same waters (Dow et al. 2007). Juvenile green turtles from multiple rookeries also frequently utilize the nearshore waters off Brazil as foraging grounds as evidenced from the frequent captures by fisheries (Lima et al. 2010; López-Barrera et al. 2012; Marcovaldi et al. 2009). Genetic analysis of green turtles on the foraging grounds off Ubatuba and Almofala, Brazil show mixed stocks coming primarily from Ascension, Suriname and Trindade as a secondary source, but also Aves, and even sometimes Costa Rica (North Atlantic DPS) (Naro-Maciel et al. 2007; Naro-Maciel et al. 2012). While no nesting occurs as far south as Uruguay and Argentina, both have important foraging grounds for South Atlantic green turtles (Gonzalez Carman et al. 2011; Lezama 2009; López-Mendilaharsu et al. 2006; Prosdocimi et al. 2012; Rivas-Zinno 2012).

Life History Information

Green sea turtles reproduce sexually, and mating occurs in the waters off nesting beaches and along migratory routes. Mature females return to their natal beaches (i.e., the same beaches where they were born) to lay eggs (Balazs 1982; Frazer and Ehrhart 1985) every 2-4 years while males are known to reproduce every year (Balazs 1983). In the southeastern United States, females generally nest between June and September, and peak nesting occurs in June and July

(Witherington and Ehrhart 1989b). During the nesting season, females nest at approximately 2-week intervals, laying an average of 3-4 clutches (Johnson and Ehrhart 1996). Clutch size often varies among subpopulations, but mean clutch size is approximately 110-115 eggs. In Florida, green sea turtle nests contain an average of 136 eggs (Witherington and Ehrhart 1989b). Eggs incubate for approximately 2 months before hatching. Hatchling green sea turtles are approximately 2 in (5 cm) in length and weigh approximately 0.9 oz (25 g). Survivorship at any particular nesting site is greatly influenced by the level of man-made stressors, with the more pristine and less disturbed nesting sites (e.g., along the Great Barrier Reef in Australia) showing higher survivorship values than nesting sites known to be highly disturbed (e.g., Nicaragua) (Campell and Lagueux 2005; Chaloupka and Limpus 2005).

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

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

Status and Population Dynamics

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

North Atlantic DPS

The North Atlantic 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. 2015b).

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

Tortuguero, Costa Rica is by far the predominant nesting site, accounting for an estimated 79% of nesting for the DPS (Seminoff et al. 2015b). 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 (Meylan et al. 1994; Weishampel et al. 2003). Occasional nesting has also been documented along the Gulf Coast of Florida (Meylan et al. 1995). Green sea turtle nesting is documented annually on beaches of North Carolina, South Carolina, and Georgia, though nesting is found in low quantities (up to tens of nests) (nesting databases maintained on www.seaturtle.org).

Florida accounts for approximately 5% of nesting for this DPS (Seminoff et al. 2015b). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9% at that time. Increases have been even more rapid in recent years. 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 5**). According to data collected from Florida's index nesting beach survey from 1989-2021, green sea turtle nest counts across Florida have increased dramatically, from a low of 267 in the early 1990s to a high of 40,911 in 2019. Two consecutive years of nesting declines in 2008 and 2009 caused some concern, but this was followed by increases in 2010 and 2011. The pattern departed from the low lows and high peaks in 2020 and 2021 as well, when 2020 nesting only dropped by half from the 2019 high, while 2021 nesting only increased by a small amount over the 2020 nesting (**Figure 5**).

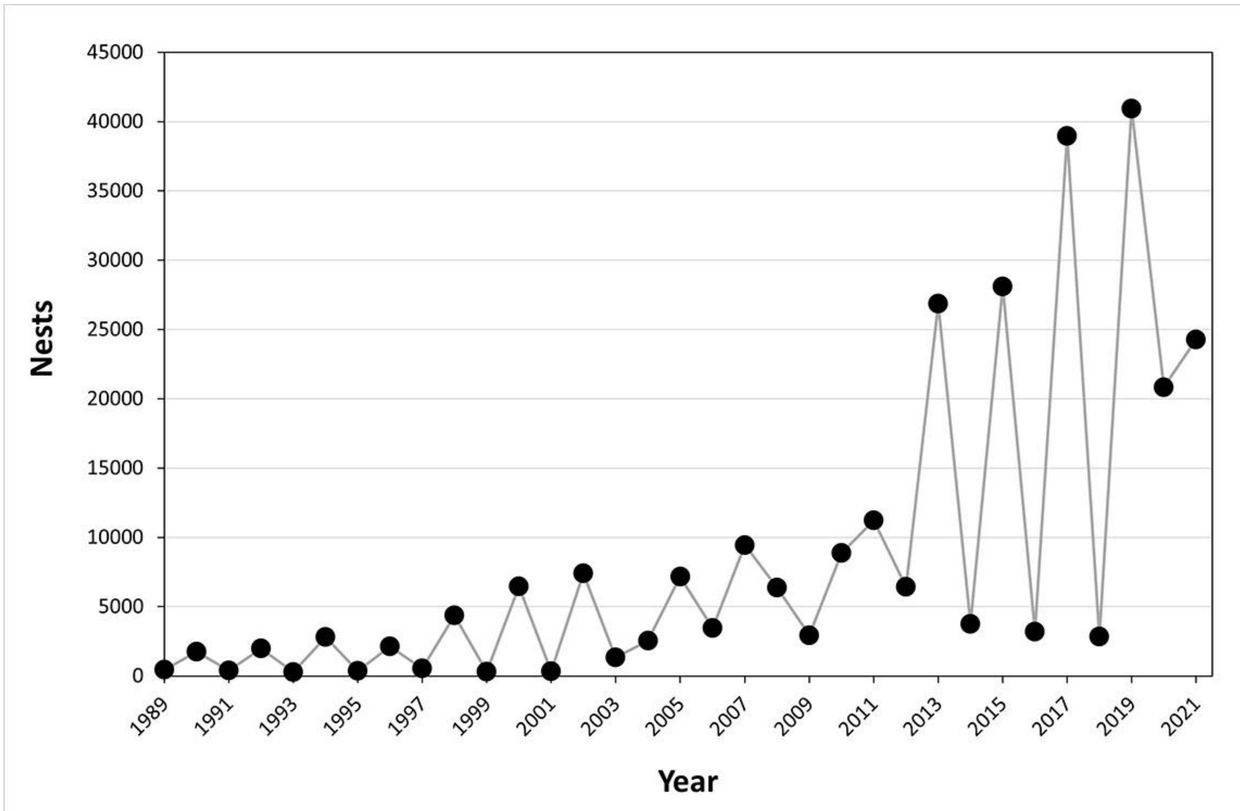

Figure 5. Green sea turtle nesting at Florida index beaches since 1989

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 percent increase over 24 years (Ehrhart et al. 2007), and the St Lucie Power Plant site, with a significant increase in the annual rate of capture of immature green turtles (SCL<90 cm) from 1977 to 2002 or 26 years (3,557 green turtles total; M. Bressette, Inwater Research Group, unpublished data; (Witherington et al. 2006).

<u>South Atlantic DPS</u>

The South Atlantic 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. 2015b). 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 South Atlantic DPS was not considered to be a major concern as some of the largest nesting beaches such as Ascension Island (United Kingdom), Aves Island (Venezuela), and Galibi (Suriname) appear to be increasing. Others such as Trindade (Brazil), Atol das Rocas (Brazil), and Poilão (Guinea-Bissau) and the rest of Guinea-Bissau seem to be stable or do not have sufficient data to make a determination. Bioko

(Equatorial Guinea) appears to be in decline but has less nesting than the other primary sites (Seminoff et al. 2015b).

In the United States, nesting of South Atlantic 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. 2015b).

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 4.1.1.

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

Cold-stunning is another natural threat to green sea turtles. Although it is not considered a major source of mortality in most cases, as temperatures fall below 46.4°-50°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 4.1.1.1, 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 2015b). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil or dispersants or both, and loss of foraging resources, which could lead to compromised growth and 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 2015b).

4.1.1.3 Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was listed as endangered on December 2, 1970, under the Endangered Species Conservation Act of 1969, a precursor to the ESA. Internationally, the Kemp's ridley is considered the most endangered sea turtle (Groombridge 1982; TEWG 2000; Zwinenberg 1977).

Species Description and Distribution
The Kemp's ridley sea turtle is the smallest of all sea turtles. Adults generally weigh less than 100 lb (45 kg) and have a carapace length of around 2.1 ft (65 cm). Adult Kemp's ridley shells are almost as wide as they are long. Coloration changes significantly during development from the grey-black dorsum and plastron of hatchlings, a grey-black dorsum with a yellowish-white plastron as post-pelagic juveniles, and then to the lighter grey-olive carapace and cream-white or yellowish plastron of adults. There are 2 pairs of prefrontal scales on the head, 5 vertebral scutes, usually 5 pairs of costal scutes, and generally 12 pairs of marginal scutes on the carapace. In

each bridge adjoining the plastron to the carapace, there are 4 scutes, each of which is perforated by a pore.

Kemp's ridley habitat largely consists of sandy and muddy areas in shallow, nearshore waters less than 120 ft (37 m) deep, although they can also be found in deeper offshore waters. These areas support the primary prey species of the Kemp's ridley sea turtle, which consist of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The primary range of Kemp's ridley sea turtles is within the Gulf of Mexico basin, though they also occur in coastal and offshore waters of the U.S. Atlantic Ocean. Juvenile Kemp's ridley sea turtles, possibly carried by oceanic currents, have been recorded as far north as Nova Scotia. Historic records indicate a nesting range from Mustang Island, Texas, in the north to Veracruz, Mexico, in the south. Kemp's ridley sea turtles have recently been nesting along the Atlantic Coast of the United States, with nests recorded from beaches in Florida, Georgia, and the Carolinas. In 2012, the first Kemp's ridley sea turtle nest was recorded in Virginia. The Kemp's ridley nesting population had been exponentially increasing prior to the recent low nesting years, which may indicate that the population had been experiencing a similar increase. Additional nesting data in the coming years will be required to determine what the recent nesting decline means for the population trajectory.

Life History Information
Kemp's ridley sea turtles share a general life history pattern similar to other sea turtles. Females lay their eggs on coastal beaches where the eggs incubate in sandy nests. After 45-58 days of embryonic development, the hatchlings emerge and swim offshore into deeper, ocean water where they feed and grow until returning at a larger size. Hatchlings generally range from 1.65-1.89 in (42-48 mm) SCL, 1.26-1.73 in (32-44 mm) in width, and 0.3-0.4 lb (15-20 g) in weight. Their return to nearshore coastal habitats typically occurs around 2 years of age (Ogren 1989), although the time spent in the oceanic zone may vary from 1-4 years or perhaps more (TEWG 2000). Juvenile Kemp's ridley sea turtles use these nearshore coastal habitats from April through November, but they move towards more suitable overwintering habitat in deeper offshore waters (or more southern waters along the Atlantic coast) as water temperature drops.

The average rates of growth may vary by location, but generally fall within 2.2-2.9 ± 2.4 in per year (5.5-7.5 ± 6.2 cm/year) (Schmid and Barichivich 2006; Schmid and Woodhead 2000). Age to sexual maturity ranges greatly from 5-16 years, though NMFS et al. (2011a) determined the best estimate of age to maturity for Kemp's ridley sea turtles was 12 years. It is unlikely that most adults grow very much after maturity. While some sea turtles nest annually, the weighted mean remigration rate for Kemp's ridley sea turtles is approximately 2 years. Nesting generally occurs from April to July. Females lay approximately 2.5 nests per season with each nest containing approximately 100 eggs (Márquez M. 1994).

Population Dynamics
Of the 7 species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nest on the beaches of Rancho Nuevo, Mexico (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963).

By the mid-1980s, however, nesting numbers from Rancho Nuevo and adjacent Mexican beaches were below 1,000, with a low of 702 nests in 1985. Yet, nesting steadily increased through the 1990s, and then accelerated during the first decade of the twenty-first century (**Figure 6**), which indicates the species is recovering.

It is worth noting that when the Bi-National Kemp's Ridley Sea Turtle Population Restoration Project was initiated in 1978, only Rancho Nuevo nests were recorded. In 1988, nesting data from southern beaches at Playa Dos and Barra del Tordo were added. In 1989, data from the northern beaches of Barra Ostionales and Tepehuajes were added, and most recently in 1996, data from La Pesca and Altamira beaches were recorded. Currently, nesting at Rancho Nuevo accounts for just over 81% of all recorded Kemp's ridley nests in Mexico. Following a significant, unexplained 1-year decline in 2010, Kemp's ridley nests in Mexico increased to 21,797 in 2012 (Gladys Porter Zoo 2013). From 2013 through 2014, there was a second significant decline, as only 16,385 and 11,279 nests were recorded, respectively. More recent data, however, indicated an increase in nesting. In 2015 there were 14,006 recorded nests, and in 2016 overall numbers increased to 18,354 recorded nests (Gladys Porter Zoo 2016). There was a record high nesting season in 2017, with 24,570 nests recorded (J. Pena, pers. comm., August 31, 2017), but nesting for 2018 declined to 17,945, with another steep drop to 11,090 nests in 2019 (Gladys Porter Zoo data, 2019). Nesting numbers rebounded in 2020 (18,068 nests) and 2021 (17,671 nests) (CONAMP data, 2021). At this time, it is unclear whether the increases and declines in nesting seen over the past decade represents a population oscillating around an equilibrium point or if nesting will decline or increase in the future.

A small nesting population is also emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 42 in 2004, to a record high of 353 nests in 2017 (National Park Service data). It is worth noting that nesting in Texas has paralleled the trends observed in Mexico, characterized by a significant decline in 2010, followed by a second decline in 2013-2014, but with a rebound in 2015, the record nesting in 2017, and then a drop back down to 190 nests in 2019, rebounding to 262 nests in 2020, and back to 195 nests in 2021 (National Park Service data). This year, Kemp's ridley nests were recorded in the Chandeleur Islands of coastal Louisiana (https://www.washingtonpost.com/national/kemps-ridley-sea-turtle-nests-1st-in-75-years-in-louisiana/2022/08/17/0ca8f9b2-1e5a-11ed-9ce6-68253bd31864_story.html).

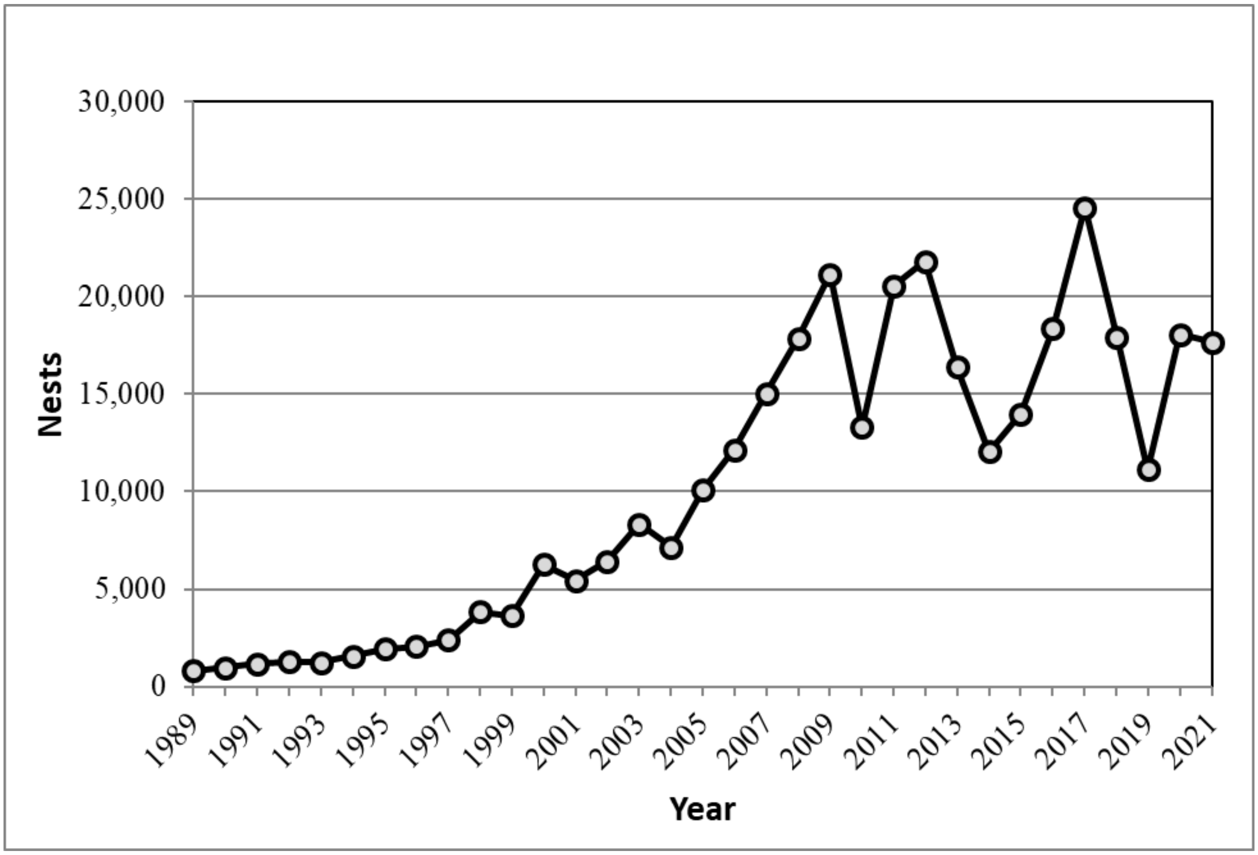

Figure 6. Kemp's ridley nest totals from Mexican beaches (Gladys Porter Zoo nesting database 2019 and CONAMP data 2020, 2021)

Through modelling, Heppell et al. (2005) predicted the population is expected to increase at least 12-16% per year and could reach at least 10,000 females nesting on Mexico beaches by 2015. NMFS et al. (2011a) produced an updated model that predicted the population to increase 19% per year and to attain at least 10,000 females nesting on Mexico beaches by 2011. Approximately 25,000 nests would be needed for an estimate of 10,000 nesters on the beach, based on an average 2.5 nests/nesting female. While counts did not reach 25,000 nests by 2015, it is clear that the population has increased over the long term. The increases in Kemp's ridley sea turtle nesting over the last 2 decades is likely due to a combination of management measures including elimination of direct harvest, nest protection, the use of TEDs, reduced trawling effort in Mexico and the United States, and possibly other changes in vital rates (TEWG 1998; TEWG 2000). While these results are encouraging, the species' limited range as well as low global abundance makes it particularly vulnerable to new sources of mortality as well as demographic and environmental randomness, all factors which are often difficult to predict with any certainty. Additionally, the significant nesting declines observed in 2010 and 2013-2014 potentially indicate a serious population-level impact, and the ongoing recovery trajectory is unclear.

Threats

Kemp's ridley sea turtles 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 (plastics, petroleum products, petrochemicals, etc.), ecosystem alterations (nesting beach development, beach nourishment and shoreline stabilization, vegetation changes, etc.), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 4.1.1.1; the remainder of this section will expand on a few of the aforementioned threats and how they may specifically impact Kemp's ridley sea turtles.

As Kemp's ridley sea turtles continue to recover and nesting *arribadas* are increasingly established, bacterial and fungal pathogens in nests are also likely to increase. *Arribada* is the Spanish word for "arrival" and is the term used for massive synchronized nesting within the genus *Lepidochelys.* Bacterial and fungal pathogen impacts have been well documented in the large arribadas of the olive ridley at Nancite in Costa Rica (Mo 1988). In some years, and on some sections of the beach, the hatching success can be as low as 5% (Mo 1988). As the Kemp's ridley nest density at Rancho Nuevo and adjacent beaches continues to increase, appropriate monitoring of emergence success will be necessary to determine if there are any density-dependent effects.

Since 2010, we have documented (via the STSSN data, https://www.fisheries.noaa.gov/national/marine-life-distress/sea-turtle-stranding-and-salvage-network) elevated sea turtle strandings in the northern Gulf of Mexico, particularly throughout the Mississippi Sound area. For example, in the first 3 weeks of June 2010, over 120 sea turtle strandings were reported from Mississippi and Alabama waters, none of which exhibited any signs of external oiling to indicate effects associated with the DWH oil spill event. A total of 644 sea turtle strandings were reported in 2010 from Louisiana, Mississippi, and Alabama waters, 561 (87%) of which were Kemp's ridley sea turtles. During March through May of 2011, 267 sea turtle strandings were reported from Mississippi and Alabama waters alone. A total of 525 sea turtle strandings were reported in 2011 from Louisiana, Mississippi, and Alabama waters, with the majority (455) having occurred from March through July, 390 (86%) of which were Kemp's ridley sea turtles. During 2012, a total of 384 sea turtles were reported from Louisiana, Mississippi, and Alabama waters. Of these reported strandings, 343 (89%) were Kemp's ridley sea turtles. During 2014, a total of 285 sea turtles were reported from Louisiana, Mississippi, and Alabama waters, though the data is incomplete. Of these reported strandings, 229 (80%) were Kemp's ridley sea turtles. These stranding numbers are significantly greater than reported in past years; Louisiana, Mississippi, and Alabama waters reported 42 and 73 sea turtle strandings for 2008 and 2009, respectively. It should be noted that stranding coverage has increased considerably due to the DWH oil spill event.

Nonetheless, considering that strandings typically represent only a small fraction of actual mortality, these stranding events potentially represent a serious impact to the recovery and survival of the local sea turtle populations. While a definitive cause for these strandings has not been identified, necropsy results indicate a significant number of stranded turtles from these events likely perished due to forced submergence, which is commonly associated with fishery interactions (B. Stacy, NMFS, pers. comm. to M. Barnette, NMFS PRD, March 2012). Yet, available information indicates fishery effort was extremely limited during the stranding events. The fact that 80% or more of all Louisiana, Mississippi, and Alabama stranded sea turtles in the past 5 years were Kemp's ridley sea turtles is notable; however, this could simply be a function of the species' preference for shallow, inshore waters coupled with increased population abundance, as reflected in recent Kemp's ridley nesting increases.

In response to these strandings, and due to speculation that fishery interactions may be the cause, fishery observer effort was shifted to evaluate the inshore skimmer trawl fisheries beginning in 2012. During May-July of that year, observers reported 24 sea turtle interactions in the skimmer trawl fisheries. All but a single sea turtle were identified as Kemp's ridley sea turtles (1 sea turtle was an unidentified hardshell turtle). Encountered sea turtles were all very small juvenile specimens, ranging from 7.6-19.0 in (19.4-48.3 cm) CCL. Subsequent years of observation noted additional captures in the skimmer trawl fisheries, including some mortalities. The small average size of encountered Kemp's ridley sea turtles introduces a potential conservation issue, as over 50% of these reported sea turtles could potentially pass through the maximum 4-in bar spacing of TEDs currently required in the shrimp fisheries. Due to this issue, a proposed 2012 rule to require 4-in bar spacing TEDs in the skimmer trawl fisheries (77 FR 27411) was not implemented. Following additional gear testing, however, we proposed a new rule in 2016 (81 FR 91097) to require TEDs with 3-in bar spacing for all vessels using skimmer trawls, pusher-head trawls, or wing nets. Ultimately, we published a final rule on December 20, 2019 (84 FR 70048), that requires all skimmer trawl vessels 40 feet and greater in length to use TEDs designed to exclude small sea turtles in their nets effective April 1, 2021. Given the nesting trends and habitat utilization of Kemp's ridley sea turtles, it is likely that fishery interactions in the Northern Gulf of Mexico may continue to be an issue of concern for the species, and one that may potentially slow the rate of recovery for Kemp's ridley sea turtles.

While oil spill impacts are discussed generally for all species in Section 4.1.1.1, specific impacts of the DWH oil spill event on Kemp's ridley sea turtles are considered here. Kemp's ridley sea turtles experienced the greatest negative impact stemming from the DWH oil spill event of any sea turtle species. Impacts to Kemp's ridley sea turtles occurred to offshore small juveniles, as well as large juveniles and adults. Loss of hatchling production resulting from injury to adult turtles was also estimated for this species. Injuries to adult turtles of other species, such as loggerheads, certainly would have resulted in unrealized nests and hatchlings to those species as well. Yet, the calculation of unrealized nests and hatchlings was limited to Kemp's ridley sea turtles for several reasons. All Kemp's ridley sea turtles in the Gulf belong to the same population (NMFS et al. 2011a), so total population abundance could be calculated based on numbers of hatchlings because all individuals that enter the population could reasonably be expected to inhabit the northern Gulf of Mexico throughout their lives (DWH Trustees 2016).

A total of 217,000 small juvenile Kemp's ridley sea turtles (51.5% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. That means approximately half of all small juvenile Kemp's ridley sea turtles from the total population estimate of 430,000 oceanic small juveniles were exposed to oil. Furthermore, a large number of small juveniles were removed from the population, as up to 90,300 small juveniles Kemp's ridley sea turtles are estimated to have died as a direct result of the exposure. Therefore, as much as 20% of the small oceanic juveniles of this species were killed during that year. Impacts to large juveniles (>3 years old) and adults were also high. An estimated 21,990 such individuals were exposed to oil (about 22% of the total estimated population for those age classes); of those, 3,110 mortalities were estimated (or 3% of the population for those age classes). The loss of near-reproductive and reproductive-stage females would have contributed to some extent to the decline in total nesting abundance observed between 2011 and 2014. The estimated number of unrealized Kemp's ridley nests is between 1,300 and 2,000, which translates to between approximately 65,000 and 95,000 unrealized hatchlings (DWH Trustees 2016). This is a minimum estimate, however, because the sublethal effects of the DWH oil spill event on turtles, their prey, and their habitats might have delayed or reduced reproduction in subsequent years, which may have contributed substantially to additional nesting deficits observed following the DWH oil spill event. These sublethal effects could have slowed growth and maturation rates, increased remigration intervals, and decreased clutch frequency (number of nests per female per nesting season). The nature of the DWH oil spill event effect on reduced Kemp's ridley nesting abundance and associated hatchling production after 2010 requires further evaluation. It is clear that the DWH oil spill event resulted in large losses to the Kemp's ridley population across various age classes, and likely had an important population-level effect on the species. Still, we do not have a clear understanding of those impacts on the population trajectory for the species into the future.

4.1.1.4 Loggerhead Sea Turtle (Northwest Atlantic DPS)

The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. NMFS and USFWS published a final rule which designated 9 DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011, and effective October 24, 2011). This rule listed the following DPSs: (1) 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 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 SCL, and weigh approximately 255 lb (116 kg) (Ehrhart and Yoder 1978). Adult and subadult loggerhead sea turtles typically have a light yellow plastron and a reddish brown carapace covered by non-overlapping scutes that meet along seam lines. They typically have 11 or 12 pairs of marginal scutes, 5 pairs of costals, 5 vertebrals, and a nuchal (precentral) scute that is in contact with the first pair of costal scutes (Dodd Jr. 1988).

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

The majority of loggerhead nesting occurs at the western rims of the Atlantic and Indian Oceans concentrated in the north and south temperate zones and subtropics (NRC 1990). For the Northwest Atlantic DPS, most nesting occurs along the coast of the United States, from southern

Virginia to Alabama. Additional nesting beaches for this DPS are found along the northern and western Gulf of Mexico, eastern Yucatán Peninsula, at Cay Sal Bank in the eastern Bahamas (Addison 1997; Addison and Morford 1996), off the southwestern coast of Cuba (Moncada Gavilan 2001), and along the coasts of Central America, Colombia, Venezuela, and the eastern Caribbean Islands.

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

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

The recovery plan for the Northwest Atlantic population of loggerhead sea turtles concluded that there is no genetic distinction between loggerheads nesting on adjacent beaches along the Florida Peninsula. It also concluded that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the recovery plan uses a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, to identify recovery units. The recovery units are as follows: (1) the Northern Recovery Unit (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 2008a). 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 Northwest Atlantic DPS, the recovery units for what was then termed the Northwest Atlantic population apply to the Northwest Atlantic 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; the nearshore marine environment from the surface to the sea floor where water depths do not exceed 200 meters), (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 2008a). Loggerheads are long-lived animals. They reach sexual maturity between 20-38 years of age, although age of maturity varies widely among populations (Frazer and Ehrhart 1985; NMFS 2001). The annual mating season occurs from late March to early June, and female turtles lay eggs throughout the summer months. Females deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984), but an individual female only nests every 3.7 years on average (Tucker 2010). Each nest contains an average of 100-126 eggs (Dodd Jr. 1988) which incubate for 42-75 days before hatching (NMFS and USFWS 2008a). Loggerhead hatchlings are 1.5-2-in-long and weigh about 0.7 oz (20 g).

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

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

Like juveniles, non-nesting adult loggerheads also use the neritic zone. However, these adult loggerheads do not use the relatively enclosed shallow-water estuarine habitats with limited ocean access as frequently as juveniles. Areas such as Pamlico Sound, North Carolina, and 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 mid-Atlantic United States. Shallow-water habitats with large expanses of open ocean access, such as Florida Bay, provide year-round resident foraging areas for significant numbers of male and female adult loggerheads (Conant et al. 2009).

Offshore, adults primarily inhabit continental shelf waters, from New York south through Florida, The Bahamas, Cuba, and the Gulf of Mexico. Seasonal use of mid-Atlantic shelf waters, especially offshore New Jersey, Delaware, and Virginia during summer months, and offshore shelf waters, such as Onslow Bay (off the North Carolina coast), during winter months has also been documented (Hawkes et al. 2007), GADNR, unpublished data; SCDNR, unpublished data).

Satellite telemetry has identified the shelf waters along the west Florida coast, the Bahamas, Cuba, and the Yucatán Peninsula as important resident areas for adult female loggerheads that nest in Florida (Foley et al. 2008; Girard et al. 2009; Hart et al. 2012). The southern edge of the Grand Bahama Bank is important habitat for loggerheads nesting on the Cay Sal Bank in the Bahamas, but nesting females are also resident in the bights of Eleuthera, Long Island, and Ragged Islands. They also reside in Florida Bay in the United States, and along the north coast of Cuba (A. Bolten and K. Bjorndal, University of Florida, unpublished data). Moncada et al. (2010) reported the recapture of 5 adult female loggerheads in Cuban waters originally flipper-tagged in Quintana Roo, Mexico, which indicates that Cuban shelf waters likely also provide foraging habitat for adult females that nest in Mexico.

Status and Population Dynamics

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

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

Peninsular Florida Recovery Unit

The Peninsular Florida Recovery Unit 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 2008a). The statewide estimated total for 2020 was 105,164 nests (FWRI nesting database).

In addition to the total nest count estimates, the 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. FWRI uses the standardized index survey data to analyze the nesting trends (**Figure 7**) (https://myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals/). Since the beginning of the index program in 1989, 3 distinct trends were identified. From 1989-1998, there was a 24% increase that was followed by a sharp decline over the subsequent 9 years. A large increase in loggerhead nesting has occurred since, as indicated by the 71% increase in nesting over the 10-year period from 2007 and 2016. Nesting in 2016 also represented a new record for loggerheads on the core index beaches. While nest numbers subsequently declined from the 2016 high FWRI noted that the 2007-2021 period represents a period of increase. 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 non-significant increasing trend. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability between 2012-2016 resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose again each year through 2020, reaching 53,443 nests before dipping back to 49,100 in 2021. It is important to note that with the wide confidence intervals and uncertainty around the variability in nesting parameters (changes and variability in nests/female, nesting intervals, etc.) it is unclear whether the nesting trend equates to an increase in the population or nesting females over that time frame (Ceriani, et al. 2019; https://esajournals.onlinelibrary.wiley.com/doi/pdf/10.1002/ecs2.2936).

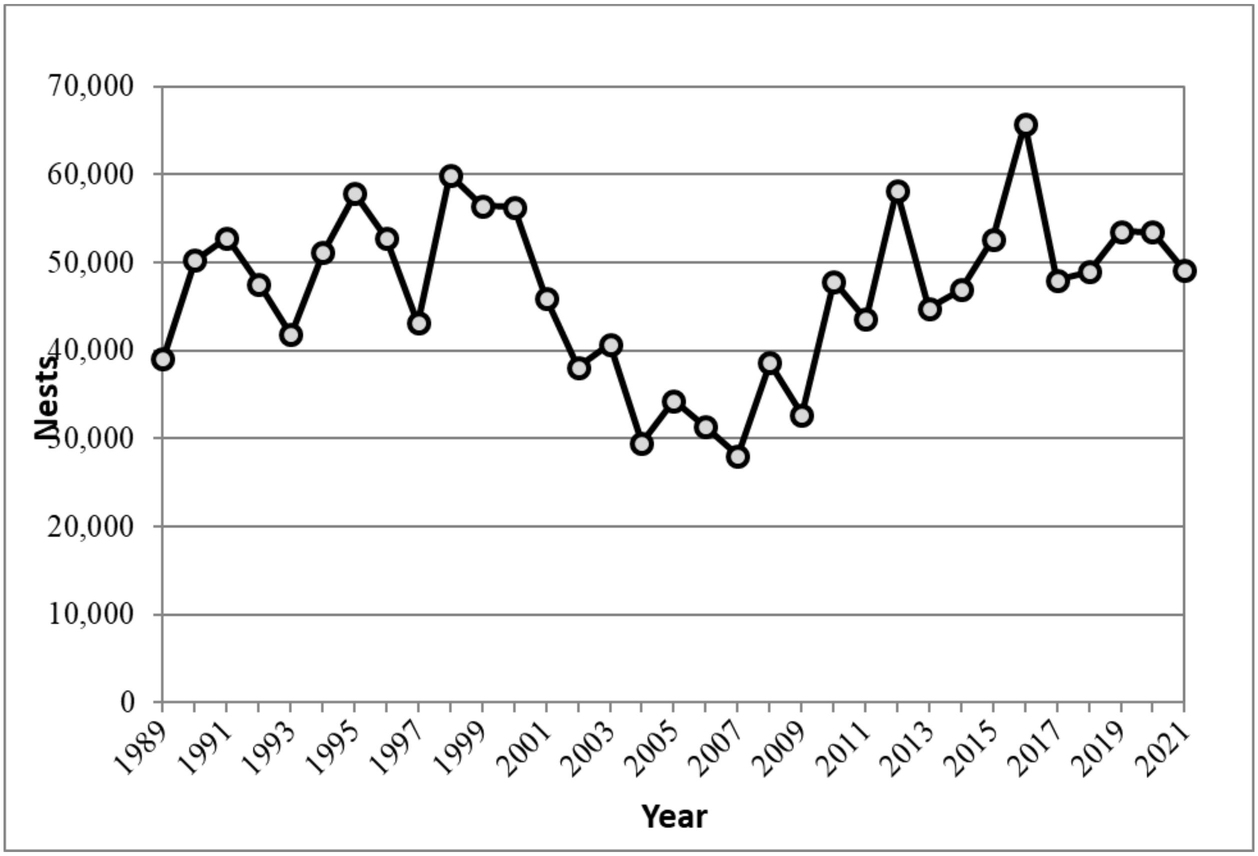

Figure 7. Loggerhead sea turtle nesting at Florida index beaches since 1989

Northern Recovery Unit

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

Data since that analysis (**Table 7**) 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, https://georgiawildlife.com/loggerhead-nest-season-begins-where-monitoring-began). South Carolina and North Carolina nesting have also begun to shift away from the past declining trend. Loggerhead nesting in Georgia, South Carolina, and North Carolina all broke records in 2015 and then topped those records again in 2016. Nesting in 2017 and 2018 declined relative to 2016, back to levels seen in 2013 to 2015, but then bounced back in 2019, breaking records for each of the three states and the overall recovery unit. Nesting in 2020 and 2021 declined from the 2019 records, but still remained high, representing the third and fourth highest total numbers for the Northern Recovery Unit since 2008.

Table 7. Total Number of NRU Loggerhead Nests (GADNR, SCDNR, and NCWRC nesting datasets compiled at Seaturtle.org)

Year	Georgia	South Carolina	North Carolina	Totals
2008	1,649	4,500	841	**6,990**
2009	998	2,182	302	**3,472**
2010	1,760	3,141	856	**5,757**
2011	1,992	4,015	950	**6,957**
2012	2,241	4,615	1,074	**7,930**
2013	2,289	5,193	1,260	**8,742**
2014	1,196	2,083	542	**3,821**
2015	2,319	5,104	1,254	**8,677**
2016	3,265	6,443	1,612	**11,320**
2017	2,155	5,232	1,195	**8,582**
2018	1,735	2,762	765	**5,262**
2019	3,945	8,774	2,291	**15,010**
2020	2,786	5,551	1,335	**9,672**
2021	2,493	5,639	1,448	**9,580**

South Carolina also conducts an index beach nesting survey similar to the one described for Florida. Although the survey only includes a subset of nesting, the standardized effort and locations allow for a better representation of the nesting trend over time. Increases in nesting were seen for the period from 2009-2013, with a subsequent steep drop in 2014. Nesting then rebounded in 2015 and 2016, setting new highs each of those years. Nesting in 2017 dropped back down from the 2016 high, but was still the second highest on record. After another drop in 2018, a new record was set for the 2019 season, with a return to 2016 levels in 2020 and 2021 (**Figure 8**).

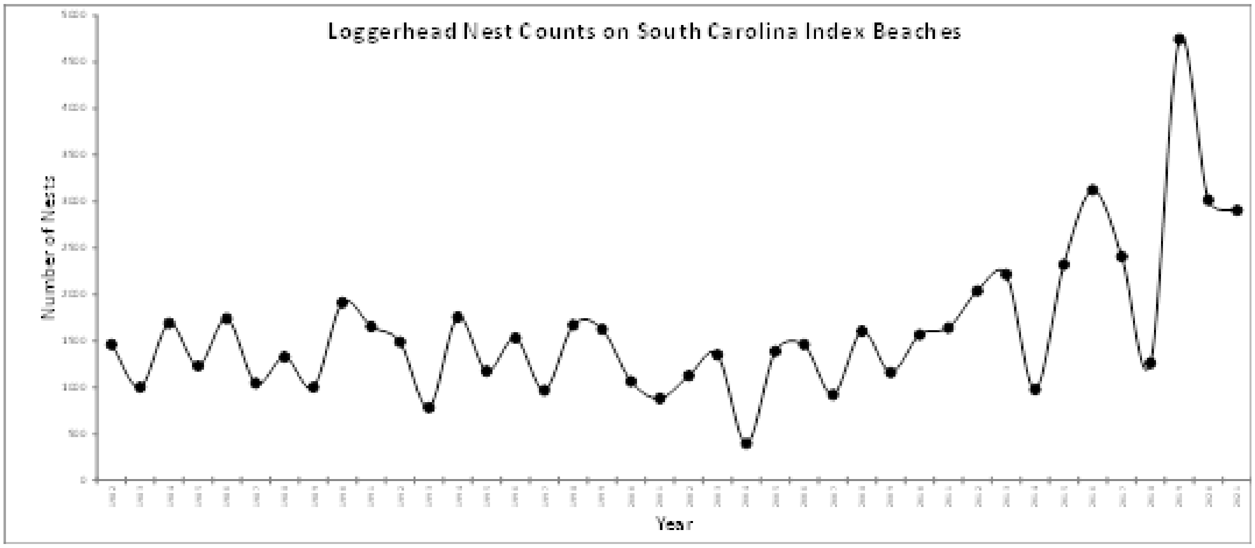

Figure 8. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website: https://www.dnr.sc.gov/seaturtle/ibs.htm)

Other Northwest Atlantic DPS Recovery Units

The remaining 3 recovery units—Dry Tortugas, Northern Gulf of Mexico, and Greater Caribbean—are much smaller nesting assemblages, but they are still considered essential to the continued existence of the species. Nesting surveys for the Dry Tortugas Recovery Unit 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 2008a). Nest counts for the Northern Gulf of Mexico Recovery Unit 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 Northern Gulf of Mexico Recovery Unit 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. From 1989-2018 the average number of Northern Gulf of Mexico Recovery Unit nests annually on index beaches was 169 nests, with an average of 1100 counted in the statewide nesting counts (Ceriani et al. 2019). Nesting survey effort has been inconsistent among the Greater Caribbean Recovery Unit nesting beaches, and no trend can be determined for this subpopulation (NMFS and USFWS 2008a). 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 2008a).

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 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 (2008a), caution about extrapolating localized in-water trends to the broader population and relating localized trends in neritic sites to population trends at nesting beaches. The apparent overall increase in the abundance of neritic loggerheads in the southeastern United States may be due to increased abundance of the largest oceanic/neritic juveniles (historically referred to as small benthic juveniles), which could indicate a relatively large number of individuals around the same age may mature in the near future (TEWG 2009). In-water studies throughout the eastern United States, however, indicated a substantial decrease in the abundance of the smallest oceanic/neritic juvenile loggerheads at that time, a pattern corroborated by stranding data (TEWG 2009).

Population Estimate

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

Threats

The threats faced by loggerhead sea turtles are well summarized in the general discussion of threats in Section 4.1.1.1. 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 Northwest Atlantic DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009).

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

While oil spill impacts are discussed generally for all species in Section 4.1.1.1, specific impacts of the DWH oil spill event on loggerhead sea turtles are considered here. Impacts to loggerhead sea turtles occurred to offshore small juveniles as well as large juveniles and adults. A total of 30,800 small juvenile loggerheads (7.3% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. Of those exposed, 10,700 small juveniles are estimated to have died as a result of the exposure. In contrast to small juveniles, loggerheads represented a large proportion of the adults and large juveniles exposed to and killed by the oil. There were 30,000 exposures (almost 52% of all exposures for those age/size classes) and 3,600 estimated mortalities. A total of 265 nests (27,618 eggs) were also translocated during response efforts, with 14,216 hatchlings released, the fate of which is unknown (DWH Trustees 2015b). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil or dispersants or both, and loss of foraging resources which could lead to compromised growth and reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

Unlike Kemp's ridley sea turtles, the majority of nesting for the Northwest Atlantic DPS occurs on the Atlantic coast and, thus, loggerheads were impacted to a relatively lesser degree. However, it is likely that impacts to the Northern Gulf of Mexico Recovery Unit of the Northwest Atlantic 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 Northern Gulf of Mexico Recovery Unit, especially mating and nesting adults likely had an impact on the Northern Gulf of Mexico Recovery Unit. Based on the response injury evaluations for Florida Panhandle and Alabama nesting beaches (which fall under the Northern Gulf of Mexico Recovery Unit), the DWH Trustees (2016) estimated that approximately 20,000 loggerhead hatchlings were lost due to DWH oil spill response activities on nesting beaches. Although the long-term effects remain unknown, the DWH oil spill event impacts to the Northern Gulf of Mexico Recovery Unit may result in some nesting declines in the future due to a large reduction of oceanic age classes during the DWH oil spill event. Although adverse impacts occurred to loggerheads, the proportion of the population that is expected to have been exposed to and directly impacted by the DWH oil spill event is relatively low. Thus we do not believe a population-level impact occurred due to the widespread distribution and nesting location outside of the Gulf of Mexico for this species.

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

4.1.2 Smalltooth Sawfish (United States DPS)

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

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

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

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

68 cm) in the second year. Uncertainty remains in estimating post-juvenile growth rates and age at maturity; yet, recent advances indicate maturity at 7-11 years (Carlson and Simpfendorfer 2015) at lengths of approximately 340 cm for males and 350-370 cm for females (Gelsleichter unpub data).

There are distinct differences in habitat use based on life history stage as the species shifts use through ontogeny. Juvenile smalltooth sawfish less than 220 cm, inhabit the shallow euryhaline waters (i.e., variable salinity) of estuaries and can be found in sheltered bays, dredged canals, along banks and sandbars, and in rivers (NMFS 2000). These juveniles are often closely associated with muddy or sandy substrates, and shorelines containing red mangroves, *Rhizophora mangle* (Simpfendorfer 2001; Simpfendorfer 2003). Simpfendorfer et al. (2010) indicated the smallest juveniles (young-of-the-year juveniles measuring < 100 cm in length) generally used the shallowest water (depths less than 0.5 m (1.64 ft)), had small home ranges (4,264-4,557 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 as they continue to mature.

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

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

While adult smalltooth sawfish may also use the estuarine habitats used by juveniles, they are commonly observed in deeper waters along the coasts. Poulakis and Seitz (2004) noted that nearly half of the encounters with adult-sized smalltooth sawfish in Florida Bay and the Florida

Keys occurred in depths from 200-400 ft (70-122 m) of water. Similarly, Simpfendorfer and Wiley (2005) reported encounters in deeper waters off the Florida Keys, and observations from both commercial longline fishing vessels and fishery-independent sampling in the Florida Straits report large smalltooth sawfish in depths up to 130 ft (~40 m)(ISED 2014). Yet, current field studies show adult smalltooth sawfish also use shallow estuarine habitats within Florida Bay and the Everglades (Grubbs unpub. data). Further, NMFS expects that females return to shallow estuaries during parturition (when adult females return to shallow estuaries to give birth).

Status and Population Dynamics

Based on the contraction of the species' geographic range, we expect that the population to be a fraction of its historical size. However, few long-term abundance data exist for the smalltooth sawfish, making it very difficult to estimate the current population size. Despite the lack of scientific data, recent encounters with young-of-the-year, older juveniles, and sexually mature smalltooth sawfish indicate that the U.S. population is currently reproducing (Seitz and Poulakis 2002; Simpfendorfer 2003). The abundance of juveniles publically encountered by anglers and boaters, including very small individuals, suggests that the population remains viable (Simpfendorfer and Wiley 2004), and data analyzed from Everglades National Park as part of an established fisheries-dependent monitoring program (angler interviews) indicated a slightly increasing trend in juvenile abundance within the park over the past decade (Carlson and Osborne 2012; Carlson et al. 2007). Similarly, preliminary results of juvenile smalltooth sawfish sampling programs in both ENP and Charlotte Harbor indicate the juvenile population is at least stable and possibly increasing (Poulakis unpubl. data, Carlson unpubl. data).

Using a demographic approach and life history data for smalltooth sawfish and similar species from the literature, Simpfendorfer (2000) estimated intrinsic rates of natural population increase for the species at 0.08-0.13 per year and population doubling times from 5.4-8.5 years. These low intrinsic rates (rates at which a population increases in size if there are no density-dependent forces regulating the population) of population increase, suggest that the species is particularly vulnerable to excessive mortality and rapid population declines, after which recovery may take decades. Carlson and Simpfendorfer (2015) constructed an age-structured Leslie matrix model for the U.S. population of smalltooth sawfish, using updated life history information, to determine the species' ability to recover under scenarios of variable life history inputs and the effects of bycatch mortality and catastrophes. As expected, population growth was highest (λ=1.237 yr-1) when age-at-maturity was 7 yr and decreased to 1.150 yr-1 when age-at-maturity was 11 yr. Despite a high level of variability throughout the model runs, in the absence of fishing mortality or catastrophic climate effects, the population grew at a relatively rapid rate approaching carrying capacity in 40 years when the initial population was set at 2250 females or 50 years with an initial population of 600 females. Carlson and Simpfendorfer (2015) concluded that smalltooth sawfish in U.S. waters appear to have the ability to recover within the foreseeable future based on a model relying upon optimistic estimates of population size, lower age-at-maturity and the lower level of fisheries-related mortality. Another analysis was less optimistic based on lower estimates of breeding females in the Caloosahatchee River nursery (Chapman unpubl. data). Assuming similar numbers of females among the 5 known nurseries, that study would suggest an initial breeding population of only 140-390 females, essentially half of the initial population considered by Carlson and Simpfendorfer (2015). A smaller initial breeding population would extend the time to reach carrying capacity.

Threats

Past literature indicates smalltooth sawfish were once abundant along both coasts of Florida and quite common along the shores of Texas and the northern Gulf coast (NMFS 2010) 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 2009a). This has historically been reported in Florida (Snelson and Williams 1981), Louisiana (Simpfendorfer 2002), and Texas (Baughman 1943). For instance, one fisherman interviewed by Evermann and Bean (1897) reported taking an estimated 300 smalltooth sawfish in just one netting season in the Indian River Lagoon, Florida. In another example, smalltooth sawfish landings data gathered by Louisiana shrimp trawlers from 1945-1978, which contained both landings data and crude information on effort (number of vessels, vessel tonnage, number of gear units), indicated declines in smalltooth sawfish landings from a high of 34,900 lbs in 1949 to less than 1,500 lbs in most years after 1967. The Florida net ban passed in 1995 has led to a reduction in the number of smalltooth sawfish incidentally captured, "…by prohibiting the use of gill and other entangling nets in all Florida waters, and prohibiting the use of other nets larger than 500 square feet in mesh area in nearshore and inshore Florida waters"[1] (FLA. CONST. art. X, § 16). However, the threat of bycatch currently remains in commercial fisheries (e.g., South Atlantic shrimp fishery, Gulf of Mexico shrimp fishery, federal shark fisheries of the South Atlantic, and the Gulf of Mexico reef fish fishery), though anecdotal information collected by NMFS port agents suggest smalltooth sawfish captures are now rare.

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

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[1] "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.

Habitat Loss

Modification and loss of smalltooth sawfish habitat, especially nursery habitat, is another contributing factor in the decline of the species. Activities such as agricultural and urban development, commercial activities, dredge-and-fill operations, boating, erosion, and diversions of freshwater runoff contribute to these losses (SAFMC 1998). Large areas of coastal habitat were modified or lost between the mid-1970s and mid-1980s within the 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. Prohaska et al. (2018) showed that juvenile smalltooth sawfish within the anthropogenically altered Charlotte Harbor estuary have higher metabolic stress compared to those collected from more pristine nurseries in the Everglades. Although many forms of habitat modification are currently regulated, some permitted direct and/or indirect damage to habitat from increased urbanization still occurs and is expected to continue to threaten survival and recovery of the species in the future.

Life History Limitations

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

Stochastic Events

Although stochastic events such as aperiodic extreme weather and harmful algal blooms are expected to affect smalltooth, we are currently unsure of their impact. A strong and prolonged cold weather event in January 2010 resulted in the mortality of at least 15 juvenile and 1 adult sawfish (Poulakis et al. 2011; Scharer et al. 2012), and led to far fewer catches in directed research throughout the remainder of the year (Bethea et al. 2011). Another less severe cold front in 2011 did not result in any known mortality but did alter the typical habitat use patterns of juvenile sawfish within the Caloosahatchee River. Since surveys began, 3 hurricanes have made direct landfall within the core range of US sawfish. While these storms denuded mangroves along the shoreline and created hypoxic water conditions, we are unaware of any direct effects to sawfish. Just prior to the passage of Hurricane Irma in 2017, acoustically tagged sawfish moved away from their normal shallow nurseries and then returned within a few days (Poulakis unpubl. data; Carlson unpubl. data). Harmful algal blooms have occurred within the core range of smalltooth sawfish and affected a variety of fauna including sea turtles, fish, and marine mammals, but to date no sawfish mortalities have been reported.

Current Threats

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

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

5 ENVIRONMENTAL BASELINE

5.1 Overview

This section describes the effects of past and ongoing human and natural factors contributing to the current status of the species, their habitats, 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 ecosystem. The environmental baseline describes the species' health based on information available at the time of the consultation.

By regulation, the environmental baseline for an Opinion refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (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 that occur in an action area, that will be exposed to effects from the action under consultation. This focus is important because, in some states or life history stages, or areas of their ranges, listed individuals 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.

5.2 Baseline Status of ESA-Listed Species Considered for Further Analysis

The status of this species in the action area, as well as the threats to this species, is supported by the species accounts in Section 4 (Status of the Species).

As stated the Action Area (Section 2.2), the proposed action occurs adjacent to the Gulf of Mexico east of Hog Island in the Suwannee Sound at 29.206710, -83.069286 (NAD83) in the LSNWR in Cedar Key, Levy County, Florida. For the purposes of this federal action, the action area includes the pier's existing physical footprint, the area surrounding by turbidity curtains during demolition and construction, the surrounding water accessible to recreational anglers upon completion of the proposed action (i.e., casting distance or approximately 200-ft), and the equivalent of the largest radius of effects on ESA-listed species based on the proposed installation of 9-in-diameter wood piles by vibratory hammer, (i.e., 207-ft-away from the pile driving operations; see the pile driving noise analysis in Section 3.1.2). Additionally, the action area is within the boundary of Gulf sturgeon critical habitat, Unit 14 – Suwannee Sound; we determined that the proposed action is not likely to adversely affect any of the PCEs of Gulf sturgeon critical habitat (See Section 3.2.2).

5.2.1 Sea Turtles

Based on the STSSN inshore stranding data for Zone 7, 2007-2016, (**Table 3**) and the FWC dataset for Jefferson, Tayler, Dixie, Levy, Citrus, and Hernando counties, 2017-2022 (**Table 4**), we believe green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, and loggerhead sea turtle (Northwest Atlantic DPS) may be in the action area and adversely affected by recreational hook-and-line fishing that will occur at the LSNWR fishing pier upon completion of the proposed action. Further, Levy County is positioned between Franklin and Pinellas counties, which have known medium to high density nesting beaches for green, Kemp's ridley, and loggerhead sea turtles and there are continuous seagrass beds adjacent to and offshore of the action area. These factors lead us to suspect juvenile and adult sea turtles of these species may be present in the action area during construction and after the completion of the pier. All of these sea turtle species are migratory, traveling to forage grounds or for reproduction purposes. The Gulf of Mexico waters within the action area are likely used by these species of sea turtle for nearshore reproductive, developmental, and foraging habitat. NMFS believes that no individual sea turtle is likely to be a permanent resident of the action area, although some individuals may be present at any given time. These same individuals will migrate into offshore waters of the Gulf of Mexico, Caribbean Sea, and other areas of the North Atlantic Ocean at certain times of the year, and thus may be affected by activities occurring there. Therefore, the status of the sea turtles species in the action area are considered the same as those discussed in Sections 4.1.1.

5.2.2 Smalltooth Sawfish (United States DPS)

Based on the U.S. Sawfish Recovery Database for Dixie, Levy, and Citrus counties, 2000-current (**Table 5**), we believe smalltooth sawfish may be in the action area and adversely affected by recreational hook-and-line fishing that will occur at the LSNWR fishing pier upon completion of the proposed action. NMFS believes that no individual smalltooth sawfish is likely to be a permanent resident of the action area. These same individuals will migrate into coastal and offshore waters of the Gulf of Mexico and potentially areas of the North Atlantic Ocean, and thus may be affected by activities occurring there. Therefore, the status of smalltooth sawfish in the action area is considered to be the same as those discussed in Section 4.1.2.

5.3 Additional Factors Affecting the Baseline Status of ESA-Listed Species Considered for Further Analysis

5.3.1 Federal Actions

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.

NMFS published a Final Rule (70 FR 42508, July 25, 2005) that 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 affords the same protection to sea turtles listed as threatened under the ESA [50 CFR 223.206(b)].

No other projects federally permitted, funded, or carried out, which would be subject to ESA Section 7 consultation, are known to have occurred within the action area, as per a review of the NMFS SERO PRD's completed consultation database by the consulting biologist on March 13, 2023.

5.3.2 State and Private Actions

5.3.2.1 Recreational Fishing

Recreational fishing as regulated by the State of Florida can affect green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS) within the action area. Pressure from recreational fishing in and adjacent to the action area is likely to continue. Observations of state recreational fisheries have shown that sea turtles are known to bite baited hooks and frequently ingest the hooks. Overall, hooked sea turtles have been reported to the STSSN by the public fishing from boats, piers, and beach, banks, and jetties and from commercial anglers fishing for reef fish and for sharks with both single rigs and bottom longlines (NMFS 2001). Additionally, lost fishing gear such as line cut after snagging on rocks, or discarded hooks and line, can also pose an entanglement threat to sea turtles in the area. A detailed summary of the known impacts of hook-and-line incidental captures to Kemp's ridley and loggerhead sea turtles can be found in the TEWG reports (1998; 2000).

The LSNWR fishing pier and boardwalk was originally built in 1994. The pier is open year-round, sunrise to sunset. Use of the pier by anglers and is dependent on weather, tide, and fishing conditions. The applicant estimates that up to 10 anglers may use the fishing pier per day and states that recreational fishing is seasonally dependent. As stated above, the 10-year STSSN dataset (2007-2016) for inshore Zone 7 and the U.S. Sawfish Recovery Database for Dixie, Levy, and Citrus counties, 2000-current contain no reported recreational hook-and-line captures of sea turtles or smalltooth sawfish from the LSNWR fishing pier. We have no way of knowing how many unreported captures of these species may have occurred at the LSNWR fishing pier in the past. However, because the proposed action is a repair of an existing fishing pier, recreational fishing and any associated take (reported or unreported) of green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS) is part of the baseline. That is, accidental captures of these species due to recreational fishing has likely occurred in the past, and the impact of such captures are factored into the abundance trends of these species.

5.3.3 Marine Debris, Pollution, and Environmental Contamination

A number of activities that may affect green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS) in the action area include anthropogenic marine debris. The effects from these activities are difficult to measure. Where possible, conservation actions are being implemented to monitor or study the effects to sea turtles from these sources.

Sources of pollutants along the coast that may affect green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS). PCB loading, stormwater runoff from coastal towns and cities into rivers and canals emptying into bays and the ocean, and groundwater and other discharges (Vargo et al. 1986). Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986), the impacts of many other anthropogenic toxins have not been investigated. Although these contaminant concentrations do not likely affect the more pelagic waters, the species analyzed in this Opinion travel between near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles within the action area.

5.3.4 Stochastic Events

Stochastic (i.e., random) events, such as hurricanes or cold snaps, occur in the action area on an irregular and can affect green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS) in the action area. These events are unpredictable and their effect on the recovery of these ESA-listed sea turtles and smalltooth sawfish is unknown; yet, they have the potential to impede recovery if animals die as a result or indirectly if important habitats are damaged.

6 EFFECTS OF THE ACTION

6.1 Overview

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

In this section of our Opinion, we assess the effects of the action on listed species that are likely to be adversely affected. The analysis in this section forms the foundation for our jeopardy analysis in Section 8. The quantitative and qualitative analyses in this section are based upon the best available commercial and scientific data on species biology and the effects of the action. Data are limited, so we are often forced to make assumptions to overcome the limits in our knowledge. Sometimes, the best available information may include a range of values for a particular aspect under consideration, or different analytical approaches may be applied to the same data set. In those cases, the uncertainty is resolved in favor of the species. NMFS generally selects the value that would lead to conclusions of higher, rather than lower risk to endangered or threatened species. This approach provides the "benefit of the doubt" to threatened and endangered species.

6.2 Effects of the Proposed Action on ESA-Listed Species Considered for Further Analysis

6.2.1 Routes of Effect That Are Not Likely to Adversely Affect ESA-Listed Species Considered for Further Analysis

Sea turtles and smalltooth sawfish may be physically injured if struck by construction equipment, support vessels, or materials. However, we believe this route of effect is extremely unlikely to occur because mobile species, such as these, are able to avoid slow-moving equipment, support vessels, and the placement of materials. The applicant's implementation of our *Protected Species Construction Conditions* (revised 2021) will further reduce the risk to these species. Operation of moving equipment shall cease immediately if a protected species is seen within a 150-ft radius of operations. Activities may not resume until the protected species has departed the project area of its own volition or 20 minutes have passed since the animal was last seen in the area. Further, construction would be limited to daylight hours so construction workers are able to see protected species, if present, and avoid interactions with them.

The action area contains shallow-water habitat that may be used by sea turtles and smalltooth sawfish for foraging and refuge. These species may be affected if they are temporarily unable to use the site for forage or refuge habitat due to avoidance of construction activities, related noise, and physical exclusion from the use of turbidity curtains. Although species will be temporarily unable to access the construction area due to the presence of turbidity curtains, these effects will be insignificant given the project's limited footprint and availability of similar habitat nearby. Any disturbances to species would be temporary, limited to approximately 6 months of in-water construction during daylight hours only, after which animals will be able to return to the site.

The NMFS educational sign "Save Dolphins, Sea Turtles, Sawfish, and Manta Ray" will be installed in a visible location upon completion of the proposed action prior to the fishing pier being open to the public. We believe the placement of this educational sign will reduce the likelihood of recreational hook-and-line interactions with the listed species in the action area. The sign will provide information to the public on how to avoid and minimize encounters with these species as well as proper handling techniques. The sign will also encourage anglers to report sightings and interactions, thus providing valuable distribution and abundance data to researchers and resource managers. Accurate distribution and abundance data allows management to evaluate the status of the species and refine conservation and recovery measures.

Sea turtles and smalltooth sawfish may be injured due to entanglement in improperly discarded fishing gear resulting from future use of the fishing pier after completion of the proposed action. We believe this route of effect is extremely unlikely to occur. To the best of our knowledge, there has never been a reported entanglement with any of these species at this fishing pier. To help further reduce the risk of entanglement in improperly discarded fishing gear, the USFWS will install and maintain fishing line recycling receptacles and trashcans with lids at the pier to keep debris out of the water, and we expect that anglers will appropriately dispose of fishing gear when disposal bins are available. The receptacles will be clearly marked and will be emptied regularly to ensure they are not overfilled and that fishing lines are disposed of properly. The

USFWS will also perform in-water and out-of-water fishing debris cleanups, minimizing the accumulation of fishing line over time.

As stated above in Section 3.1.2, we use the proposed action's pile driving information and NMFS Multi-Species Pile Driving Tool to calculate the radii of physical injury and behavioral effects on ESA-listed species that may be located in the action area based on the NMFS-accepted pile driving sound measurement thresholds for species in the NMFS Southeast Region. As stated above, NMFS does not recognize any injurious sound thresholds for fishes when vibratory pile driving is used; only a behavioral sound measurement threshold exist for fishes (150 dB). Similarly, there is no peak pressure injury threshold for sea turtles when vibratory pile driving is used. There is, however, a cumulate sound exposure (SELcum) injury threshold for sea turtles (220 dB) and behavioral sound measurement threshold (175 dB).

The installation of up to ten 9-in wood piles per day by vibratory hammer without any noise abatement measures may cause SELcum injurious noise effects to ESA-listed sea turtles at a radius of up to 0.9-ft-away from the pile-driving operations over a 24-hour period. We believe SELcum injurious noise effects are extremely unlikely to occur because this distance is within the 150-ft "stop-work" radius defined in our *Protected Species Construction Conditions* (revised 2021). Movement away from the injurious sound radius is a behavioral response, which is discussed below.

The installation of up to ten 9-inch wood piles per 8-hour workday by vibratory hammer without any noise abatement measures could result in behavioral noise effects to sea turtles at a radius of up to 4.5-ft-away from the pile driving operations and smalltooth sawfish at a radius of up to 207-ft-away from the pile driving operations. Due to the mobility of these species and the open-water environment, we expect these animals to move away from noise disturbances. Because there is similar habitat nearby, we believe behavioral effects will be insignificant. If an animal chooses to remain within the behavioral response zone, it could be exposed to behavioral noise effects during pile installations. Because pile installations will occur during daylight hours only, 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.

6.2.2 Routes of Effect That Are Likely to Adversely Affect ESA-Listed Species

As stated above, we believe hook-and-line gear commonly used by recreational anglers fishing at the LSNWR fishing pier may adversely affect green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS). In Section 6.2.2.1-6.2.2.3, we provide more detail on the potential effects of entanglement in actively fishing recreational gear, hooking by recreational fishing gear, and trailing line to these species from hook-and-line gear. Section 6.3 addresses how we estimate future captures of sea turtles. Section 6.4 addresses how we estimate future captures of smalltooth sawfish.

6.2.2.1 Entanglement in Recreational Fishing Gear

This analysis discusses the effects of a species entanglement in fishing gear while a person is actively fishing, rather than entanglement in derelict fishing gear, which is discussed above in Section 6.2.1.

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

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

6.2.2.2 Hooking by Recreational Fishing 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 (i.e., “foul-hooking”, when an animal is hooked anywhere on the body without having taken the bait in its mouth), or internally inside the mouth or when the animal has swallowed the bait (Balazs et al. 1995). Swallowed hooks are the greatest threat to sea turtles. A sea turtle’s esophagus (throat) is lined with strong conical papillae directed towards the stomach (White 1994). The presence of these papillae in combination with an S-shaped bend in the esophagus make it difficult to see hooks when looking through a sea turtle’s mouth, especially if the hooks have been deeply ingested. Because of a sea turtle’s digestive structure, deeply ingested hooks are also very difficult to remove without seriously injuring the turtle. A sea turtle’s esophagus is also firmly attached to underlying tissue; thus, if a sea turtle swallows a hook and tries to free itself or is hauled on board a vessel, the hook can pierce the sea turtle’s esophagus or stomach and can pull organs from its connective tissue. These injuries can cause the sea turtle to bleed internally or can result in infections, both of which can kill the sea turtle. If an ingested hook does not lodge into, or pierce, a sea turtle’s digestive organs, it can pass through the digestive system entirely (Aguilar et al. 1995; Balazs et al. 1995) with little damage (Work 2000). For example, a study of loggerheads deeply hooked by the Spanish Mediterranean pelagic longline fleet found ingested hooks could be expelled after 53 to 285 days (average 118 days) (Aguilar et al. 1995). If a hook passes through a sea turtle’s digestive tract without getting lodged, the hook probably has not harmed the turtle.

At present, the U.S. Smalltooth Sawfish Recovery Database contains several recreational hook-and-line captures of smalltooth sawfish from fishing structures (A. Brame, NOAA NMFS SERO

PRD, to consulting biologist on March 20, 2023). Based on this data, smalltooth sawfish do not appear to be actively attracted to recreational fishing structures or to habituate near recreational fishing structures as a forage source. We believe smalltooth sawfish captures are largely a function of co-occurrence in space and time rather than triggered by the presence of a recreational fishing structure. While hooking interactions within the recreational fishery are numerous, the level of mortality is likely low when smalltooth sawfish are handled and released properly. Further, the threat of mortality associated with recreational fisheries in Florida is expected to be low given that possession of the species in Florida has been prohibited since 1992. Longer fights on recreational hook-and-line gear as opposed to commercial bottom longlines may elevate lactate and HCO_3 levels (Prohaska et al. (2018); however, smalltooth sawfish appear resilient and, when considered in conjunction with information from ongoing tagging and telemetry studies, post-release survival is expected to be high (Brame et al. 2019).

6.2.2.3 Trailing Line

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

The effects to smalltooth sawfish from trailing lines are the same as sea turtles, as discussed above.

6.3 Estimating Hook-and-Line Interactions with Sea Turtles

6.3.1 Estimating Future Reported Hook-and-Line Interactions with Sea Turtles

We believe the best available data to estimate future reported recreational hook-and-line interactions with sea turtles at public fishing structures comes from the historic reported captures at similar structures obtained from inshore STSSN data for Zone 7 and any additional information regarding captures at the fishing structure under consultation. The STSSN data contains the number and location of sea turtle recreational hook-and-line captures that were reported to the STSSN; it does not provide the total number of potential public fishing structures available in a particular zone, and NMFS does not have that information. Below, we provide additional discussion regarding why this is the best available information to estimate the expected annual number of reported recreational hook-and-line captures of sea turtles at the LSNWR fishing pier and boardwalk in the future.

As previously stated, the LSNWR fishing pier is located in the inshore, protected waters of Zone 7. The STSSN dataset (2007-2016) contains no reported captures of sea turtles at the LSNWR fishing pier and boardwalk (recreational hook-and-line or otherwise) and the applicant also indicated no interactions have been reported. However, there are 33 reported recreational hook-and-line captures of a sea turtle across 12 similar inshore, public fishing structures in Zone 7 during this same period. Because these fishing structures are in a similar habitat and location as the LSNWR fishing pier (i.e., inshore Zone 7), we assume sea turtle behavior, density, and species composition are comparable at these locations. Because these fishing structures are of a similar size, they likely have comparable angler effort. Further, we assume anglers fishing from all of these structures use similar baits, equipment, and fishing techniques. Therefore, even though the historic reported hook-and-line captures are different between these structures, the potential for interactions with sea turtles is likely comparable at all locations.

Whether interactions with sea turtles are reported varies depending on a number of factors, including whether there are educational signs encouraging reporting and angler behavior; sometimes anglers do not report encounters with ESA-listed species due to concerns over their personal liability or public perception at the time of the capture even if there are posted signs. Given this variability, it is difficult to estimate reporting behavior. However, we assume that similar fishing structures within the same statistical fishing zone (in this case, inshore Zone 7) would have similar reporting rates. Because piers in the same reporting zone are in similar geographic locations, we assume public perception about reporting and angler-reporting behavior is likely the same. Therefore, even though the historic reported hook-and-line captures are different between these structures, the potential for reported captures is the same at all locations.

Thus, we believe the best available data to estimate the number of future reported recreational hook-and-line captures of sea turtles at the LSNWR fishing pier is the average of the historic reported recreational hook-and-line captures at the similar fishing structures in the inshore Zone 7 STSSN dataset and the absence of reported captures at the LSNWR fishing pier. Averaging the inshore Zone 7 data this way helps smooth variability in both the potential for interactions (i.e., number and species composition) and in reporting behavior among the locations and over time, providing for a more accurate overall estimate of future reported captures at the consultation pier. There is no additional information that can be used to estimate potential reported interactions.

To calculate the average number of reported hook-and-line captures at these 13 similar fishing structures in the inshore, protected waters of Zone 7 (12 in the dataset, plus the LSNWR fishing pier, we use available STSSN data and the following equation:

$$
\begin{aligned}
&Average\ Reported\ Captures\ Per\ Structure\ in\ 10\ years \\
&= Sum\ of\ Reported\ Captures\ in\ 10\ years \div 13\ Locations \\
&= 33 \div 13 \\
&= 2.5385\ per\ structure\ in\ 10\ years
\end{aligned}
$$

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

$Expected\ Annual\ Reported\ Captures$
$= Average\ Reported\ Captures\ Per\ Structure\ in\ 10\ years \div 10\ years$
$= 2.5385 \div 10$
$= 0.2539\ per\ year$ (Table 9, $\boldsymbol{Line\ 1}$)

6.3.2 Estimating Unreported Hook-and-Line Interactions with Sea Turtles

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

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

NMFS conducted the fishing pier survey in Mississippi that interviewed 382 anglers. This survey indicated that approximately 60% of anglers who incidentally caught a sea turtle on hook-and-line reported it (i.e., 40% of anglers who incidentally caught a sea turtle did not report it) (Cook et al. 2016). It is important to note that in 2012 educational signs were installed at all fishing piers in Mississippi, alerting anglers to report accidental hook-and-line captures of sea turtles. After the signs were installed, there was a dramatic increase in the number of reported sea turtle hook-and-line captures. Though this increase in reported captures may not solely be related to outreach efforts, it does highlight the importance of educational signs on fishing piers. The STSSN in Mississippi indicated that inconsistency in reporting of captures may also be due to anglers' concerns over their personal liability, public perception at the time of the capture, or other consequences from turtle captures (M. Cook, STSSN, pers. comm. to N. Bonine, NMFS SERO PRD, April 17, 2015). Anglers often do not admit the incidental capture for fear of liability.

We believe it is most appropriate to use the unreported rate in the Hill (2013) fishing pier study to estimate the future unreported captures at the LSNWR fishing pier. Because the study is in a similar location (i.e., Gulf of Mexico-coast of Florida), it is a reasonable proxy for reporting behavior at the LSNWR fishing pier. In addition, in the absence of additional information on factors that might affect angler reporting behavior, such as similarity of outreach and education, signage, or culture, we will err on the side of the species and assume fewer interactions were reported, as this will result in a higher total expected interactions. Therefore, we will address unreported captures by assuming that the expected annual reported captures of 0.2585 sea turtles per year at the LSNWR fishing pier represents 8% of the actual captures and 92% of sea turtle captures will be unreported. Reinitiation may be required if information reveals changes in reporting behavior.

$$\begin{aligned}
&\textit{Expected Annual Unreported Captures}\\
&= (\textit{Expected Annual Reported Captures} \div 8\%) \times 92\%\\
&= (0.2585 \ \div 0.08) \times 0.92\\
&= \ 2.9199\ \textit{per year}\ (\text{Table } 8, \boldsymbol{Line\ 2})
\end{aligned}$$

6.3.3 Calculating Total Hook-and-Line Interactions with Sea Turtles

The number of captures in any given year can be influenced by sea temperatures, species abundances, fluctuating salinity levels in estuarine habitats where piers may be located, and other factors that cannot be predicted. For these reasons, we believe basing our future capture estimate on a 1-year estimated capture is largely impractical. Using our experience monitoring other fisheries, a 3-year time period is appropriate for meaningful evaluation of future impacts and monitoring. The triennial takes are set as 3-year running sums (i.e., 2024-2026, 2025-2027, and so on) and not for static 3-year periods (i.e., 2024-2026, 2027-2029, and so on). This approach reduces the likelihood of reinitiation of the formal consultation process because of inherent variability in captures, while still allowing for an accurate assessment of how the proposed action is performing versus our expectations. **Table 8** shows the projected total sea turtle captures at the consultation pier for any 3-year consecutive period based on the expected annual reported and unreported captures.

Table 8. Summary of Expected Hook-and-Line Interactions with Sea Turtles

Captures	Total
1. Expected Annual Reported	0.2585
2. Expected Annual Unreported	2.9199
Annual Total	3.1738
Triennial (3-year) Total	9.5214

6.3.4 Estimating Post Release Mortality of Sea Turtles

6.3.4.1 Estimating Post Release Mortality for Hook-and-Line Interactions with Sea Turtles

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

We believe the 10-year STSSN dataset for inshore recreational hook and line captures and entanglements in Zone 7 is the most accurate representation of PRM for reported captures of sea turtles in the action area because this dataset pertains specifically to Florida where future reported captures are anticipated to occur. **Table 9** provides a breakdown of final disposition of the 44 sea turtles caught or entangled in recreational hook-and-line gear in the STSSN dataset for Zone 7.

Table 9. Final Disposition of Sea Turtles from Reported Recreational Hook-and-Line Captures and Gear Entanglements in inshore Zone 7, 2007-2016 (n=44)

	Dead or Died Onsite	Released Alive Immediately (Not Evaluated)	Released Alive, Immediately (Evaluated)	Taken to Rehab, Released Alive Later	Taken to Rehab, Kept or Died in Rehab
Number of Records	4	1	2	12	25
Percentage	9.1	2.3	4.5	27.3	56.8

Of the 44 sea turtles reported captured on recreational hook-and-line or entangled in gear in inshore Zone 7, 65.9% were removed from the wild population either through death or being unable to be released from the rehabilitation facility (i.e., lethal captures, 9.1 + 56.8) and 34.1% were released alive back into the wild population (i.e., non-lethal captures, 2.3 + 4.5 + 27.3). To be conservative to the species, we consider the disposition 'Unknown' to be lethal

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

$$\begin{aligned} &Annual\ Lethal\ Reported\ Captures \\ &= Expected\ Annual\ Reported\ Captures\ [Table\ 7, Line\ 1] \\ &\qquad \times Lethal\ Captures\ [calculated\ from\ Table\ 9] \\ &= 0.2585 \times\ 0.659 \\ &= 0.1673\ per\ year\ (\text{Table 13}, \boldsymbol{Line\ 1A}) \end{aligned}$$

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

$$\begin{aligned} &Annual\ Non-lethal\ Reported\ Captures \\ &= Expected\ Annual\ Reported\ Captures\ [Table\ 7, Line\ 1] \times Non \\ &\qquad - lethal\ Captures\ [calculated\ from\ Table\ 9] \\ &= 0.2585 \times 0.341 \\ &= 0.0866\ per\ year\ (\text{Table 13}, \boldsymbol{Line\ 1B}) \end{aligned}$$

6.3.4.2 Estimating Post-Release Mortality for Unreported Hook-and-Line Interactions with Sea Turtles

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

In January 2004, NMFS convened a workshop of experts to develop criteria for estimating PRM of sea turtles caught in the pelagic longline fishery based on the severity of injury. In 2006, those criteria were revised and finalized (Ryder et al. 2006). In February 2012, the Southeast Fisheries Science Center updated the criteria again by adding 3 additional hooking scenarios, bringing the total to 6 categories of injury (NMFS2012a). **Table 10** describes injury categories for hardshell sea turtles captured on hook-and-line gear and the associated PRM estimates for sea turtles released with hook and trailing line greater than or equal to half the length of the carapace (i.e., Release Condition B as defined in (NMFS 2012). We use these criteria when estimating the PRM for unreported captures of sea turtles because it accounts for the expected differences in handling and care of reported versus unreported sea turtles. Please note the following, there is no PRM estimate of Release Condition B for Injury Category V. For Injury Category V, we believe it is prudent to use the PRM for Release Condition A (Released Entangled) because we know the sea turtle was released entangled without a hook, but we do not know how much line was remaining. For Injury Category 6, we believe it is prudent to use the PRM Release Condition D (Released with All Gear Removed) because we believe that if a fisher took the time to resuscitate the sea turtle, then it is likely the fisher also took the time to disentangle the animal completely before releasing it back into the wild

Table 10. Estimated Post Release Mortality Based on Injury Category for Hardshell Sea Turtles Captured via Commercial Pelagic Longline and Released in Release Condition B (NMFS 2012)

Injury Category	Description	Post-release Mortality
I	Hooked externally with or without entanglement	20%
II	Hooked in upper or lower jaw with or without entanglement—includes ramphotheca (i.e., beak), but not any other jaw/mouth tissue parts	30%

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

PRM varies based on the initial injury the animal sustained and the amount of gear left on the animal at the time of release. Again, we will rely on the STSSN dataset we used in **Table 9** because this data includes on what part of the body the sea turtle was hooked for 31 of the 44 interactions (**Table 11**). SERO PRD assigned an Injury Category of 0 to all records with unknown hooking and entanglement locations. We exclude Injury Category 0 from the calculation because we are unsure of the location and therefore cannot assign a corresponding PRM. In this case, there are 13 interactions with an unknown hooking/entanglement location in the dataset.

Table 11. Category of Injury of Sea Turtles from Reported Recreational Hook-and-Line Captures and Gear Entanglements in Zone 5, 2007-2016 (n=31)

Injury Category*	I	II	III	IV	V	VI
Number	1	2	10	12	6	0
Percentage	3.2	6.5	32.3	38.7	19.4	0

As above, we assume that 8% of the sea turtles captured at the pier will be reported, and that reported turtles will be sent to rehabilitation if needed. To estimate the fate of the 92% of sea turtles expected to go unreported at the consultation pier, and therefore un-evaluated or rehabilitated, we use the estimated PRM for the injury categories in **Table 10** along with the percentage of captures in each injury category in **Table 11** to calculate the weighted PRM for each injury category. We then sum the weighted PRMs across all injury categories to determine the overall PRM for sea turtles (**Table 12**). This overall rate helps us account for the varying severity of future injuries and varying PRM associated with these injuries. Based on the assumptions we have made about the percentage of sea turtles that will be released alive without rehabilitation, the hooking location, and the amount of fishing gear likely to remain on an animal released immediately at the pier, we estimate a total weighted PRM of 50.0% for the 92% of sea turtles captured, unreported, and released immediately at the consultation pier.

Table 12. Estimated Weighted and Overall Post Release Mortality for Sea Turtles Captured, Unreported, and Released Immediately

Injury Category	PRM (%) [from Table 10]	Percentage [from Table 11]	% Weighted PRM (% PRM × % Captures for each Injury Category)
I	20	3.2	0.6
II	30	6.5	1.9
III	45	32.3	14.5
IV	60	38.7	23.3
V	50	19.4	9.7
VI	60	0.0	0.0
		Total % Weighted PRM	50.0

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

$$\begin{aligned}&\mathit{Annual\ Unreported\ Lethal\ Captures}\\&= \mathit{Annual\ Unreported\ Captures}\ [\text{Table 8}, \boldsymbol{Line\ 2}] \times \mathit{Total\ Weighted\ PRM}\ [\text{Table 12}]\\&= 2.9199 \times 0.50\\&= 1.4600\ \mathit{per\ year}\ (\text{Table 13}, \boldsymbol{Line\ 2A})\end{aligned}$$

If the equation for calculating annual lethal captures of unreported sea turtles multiplies the annual unreported captures by the total weighted PRM of 50.0%, then the equation for calculating annual non-lethal captures of unreported sea turtles would multiply the annual unreported captures by 50.0% (100% – 50.0%). Therefore, to calculate the estimated annual non-lethal captures of unreported sea turtles at the consultation pier, we use the following equation:

$$\begin{aligned}&\mathit{Annual\ Unreported\ Non-lethal\ Captures}\\&= \mathit{Annual\ Unreported\ Captures}\ [\text{Table 8}, \boldsymbol{Line\ 2}] \times 50.0\%\\&= 2.9199 \times 0.50\\&= 1.4600\ \mathit{per\ year}\ (\text{Table 13}, \boldsymbol{Line\ 2B})\end{aligned}$$

6.3.4.3 Calculating Total Post Release Mortality of Sea Turtles

As we discussed above, we use a 3-year running total to evaluate future impacts to sea turtles due to PRM. **Table 13** shows the total sea turtle captures at the consultation pier for any 3-year consecutive period based on the expected annual lethal and non-lethal reported and unreported captures.

Table 13. Summary of Post Release Mortality of Sea Turtles

Captures	A. Lethal	B. Non-lethal
1. Annual Reported Captures	0.1673	0.0866
2. Annual Unreported Captures	1.4600	1.4600
Annual Total	1.6273	1.5466

Captures	A. Lethal	B. Non-lethal
Triennial (3-year) Total	4.8819	4.6398

6.3.5 Estimating Hook-and-Line Interactions of Sea Turtles by Species

Of the sea turtles in the STSSN Zone 7 inshore data identifiable to species and which may be adversely affected by recreational fishing upon completion of the proposed action (n=116), 21.6% were green (n=25), 56.0% were Kemp's ridley (n=65), and 22.4% were loggerhead sea turtles (n=26) (**Table 3**). We will assume the same potential species composition for future captures at the consultation pier because this is the only available data regarding the relative abundance of sea turtle species that may be affected by hook and line gear in the action area; there are no reported captures of sea turtles at the LSNWR fishing pier.

Table 14 estimates the number of lethal and non-lethal captures by sea turtles species for any consecutive 3-year period based on our calculations from Section 6.3. To be conservative to the individual species, numbers of captures are rounded up to the nearest whole number. While this results in an increase in the total number of sea turtles, compared to what is presented in the non-species-specific total estimates in **Table 8** and **Table 13**, this approach is most conservative to the species, ensures that we are adequately analyzing the effects of the proposed action on whole animals, and that impacts from the proposed action can be more easily tracked. The impacts of future captures to the individual green sea turtle DPSs are discussed in the Jeopardy Analysis (Section 8) and presented in the Incidental Take Statement (Section 10).

Table 14. Estimated Captures of Sea Turtle Species for Any Consecutive 3-Year Period

Species	Lethal Captures	Non-lethal Captures	Total Captures
Green sea turtle (North Atlantic or South Atlantic DPS)	2 (4.8819 × 0.216 = 1.0521)	1 (4.63984 × 0.216 = 1.000)	3
Kemp's ridley sea turtle	3 (4.8819 × 0.560 = 2.7355)	3 (4.63984 × 0.560 = 2.599)	6
Loggerhead sea turtle (Northwest Atlantic DPS)	2 (4.8819 × 0.224 = 1.0942)	2 (4.63984 × 0.224 = 1.040)	4

6.4 Estimating Hook-and-Line Interactions with Smalltooth Sawfish (United States DPS)

6.4.1 Estimating Reported Captures of Smalltooth Sawfish

We believe the best available data to estimate future reported recreational hook-and-line captures of smalltooth sawfish at the LSNWR fishing pier comes from the historic reported recreational captures in the U.S. Sawfish Recovery Database for Levy County, 2000-2022 (**Table 5, Line 2**). The U.S. Sawfish Recovery Database contains the number and location of smalltooth sawfish recreational hook-and-line captures that were reported; it does not provide the total number of potential public fishing structures available in a particular area, and NMFS does not have that information. Further, it does not always provide the location of where the angler was fishing (e.g., fishing from shore, a structure, or a boat). Below, we discuss why the historic reported total recreational captures in the U.S. Sawfish Recovery Database for Levy County, 2000-2022, is the best available information to estimate the expected annual number of reported recreational hook-and-line captures of smalltooth sawfish at the LSNWR fishing pier in the future.

As previously stated, the LSNWR fishing pier is located in Levy County, Florida. The U.S. Sawfish Recovery Database for Dixie, Levy, and Citrus counties, 2000-2022, contains no reported encounters of smalltooth sawfish at the LSNWR fishing pier (recreational hook-and-line or otherwise), and the applicant indicated that no interactions have been reported. Of the 12 total reported recreational hook-and-line captures of smalltooth sawfish in Dixie, Levy, and Citrus counties during this period, 4 occurred in Levy County. None of these reported captures occurred at a fishing pier; however, because recreational fishing is occurring in a similar habitat and region as the LSNWR fishing pier (i.e., coastal Levy County), we assume smalltooth sawfish behavior and density is the same throughout coastal Levy County. Because anglers in the area are subject to similar seasonal fishing trends, coastal Levy County likely has similar angler effort throughout. Further, we assume anglers fishing along the coast of Levy County use similar baits, equipment, and fishing techniques. Therefore, even though there are no historic reported hook-and-line captures at the LSNWR fishing pier, the potential for interactions with smalltooth sawfish is likely the same throughout Levy County.

Whether encounters with smalltooth sawfish are reported varies depending on a number of factors, including whether there are educational signs encouraging reporting and angler behavior; sometimes anglers do not report encounters with ESA-listed species due to concerns over their personal liability or public perception at the time of the capture. Given this variability, it is difficult to estimate reporting behavior. However, we assume that anglers within the same area (in this case, coastal Levy County) would have similar reporting rates as anglers fishing from the LSNWR fishing pier. Because they are in similar geographic locations, we assume public perception about reporting and angler reporting behavior is likely the same. Therefore, even though the historic reported hook-and-line captures are different, the potential for reported captures is the same.

Thus, we believe the best available data to estimate the number of future reported recreational hook-and-line captures of smalltooth sawfish at the LSNWR fishing pier can be determined by taking the average of the historic total reported recreational hook-and-line captures in Levy County, 2000-2022. Averaging the data in this way helps smooth variability in both the potential for interactions and in reporting behavior among the locations and over time, providing for a more accurate overall estimate of future reported captures at the LSNWR fishing pier. There is no additional information that can be used to estimate potential reported interactions.

To calculate the average number of reported hook-and-line captures in Levy County, and thus the LSNWR fishing pier, we use the historic reported recreational hook-and-line captures in Levy County, 2000-2022, and the following equation:

$$Average\ Reported\ Captures\ in\ Levy\ County\ in\ 23\ years$$
$$= Sum\ of\ Reported\ Captures\ in\ Levy\ County\ in\ 23\ years \div 23\ years$$
$$= 4 \div 23$$
$$= 0.1739\ per\ year\ \text{(Table 15,}\ \boldsymbol{Line\ 1}\text{)}$$

6.4.2 Estimating Unreported Captures of Smalltooth Sawfish

While we believe the best available information for estimating expected reported captures at the LSNWR fishing pier is the average of the historic reported recreational hook-and-line captures in Levy County, 2000-2022, we also recognize the need to account for unreported captures. As previously discussed, only 2 fishing pier surveys aimed at collecting data regarding unreported recreational hook-and-line captures of ESA-listed species have been conducted in the Southeast. Like above, we will use the unreported rate from Hill (2013). Hill (2013) found that only 12% of anglers would have reported a smalltooth sawfish hook-and-line capture (i.e., 88% of anglers would not have reported a smalltooth sawfish capture).

Below, we will address unreported captures by assuming that the expected annual reported captures of 0.1739 smalltooth sawfish per year represents 12% of the actual captures and 88% of captures will be unreported. Because the study is in a similar location (i.e., Gulf of Mexico-coast of Florida), it is a reasonable proxy for reporting behavior at the LSNWR fishing pier. In addition, in the absence of additional information on factors that might affect angler reporting behavior, such as similarity of outreach and education, signage, or culture, we will err on the side of the species and assume fewer interactions were reported, as this will result in a higher total expected interactions. Reinitiation may be required if information reveals changes in reporting behavior.

Therefore, to calculate the expected annual number of unreported recreational hook-and-line captures of smalltooth sawfish in Levy County, we use the equation:

$$Expected\ Annual\ Unreported\ Captures\ in\ Levy\ County$$
$$= (Expected\ Annual\ Reported\ Captures \div 12\%) \times 88\%$$
$$= (0.1739 \div 0.12) \times 0.88$$
$$= 1.2753\ per\ year\ \text{(Table 15,}\ \boldsymbol{Line\ 2}\text{)}$$

6.4.3 Calculating Total Captures of Smalltooth Sawfish

As previously discussed, we believe using a 3-year period is appropriate for meaningful monitoring. **Table 15** presents the estimated smalltooth sawfish captures at the LSNWR fishing pier, using the average Levy County encounter data as a proxy, for any 3-year consecutive period based on the expected annual reported and unreported captures calculated above.

Table 15. Summary of Expected Captures of Smalltooth Sawfish

Captures	Total
1. Expected Annual Reported	0.1739
2. Expected Annual Unreported	1.2753
Annual Total	1.4492

Captures	Total
Triennial (3-year) Total	4.3476

We round 4.3476 up to 5 to account for the capture of whole animals in our Jeopardy analysis. Therefore, we estimate that up to 5 smalltooth sawfish could be caught at the LSNWR fishing pier during any consecutive 3-year period.

We believe that all captures of smalltooth sawfish at the LSNWR fishing pier will be non-lethal with no associated PRM given that the level of mortality is likely low when smalltooth sawfish are handled and released properly, that possession of the species in Florida has been prohibited since 1992, and, when considered in conjunction with information from ongoing tagging and telemetry studies, post-release survival is expected to be high (Brame et al. 2019).

7 CUMULATIVE EFFECTS

ESA Section 7 regulations require NMFS to consider cumulative effects in formulating its Opinions (50 CFR 402.14). Cumulative effects include the effects of future state or private actions, not involving federal activities, that are reasonably certain to occur within the action area considered in this Opinion (50 CFR 402.02). NMFS is not aware of any future projects that may contribute to cumulative effects. Within the action area, the ongoing activities and processes described in the environmental baseline are expected to continue and NMFS did not identify any additional sources of potential cumulative effect. Although the present human uses of the action area are expected to continue, some may occur at increased levels, frequency, or intensity in the near future as described in the environmental baseline.

8 JEOPARDY ANALYSIS

To "jeopardize the continued existence of" a species 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. If there is a reduction in 1 or more of these elements, we evaluate whether the action 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 these terms 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." The Handbook further explains that 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. Per the Handbook and the ESA regulations at 50 CFR 402.02, recovery means "improvement in the status of 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 or threats to the species are removed or both so that self-sustaining and self-regulating populations of listed species can be supported as persistent members of native biotic communities.

The analyses conducted in the previous sections of this Opinion serve to provide a basis to determine whether the proposed action would be likely to jeopardize the continued existence of green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS). In Section 6, we outlined how the proposed action can adversely affect these species. Now we turn to an assessment of the species response to these impacts, 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 4), the Environmental Baseline (Section 5), and the Cumulative Effects (Section 7), will jeopardize the continued existence of the affected species. For any species listed globally, our jeopardy determination must evaluate whether the proposed action will appreciably reduce the likelihood of survival and recovery at the species' global range. For any species listed as DPSs, a jeopardy determination must evaluate whether the proposed action will appreciably reduce the likelihood of survival and recovery of that DPS.

8.1 Green Sea Turtles (North Atlantic and South Atlantic DPSs)

Within U.S. waters, individuals from both the North Atlantic and South Atlantic DPS of green sea turtle can be found on foraging grounds. While there are currently no in-depth studies available to determine the percent of North Atlantic and South Atlantic DPS individuals in any given location, 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 South Atlantic DPS (specifically Suriname, Aves Island, Brazil, Ascension Island, and Guinea Bissau) (Foley et al. 2007). This information suggests that the vast majority of the anticipated captures in the Gulf of Mexico are likely to come from the North Atlantic DPS. However, it is possible that animals from the South Atlantic DPS could be captured during the proposed action. For these reasons, we will act conservatively and conduct 2 jeopardy analyses (1 for each DPS). The North Atlantic DPS analysis will assume based on Foley et al. (2007) that 96% of animals adversely affected during the proposed actions are from that DPS. The South Atlantic DPS analysis will assume that 4% of the green sea turtles adversely affected by the proposed action are from that DPS.

Applying the above percentages to our estimated 3 total captures of green sea turtles (2 lethal, 1 non-lethal) during any consecutive 3-year period, we estimate the following:

- Up to 3 green sea turtles will come from the North Atlantic DPS (96% of 3 is 2.88, rounded up to 3), of which 2 will be lethal and 1 will be non-lethal, and
- Up to 1 green sea turtle will come from the South Atlantic DPS (4% of 3 is 0.12, rounded up to 1), which could be lethal or non-lethal.

We note rounding when splitting the take into the DPSs results in a slightly higher combined total than the 3-year total in **Table 14** (i.e., 4 instead of 3). This approach provides a conservative estimate for total number of captures at the consultation pier. While we use the higher numbers for purposes of analyzing the likelihood of jeopardy to the DPSs (Section 8.1.1 and 8.1.2), we do not expect more than 3 green sea turtle captures at the LSNWR fishing pier during any consecutive 3-year period.

8.1.1 North Atlantic DPS of Green Sea Turtle

8.1.1.1 Survival

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

Whether the reductions in numbers and reproduction of this species would appreciably reduce the species likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species (Section 4.1.1.2), we presented the status of the North Atlantic DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we outlined the past and present impacts of all state, federal, or private actions and other human activities in or having effects in the action area that have affected and continue to affect the North Atlantic DPS. In the Cumulative Effects, we discussed the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In Section 4.1.1.2, we summarized the available information on number of green sea turtle nesters and nesting trends at North Atlantic DPS beaches; all major nesting populations demonstrate long-term increases in abundance (Seminoff et al. 2015a). Therefore, nesting at the primary nesting beaches has been increasing over the course of the decades, against the background of the past and ongoing human and natural factors that have contributed to the Status of the Species. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. Since the nesting abundance trend information for the North Atlantic DPS of green sea turtle is clearly increasing, we believe the combined potential lethal take of up to 3 green sea turtle from the North Atlantic DPS during any consecutive 3-year period attributed to the LSNWR fishing pier will not have any measurable effect on that trend. While there have been no reported take of sea turtles at the LSNWR fishing pier, the proposed action is a rebuild of an existing pier and fishing impacts from this pier are already part of the baseline. Accidental captures of these species due to recreational fishing has likely been occurring in the past while the abundance trends of this species (DPS) has also been increasing. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe that recreational fishing from the proposed pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the green sea turtle North Atlantic DPS in the wild.

8.1.1.2 Recovery

The North Atlantic DPS of green sea turtles does not have a separate recovery plan at this time. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991b) does exist. Since the animals within the North Atlantic 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 the Atlantic DPS, is developed. The Atlantic Recovery Plan lists the following relevant recovery objectives over a period of 25 continuous years:

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

According to data collected from Florida's index nesting beach survey from 1989-2019, green sea turtle nest counts across Florida index beaches have increased substantially from a low of approximately 267 in the early 1990s to a high of almost 41,000 in 2019 (See **Figure 5**), and indicate that the first listed recovery objective is being met. There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the clear increases in nesting, however, it is likely that numbers on foraging grounds have increased, which is consistent with the criteria of the second listed recovery objective.

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

8.1.1.3 Conclusion

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

8.1.2 South Atlantic DPS of Green Sea Turtle

8.1.2.1 Survival

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

Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species (Section 4.1.1.2), we presented the status of the DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we considered the past and present impacts of all state, federal, or private actions and other human activities in, or having effects in, the action area that have affected and continue to affect this DPS. In the Cumulative Effects, we considered the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In Section 4.1.1.2, we summarized available information on number of green sea turtle nesters and nesting trends at South Atlantic DPS beaches; some of the largest nesting beaches such as Ascension Island, Aves Island (Venezuela), and Galibi (Suriname) appear to be increasing.

Therefore, it is likely that nesting at the primary nesting beaches has been increasing for decades, despite past and ongoing human and natural factors that have contributed to the status of the species. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. Since the nesting abundance trend information for green sea turtles appears to be increasing, we believe lethal capture during any consecutive 3-year period attributed to recreational fishing at the consultation pier will not have any measurable effect on that trend. While there have been no reported take of sea turtles at the LSNWR fishing pier, the proposed action is a rebuild of an existing pier and fishing impacts from this pier are already part of the baseline. That is, accidental captures of this species (DPS) due to recreational fishing has likely been occurring in the past while the abundance trends of this species has also been increasing. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe that recreational fishing from the proposed pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the South Atlantic DPS of green sea turtle in the wild.

8.1.2.2 Recovery

Like the North Atlantic DPS, the South Atlantic DPS of green sea turtles does not have a separate recovery plan in place at this time. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991b) does exist. Since the animals within the South Atlantic 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 the Atlantic Recovery Plan as a guide until a new plan, specific to the South Atlantic DPS, is developed. In our analysis for the North Atlantic DPS, we stated that the Atlantic Recovery Plan lists the following relevant recovery objectives over a period of 25 continuous years:

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

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

The potential lethal capture of up to 1 green sea turtle from the South Atlantic DPS during any consecutive 3-year period will result in a reduction in numbers; however, it is unlikely to have any detectable influence on the trends noted above, even when considered in context with the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. Any non-lethal captures would not affect the adult female nesting population or number of nests per nesting season. Thus, the recreational fishing from the proposed pier will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of the South Atlantic DPS of green sea turtles' recovery in the wild.

8.1.2.3 Conclusion

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

8.2 Kemp's Ridley Sea Turtle

8.2.1 Survival

The proposed action is expected to result in the capture of up to 6 Kemp's ridley sea turtles (3 lethal, 3 non-lethal) during any consecutive 3-year period. Any potential non-lethal capture is not expected to have any measurable impact on the reproduction, numbers, or distribution of the species. The individual suffering non-lethal injuries or stresses are expected to fully recover such that no reductions in reproduction or numbers of Kemp's ridley sea turtles are anticipated. A non-lethal capture will occur in the action area, which encompasses a small portion of this species overall range/distribution. Any incidentally caught animal would be released within the general area where caught and no change in the distribution of Kemp's ridley sea turtles would be anticipated. The potential lethal captures during any consecutive 3-year period would reduce the species' population compared to the number that would have been present in the absence of the proposed actions, assuming all other variables remained the same. The Turtle Expert Working Group (Turtle Expert Working Group 1998) estimates age at maturity from 7-15 years for this species. Females return to their nesting beach about every 2 years (Turtle Expert Working Group 1998). The mean clutch size for Kemp's ridley sea turtle is 100 eggs per nest, with an average of 2.5 nests per female per season. A lethal capture could also result in a potential reduction in future reproduction, assuming at least one of these individuals would be female and would have survived to reproduce in the future. The loss could preclude the production of thousands of eggs and hatchlings, of which a fractional percentage would be expected to survive to sexual maturity. Thus, the death of any females would eliminate their contribution to future generations, and result in a reduction in sea turtle reproduction. However, the potential lethal take during any consecutive 3-year period is expected to occur in a small, discrete area and Kemp's ridley sea turtle generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species (Section 4.1.1.3), we presented the status of the Kemp's ridley sea turtle, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we considered the past and present impacts of all state, federal, or private actions and other human activities in, or having effects in, the action area that have affected and continue to affect this species. In the Cumulative Effects, we considered the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. It is important to remember that with significant inter-annual variation in nesting data, sea turtle population trends necessarily are measured over decades and the long-term trend line better reflects the population trend. In Section 4.1.1.3, we summarized available information on Kemp's ridley sea turtle nesters and nesting trends. At this time, it is unclear whether the increases and declines in Kemp's ridley sea turtle nesting seen over the past decade at nesting beaches in Mexico, or the similar trend with the emerging Texas population, represents a population oscillating around an equilibrium point or if nesting will decline or increase in the future. With the recent period of increases in nesting (2015-2017) bookended by recent periods of declining numbers of nests (2013-2014 and 2018-2019), it is too early to tell whether the long-term trend line is affected. Nonetheless, the full data set from 1990 to present continues to support the conclusion that Kemp's ridley sea turtles are increasing in population size. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. Since the nesting trend information is increasing, we believe the potential lethal captures during any consecutive 3-year period will not have any measurable effect on that trend. While there have been no reported take of sea turtles at the LSNWR fishing pier, the proposed action is a rebuild of an existing pier and fishing impacts from this pier are already part of the baseline. Accidental captures of this species due to recreational fishing has likely been occurring in the past and these impacts are already factored into the abundance trends of this species. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe that recreational fishing from the proposed pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of Kemp's ridley sea turtle in the wild.

8.3.1 Recovery

As to whether the consultation pier will appreciably reduce the species' likelihood of recovery, the recovery plan for the Kemp's ridley sea turtle (NMFS et al. 2011b) lists the following relevant recovery objective:

- A population of at least 10,000 nesting females in a season (as measured by clutch frequency per female per season) distributed at the primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) in Mexico is attained. Methodology and capacity to implement and ensure accurate nesting female counts have been developed.

The recovery plan states the average number of nests per female is 2.5; it sets a recovery goal of 10,000 nesting females associated with 25,000 nests. The 2012 nesting season recorded approximately 22,000 nests in Mexico. Yet, in 2013 through 2014, there was a significant decline, with only 16,385 and 11,279 nests recorded, respectively, which would equate to 6,554 nesting females in 2013 (16,385 ÷ 2.5) and 4,512 in 2014 (11,279 ÷ 2.5). Nest counts increased 2015-2017, they did not reach 25,000 by 2017, and they decreased 2018-2019; however, it is clear that the population has increased over the last 2 decades. The increase in Kemp's ridley sea turtle nesting is likely due to a combination of management measures including elimination of direct harvest, nest protection, the use of TEDs, reduced trawling effort in Mexico and the U.S., and possibly other changes in vital rates (Turtle Expert Working Group 1998; Turtle Expert Working Group 2000).

The potential lethal captures during any consecutive 3-year period by recreational fishing at the pier will result in a reduction in numbers and reproduction; however, it is unlikely to have any detectable influence on the nesting trends. Given annual nesting numbers are in the thousands, the projected loss is not expected to have any discernable impact to the species. Any non-lethal capture would not affect the adult female nesting population. Thus, recreational fishing at the pier will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of the Kemp's ridley sea turtles' recovery in the wild.

8.3.2 Conclusion

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

8.3 Loggerhead Sea Turtle (Northwest Atlantic DPS)

8.3.3 Survival

The proposed action is expected to result in the capture of up to 4 loggerhead sea turtles (2 lethal, 2 non-lethal) from the Northwest Atlantic DPS during any consecutive 3-year period. Any potential non-lethal captures during any consecutive 3-year period are not expected to have a measurable impact on the reproduction, numbers, or distribution of the species. The individual suffering non-lethal injuries or stresses is expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. All non-lethal captures will occur in the action area, which encompass a small portion of the overall range or distribution of loggerhead sea turtles within the Northwest Atlantic DPS. Any incidentally caught animals would be released within the general area where caught and no change in the distribution of Northwest Atlantic DPS of loggerhead sea turtles would be anticipated.

The potential lethal capture during any consecutive 3-year period would reduce the number of Northwest Atlantic DPS loggerhead sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. Potential lethal capture would also result in a reduction in future reproduction, assuming the individual was female and would have survived otherwise to reproduce. For example, an adult female loggerhead sea turtle can lay approximately 4 clutches of eggs every 3-4 years, with 100-126 eggs per clutch. Thus, the loss of adult females could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. However, the potential lethal take during any consecutive 3-year period is expected to occur in a small, discrete area and loggerhead sea turtle generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species (Section 4.1.4), we presented the status of the DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we considered the past and present impacts of all state, federal, or private actions and other human activities in, or having effects in, the action area that have affected and continue to affect this DPS. In the Cumulative Effects, we considered the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. Abundance estimates in the western North Atlantic indicate the population is large (i.e., several hundred thousand individuals). In Section 4.1.4, we summarized available information on number of loggerhead sea turtle nesters and nesting trends. Nesting trends across all of the recovery units have been steady or increasing over several years against the background of the past and ongoing human and natural factors that have contributed to the current status of the species. Additionally, in-water research suggests the abundance of neritic juvenile loggerheads is steady or increasing.

While the potential lethal capture of a loggerhead sea turtle during any consecutive 3-year period will affect the population, in the context of the overall population’s size and current trend, we do not expect this loss to result in a detectable change to the population numbers or increasing trend. While there have been no reported take of sea turtles at the LSNWR fishing pier, the proposed action is a rebuild of an existing pier and fishing impacts from this pier are already part of the baseline. That is, accidental captures of this species due to recreational fishing has likely been occurring in the past and therefore the impacts are already factored into the abundance trends of these species. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe the proposed pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the Northwest Atlantic DPS of loggerhead sea turtle in the wild.

8.3.4 Recovery

The recovery plan for the for the Northwest Atlantic population of loggerhead sea turtles (NMFS and USFWS 2008b) was written prior to the loggerhead sea turtle DPS listings. However, this plan deals with the populations that comprise the current Northwest Atlantic DPS and is therefore, the best information on recovery criteria and goals for the DPS. It lists the following recovery objectives that are relevant to the effects of the proposed action:

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

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

In Section 4.1.1.4, we summarized available information on number of loggerhead sea turtle nesters and nesting trends. Nesting trends across all of the recovery units have been steady or increasing over several years against the background of the past and ongoing human and natural factors that have contributed to the current status of the species. 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 non-significant 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 from 2012-2016 resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose slightly again to 48,983 in 2018, which is still the fourth highest total since 2001. It is important to note that with the wide confidence intervals and uncertainty around the variability in nesting parameters (changes and variability in nests/female, nesting intervals, etc.), it is unclear whether the nesting trend equates to an increase in the population or nesting females over that time frame (Ceriani et al. 2019). In-water research suggests the abundance of neritic juvenile loggerheads is also steady or increasing. Thus, the potential lethal capture of 2 loggerhead sea turtle during any consecutive 3-year period is so small in relation to the overall population, even when considered in the context of the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. We believe this is true for both nesting and juvenile in-water populations. The potential non-lethal from the Northwest Atlantic DPS would not affect the adult female nesting population, number of nests per nesting season, or juvenile in-water populations. Thus, recreational fishing at the proposed pier will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of Northwest Atlantic DPS of loggerhead sea turtles' recovery in the wild.

8.3.5 Conclusion

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

8.4 Smalltooth Sawfish (United States DPS)

The proposed action is expected to result in the capture of up to 5 smalltooth sawfish over any consecutive 3-year period. We expect all captures to be non-lethal with no associated PRM.

8.4.1 Survival

The potential non-lethal capture of smalltooth sawfish over any consecutive 3-year period is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. The individuals captured are expected to fully recover such that no reductions in reproduction or numbers of this species are anticipated. Since these captures may occur in the small, discrete action area and would be released within the general area where caught, no change in the distribution of smalltooth sawfish is anticipated. While there have been no reported take of smalltooth sawfish at the LSNWR fishing pier, the proposed action is a rebuild of an existing pier and fishing impacts from this pier are already part of the baseline. That is, accidental captures of this species due to recreational fishing has likely been occurring in the past and these impacts are already factored into the abundance trend of this species.

8.4.2 Recovery

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

Objective - Minimize Human Interactions and Associated Injury and Mortality

Sub-objective:

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

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

Sub-objective:

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

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

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

8.4.3 Conclusion

The potential non-lethal capture of smalltooth sawfish is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. Because the proposed action will not affect the population of reproductive adult females, we do not expect it to affect Recovery Objective #3, above, which focuses on ensuring abundance increases. The proposed action also will not interfere with Recovery Objective #1. Mortalities are not expected, and the proposed action furthers outreach efforts by ensuring signs are maintained at the pier to educate anglers about safe handling and reporting interactions with the species. Thus, the recreational fishing effects from the proposed pier will not result in an appreciable reduction in the likelihood of smalltooth sawfish U.S. DPS recovery in the wild.

9 CONCLUSION

We reviewed the Status of the Species, the Environmental Baseline, the Effects of the Action, and the Cumulative Effects using the best available data.

The proposed action will result in the take of up to 3 green sea turtles (North Atlantic and South Atlantic DPSs), 6 Kemp's ridley sea turtles, and 4 loggerhead sea turtles (Northwest Atlantic DPS) (**Table 14**). Given the nature of the proposed action and the information provided above, we conclude that the action, as proposed, is not likely to jeopardize the continued existence of green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS).

10 INCIDENTAL TAKE STATEMENT

10.1 Overview

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 (ESA Section 2(19)). *Incidental take* refers to takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant. 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 of the Opinion.

Section 7(b)(4)(c) of the ESA specifies that to provide an Incidental Take Statement for an endangered or threatened species of marine mammal, the taking must be authorized under Section 101(a)(5) of the MMPA. Since no incidental take of listed marine mammals is anticipated as a result of the proposed action, no statement on incidental take of protected marine mammals is provided and no take is authorized. Nevertheless, the USFWS must immediately notify (within 24 hours, if communication is possible) our Office of Protected Resources if a take of a listed marine mammal occurs.

As soon as the USFWS becomes aware of any take of an ESA-listed species under NMFS's purview that occurs due to recreational fishing upon completion of the proposed action, the USACE shall report the take to NMFS SERO PRD via the NMFS SERO Endangered Species Take Report Form (https://forms.gle/85fP2da4Ds9jEL829). This form shall be completed for each individual known reported capture, entanglement, stranding, or other take incident. Information provided via this form shall include the title, LSNWR Shell Mound Fishing Pier and Boardwalk, the issuance date, and NMFS tracking number (SERO-2022-01373) for this Opinion; the species name; the date and time of the incident; the general location and activity resulting in capture; condition of the species (i.e., alive, dead, sent to rehabilitation); size of the individual, behavior, identifying features (i.e., presence of tags, scars, or distinguishing marks), and any photos that may have been taken. At that time, consultation may need to be reinitiated.

The USACE has a continuing duty to ensure compliance with the reasonable and prudent measures and terms and conditions included in this Incidental Take Statement. If the USACE (1) fails to assume and implement the terms and conditions or (2) fails to require the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit or grant document or other similar document, the protective coverage of Section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the USACE must report the progress of the action and its impact on the species to NMFS as specified in the Incidental Take Statement (50 CFR 402.14(i)(3)).

10.2 Amount of Extent of Anticipated Incidental Take

The take limits prescribed in this Opinion that will trigger the requirement to reinitiate consultation are based on the amount of take that we expect *to be reported* as it is not possible to directly monitor the incidents that go unreported. The best available information for estimating the amount of future take of sea turtles and smalltooth sawfish that will be reported at the LSNWR fishing pier is described in Section 6.

In Sections 6.3.1-6.3.3, we developed an estimate of the total number of sea turtle captures expected to be reported annually (0.2539; **Table 8**, Line 1). We take that number and multiply by 3 to get the 3-year total estimate of reported sea turtle captures (0.2539 × 3 = 0.7617). We then apply that number to the species breakdown reported in the STSSN inshore data for recreational hook-and-line captures and gear entanglement in Zone 7 (described in Section 6.3.5) to obtain the 3-year total estimate of reported take of each species of sea turtle. For those estimates that come out to be less than 1, we round up to 1 to reach a whole number that can be used as the take limit. The anticipated, unreported sea turtle takes are not directly monitored but can be estimated from reported takes using the process described in Section 6.3.2. Based on the data collected from the Hill (2013) fishing pier study, we anticipate 92% of sea turtle takes will go unreported.

In Sections 6.4, we developed an estimate of the total number of smalltooth sawfish captures expected to be reported annually (0.1739; **Table 15**, Line 1). We take that number and multiply by 3 to get the 3-year total estimate of reported sea turtle captures (0.1739 × 3 = 0.5217, rounded up to 1). We round up to 1 to reach a whole number that can be used as the take limit. The anticipated, unreported sea turtle takes are not directly monitored but can be estimated from reported takes using the process described in Section 6.4. Based on the data collected from the Hill (2013) fishing pier study, we anticipate 88% of smalltooth sawfish takes will go unreported.

The take limits shown in **Table 16** are our best estimates of the amount of take expected to be reported over any consecutive 3-year period. We do not anticipate more than 1 green sea turtle take during any consecutive 3-year time period, which may come from either the North Atlantic or the South Atlantic DPS.

Table 16. Incidental Take Limits by Species for Any Consecutive 3-Year Period

Species	Total Estimated Reported Captures	Incidental Take Limits that will Trigger Reinitiation
Green sea turtle (North Atlantic or South Atlantic DPS)	0.7617 × 21.6% = 0.1645, rounded up to 1	No more than 1 reported capture
Kemp's ridley sea turtle	0.7617 × 56.0% = 0.4265, rounded up to 1	No more than 1 reported capture
Loggerhead sea turtle (Northwest Atlantic DPS)	0.7617 × 22.4% = 0.1706, rounded up to 1	No more than 1 reported capture
Smalltooth sawfish	0.1739 × 3 = 0.5217, rounded up to 1	No more than 1 reported capture

It is important to note that the mortality rates estimated in Section 6.3 for sea turtles are not likely to be detected in the initial reporting of captures, as most sea turtles are expected to live for some period following capture. Some of these individuals may be sent to rehabilitation facilities and later die in those facilities, or may be released and die in the wild from undetected injuries, as discussed in our PRM analysis. While it is also possible that some sea turtles may die immediately from severe injuries related to hook and line capture or entanglement (which will be included in the annual reports discussed below), we do not expect that result. At the time of the interaction, we expect the sea turtle take in the above ITS to be non-lethal. As previously discussed in Section 6.3.4.2, up to 50.0% of the reported interactions could result in a mortality, and reports of such PRM are consistent with the analysis in this Opinion and this ITS. Likewise, we expect PRM of the unreported sea turtle interactions, as described in Section 6.3.4.2.

As previously discussed, we expect all interactions with smalltooth sawfish to be non-lethal with no associated PRM.

10.3 Effect of Take

NMFS has determined that the anticipated incidental take specified in Section 10.2 is not likely to jeopardize the continued existence of green sea turtle (North Atlantic and South Atlantic DPSs), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (United States DPS) if the project is developed as proposed.

10.4 Reasonable and Prudent Measures

Section 7(b)(4) of the ESA requires NMFS to issue to any federal 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. The Incidental Take Statement must specify the Reasonable and Prudent Measures necessary to minimize the impacts of the incidental taking from the proposed action on the species, and Terms and Conditions to implement those measures. "Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take" (50 CFR 402.02). Per Section 7(o)(2), any incidental taking that complies with the specified terms and conditions is not considered to be a prohibited taking of the species concerned.

The Reasonable and Prudent Measures and terms and conditions are required to document the incidental take by the proposed action and to minimize the impact of that take on ESA-listed species (50 CFR 402.14(i)(1)(ii) and (iv)). These measures and terms and conditions must be implemented by the USACE for the protection of Section 7(o)(2) to apply. The USACE and USFWS have a continuing duty to ensure compliance with the reasonable and prudent measures and terms and conditions included in this Incidental Take Statement. If USACE or USFWS fails to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms, or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse. To monitor the impact of the incidental take, the USACE and USFWS must report the progress of the action and its impact on the species to SERO PRD as specified in the Incidental Take Statement [50 CFR 402.14(i)(3)].

NMFS has determined that the following Reasonable and Prudent Measures are necessary and appropriate to minimize impacts of the incidental take of ESA-listed species related to the proposed action. The following Reasonable and Prudent Measures and associated terms and conditions are established to implement these measures, and to document incidental takes. Only incidental takes that occur while these measures are in full implementation are not considered to be a prohibited taking of the species. These restrictions remain valid until reinitiation and conclusion of any subsequent Section 7 consultation.

1. The USFWS must provide take reports regarding all interactions with ESA-listed species at the LSNWR fishing pier.
2. The USFWS must minimize the likelihood of injury or mortality to ESA-listed species resulting from hook-and-line capture or entanglement by activities at the LSNWR fishing pier.
3. The USFWS must reduce the impacts to incidentally captured ESA-listed species.
4. The USFWS must coordinate periodic fishing line removal (i.e., cleanup) events with non-governmental or other local organizations.

10.5 Terms and Conditions

In order to be exempt from the prohibitions established by Section 9 of the ESA, the USACE and USFWS must comply (or must ensure that any applicant complies) with the following Terms and Conditions.

The following T&Cs implement the above RPMs:

1. To implement RPM 1, the USFWS must report all known angler-reported hook-and-line captures of ESA-listed species and any other takes of ESA-listed species to the NMFS SERO PRD.
    a. If and when the USFWS becomes aware of any known reported capture, entanglement, stranding, or other take, the applicant must report it to NMFS SERO PRD via the NMFS SERO Endangered Species Take Report Form (https://forms.gle/85fP2da4Ds9jEL829).
        i. Emails must reference this Opinion by the NMFS tracking number (SERO-2022-01373 LSNWR Shell Mound Fishing Pier and Boardwalk) and date of issuance.
        ii. This form shall be completed for each individual known reported capture, entanglement, stranding, or other take incident.
        iii. The form must include the species name, state the species, date and time of the incident, general location and activity resulting in capture (e.g., fishing from the pier by hook-and-line), condition of the species (i.e., alive, dead, sent to rehabilitation), size of the individual, behavior, identifying features (i.e., presence of tags, scars, or distinguishing marks), and any photos that may have been taken.
    b. Any known capture, entanglement, stranding, or other take of ESA-listed species will also be reported in the following manner:
        i. Sea turtles will also be reported to the FWC Wildlife Alert Hotline: (888) 404-3922.
        ii. Gulf sturgeon will also be reported to the LSNWR at (352) 493-0238 or the Refuge Manager at (703) 622-3896 and to the NMFS at (844) STURG911 (1-844-788-7491) or by E-mail at: NOAA.Sturg911@noaa.gov.
        iii. Giant manta ray will also be reported to the NMFS at (727) 824-5312 or by E-mail at: manta.ray@noaa.gov.

    iv. Smalltooth sawfish will also be reported to the FWC at (844) 472-9347 (1-844-4SAWFISH) or by E-mail at: Sawfish@MyFWC.com.

  c. Every year, the USFWS must submit a summary report of capture, entanglement, stranding, or other take of ESA-listed species to NMFS SERO PRD by email to: nmfs.ser.esa.consultations@noaa.gov.
    i. Emails and summary reports must reference this Opinion by the NMFS tracking number (SERO-2022-01373 LSNWR Shell Mound Fishing Pier and Boardwalk) and date of issuance.
    ii. The summary report will contain the following information: the total number of ESA-listed species captures, entanglements, strandings, or other take that was reported at or adjacent to the piers included in this Opinion.
    iii. The summary report will contain all information for any sea turtles taken to a rehabilitation facility holding an appropriate USFWS Native Endangered and Threatened Species Recovery permit. This information can be obtained from the appropriate State Coordinator for the STSSN (https://www.fisheries.noaa.gov/state-coordinators-sea-turtle-stranding-and-salvage-network)
    iv. The summary report shall be submitted even when there has been no reported take of ESA-listed species.
    v. The summary report will include current photographs of signs and bins required in T&Cs 2, below, and records of the clean-ups required in T&C 3 below.
    vi. The first summary report will be submitted by January 31 in the year after the project has been completed, and will cover the period from pier opening until December following the pier's opening. The second report will be submitted by the following January 31, and cover the previous calendar year and the information in the first report. Thereafter, reports will be prepared every year, covering the prior rolling three-year period, and emailed no later than January 31 of any year.

2. To implement RPMs 2 and 3, the USFWS must:
  a. Install and maintain the following NMFS Protected Species Educational Signs: "Report a Sturgeon" and "Save Dolphins, Sea Turtles, Sawfish, and Manta Ray."
    i. Signs will be posted at least at the entrance to the pier.
    ii. Signs will be installed prior to opening the pier for public use.
    iii. Photographs of the installed signs will be emailed to NMFS's Southeast Regional Office (nmfs.ser.esa.consultations@noaa.gov) with the NMFS tracking number (SERO-2022-01373 LSNWR Shell Mound Fishing Pier and Boardwalk) and date of issuance.
    iv. Sign designs and installation methods are provided at the following website: https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs.
    v. Current photographs of the signs will be included in each report required by T&C 1, above.

   b. Install and maintain monofilament recycling bins and trash receptacles at the piers to reduce the probability of trash and debris entering the water.
      i. Monofilament recycling bins and trash receptacles will be installed prior to opening the pier for public use.
      ii. Photographs of the installed bins will be emailed to NMFS's Southeast Regional Office by email (nmfs.ser.esa.consultations@noaa.gov) with the NMFS tracking number for this Opinion (SERO-2022-01373 LSNWR Shell Mound Fishing Pier and Boardwalk) and date of issuance.
      iii. The applicant must regularly empty the bins and trash receptacles and make sure they are functional and upright.
      iv. Additionally, current photographs of the bins will be included in each report required by T&C 1, above.

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

11 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authority to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation Recommendations identified in Opinions can assist action agencies in implementing their responsibilities under Section 7(a)(1). Conservation recommendations are discretionary activities designed to minimize or avoid adverse effects of a proposed action on ESA-listed species or critical habitat, to help implement recovery plans, or to develop information.

The following conservation recommendations are discretionary measures that NMFS believes are consistent with this obligation and therefore should be carried out by the USACE or the USFWS:

Sea turtles:

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

Smalltooth sawfish:

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

12 REINITIATION OF CONSULTATION

This concludes formal consultation on the proposed action. As provided in 50 CFR 402.16, reinitiation of formal consultation is required and shall be requested by USACE, the USFWS, or by NMFS, where discretionary federal action agency involvement or control over the action has been retained, or is authorized by law, and if: (a) the amount or extent of incidental take specified in the Incidental Take Statement is exceeded, (b) new information reveals effects of the action on listed species or critical habitat in a manner or to an extent not considered in this Opinion, (c) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion, or (d) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the USACE and the USFWS must immediately request reinitiation of formal consultation and project activities may only resume if the USACE and the USFWS establish that such continuation will not violate Sections 7(a)(2) and 7(d) of the ESA.

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