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-2023-01928

01/29/2024

Melissa L. Gilbert
Section Chief, Fort Myers Field Office
Jacksonville District Corps of Engineers
Department of the Army
1520 Royal Palm Square Boulevard, Suite 310
Fort Myers, Florida 33919

Ref.: SAJ-1996-01274, River Refuge LLC, Paradise Isle Marina Expansion, North Fort Myers, Lee County, Florida

Dear Melissa Gilbert,

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 been given the NMFS tracking number SERO-2023-01928. Please use the NMFS tracking number in all future correspondence related to this action.

The Opinion considers the effects of the U.S. Army Corps of Engineers' (USACE) proposal to authorize the expansion of an existing marina by the applicant, River Refuge LLC, in North Fort Myers, Lee County, Florida, on the following listed species and critical habitat: green sea turtle (North Atlantic Distinct Population Segment [DPS]), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), hawksbill sea turtle, smalltooth sawfish (U.S. DPS), giant manta ray, and designated critical habitat for smalltooth sawfish (U.S. DPS). The Opinion is based on information provided by the USACE, the applicant, and the published literature cited within. NMFS concludes that the proposed action will have no effect on green sea turtle (South Atlantic DPS) and hawksbill sea turtle, and is not likely to adversely affect smalltooth sawfish (U.S. DPS) and giant manta ray. 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 DPS), Kemp's ridley sea turtle, and loggerhead sea turtle, or result in the destruction or adverse modification of critical habitat for smalltooth sawfish (U.S. 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 and applicant 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 phone at (727) 342-0249, or by email at Sarah.Garvin@noaa.gov.

Sincerely,

AMENDOLA.KIMBERLY.BARBARA.1365830769
Digitally signed by AMENDOLA.KIMBERLY.BARBARA.1365830769
Date: 2024.01.29 17:03:41 -05'00'

for Andrew J. Strelcheck
Regional Administrator

Enclosure:
NMFS Biological Opinion SERO-2023-01928
cc: Heather.M.Mason@usace.army.mil
nmfs.ser.esa.consultations@noaa.gov
File: 1514-22.f.4

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency:	United States Army Corps of Engineers Permit number: SAJ-1996-01274
Applicant:	River Refuge LLC
Activity:	Paradise Isle Marina Expansion and Redevelopment
Location:	North Fort Myers, Lee 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-2023-01928

Approved by: for AMENDOLA.KIMBERLY.BARBARA.1365830769 Digitally signed by AMENDOLA.KIMBERLY.BARBARA.1365830769 Date: 2024.01.29 17:06:07 -05'00'

Andrew J. Strelcheck, Regional Administrator
NMFS, Southeast Regional Office
St. Petersburg, Florida

Date Issued: ______________________

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ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

ac	acre(s)
°C	degrees Celsius
CCL	curved carapace length
CFR	Code of Federal Regulations
CHEU	Charlotte Harbor Estuary Unit
cm	centimeter(s)
CPUE	catch per unit effort
DDT	dichlorodiphenyltrichloroethane
DNA	deoxyribonucleic acid
DPS	Distinct Population Segment
DTRU	Dry Tortugas Recovery Unit
DW	disc width
DWH	Deepwater Horizon
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
GADNR	Georgia Department of Natural Resources
GCRU	Greater Caribbean Recovery Unit
in	inch(es)
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram(s)
km	kilometer(s)
lb	pound(s)
lin ft	linear foot/feet
m	meter(s)
MHW	Mean High Water
mi	mile(s)
mi^2	square mile(s)
MIT	Massachusetts Institute of Technology
MLW	Mean Low Water
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MMF	Marine Megafauna Foundation
MRFSS	Marine Recreational Fisheries Statistics Survey
MRIP	Marine Recreational Information Program
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAD 83	North American Datum of 1983
NCWRC	North Carolina Wildlife Resources Commission
NGMRU	Northern Gulf of Mexico Recovery Unit

NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRU	Northern Recovery Unit
Opinion	Biological Opinion, Conference Biological Opinion, or Draft Biological Opinion
oz	ounce(s)
PCB	polychlorinated biphenyls
PFC	perfluorinated chemicals
PFRU	Peninsular Florida Recovery Unit
PK	peak sound pressure level
RMS	root-mean-square pressure level
SERO PRD	NMFS Southeast Regional Office, Protected Resources Division
SAV	Submerged Aquatic Vegetation
SCDNR	South Carolina Department of Natural Resources
SCL	straight carapace length
SEFSC	NMFS Southeast Fisheries Science Center
SEL	sound exposure level
SELcum	cumulative sound exposure level
SSRIT	Smalltooth Sawfish Recovery Implementation Team
STSSN	Sea Turtle Stranding and Salvage Network
TED	Turtle Excluder Device
TEWG	Turtle Expert Working Group
TTIEU	Ten Thousand Islands Estuary Unit
U.S.	United States of America
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VSI	vessel strike injury
YOY	young of year

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 based on our review of potential effects of the USACE's proposal to authorize the expansion of an existing marina by River Refuge LLC (the applicant) in North Fort Myers, Lee County, Florida, on the following listed species and critical habitat: green sea turtle (North Atlantic Distinct Population Segment [DPS]), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), hawksbill sea turtle, smalltooth sawfish (U.S. DPS), giant manta ray, and designated critical habitat for smalltooth sawfish (U.S. DPS). Our Opinion is based on information provided by the USACE, the applicant, 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-2023-01928, Paradise Isle Marina Expansion.

On August 16, 2023, we received a request for formal consultation under Section 7 of the ESA from the USACE to permit the expansion of an existing marina by River Refuge LLC (the applicant) in North Fort Myers, Lee County, Florida, in a letter dated August 16, 2023.

On September 20, 2023, we requested additional information related to the project details and best practices. We received a final response on September 22, 2023, and initiated formal consultation that day.

2 PROPOSED ACTION

2.1 Project Details

2.1.1 Project Description

The USACE proposes to authorize River Refuge LLC (the applicant) to expand the existing Paradise Marina as part of the large, planned, mixed-use redevelopment project on a 271.71 ac parcel adjacent to the Caloosahatchee River in North Fort Myers, Lee County, Florida. The existing marina is an upland-cut, 114,800 ft^2 (2.64 ac) boat basin with 66 wet slips. Currently, there are 9,600 ft^2 of overwater dock structures and 1,325 lin ft of seawall. The proposed project includes removal of existing overwater structures and seawalls, creation of shallow tidal lagoons, enlargement of the marina basin, construction of new overwater structures, construction of dry storage for vessels, shoreline stabilization, and habitat creation. The proposed work is expected to take up to one year to complete.

Demolition
The existing marina's overwater structures and seawalls will be removed using equipment situated on the uplands or mounted on a barge. The existing timber piles will be pulled. Any piles that cannot be removed will be cut off at the final design depth. All debris will be disposed of at an upland facility.

Marina Expansion
The marina basin will be enlarged by excavating 322,000 ft^2 (7.39 ac) of uplands and by dredging 101,400 ft^2 of material from the existing marina basin, all to a depth of -6 ft MLW. Approximately 40,890 ft^2 of overwater structures will be constructed using 900 new 8-in-diameter wood piles and 81 new 14-in square concrete piles. Wood piles will be installed by jetting. Concrete piles will be installed using an impact hammer and a noise abatement cushion. No more than 10 concrete piles per day will be installed. Overwater structures include fixed and floating docks that will accommodate up to 206 vessels and a T-shaped private fishing pier

extending into the Caloosahatchee River. Vessel sizes accommodated by the new docks range between 30 and 60 ft in length. A maximum of 39 slips will accommodate vessels 60 ft in length, with most wet slips accommodating vessels 40 ft in length. The fishing pier access walkway will measure 180 ft long by 5 ft wide. The terminal platform of the pier will measure 10 ft by 10 ft. It is expected that 1 fisher per day will utilize the pier. The new upland dry storage unit will accommodate 200 vessels.

Four tidal lagoons and a tidal connection channel will be created to facilitate flushing of the marina. Tidal lagoons will be created by excavation of uplands and by filling existing golf course ponds to a depth of -1 ft MLLW. Approximately 225,600 ft^2 of fill will be deposited into existing golf course ponds. Tidal lagoons will have the dimensions listed in Table 1 below.

Table 1. Proposed Lagoon Dimensions

Lagoon	**Area (ft^2)**	**Water depth (ft below MLLW)**	**Riprap Revetment Placed (lin ft)**	**Concrete Seawall Placed (lin ft)**
1	55,400	1	600	--
2	375,300	1	2,810	860
3	152,700	1	1,210	1,315
4	83,200	1	2,885	--

Shoreline Stabilization

Approximately 4,300 lin ft of concrete or vinyl seawall panels will be jetted into place along portions of the enlarged marina basin and portions of tidal lagoons 2 and 3. If concrete panels are used, they will be 5 ft wide with a toe depth commensurate with site soil conditions, and approximately 860 panels will be installed. All panels will be 8 in thick. If vinyl panels are used, they are typically 1 ft wide, are steel reinforced, and filled with concrete. Approximately 4,300 vinyl panels will be installed if concrete panels are not used during final construction.

Approximately 7,500 lin ft of riprap revetment will also be placed within each of the 4 new tidal lagoons with a 3:1 slope (see Table 1). All shoreline stabilization materials will be placed either within the existing marina's basin or in areas created from upland excavation.

Channel deepening

The existing marina access channel will be dredged to a depth of -6 ft MLW. The current dredge depth for the channel is -4.5 ft MLW. A total of 115,000 ft^2 of material will be dredged from the access channel.

Habitat Creation

Habitat creation will occur within the tidal lagoons created by upland excavation and consist of the following features.

- Approximately 47,430 ft^2 of mangroves will be planted along riprap revetments with each of the 4 new tidal lagoons.
- Approximately 53,270 ft^2 of *Spartina alterniflora* will be planted for marsh creation within tidal lagoons 2 and 3.
- Approximately 380 lin ft of 3-ft diameter reef balls will be placed in tidal lagoon 2.

2.1.2 Mitigation Measures

- All work will be conducted during daylight hours only.
- An ESA-species pre-construction meeting will be held for all workers.
- The SERO Protected Species Construction Conditions will be implemented during construction.
- Vessel Strike Avoidance Measures will be implemented during construction.
- At least 1 ft of clearance between the bottom of vessels and the bottom of the waterbody will be required at all times during construction.
- Vessel speeds will be reduced while maintaining sufficient maneuverability and navigation.
- Turbidity barriers will be used and will be placed in the water by hand.

2.1.3 Best Practices

- The applicant will report all future sightings of smalltooth sawfish at the property to the FWC via E-mail: Sawfish@MyFWC.com, or telephone: 844-472-9347 (1-844-4SAWFISH).
- Upon completion of the fishing pier, NMFS-approved educational signs will be posted in a visible location at least at the entrance to and terminal end of the fishing structure, alerting users of listed species in the area. The applicant will post at the pier the following signs, which are available for download at the following website: https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs. It is suggested that both English and Spanish versions of the signs are posted.
  - *"Save Dolphins, Sea Turtles, Sawfish, and Manta Ray";*
  - *"Save Sawfish"*
  - *"Notice to Recreational and Commercial Fishers"*
- The applicant will place a trash receptacle with a lid on the fishing pier. The trash receptacle will be clearly marked and will be emptied regularly to ensure it does not overfill and that fish carcasses are disposed of properly.
- A fishing line-recycling bin will be placed on the fishing pier in order to prevent fishing line and debris from being disposed of in the water or on the shore. The receptacle will be clearly marked and will be emptied regularly to ensure it does not overfill and that fishing lines are disposed of properly.

2.2 Action Area

The project site is located at 26.62901ºN, 81.91890ºW (NAD 83) in North Fort Myers, Lee County, Florida. The project site consists of an existing, 66-slip marina in the Caloosahatchee River approximately 19 river miles away from the Gulf of Mexico. The marina was originally constructed in 1977. The marina is currently operating at about 75% occupancy and there is no fuel dock or fishing pier present. Substrate within the existing marina basin consists of sand, and water depths are approximately -6 ft MLW.

Figure 1. Location of the proposed project in the Caloosahatchee River, North Fort Myers, Lee County, Florida (© Google Earth 2022).

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 existing marina's physical footprint, the new, expanded marina footprint, existing access channel, the radius of effects on ESA-listed species based on the proposed installation of 14-in-square concrete piles by impact hammer (i.e., 3,2825.2 ft), and the surrounding water accessible to vessels (i.e., the Caloosahatchee River and Gulf of Mexico) and to recreational anglers upon completion of the proposed fishing pier (i.e., casting distance or approximately 200 ft. There are no corals or SAV within the action area. Most of the wetlands at the project site are composed of extensive, dense, mature Brazilian pepper *(Schinus terebinthifolia)* vegetation. Red mangroves are present at the project site, and the creation of the tidal connector will result in the removal 1,700 ft^2 of red mangroves.

The action area is within the boundary of the Charlotte Harbor Unit of designated critical habitat for smalltooth sawfish (U.S. DPS). Substrate in the action area is sand. The water depth within the channel proposed for deepening are -4.5 ft MLLW. The water depth within the existing marina basin is -6 ft MLLW.

The action area is also located 3 miles southwest and downriver from the U.S. 41 High Use Area for smalltooth sawfish (U.S. DPS).

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: 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	LAA	LAA
Green sea turtle (South Atlantic DPS)	T	81 FR 20057/ April 6, 2016	October 1991	LAA	NE
Hawksbill sea turtle	E	35 FR 8491/ June 2, 1970	December 1993	LAA	NE
Kemp's ridley sea turtle	E	35 FR 18319/ December 2, 1970	September 2011	LAA	LAA
Loggerhead sea turtle (Northwest Atlantic DPS)	T	76 FR 58868/ September 22, 2011	December 2008	LAA	LAA
Fishes					
Giant manta ray	T	83 FR 2916/ January 22, 2018	2019 (Outline)	LAA	NLAA
Smalltooth sawfish (U.S. DPS)	E	68 FR 15674/ April 1, 2003	January 2009	LAA	NLAA

We believe the proposed action will have No Effect on the South Atlantic DPS of green sea turtles. Limited information previously indicated that benthic juveniles from both the North Atlantic and South Atlantic DPSs may be found in waters off the mainland United States.

However, additional research has determined that juveniles from the South Atlantic DPS are not likely to occur in these waters, including the action area for this project.

We also believe the proposed action will have No Effect on hawksbill sea turtle. Hawksbill sea turtle primarily occurs in Florida and Texas waters, though this species is present in all the Gulf States. In Florida, hawksbill sea turtle occupy reefs off Palm Beach, Broward, Miami-Dade, and Monroe Counties. Adult hawksbill sea turtles occupy areas supporting reefs and other hardbottom habitats supporting sponges (especially the East Coast of Florida from Palm Beach County south to the Florida Keys, where there are established hawksbill home ranges). There are no corals and no hardbottom habitat present in the action area, which is located 19 river miles from the Gulf of Mexico.

We do not expect giant manta ray to be present within the immediate area of the proposed construction activities, which are located 19 miles upriver from the Gulf of Mexico in the Caloosahatchee River. Giant manta ray are likely to be present at the mouth of the river where is meets the Gulf of Mexico, where this species may interact with vessels originating from the proposed expanded marina.

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

The proposed action includes dredging, upland excavation, removal of red mangroves, and installation of new piles. Use of turbidity curtains, project activities, and related noise may preclude or deter smalltooth sawfish from entering the project area. We believe the temporary exclusion from a project area due to the project activities, including related noise and presence of turbidity curtains, will have an insignificant effect on smalltooth sawfish. Construction activities will occur during daylight hours only. Turbidity curtains will enclose the project site, or portions of the project site, at any given time and will be removed after project completion. Smalltooth sawfish excluded from the project area will also be able to use surrounding areas with similar available habitat during the project and return to the project site when the activity is complete. The proposed project also may provide enhanced foraging and/or nursery habitat after construction is complete because the following habitat types will be created.

- Approximately 47,430 ft^2 of red mangrove habitat will be created by planting red and white mangroves within the riprap revetments within the lagoon areas.
- Approximately 53,270 ft^2 of *Spartina alterniflora* marsh habitat will be created adjacent to the seawalls in the lagoon areas.
- Approximately 667,607 ft^2 of shallow, euryhaline habitat will be created through creation of the tidal lagoons and tidal connection channel.

Smalltooth sawfish may be physically injured if struck by dredging equipment or other in-water construction activities. We believe the risk of physical injury is extremely unlikely to occur due to these species' abilities to move away from the project site and into adjacent suitable habitat, if disturbed. NMFS previously determined in dredging Biological Opinions that, while oceangoing hopper-type dredges may lethally entrain protected species, non-hopper-type dredging methods, such as the mechanical methods proposed in this project, are slower and extremely unlikely to overtake or adversely affect them (NMFS 2007). Additionally, the implementation of NMFS Southeast Region's *Protected Species Construction Conditions* (NMFS 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 150 ft 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 would be more likely to see listed species, if present, and avoid interactions with them.

Smalltooth sawfish may be injured due to entanglement in improperly discarded fishing gear resulting from future use of the private fishing pier after completion of the proposed action. We believe this route of effect is extremely unlikely to occur. To minimize the risk of entanglement in improperly discarded fishing gear, the applicant will install and maintain a fishing line recycling receptacle and trashcan with lid at the pier to keep debris out of the water, and we expect that anglers will appropriately dispose of fishing gear when a disposal bin is 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. Additionally, the NMFS educational signs *"Save Dolphins, Sea Turtles, Sawfish and Manta Ray"* and *"Save Sawfish"* signs will be installed in visible locations at the fishing pier upon completion of the proposed action. We believe the placement of educational signs is a beneficial effect to smalltooth sawfish. 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.

Smalltooth sawfish also may be injured by hook-and-line capture resulting from future use of the new fishing pier after completion of the proposed action. We believe incidental capture of these species is extremely unlikely to occur due to the small size and limited accessibility of the proposed fishing pier at the expanded marina. Because of limited access to only guests or residents of the multi-use development, and the likelihood that guests and residential users not continuously fishing, the proposed fishing pier is not expected to have the constant fishing pressure that larger, public fishing structures will have. The applicant estimates that approximately 1 fisher per day will utilize the pier. Larger, public fishing structures tend to continuously have people on site with the sole purpose of fishing; therefore, there is a much greater chance that fishing lines, bait, or discarded fish carcasses will be in the water to potentially attract or entangle ESA-listed species, especially sea turtles.

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.

When an impact hammer strikes a pile, a pulse is created that propagates through the pile and radiates sound into the water, the ground substrate, and the air. Pulsed sounds underwater are typically high volume events that have the potential to cause hearing injury. 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. Please note that for vibratory pile driving, only behavioral sound measurement thresholds exist for fishes; NMFS does not recognize any injurious sound thresholds for fishes when vibratory pile driving is used.

We use the NMFS Multi-species Pile Driving Tool (dated May 2022) 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 reference above. The USACE proposes to permit impact pile driving of up to ten 14-in concrete piles per day during daylight hours only using a pile-cushion as noise abatement. Each pile will require approximately 55 strikes to install. Pile driving will occur in a confined space. We define a confined space as any area that has a solid, vertical structure (e.g., jetty or seawall) or natural shoreline that would effectively serve as a barrier or otherwise prevent an animal from exiting the area. That is, in order for the animal to move away from the noise source, the animal would be forced to pass through the radius of noise effects. Because multiple pile-types (i.e., 8-in-diameter wood piles, pre-cast concrete panels, and 14-in square concrete piles) and installation methods (i.e., jetting and impact hammer) are proposed, the noise analysis in this consultation evaluates the pile-type and installation method with the greatest potential effects and largest potential effect radius (i.e., 14-in square concrete piles). Any potential effects of pile driving noise from other proposed pile types and methods would not exceed those described below. Therefore, the potential pile driving noise effects from the other proposed pile types and methods, if any, are expected to occur within a radius of that size or smaller and would result in, at most, the potential effects described below.

The installation of up to eighty-one 14-in square concrete piles by impact hammer using a cushion as noise abatement measures may cause PK injurious noise effects to ESA-listed fishes at a radius of up to 3.8 ft (1.2 m). We believe PK injurious noise effects are extremely unlikely to occur because this distance is within the 150-ft (46-m) “stop-work” radius defined in SERO’s Protected Species Construction Conditions (revised 2021). Additionally, the SELcum may cause injury to ESA-listed fishes at a radius of up 553.2 ft (168.6 m) away from the pile-driving operations over a 24-hour period. We believe the SELcum injurious noise effects are unlikely to occur due to the mobility of these species. That is, we expect these species to move away from the noise disturbances before the exposure to the noise causes physical injury. Movement away from the injurious sound radius is a behavioral response, which is discussed below.

The installation of eighty-one 14-in square concrete piles by impact hammer could result in behavioral effects to ESA-listed fishes at a radius of up to 3,825.2-ft (1,165.9-m) away from the impact pile driving operations. Although we generally expect mobile species to move away from noise disturbances, the proposed action will occur in a confined space. If an animal remains within the project area, it could be exposed to behavioral noise effects during pile installations. Because pile installations will occur intermittently during daylight hours only, and a maximum of only 10 piles per day will be driven, these species will be able to resume normal activities during quiet periods between pile installations and at night.

The proposed project includes to expansion of an existing marina. The current capacity of the marina is 66 wet slips. The proposed project will result in a total of 206 wet slips plus dry storage for up to 200 vessels. Vessel sizes accommodated by the expanded marina range between 30 and 60 ft in length. A maximum of 39 slips will accommodate vessels 60 ft in length, with most wet slips accommodating vessels 40 ft in length. Vessel traffic, both recreational and commercial, has been documented to adversely affect protected species such as giant manta ray. In general, little information exists on interactions with smalltooth sawfish. This is likely because sawfish are primarily demersal and rarely would be at risk from moving vessels. As vessels need sufficient water to navigate without encountering the bottom, vessels typically transit shoal areas with marginal clearance cautiously (i.e., slowly), and impacts with this species is not anticipated.

Vessel strikes are evident in every monitored manta ray population across the globe (Stewart et al. 2018a). Spending considerable time at the surface (e.g., while feeding and basking; Braun et al. 2014; Braun et al. 2015) manta rays are especially susceptible to vessel strikes (McGregor et al. 2019; Stevens and Froman 2019; Armstrong et al. 2020; Augliere 2020). Several studies have indicated that vessel strikes are significantly underestimated for manta rays. Documenting vessel strikes on manta rays is challenging because injuries are frequently misidentified and attributed to predation, fishing line, and entanglement injuries (McGregor et al., 2019), but are also underestimated due to the species ability to heal rapidly as the injury may not be recognizable in a quick underwater encounter (Marshall and Bennett 2010; McGregor et al., 2019; Pate and Marshall 2020). This misidentification of injuries and rapid wound healing indicates that vessel strikes are underestimated for manta ray populations (McGregor et al. 2019). It is also possible that manta rays are experiencing blunt force trauma from a vessel strike, yet are not exhibiting any obvious external injuries (Pate and Marshall 2020). In addition, any mortality caused by vessel strikes would likely be cryptic as manta rays are negatively buoyant and will sink after they die making documenting mortalities unlikely. While wound recovery is beneficial it likely requires significant energy cost and metabolic processes, which may shift energy allocation from reproductive effort, growth, and ability to feed, thereby reducing individual fitness (Archie 2013; Chin et al. 2015; Harvey-Carroll et al. 2021; Womersley et al. 2021).

The risk of vessel strike for giant manta rays is temporally and spatially variable (i.e., vessel strikes are more likely to occur where vessel density and manta ray density is high). In addition, when comparing the likelihood of vessel strikes on juveniles versus adults, the observed habitat use of juveniles may make them more prone to this threat. For example, in southeast Florida between Jupiter Inlet and Boynton Beach Inlet (i.e., Palm Beach County) vessel strikes were one of the most common sources of injuries to juvenile giant manta rays that frequent the shallow coastal waters there, where human activity and vessel traffic is heavily concentrated (Pate and Marshall 2020).

Any vessel traffic originating from the expanded marina at Paradise Isle and entering coastal areas of the Gulf of Mexico via Caloosahatchee River are not likely to encounter giant manta rays. While giant manta rays are occasionally sighted along Florida's gulf coast and can be observed feeding within ocean inlets and river plumes (NMFS 2024), the mouth of the Caloosahatchee River is not a location known to have a high or moderate occurrence of giant manta rays (Farmer et al. 2022). Southeast Florida is a known giant manta ray nursery area with a high occurrence of giant manta ray and high vessel traffic (Farmer et al. 2022; Pate and Marshall 2020). Of the known individual giant manta rays (n=179) occurring in Southeast Florida, 15 of those individuals (8%) have been recorded with vessel strike injuries between June 2016 and December 2023 (J. Pate, pers. comm. to C. Horn, NMFS SERO PRD, January 12, 2024. This calculates out to an average of 4 vessel strikes per year for giant manta ray in Palm Beach County (i.e., 15 total strikes in 7 years = 2.14 strikes per year; rounded up to 3).

While we do not have a maximum projected number of potential vessel trips within Palm Beach County waters for the 38,372 registered vessels in that county, Barnette (2018) calculated a maximum projected total of 2,214,757 potential vessel trips in Miami-Dade waters during the course of a year. We use Miami-Dade County as a proxy for Palm Beach County because of the similarity between high vessel traffic observed and the high number of giant manta ray occurrences in both counties. Barnette (2018) assumed that each vessel trip possesses the same likelihood of resulting in the strike of a sea turtle or giant manta ray. Utilizing an average of 3 vessel strikes per year based on documented giant manta ray strandings data, coupled with the high-effort average annual number of vessel trips observed in the Miami-Dade area (2,214,757), we calculated that, on average, a vessel strike would occur every 738,252.33 vessel trips. Based on the annual average of 36 vessel trips per boater (2.975 trips/vessel/month × 12 months/year), an average boater would strike a giant manta every 20,507 years.

While this is likely an underestimate, when compared to 406 vessels introduced into the action area, the potential for vessel strikes of giant manta ray resulting from vessels originating from the proposed expanded marina is extremely unlikely to occur. The action area is not an area with known high occurrences of giant manta ray. Operation of the marina will not result in all 406 of the vessels moored and stored at the facility being in the water at the same time, nor will a majority of vessels originating from the expanded marina be traveling to the Gulf of Mexico where the occurrence of giant manta ray is more likely.

Therefore, NMFS believes any vessel traffic effects to smalltooth sawfish and giant manta ray will be extremely unlikely to occur.

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

We have determined that green sea turtle (North Atlantic DPS), Kemp's sea turtle, and loggerhead sea turtle (Northwest Atlantic DPS) are likely to be adversely affected by the proposed action and thus require further analysis. We provide greater detail on the potential effects to these species from the proposed action in the Effects of the Action (Section 6.1) and whether those effects, when considered in the context of the Status of the Species (Section 4.1), the Environmental Baseline (Section 5), and the Cumulative Effects (Section 7), are likely to 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 Determination

We have assessed the designated critical habitat that overlaps with the action area and our determination of the project's potential effects is shown in **Table 3** below.

Table 3. 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)
Smalltooth sawfish (U.S. DPS)	Charlotte Harbor Estuary Unit	74 FR 45353/ September 2, 2009	NLAA	LAA

3.2.2 Critical Habitat Likely to be Adversely Affected by the Proposed Action

We have determined that the Charlotte Harbor Estuary Unit of designated critical habitat for smalltooth sawfish is likely to be adversely affected by the proposed action and thus requires further analysis. We provide greater detail on the potential effects to critical habitat from the proposed action in the Effects of the Action (Section 6.2) and whether those effects, when considered in the context of the Status of the Critical Habitat (Section 4.2), the Environmental Baseline (Section 5), and the Cumulative Effects (Section 7), are likely to cause destruction or adverse modification of critical habitat.

4 STATUS OF ESA-LISTED SPECIES AND CRITICAL HABITAT CONSIDERED FOR FURTHER ANALYSIS

4.1 Rangewide Status of the Species Considered for Further Analysis

4.1.1 Overview Status of Sea Turtles

There are 5 species of sea turtles (green, hawksbill, Kemp's ridley, leatherback, and loggerhead) that travel widely throughout the South Atlantic, Gulf of Mexico and the Caribbean. These species are highly migratory and therefore could occur within the action area. Section 4.1.1 will address the general threats that confront all sea turtle species. The remainder of Section 4.1.1 (Sections 4.1.2-4.1.3) will address information on the distribution, life history, population structure, abundance, population trends, and unique threats to each species of sea turtle.

4.1.2 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 of the Species sections where appropriate.

Fisheries

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

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

Non-Fishery In-Water Activities

There are also many non-fishery impacts affecting the status of sea turtle species, both in the ocean and on land. In nearshore waters of the United States, the construction and maintenance of federal navigation channels has been identified as a source of sea turtle mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move relatively rapidly and can entrain and kill sea turtles (NMFS 1997). Sea turtles entering coastal or inshore areas have also been affected by entrainment in the cooling-water systems of electrical generating plants. Other nearshore threats include harassment and/or injury resulting from private and commercial vessel operations, military detonations and training exercises, in-water construction activities, and scientific research activities.

Coastal Development and Erosion Control
Coastal development can deter or interfere with nesting, affect nesting success, and degrade nesting habitats for sea turtles. Structural impacts to nesting habitat include the construction of buildings and pilings, beach armoring and renourishment, and sand extraction (Bouchard et al. 1998; Lutcavage et al. 1997). These factors may decrease the amount of nesting area available to females and change the natural behaviors of both adults and hatchlings, directly or indirectly, through loss of beach habitat or changing thermal profiles and increasing erosion, respectively (Ackerman 1997; Witherington et al. 2003; Witherington et al. 2007). In addition, coastal development is usually accompanied by artificial lighting which can alter the behavior of nesting adults (Witherington 1992) and is often fatal to emerging hatchlings that are drawn away from the water (Witherington and Bjorndal 1991). In-water erosion control structures such as breakwaters, groins, and jetties can impact nesting females and 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, PCB, and PFC), and others that may cause adverse health effects to sea turtles (Garrett 2004; Grant and Ross 2002; Hartwell 2004; Iwata et al. 1993). Acute exposure to hydrocarbons from petroleum products released into the environment via oil spills and other discharges may directly injure individuals through skin contact with oils (Geraci 1990), inhalation at the water's surface and ingesting compounds while feeding (Matkin and Saulitis 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability in the action area.

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

Marine debris is a continuing problem for sea turtles. Sea turtles living in the pelagic environment commonly eat or become entangled in marine debris (e.g., tar balls, plastic bags/pellets, balloons, and lost, abandoned or discarded fishing gear) as they feed along oceanographic fronts where debris and their natural food items converge. Marine debris can cause significant habitat destruction from derelict vessels, further exacerbated by tropical storms moving debris and scouring and destroying corals and seagrass beds, for instance. Sea turtles that spend significant portions of their lives in the pelagic environment (i.e., juvenile loggerheads, and juvenile green turtles) are especially susceptible to threats from entanglement in marine debris when they return to coastal waters to breed and nest.

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 2007a). In sea turtles, sex is determined by the ambient sand temperature (during the middle third of incubation) with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007a).

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

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

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

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

4.1.3 Green Sea Turtle – North 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 2). 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. Only individuals from the South Atlantic DPS and North Atlantic DPS may occur in waters under the purview of the NMFS Southeast Region, with South Atlantic DPS individuals only expected to occur in the U.S. Caribbean.

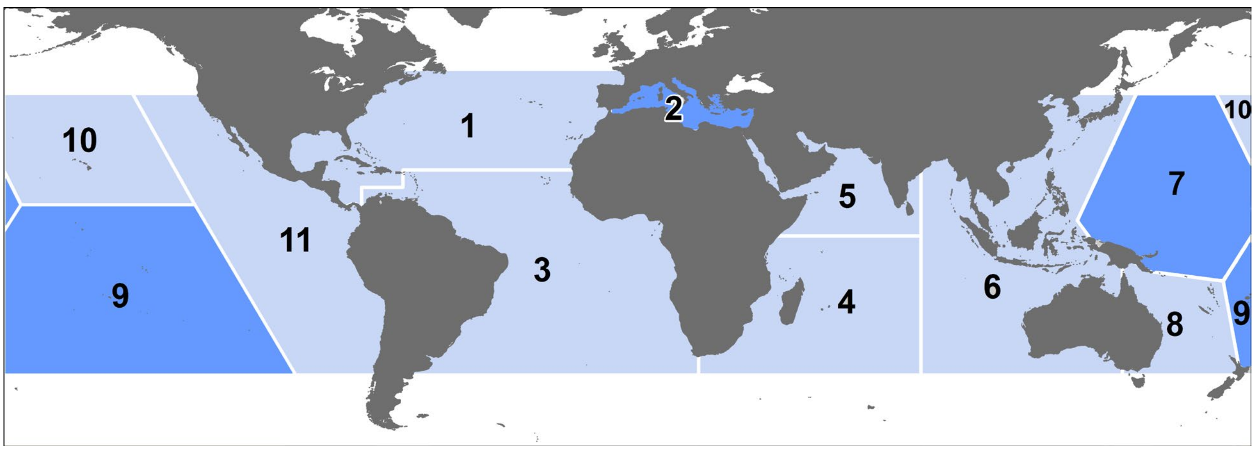

Figure 2. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11.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

Species Description and Distribution

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

With the exception of post-hatchlings, green sea turtles live in nearshore tropical and subtropical waters where they generally feed on marine algae and seagrasses. They have specific foraging grounds and may make large migrations between these forage sites and natal beaches for nesting (Hays et al. 2001). Green sea turtles nest on sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands in more than 80 countries worldwide (Hirth 1997). The two 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. Limited early information indicated that within U.S. waters benthic juveniles from both the North Atlantic and South Atlantic DPSs may be found on foraging grounds. Two small-scale studies provided an insight into the possible 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). 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). However, with additional research it has been determined that South Atlantic juveniles are not likely to be occurring in U.S. mainland coastal waters in anything more than negligible numbers. Jensen et al. (2013) indicated that the earlier studies might represent a statistical artifact as they lack sufficient precision, with error intervals that span zero. More recent studies with better rookery baseline representation found negligible (<1%) contributions from the South Atlantic DPS among Texas and Florida GoM juvenile green turtle assemblages (Shamblin et al. 2016, 2018). Finally, an as-yet published genetic analysis of samples from various coastal areas in the Gulf of Mexico and Atlantic has now solidified the conclusion that South Atlantic juveniles represent at best a negligible number of individuals in mainland United States waters (Peter Dutton, SWFSC, pers. comm. April 2022). Therefore, we will not consider South Atlantic DPS individuals when conducting consultations for projects in the waters off the mainland United States.

The North Atlantic DPS boundary is illustrated in Figure 1. Four regions support nesting concentrations of particular interest in the North Atlantic DPS: Costa Rica (Tortuguero), Mexico (Campeche, Yucatan, and Quintana Roo), U.S. (Florida), and Cuba. By far the most important nesting concentration for green turtles in this DPS is Tortuguero, Costa Rica. Nesting also occurs in the Bahamas, Belize, Cayman Islands, Dominican Republic, Haiti, Honduras, Jamaica, Nicaragua, Panama, Puerto Rico, Turks and Caicos Islands, and North Carolina, South Carolina, Georgia, and Texas, U.S.A. In the eastern North Atlantic, nesting has been reported in Mauritania (Fretey 2001).

The complete nesting range of 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 1991). The vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Johnson and Ehrhart 1994; Meylan et al. 1995).

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

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

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 ounces (25 grams). Survivorship at any particular nesting site is greatly influenced by the level of man-made stressors, with the more pristine and less disturbed nesting sites (e.g., along the Great Barrier Reef in Australia) showing higher survivorship values than nesting sites known to be highly disturbed (e.g., Nicaragua) (Campell and Lagueux 2005; Chaloupka and Limpus 2005).

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

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

Status and Population Dynamics

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

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. 2015).

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

Tortuguero, Costa Rica is by far the predominant nesting site, accounting for an estimated 79% of nesting for the DPS (Seminoff et al. 2015). Nesting at Tortuguero appears to have been increasing since the 1970's, when monitoring began. For instance, from 1971-1975 there were approximately 41,250 average annual emergences documented and this number increased to an average of 72,200 emergences from 1992-1996 (Bjorndal et al. 1999). Troëng and Rankin (2005) collected nest counts from 1999-2003 and also reported increasing trends in the population consistent with the earlier studies, with nest count data suggesting 17,402-37,290 nesting females per year (NMFS and USFWS 2007). 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. However, a recent long-term study spanning over 50 years of nesting at Tortuguero found that while nest numbers increased steadily over 37 years from 1971-2008, the rate of increase slowed gradually from 2000-2008. After 2008 the nesting trend has been downwards, with current nesting levels having reverted to that of the mid 1990's and the overall long-term trend has now become negative (Restrepo, et al. 2023).

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. 2015). 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 2). 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, with another increase in 2022 still well below the 2019 high (Figure 2). While nesting in Florida has shown dramatic increases over the past decade, individuals from the Tortuguero, the Florida, and the other Caribbean and Gulf of Mexico populations in the North Atlantic DPS intermix and share developmental habitat. Therefore, threats that have affected the Tortuguero population as described previously may ultimately influence the other population trajectories, including Florida. Given the large size of the Tortuguero nesting population, which is currently in decline, its status and trend largely drives the status of North Atlantic DPS.

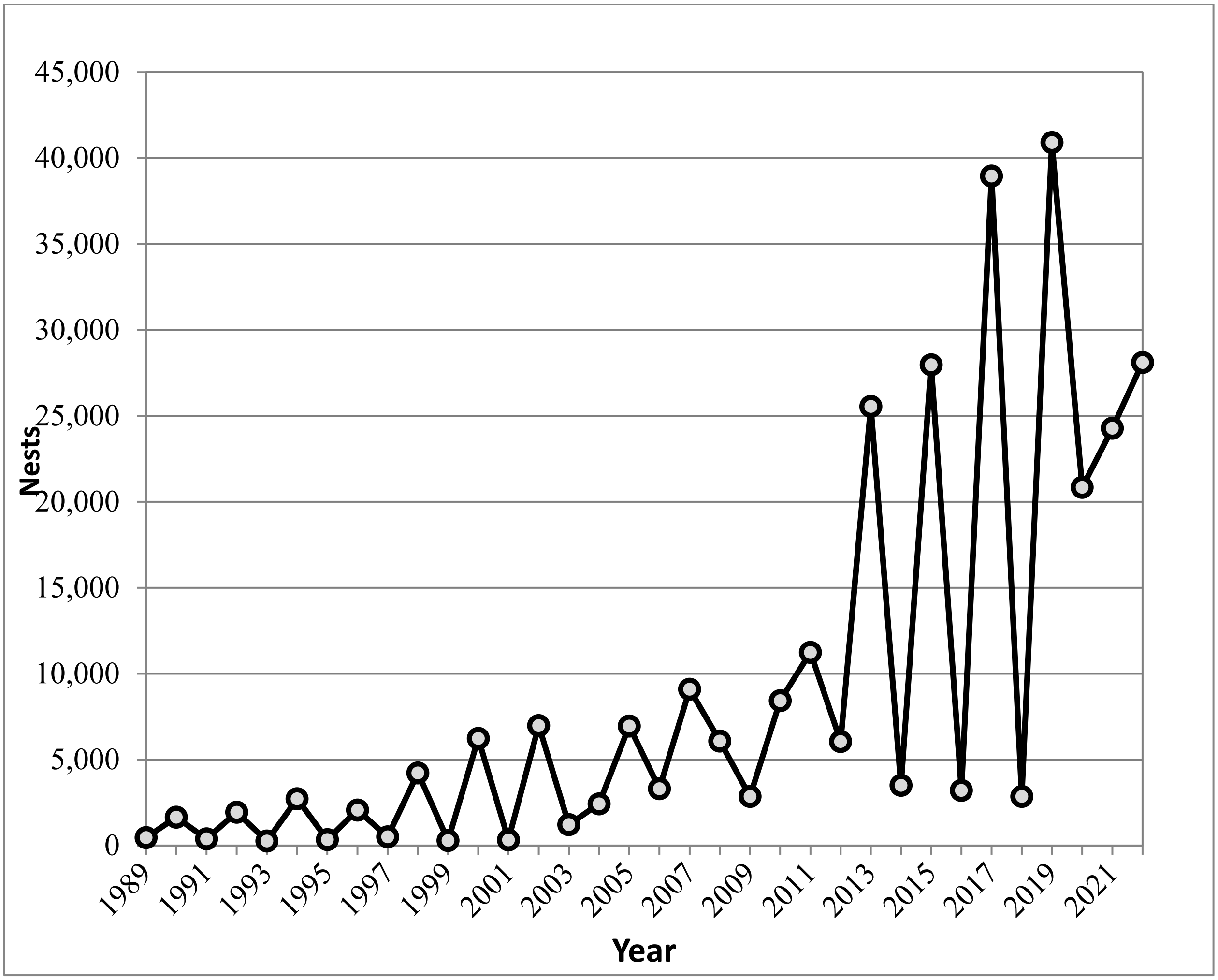

Figure 3. Green sea turtle nesting at Florida index beaches since 1989

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

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 Fibropapillomatosis (FP) disease. FP results in the growth of tumors on soft external tissues (flippers, neck, tail, etc.), the carapace, the eyes, the mouth, and internal organs (gastrointestinal tract, heart, lungs, etc.) of turtles (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). These tumors range in size from 0.04 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, specific impacts of the DWH spill on green sea turtles are considered here. Impacts to green sea turtles occurred to offshore small juveniles only. A total of 154,000 small juvenile greens (36.6% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. A large number of small juveniles were removed from the population, as 57,300 small juveniles greens are estimated to have died as a result of the exposure. A total of 4 nests (580 eggs) were also translocated during response efforts, with 455 hatchlings released (the fate of which is unknown) (DWH Trustees 2015). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources, which could lead to compromised growth and/or reproductive potential.

There is no information currently available to determine the extent of those impacts, if they occurred.

While green turtles regularly use the northern Gulf of Mexico, they have a widespread distribution throughout the entire Gulf of Mexico, Caribbean, and Atlantic, and the proportion of the population using the northern Gulf of Mexico at any given time is relatively low. Although it is known that adverse impacts occurred and numbers of animals in the Gulf of Mexico were reduced as a result of the DWH oil spill of 2010, the relative proportion of the population that is expected to have been exposed to and directly impacted by the DWH event, as well as the impacts being primarily to smaller juveniles (lower reproductive value than adults and large juveniles), reduces the impact to the overall population. It is unclear what impact these losses may have caused on a population level, but it is not expected to have had a large impact on the population trajectory moving forward. However, recovery of green turtle numbers equivalent to what was lost in the northern Gulf of Mexico as a result of the spill will likely take decades of sustained efforts to reduce the existing threats and enhance survivorship of multiple life stages (DWH Trustees 2015).

4.1.4 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. (2011) 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 4), which indicated the species was 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), 2021 (17,671 nests), and 2022 (17,418) (CONAMP data, 2022). At this time, it is unclear whether the increases and declines in nesting seen over the past decade-and-a-half represents a population oscillating around an equilibrium point, if the recent three years (2020-2022) of relatively steady nesting indicates that equilibrium point, or if nesting will decline or increase in the future. So at this point we can only conclude that the population has dramatically rebounded from the lows seen in the 80's and 90's, but we cannot ascertain a current population trend or trajectory.

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 somewhat 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, back to 195 nests in 2021, and then rebounding to 284 nests in 2022 (National Park Service data).

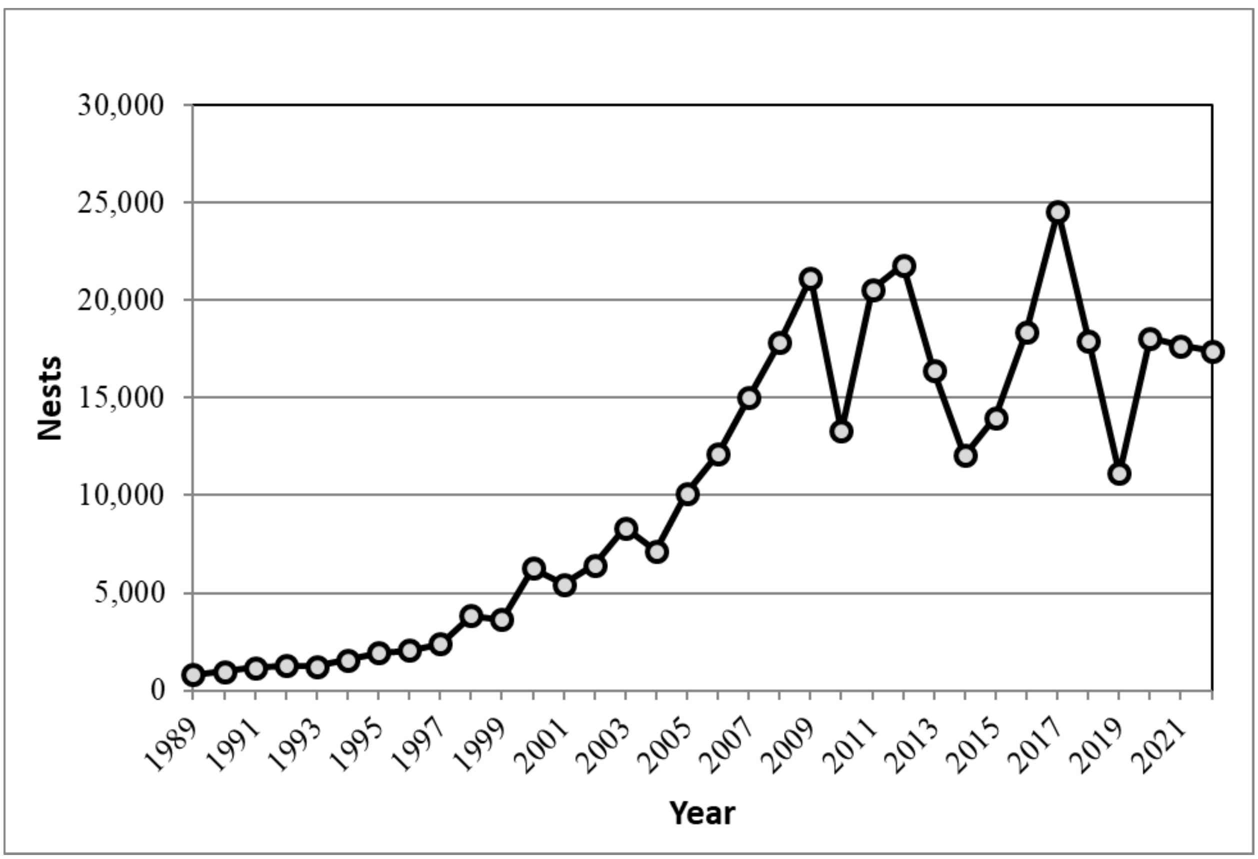

Figure 4. Kemp's ridley nest totals from Mexican beaches (Gladys Porter Zoo nesting database 2019 and CONAMP data 2020-2022).

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. (2011) 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 are 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; 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 (massive, synchronized nesting events) are increasingly established, bacterial and fungal pathogens in nests are also likely to increase. 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 Sea Turtle Stranding and Salvage Network 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. In subsequent years stranding levels during the March-May time period have been elevated but have not reached the high levels seen in the early 2010's. 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 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 sea turtle 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 (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 turtle 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, specific impacts of the DWH oil spill event on Kemp's ridley sea turtles are considered here. Kemp's ridley sea turtle 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 turtle for several reasons. All Kemp's ridley sea turtle in the Gulf belong to the same population (NMFS et al. 2011), 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 turtle (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 turtle 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 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.

4.1.5 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 further in this Opinion.

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

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

The majority of loggerhead nesting occurs at the western rims of the Atlantic and Indian Oceans concentrated in the north and south temperate zones and subtropics (NRC 1990). For the 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 (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 loggerhead sea turtles nesting on adjacent beaches along the Florida Peninsula. It also concluded that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the recovery plan uses a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, to identify recovery units. The recovery units are as follows: (1) the Northern Recovery Unit (Florida/Georgia border north through southern Virginia), (2) the Peninsular Florida Recovery Unit (Florida/Georgia border through Pinellas County, Florida), (3) the Dry Tortugas Recovery Unit (islands located west of Key West, Florida), (4) the Northern Gulf of Mexico Recovery Unit (Franklin County, Florida, through Texas), and (5) the Greater Caribbean Recovery Unit (Mexico through French Guiana, the Bahamas, Lesser Antilles, and Greater Antilles) (NMFS and USFWS 2008). The recovery plan concluded that all recovery units are essential to the recovery of the species. Although the recovery plan was written prior to the listing of the 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- 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 2008). Loggerheads are long-lived animals. They reach sexual maturity between 20-38 years of age, although age of maturity varies widely among populations (Frazer and Ehrhart 1985; NMFS 2001). The annual mating season occurs from late March to early June, and female turtles lay eggs throughout the summer months. Females deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984), but an individual female only nests every 3.7 years on average (Tucker 2010). Each nest contains an average of 100-126 eggs (Dodd Jr. 1988) which incubate for 42-75 days before hatching (NMFS and USFWS 2008). Loggerhead hatchlings range between 1.5- and 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 U.S. mid-Atlantic. Shallow-water habitats with large expanses of open ocean access, such as Florida Bay, provide year-round resident foraging areas for significant numbers of male and female adult loggerheads (Conant et al. 2009).

Offshore, adults primarily inhabit continental shelf waters, from New York south through Florida, The Bahamas, Cuba, and the Gulf of Mexico. Seasonal use of mid-Atlantic shelf waters, especially offshore New Jersey, Delaware, and Virginia during summer months, and offshore shelf waters, such as Onslow Bay (off the North Carolina coast), during winter months has also been documented (Hawkes et al. 2007) 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) report the recapture of 5 adult female loggerheads in Cuban waters originally flipper-tagged in Quintana Roo, Mexico, which indicates that Cuban shelf waters likely also provide foraging habitat for adult females that nest in Mexico.

Status and Population Dynamics

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

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

Peninsular Florida Recovery Unit

The PFRU is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census (all beaches including index nesting beaches) undertaken from 1989 to 2007 showed an average of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008). The statewide estimated total for 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 5) (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, dipping back to 49,100 in 2021, and then in 2022 reaching the second-highest number since the survey began, with 62,396 nests. It is important to note that with the wide confidence intervals and uncertainty around the variability in nesting parameters (changes and variability in nests/female, nesting intervals, etc.) it is unclear whether the nesting trend equates to an increase in the population or nesting females over that time frame (Ceriani, et al. 2019).

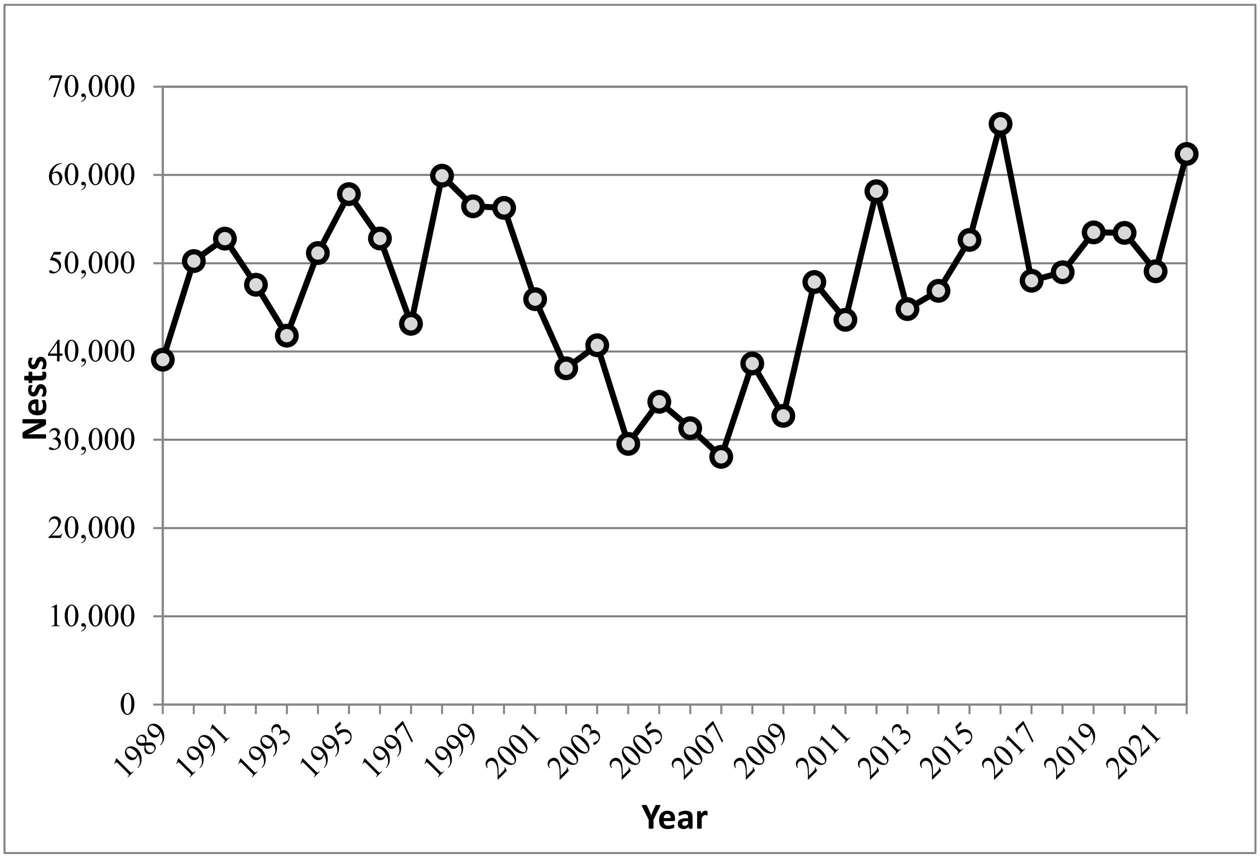

Figure 5. Loggerhead sea turtle nesting at Florida index beaches since 1989

Northern Recovery Unit

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

Data since that analysis (Table 4) 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 NRU since 2008. In 2022 Georgia loggerhead nesting broke the record at 4,071, while South Carolina and North Carolina nesting were both at the second-highest level recorded.

Table 4. 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**
2022	4,071	7,970	1,906	**13,947**

In addition to the statewide nest counts, 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 and then a rebound to the second highest level on record in 2022 (Figure 6).

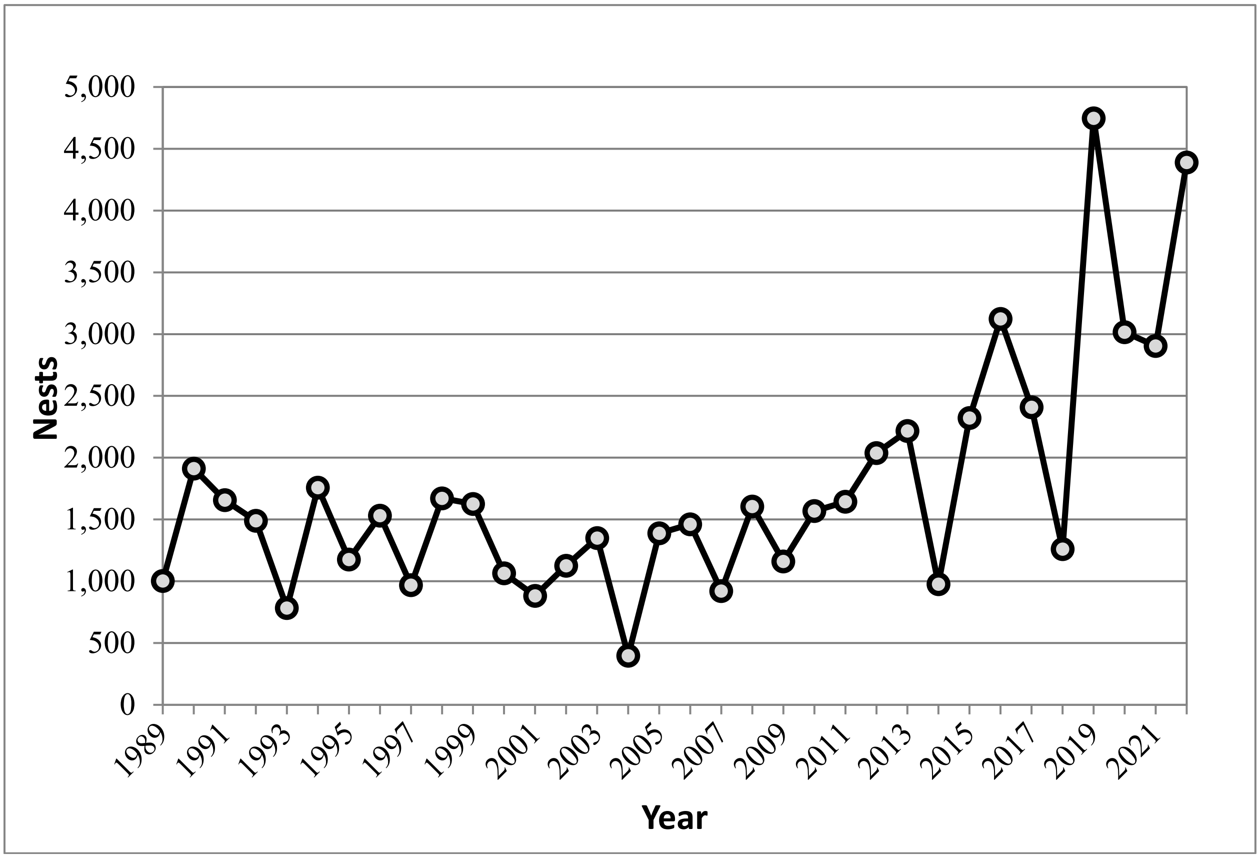

Figure 6. South Carolina index nesting beach counts for loggerhead sea turtles (data provided by SCDNR)

Other Northwest Atlantic DPS Recovery Units

The remaining 3 recovery units – DTRU, NGMRU, and GCRU – are much smaller nesting assemblages, but they are still considered essential to the continued existence of the species. Nesting surveys for the DTRU are conducted as part of Florida's statewide survey program. Survey effort was relatively stable during the 9-year period from 1995-2004, although the 2002 year was missed. Nest counts ranged from 168-270, with a mean of 246, but there was no detectable trend during this period (NMFS and USFWS 2008). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. Analysis of the 12-year dataset (1997-2008) of index nesting beaches in the area shows a statistically significant declining trend of 4.7% annually. Nesting on the Florida Panhandle index beaches, which represents the majority of NGMRU nesting, had shown a large increase in 2008, but then declined again in 2009 and 2010 before rising back to a level similar to the 2003-2007 average in 2011. From 1989-2018 the average number of NGMRU 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 GCRU nesting beaches, and no trend can be determined for this subpopulation (NMFS and USFWS 2008). Zurita et al. (2003) found a statistically significant increase in the number of nests on 7 of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. Nonetheless, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008).

In-water Trends

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

Population Estimate

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

Threats (Specific to Loggerhead Sea Turtles)

The threats faced by loggerhead sea turtles are well summarized in the general discussion of threats in Section 4.2.1. Yet the impact of fishery interactions is a point of further emphasis for this species. The joint NMFS and USFWS Loggerhead Biological Review Team determined that the greatest threats to the 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, 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 2016). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

Unlike Kemp's ridley sea turtle, 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 NGMRU 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 NGMRU recovery unit, especially mating and nesting adults likely had an impact on the NGMRU. Based on the response injury evaluations for Florida Panhandle and Alabama nesting beaches (which fall under the NFMRU), the 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 NGMRU may result in some nesting declines in the future due to a large reduction of oceanic age classes during the DWH oil spill event. Although adverse impacts occurred to loggerhead sea turtle, 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 loggerhead sea turtles 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).

4.2 Status of the Critical Habitat Considered for Further Analysis

Smalltooth Sawfish Critical Habitat

The U.S. DPS of smalltooth sawfish was listed as endangered on April 1, 2003; however, at that time, NMFS was unable to determine critical habitat. After funding additional studies necessary for the identification of specific habitats and environmental features important for the conservation of the species, establishing a smalltooth sawfish recovery team, and reviewing the best scientific data available, NMFS issued a Final Rule (74 FR 45353; see also 50 CFR 226.218) to designate critical habitat for the U.S. DPS of smalltooth sawfish on September 2, 2009. Through the additional studies, researchers identified 2 primary nursery areas in southwest Florida and centered the critical habitat designations around these nurseries. The critical habitat consists of 2 units located along the southwestern coast of Florida: the CHEU, which is comprised of approximately 221,459 ac (346 mi^2) of coastal habitat, and the TTIEU, which is comprised of approximately 619,013 ac (967 mi^2) of coastal habitat.

Critical Habitat Unit Affected by this Action

This consultation focuses on an activity occurring in the CHEU, which encompasses portions of Charlotte and Lee Counties (Figure 9). The CHEU is comprised of Charlotte Harbor, Gasparilla Sound, Matlacha Pass, Pine Island Sound, San Carlos Bay, and Estero Bay. The unit is fed by the Myakka and Peace Rivers to the north and the Caloosahatchee River to the east. A series of passes between barrier islands connect the CHEU with the Gulf of Mexico. The CHEU is a relatively shallow estuary with large areas of SAV, oyster bars, saltwater marsh, freshwater wetlands, and mangroves. Freshwater flows from the Caloosahatchee River are controlled by the Franklin Lock and Dam, which periodically releases water, which thereby affects downstream salinity regimes. The CHEU boundaries are defined in detail in the Final Rule (74 FR 45353; see also 50 CFR 226.218).

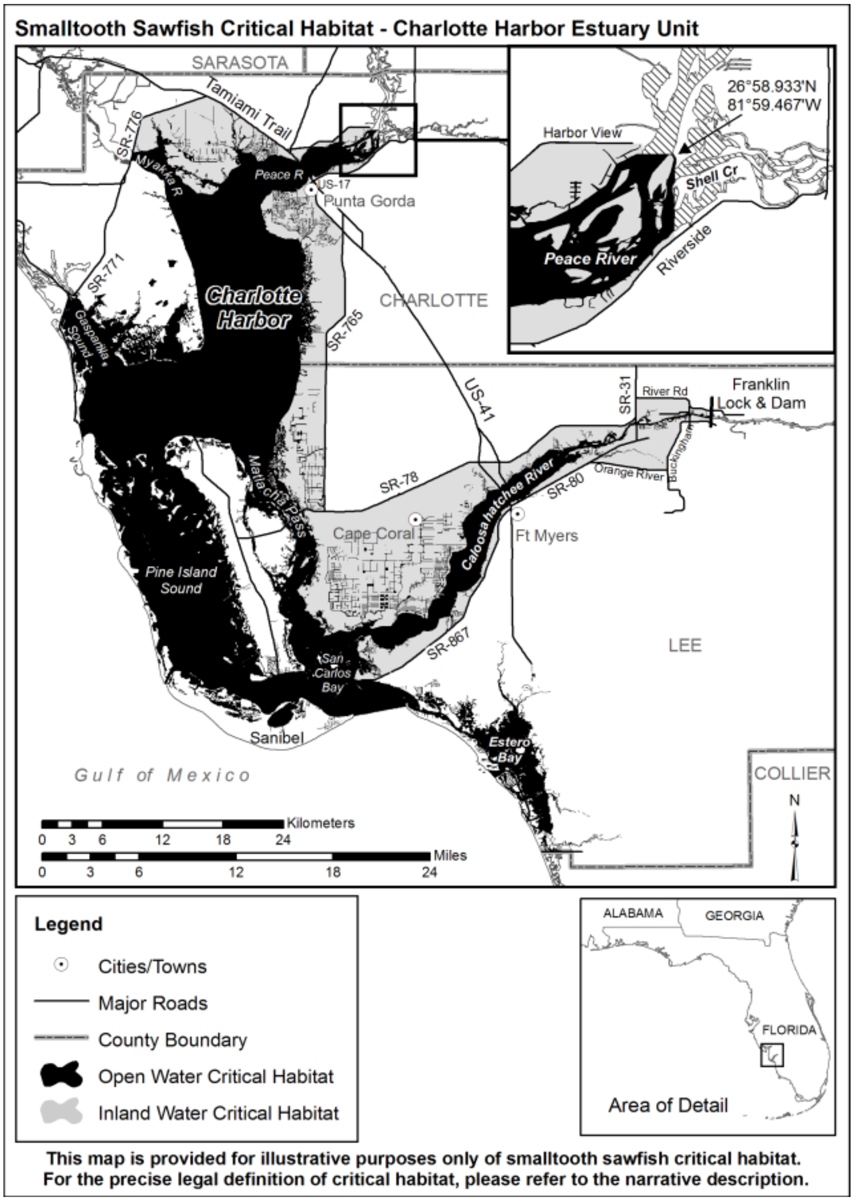

Figure 7. Map of smalltooth sawfish critical habitat – CHEU

Essential Features of Critical Habitat

The recovery plan developed for the smalltooth sawfish, which represents NMFS's best judgment about the objectives and actions necessary for the species' recovery, identified a need to increase the number of juvenile smalltooth sawfish developing into adulthood by protecting or restoring nursery habitat (NMFS 2009). NMFS determined that without sufficient habitat, the population was unlikely to increase to a level associated with low extinction risk and de-listing. Therefore, within the 2 critical habitat units NMFS identified 2 habitat features essential for the conservation of this species: (1) red mangroves, and (2) shallow, euryhaline habitats characterized by water depths between the MHW line and 3 ft (0.9 m) measured at MLLW (Final Rule, 74 FR 45353). These essential features of critical habitat provide juveniles refuge from predation and forage opportunities within their nursery habitat. One or both of these essential features must be present in an action area for it to function as critical habitat for smalltooth sawfish.

Habitat Use

Juvenile smalltooth sawfish, identified as those up to 3 years of age or approximately 8 ft (2.4 m) in length (Simpfendorfer et al. 2008), inhabit the shallow waters of estuaries and can be found in sheltered bays, dredged canals, along banks and sandbars, and in rivers (NMFS 2000). Juvenile smalltooth sawfish occur in euryhaline waters (i.e., waters with a wide range of salinities) and are often closely associated with muddy or sandy substrates, and shorelines containing red mangroves (Simpfendorfer 2001; 2003). The structural complexity of red mangrove prop roots creates a unique habitat used by a variety of fish, invertebrates, and birds. Juvenile smalltooth sawfish, particularly YOY (measuring less than 39.4 in [100 cm] in length), use these areas as both refuge from predators and forage grounds, taking advantage of the large number of fish and invertebrates found there.

Tracking data from the Caloosahatchee River in Florida indicate very shallow depths and specific salinity ranges are important abiotic factors influencing juvenile smalltooth sawfish movement patterns, habitat use, and distribution (Simpfendorfer et al. 2011). An acoustic tagging study in a developed region of Charlotte Harbor, Florida, identified the importance of mangroves in close proximity to shallow-water habitat for juvenile smalltooth sawfish, stating that juveniles generally occur in shallow water within 328 ft (100 m) of mangrove shorelines (Simpfendorfer et al. 2010). Juvenile smalltooth sawfish spend the majority of their time in waters shallower than 13 ft (4 m) deep (Simpfendorfer et al. 2010) and are seldom found deeper than 32 ft (10 m) (Poulakis and Seitz 2004). Simpfendorfer et al. (2010) also indicated the following developmental differences in habitat use: the smallest YOY juveniles generally used water shallower than 1.6 ft (0.5 m), had small home ranges, 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 undergo small movements coinciding with changing tidal stages. These movements often involve moving from shallow sandbars at low tide and among red mangrove prop roots at higher tides (Simpfendorfer et al. 2010), behavior likely to reduce the risk of predation (Simpfendorfer 2006). As juveniles increase in size, they begin to expand their home ranges (Simpfendorfer et al. 2010; Simpfendorfer et al. 2011), eventually moving to more offshore habitats where they likely feed on larger prey and eventually reach sexual maturity.

Researchers have identified several areas within the Charlotte Harbor Estuary that are disproportionately more important to juvenile smalltooth sawfish, based on intra- or inter-annual capture rates during random sampling events within the estuary (Poulakis 2012; Poulakis et al. 2011). The areas, which were termed “hotspots” in Poulakis et al. (2011), correspond with areas where public encounters are most frequently reported. Use of these “hotspots” can be variable within and among years based on the amount and timing of freshwater inflow. Smalltooth sawfish use “hotspots” further upriver during drought (i.e., high salinity) conditions 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 (e.g., presence or absence of predators and prey) or abiotic factors (e.g., flow rate, water temperature, etc.) influence this habitat selection. Still, they believe a variety of conditions in addition to salinity, such as temperature, dissolved oxygen, water depth, shoreline vegetation, and food availability, may influence smalltooth sawfish habitat selection (Poulakis et al. 2011).

Status and Threats to Critical Habitat

Modification and loss of smalltooth sawfish critical habitat is an ongoing threat contributing to the current status 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 (South Atlantic Fishery Management Council 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; USFWS 1999). Since then, rates of loss have decreased even though habitat loss continues. Between 1998 and 2004, approximately 2,450 ac (3.8 mi^2) of intertidal wetlands consisting of mangroves or other estuarine shrubs were lost along the Atlantic and Gulf coasts of the United States (Stedman and Dahl 2008). In another study, Orlando Jr. et al. (1994) analyzed 18 major southeastern estuaries and recorded over 703 mi (1,131 km) of navigation channels and 9,844 mi (15,842 km) of shoreline with modifications. Additionally, changes to the natural freshwater flows into estuarine and marine waters through construction of canals and other water-control devices have altered the temperature, salinity, and nutrient regimes, reduced both wetlands and SAV coverage, and degraded vast areas of coastal habitat utilized by smalltooth sawfish (Gilmore 1995; Quigley and Flannery 2002; Reddering 1988; Whitfield and Bruton 1989). Juvenile sawfish and their critical habitat are particularly vulnerable to these kinds of habitat losses or alterations due to the juveniles' affinity for (and developmental need of) shallow, estuarine systems. Although many forms of habitat modification are currently regulated, some permitted direct and/or indirect damage to habitat from increased urbanization still occurs and is expected to continue in the future.

In Florida, coastal development often involves the removal of mangroves, the armoring of shorelines through seawall construction, and the dredging of canals. This is especially apparent in master plan communities such as Cape Coral and Punta Gorda, which are located within the Charlotte Harbor Estuary. These communities were created through dredge-and-fill projects to increase the amount of waterfront property available for development, but in doing so, developers removed the majority of red mangrove habitat from the area. The canals created by these communities require periodic dredging for boat access, further affecting the shallow, euryhaline essential feature of critical habitat. Development continues along the shorelines of Charlotte Harbor in the form of docks, boat ramps, shoreline armoring, utility projects, and navigation channel dredging.

To protect critical habitat, federal agencies must ensure that their activities are not likely to result in the destruction or adverse modification of the physical and biological features that are essential to the conservation of sawfish, or the species' ability to access and use these features (ESA Section 7(a)(2); see also 50 CFR 424.12(b) [discussing essential features]). Therefore, proposed actions that may impact critical habitat require an analysis of potential impacts to each essential feature. As mentioned previously, there are 2 essential features of smalltooth sawfish critical habitat: (1) red mangroves; and (2) shallow, euryhaline habitats characterized by water depths between the MHW line and 3 ft (0.9 m) measured at MLLW. The USACE oversees the permitting process for residential and commercial marine development in the CHEU. The FDEP and their designated authorities also regulate mangrove removal in Florida. All red mangrove removal permit requests within smalltooth sawfish critical habitat necessitate ESA Section 7 consultation. NMFS Protected Resources Division tracks the loss of these essential features of smalltooth sawfish critical habitat.

Threats to Critical Habitat

Dock and Boat Ramp Construction

The USACE recommends that applicants construct docks in accordance with the NMFS-USACE *Dock Construction Guidelines in Florida for Docks or Other Minor Structures Constructed in or over Submerged Aquatic Vegetation (SAV), Marsh, or Mangrove Habitat* ("Dock Construction Guidelines") when possible. The current dock construction guidelines allow for some amount of mangrove removal; however, it is typically restricted to either (1) trimming to facilitate a dock, or (2) complete removal up to the width of the dock extending toward open water, which the guidelines define as a width of 4 ft.

Installation or replacement of boat ramps is often part of larger projects such as marinas, bridge approaches, and causeways where natural and previously created deepwater habitat access channels already exist. Boat ramps can result in the permanent loss of both the red mangrove and the shallow, euryhaline habitat features of critical habitat for smalltooth sawfish.

Marina Construction

Marinas have the potential to adversely affect aquatic habitats. Marinas are typically designed to be deeper than 3 ft MLLW to accommodate vessel traffic; therefore, most existing marinas lacking essential features are unlikely to function as critical habitat for smalltooth sawfish. The expansion of existing marinas and creation of new marinas can result in the permanent loss of large areas of this nursery habitat.

Bulkhead and Seawall Construction

Bulkheads and other shoreline stabilization structures are used to protect adjacent shorelines from wave and current action and to enhance water access. These projects may adversely impact critical habitat for smalltooth sawfish by removal of the essential features through direct filling and dredging to construct vertical or riprap seawalls. Generally, vegetation plantings, sloping riprap, or gabions are environmentally-preferred shoreline stabilization methods instead of vertical seawalls because they provide better quality fish and wildlife habitat. Nevertheless, placement of riprap material removes more of the shallow euryhaline essential feature than a vertical seawall. Also, many seawalls built along unconsolidated shorelines require the removal of red mangroves to accommodate the seawalls.

Cable, Pipeline, and Transmission Line Construction

While not as common as other activities, excavation of submerged lands is sometimes required for installing cables, pipelines, and transmission lines. Construction may also require temporary or permanent filling of submerged habitats. Open-cut trenching and installation of aerial transmission line footers are activities that have the ability to temporarily or permanently impact critical habitat for smalltooth sawfish.

Transportation Infrastructure Construction

Potential adverse effects from federal transportation projects in smalltooth sawfish critical habitat (CHEU) include operations of the Federal Highway Administration, USACE, and the Federal Emergency Management Agency. Construction of road improvement projects typically follow the existing alignments and expand to compensate for the increase in public use. Transportation projects may impact critical habitat for smalltooth sawfish through installation of bridge footers, fenders, piles, and abutment armoring, or through removal of existing bridge materials by blasting or mechanical efforts.

Dredging

Riverine, nearshore, and offshore areas are dredged for navigation, construction of infrastructure, and marine mining. An analysis of 18 major southeastern estuaries conducted in 1993-1994 demonstrated that over 7,000 km of navigation channels have already been dredged (Orlando Jr. et al. 1994). Habitat effects of dredging include the loss of submerged habitats by disposal of excavated materials, turbidity and siltation effects, contaminant release, alteration of hydrodynamic regimes, and fragmentation of physical habitats (Gulf of Mexico Fishery Management Council 1998; Gulf of Mexico Fishery Management Council 2005; South Atlantic Fishery Management Council 1998). In the CHEU, dredging to maintain canals and channels constructed prior to the critical habitat designation, limits the amount of available shallow, euryhaline essential feature to the edges of waterways and these dredging activities can disturb juveniles that are using these areas. At the time of critical habitat designation, many previously dredged channels and canals existed within the boundaries of the critical habitat units; however, we are unsure which of those contained the shallow-water essential feature at that time. It is likely that many of these channels and canals were originally dredged deeper than 3 ft MLLW, but they have since shoaled in and now contain the essential feature of shallow, euryhaline habitat. Therefore, maintenance dredging impacts are counted as a loss to this essential feature, even though the areas may or may not have contained the essential feature at time of designation (see Figure 10, Diagrams A and B).

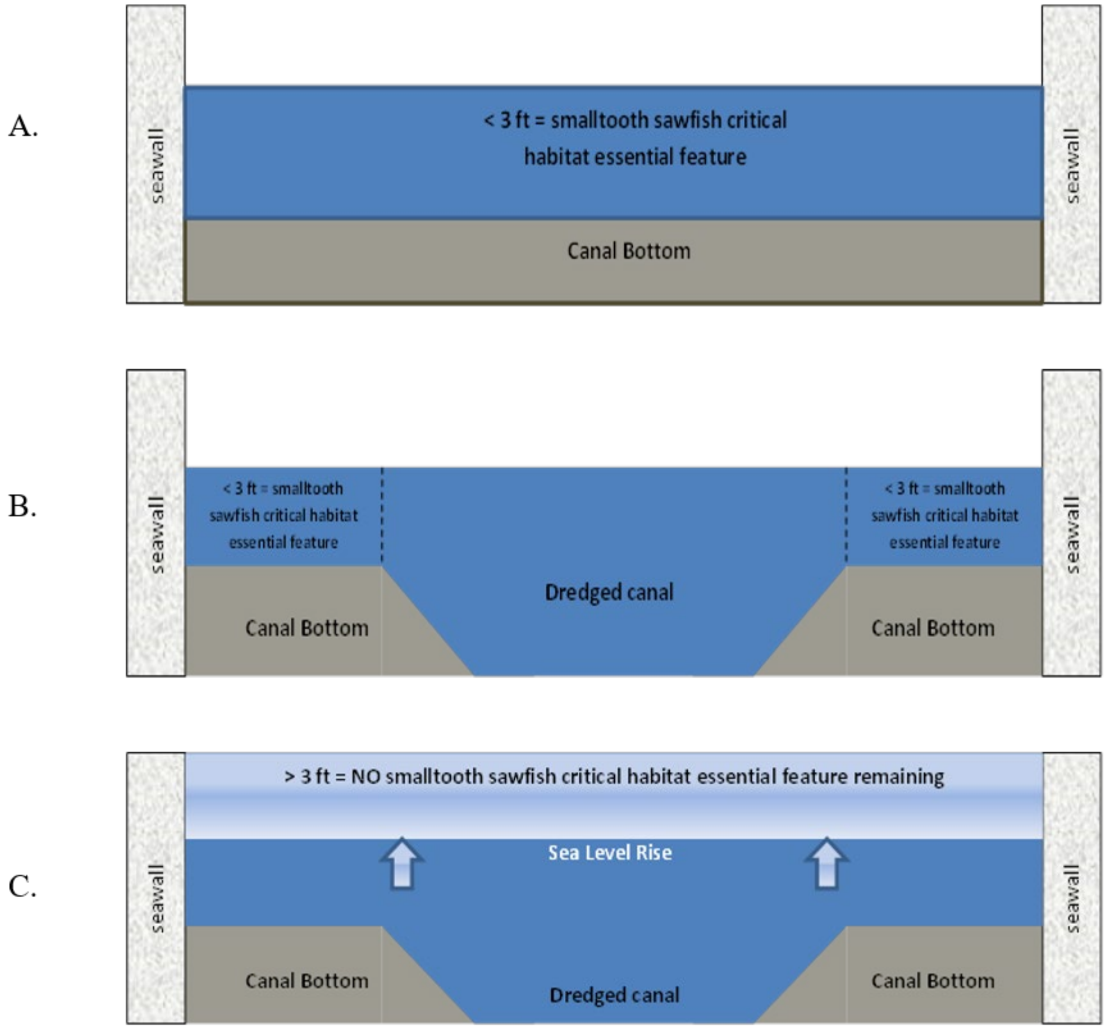

Figure 8. Diagram A depicts a cross section of a historically dredged channel/canal within the boundaries of the critical habitat units that has not been maintained. Diagram B depicts the typical cross section of a maintenance-dredged channel/canal. Diagram C depicts a cross section of a maintained dredged channel/canal after sea level rise of > 1 ft.

<u>Construction, Operations and Maintenance of Impoundments and Other Water Level Controls</u>

Federal agencies such as the USACE have historically been involved in large water control projects in Florida. Agencies sometimes propose impounding rivers and tributaries for such purposes as flood control, salt water intrusion prevention, or creation of industrial, municipal, and agricultural water supplies. Projects to repair or replace water control structures may affect smalltooth sawfish critical habitat by limiting sufficient freshwater discharge, which could alter the salinity of estuaries. The ability of an estuary to function as a nursery depends upon the quantity, timing, and input location of freshwater inflows (Garmestani and Percival 2005; Norton et al. 2012; USEPA 1994). Estuarine ecosystems are vulnerable to the following man-made disturbances: (1) decreases in seasonal inflow caused by the removal of freshwater upstream for agricultural, industrial, and domestic purposes; (2) contamination by industrial and sewage discharges; (3) agricultural runoff carrying pesticides, herbicides, and other toxic pollutants; and (4) eutrophication (e.g., influx of nutrients such as nitrates and phosphates most often from fertilizer runoff and sewage) caused by excessive nutrient inputs from a variety of nonpoint and point sources. Additionally, rivers and their tributaries are susceptible to natural disturbances, such as floods and droughts, whose effects can be exacerbated by these man-made disturbances.

As stated above, smalltooth sawfish show an affinity for a particular salinity range, moving downriver during wetter months and upriver during drier months to remain within that range (Simpfendorfer et al. 2011). Therefore, water management decisions that affect salinity regimes may impact the functionality of critical habitat. This may result in smalltooth sawfish following specific salinity gradients into less advantageous habitats (e.g., areas with less shallow-water or red mangrove habitat). Furthermore, large changes in water flow over short durations would likely escalate movement patterns for smalltooth sawfish, thereby increasing predation risk and energy output. Researchers are currently looking into the effects of large-scale freshwater discharges on smalltooth sawfish and their designated critical habitat. The most vulnerable portion of the juvenile sawfish population to water-management outfall projects appears to be smalltooth sawfish in their first year of life. Newborn smalltooth sawfish remain in smaller areas irrespective of salinity, which potentially exposes them to greater osmotic stress (a sudden change in the solute concentration around a cell, causing a rapid change in the movement of water across its cell membrane), and impacts the nursery functions of sawfish critical habitat (Poulakis et al. 2013; Simpfendorfer et al. 2011).

Climate Change Threats

The IPCC has stated that global climate change is unequivocal and its impacts to coastal resources may be significant (Intergovernmental Panel on Climate Change 2007). There is a large and growing body of literature on past, present, and future impacts of global climate change induced by human activities (i.e., global warming mostly driven by the burning of fossil fuels). The latest report by the Intergovernmental Panel on Climate Change (2013) is more explicit, stating that, "science now shows with 95% certainty that human activity is the dominant cause of observed warming since the mid-twentieth century." Some of the anticipated outcomes are sea level rise, increased frequency of severe weather events, and changes in air and water temperatures. NOAA's climate change web portal provides information on the climate-related variability and changes that are exacerbated by human activities (http://www.climate.gov/#understandingClimate).

Though the impacts on smalltooth sawfish cannot, for the most part, be predicted with any degree of certainty, we can project some effects to sawfish critical habitat. We know that both essential features (red mangroves and shallow, euryhaline waters less than 3 ft deep at MLLW) will be impacted by climate change. Sea level rise is expected to exceed 3.3 ft (1 m) globally by 2100, according to the most recent publications, exceeding the estimates of the Fourth Assessment of the IPCC (Meehl et al. 2007; Pfeffer et al. 2008; Rahmstorf et al. 2007). Mean sea level rise projections have increased since the Fourth Assessment because of the improved physical understanding of the components of sea level, the improved agreement of process-based models with observations, and the inclusion of ice-sheet dynamical changes (Intergovernmental Panel on Climate Change 2013). A 1-m sea level rise in the state of Florida is within the range of recent estimates by 2080 (Pfeffer et al. 2008; Rahmstorf et al. 2007).

Sea level increases would affect the shallow-water essential feature of smalltooth sawfish critical habitat within the CHEU. A 2010 climate change study by the MIT forecasted sea level rise in a study area with significant overlap with the CHEU (Vargas-Moreno and Flaxman 2010). The study investigated possible trajectories of future transformation in Florida's Greater Everglades landscape relative to 4 main drivers: climate change, shifts in planning approaches and regulations, population change, and variations in financial resources. MIT used (Intergovernmental Panel on Climate Change 2007) sea level modeling data to forecast a range of sea level rise trajectories from low, to moderate, to high predictions (Figure 11). The effects of sea level rise on available shallow-water habitat for smalltooth sawfish would be exacerbated in areas where there is shoreline armoring (e.g., seawalls). This is especially true in canals where the centerlines are maintenance-dredged deeper than 3 ft (0.9 m) for boat accessibility. In these areas, the areas that currently contain the essential feature depth (less than 3 ft at MLLW) will be reduced along the edges of the canals as sea level rises (see previous Figure 10, Diagram C).

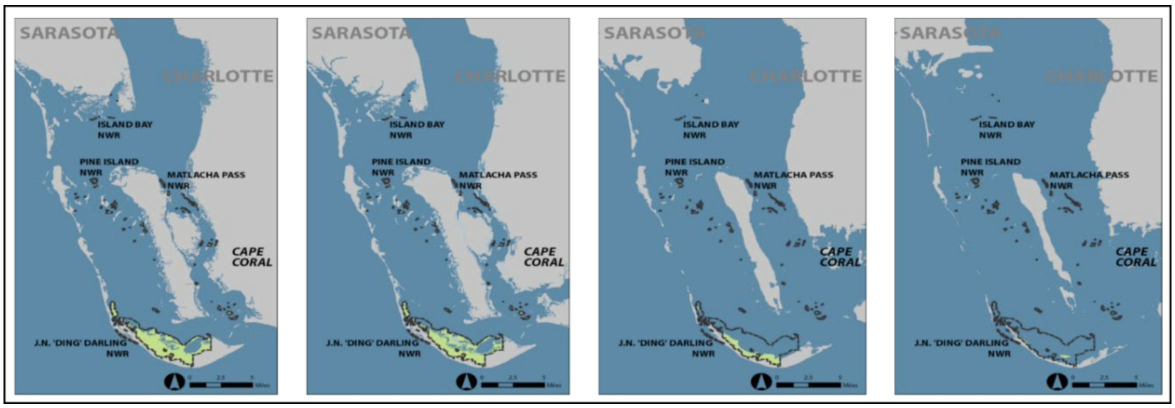

Figure 9. From left to right: current shoreline, + 3.5 in (+ 9 cm); + 18.5 in (+ 47 cm); and + 38.97 in (+ 99 cm) sea level rise by 2060.[1]

Along the Gulf Coast of Florida, and south Florida in particular, rises in sea level will impact mangrove resources. As sea levels rise, mangroves will be forced landward in order to remain at a preferred water inundation level and sediment surface elevation, which is necessary for successful growth. This retreat landward will not keep pace with conservative projected rates of elevation in sea level (Gilman et al. 2008). This forced landward progression poses the greatest threat to mangroves in areas where there is limited or no room for landward or lateral migration (Semeniuk 1994). Such is the case in areas of the CHEU where landward mangrove growth is restricted by shoreline armoring and coastal development. This man-made barrier will prohibit mangroves from moving landward and will result in the loss of the mangrove essential feature.

Other threats to mangroves result from climate change: fluctuations in precipitation amounts and distribution, seawater temperature, CO_2 levels, and damage to mangroves from increasingly severe storms and hurricanes (McLeod and Salm 2006). A 25% increase in precipitation globally is predicted by 2050 (McLeod and Salm 2006), but the specific geographic distribution will vary, leading to increases and decreases in precipitation at the regional level. Changes in precipitation patterns caused by climate change may adversely affect the growth of mangroves and their distribution (Field 1995; Snedaker 1995). Decreases in precipitation will increase salinity and

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[1] Adapted from Vargas-Moreno, J. C., and M. Flaxman. 2010. Addressing the challenges of climate change in the greater everglades landscape. Massachusetts Institute of Technology, Deparment of Urban Studies and Planning. Project Sheet November, 2010, Cambridge, MA.

inhibit mangrove productivity, growth, seedling survival, and spatial coverage (Burchett et al. 1984). Decreases in precipitation may also change mangrove species composition, favoring more salt-tolerant types (Ellison 2010). Increases in precipitation may benefit some species of mangroves, increasing spatial coverage and allowing them to out-compete other salt marsh vegetation (Harty 2004). Even so, potential mangrove expansion requires suitable habitat for mangroves to increase their range, which depends to a great extent on patterns and intensity of coastal development (i.e., bulkhead and seawall construction).

Seawater temperature changes will have potential adverse effects on mangroves as well. Many species of mangroves show an optimal shoot density in sediment temperatures between 59-77 °F (15-25 °C) (Hutchings and Saenger 1987). Yet, at temperatures between 77-95°F (25-35°C), many species begin to show a decline in leaf structure and root and leaf formation rates (Saenger and Moverley 1985). Temperatures above 95°F lead to adverse effects on root structure and survivability of seedlings (UNESCO 1991) and temperatures above 100.4°F (38°C) lead to a cessation of photosynthesis and mangrove mortality (Andrews et al. 1984). Although impossible to forecast precisely, sea surface ocean temperatures are predicted to increase 1.8-3.6°F (1-2°C) by 2060 (Chapter 11 (Intergovernmental Panel on Climate Change 2013)), which will in turn impact underlying sediment temperatures along the coast. If mangroves shift pole-ward in response to temperature increases, they will at some point be limited by temperatures at the lower end of their optimal range and available recruitment area. This is especially true when considering already armored shorelines in residential communities such as those within and surrounding the CHEU of critical habitat for smalltooth sawfish.

As atmospheric CO_2 levels increase, mostly resulting from manmade causes (e.g., burning of fossil fuels), the world's oceans will absorb much of this CO_2, causing potential increases in photosynthesis and mangrove growth rates. This increase in growth rate, however, would be limited by lower salinities expected from CO_2 absorption in the oceans (Ball et al. 1997), and by the availability of undeveloped coastline for mangroves to expand their range. A secondary effect of increased CO_2 concentrations in the oceans is the deleterious effect on coral reefs' ability to absorb calcium carbonate (Hoegh-Guldberg et al. 2007), and subsequent reef erosion. Eroded reefs may not be able to buffer mangrove habitats from waves, especially during storm/hurricane events, causing additional physical effects.

Finally, the anticipated increase in the severity of storms and hurricanes may also impact mangroves. Tropical storms are expected to increase in intensity and/or frequency, which will directly impact existing mangroves that are already adversely impacted by increased seawater temperatures, CO_2, and changes in precipitation (Cahoon et al. 2003; Trenberth 2005). The combination of all of these factors may lead to reduced mangrove height (Ning et al. 2003). Further, intense storms could result in more severe storm surges and lead to potential changes in mangrove community composition, mortality, and recruitment (Gilman et al. 2006). Increased storm surges and flooding events could also affect mangroves' ability to photosynthesize (Gilman et al. 2006) and the oxygen concentrations in the mangrove lenticels (Ellison 2010).

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 (including designated critical habitat), and ecosystem within the action area without the additional effects of the proposed action. In the case of ongoing actions, this section includes the effects that may contribute to the projected future status of the species, their habitats, and ecosystem. The environmental baseline describes the species' and critical habitat's 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, and areas of critical habitat 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 or critical habitat features will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be in other states, stages, or areas within their distributions. These localized stress responses or stressed baseline conditions may increase the severity of the adverse effects expected from the proposed action.

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

The statuses of ESA-listed sea turtle species in the action area, as well as the threats to these species, are supported by the species accounts in Section 4 (Status of the Species).

As stated in Section 2.2 (Action Area), the proposed action occurs in an existing, 66-slip marina in the Caloosahatchee River approximately 19 river miles away from the Gulf of Mexico. The marina was originally constructed in 1977. The marina is currently operating at about 75% occupancy and there no fuel dock present. There are no fishing structures present. Substrate within the existing marina basin consists of sand, and water depths are approximately 6 ft below MLW.

We believe the increased vessel traffic resulting from the proposed action is likely to adversely affect the North Atlantic DPS of green sea turtle, Kemp's ridley sea turtle, and the Northwest

Atlantic DPS of loggerhead sea turtle, as described in Section 4 (Status of the Species). These species of sea turtles are highly migratory. NMFS believes that no individual green sea turtle, Kemp's ridley sea turtle, or loggerhead sea turtle is likely to be a permanent resident of the action area. 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 the North Atlantic DPS of green of sea turtle, Kemp's ridley sea turtle, and the Northwest Atlantic DPS of loggerhead sea turtle in the action area, as well as the threats to these species, are best reflected in their range-wide statuses and supported by the species accounts in Section 4 (Status of the Species).

5.3 Baseline Status of Critical Habitat Considered for Further Analysis

The status of smalltooth sawfish critical habitat in the action area, as well as the threats to critical habitat, is supported by the species' critical habitat account in Section 4.2 (Status of the Critical Habitat Considered for Further Analysis).

As stated in Section 2.2 (Action Area), the proposed action is located within the boundaries of the CHEU of smalltooth sawfish designated critical habitat in an existing, 66-slip marina in the Caloosahatchee River approximately 19 river miles away from the Gulf of Mexico in North Fort Meyers, Lee County, Florida. Water depths at the project site shoreline are approximately 6 ft below MLW. The action area is void of corals or submerged aquatic vegetation. Red mangroves are present at the project site, and the creation of the tidal connector will result in the removal 1,700 ft^2 of red mangroves. The action area is approximately 3 mi downriver from the U.S. 41 High Use Area for juvenile smalltooth sawfish in the CHEU (Poulakis et al. 2011). As stated above, High Use Areas correspond with areas where public encounters are most frequently reported. There have been no sightings of smalltooth sawfish within the action area; however, there have been several sightings of juvenile smalltooth sawfish within the residential canal systems adjacent to the action area, both upriver and downriver, and between the action area and the High Use Area 3 miles upriver (SSRIT encounter database).

5.4 Additional Factors Affecting the Baseline Status of ESA-Listed Species and Critical Habitat Considered for Further Analysis

5.4.1 Federal Actions

NMFS has undertaken a number of Section 7 consultations to address the effects of federal actions on threatened and endangered sea turtle species, and when appropriate, has authorized the incidental taking of these species. Each of those consultations sought to minimize the adverse effects of the action on sea turtles. NMFS also has consulted on several USACE shoreline stabilization and dock construction projects in the greater residential canal system adjacent to where the project is located since the effective date of critical habitat designation for smalltooth sawfish (i.e., October 2, 2009). However, other than the proposed action, no other federal actions are known to have occurred or have had effects to ESA-listed sea turtles or smalltooth sawfish designated critical habitat within the action area, as per a review of our NMFS PRD SERO's completed consultation database by the consulting biologist on October 3, 2023.

5.4.2 State and Private Actions

Recreational Fishing

Recreational fishing as regulated by the State of Florida can affect sea turtles or their habitats within the action area. Data reported through MRIP, MRFSS, and STSSN show recreational fishers have hooked sea turtles when fishing from boats, piers, and beach, banks, and jetties. Observations of state recreational fisheries have shown that loggerhead, leatherback, Kemp's ridley, and green sea turtles are known to bite baited hooks, and loggerhead and Kemp's ridley sea turtles frequently ingest the hooks.

Although few of these state regulated fisheries are currently authorized to incidentally take listed species, several state agencies have approached NMFS to discuss applications for a Section 10(a)(1)(B) incidental take permit. Since NMFS's issuance of a Section 10(a)(1)(B) permit requires formal consultation under Section 7 of the ESA, any fisheries that come under a Section 10(a)(1)(B) permit in the future will likewise be subject to Section 7 consultation. Although the past and current effects of these fisheries on listed species are currently not determinable, NMFS believes that ongoing state fishing activities may be responsible for seasonally high levels of observed strandings of sea turtles on Gulf of Mexico coasts, including the action area. Pressure from recreational fishing in and adjacent to the action area is likely to continue.

Vessel Traffic

Commercial traffic and recreational boating pursuits can have adverse effects on sea turtles via propeller and boat strike damage. The STSSN includes many records within inshore Lee County, Florida, of vessel interactions (propeller injury) with sea turtles. Data show that vessel traffic is one cause of sea turtle mortality (Hazel and Gyuris 2006; Lutcavage et al. 1997; MSS 2003). Stranding data for the Gulf of Mexico coast show that vessel-related injuries are noted in stranded sea turtles (STSSN 2016). Data indicate that live- and dead-stranded sea turtles showing signs of vessel-related injuries continue in a high percentage of stranded sea turtles in coastal regions of the southeastern United States.

Habitat Loss or Degradation

Smalltooth sawfish habitat, in general, and designated critical habitat, specifically, have been degraded or modified throughout the southeastern U.S. from agriculture, urban development, commercial activities, channel dredging, boating activities, and the diversion of freshwater runoff. The habitat within the CHEU will likely continue to experience the same types of actions described in Section 4 (Status of Critical Habitat Considered for Further Analysis).

5.4.3 Marine Debris, Pollution, and Environmental Contamination

Marine debris is a continuing problem for sea turtles. Sea turtles foraging and finding refuge within inshore habitats adjacent to urban development commonly eat or become entangled in marine debris (e.g., plastic bags/pellets, balloons, and discarded fishing gear). The effects to sea turtles resulting from marine debris are difficult to measure. Where possible, conservation actions are being implemented to monitor or study the effects to these species from these sources.

Sources of pollutants along the action area include atmospheric loading of pollutants such as PCB, stormwater runoff from coastal towns and cities into rivers and canals emptying into bays and the ocean, and groundwater and other discharges. Nutrient loading from land-based sources such as coastal community discharges is known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effects on larger embayments are unknown. 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 man-made toxins have not been investigated.

Coastal runoff, marina and dock construction, dredging, aquaculture, increased under water noise and boat traffic can degrade marine habitats used by sea turtles (Colburn et al. 1996). The development of marinas and docks in inshore waters can negatively impact nearshore habitats. An increase in the number of docks built increases boat and vessel traffic. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. The species of turtles analyzed in this Opinion travel between near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

5.4.4 Acoustic Impacts

Acoustic effects are a known impact to ESA-listed sea turtles and they are difficult to measure. Where possible, conservation actions are being implemented to monitor or study the effects to these species from these sources.

5.4.5 Stochastic Events

Stochastic events, such as hurricanes, are common throughout the range of ESA-listed sea turtles and of smalltooth sawfish, especially in the current core of its range (i.e., south and southwest Florida). These events are by nature unpredictable and their effect on the survival and recovery of these species and on critical habitat are unknown; however, they have the potential to impede the survival and recovery directly if animals die as a result of them, or indirectly if habitat, especially critical habitat, is damaged as a result of these disturbances. Hurricanes Irma (2017) and Ian (2022) likely damaged habitat, including mangroves, in and around the action area.

5.4.6 Climate Change

Many threats to smalltooth sawfish critical habitat are expected to be exacerbated by the effects of global climate change. Potential increases in sea level may impact the availability of nursery habitat, particularly shallow, euryhaline habitat and red mangrove lined, low-lying coastal shorelines (Intergovernmental Panel on Climate Change 2014; Wanless et al. 2005). For example, nursery habitat could be negatively affected by increased temperatures, salinities, and acidification of coastal waters (Snedaker 1995), (Wanless et al. 2005), (Scavia et al. 2002), as well as increased runoff and erosion due to the expected increase in extreme storm events (Intergovernmental Panel on Climate Change 2014; Wanless et al. 2005). These alterations of the marine environment due to global climate change could affect the distribution of shallow, euryhaline habitat, which would ultimately affect the distribution, physiology, and growth rates of red mangroves. These alterations could potentially eliminate red mangroves from particular areas. The magnitude of the effects of global climate change on smalltooth sawfish critical habitat are difficult to predict, yet, when combined with the cyclical loss of habitat from extreme storm events, a decrease in the red mangrove essential feature of smalltooth sawfish critical habitat is likely (Norton et al. 2012; Scavia et al. 2002). However, the proposed action is (1) the redevelopment of an existing marina; (2) majority upland excavation to expand the existing marina; and, (3) of such a small scale, scope, and limited period that it is not very likely to contribute to, or be affected cumulatively by, climate change.

5.4.7 Conservation and Recovery Actions Shaping the Environmental Baseline

Federal EFH consultation requirements pursuant to the MSA can minimize and mitigate for losses of wetland and preserve valuable foraging and developmental habitat that is used by juvenile smalltooth sawfish, including areas that have been designated as smalltooth sawfish critical habitat. NMFS has designated mangrove and estuarine habitats as EFH as recommended by the Gulf of Mexico Fishery Management Council. Both essential features are critical components of areas designated as EFH and receive a basic level of protection under the MSA to the extent that the MSA requires minimization of impacts to EFH resources.

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 and critical habitat that are likely to be adversely affected. The analysis in this section forms the foundation for our jeopardy analysis and destruction or adverse modification 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.

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

The proposed action includes dredging, upland excavation, and installation of new piles. Use of turbidity curtains, project activities, and related noise may preclude or deter ESA-listed sea turtles from entering the project area. We believe the temporary exclusion from a project area due to the project activities, including related noise and presence of turbidity curtains, will have an insignificant effect on ESA-listed sea turtles. Construction activities will occur during daylight hours only. Turbidity curtains will enclose the project site, or portions of the project site, at any given time and will be removed after project completion. ESA-listed sea turtles excluded from the project area will also be able to use surrounding areas with similar available habitat during the project and return to the project site when the activity is complete.

ESA-listed sea turtles may be physically injured if struck by dredging equipment or other in-water construction activities. We believe the risk of physical injury is extremely unlikely to occur due to these species' abilities to move away from the project site and into adjacent suitable habitat, if disturbed. NMFS previously determined in dredging Biological Opinions that, while oceangoing hopper-type dredges may lethally entrain protected species, non-hopper-type dredging methods, such as the mechanical methods proposed in this project, are slower and extremely unlikely to overtake or adversely affect them (NMFS 2007). Additionally, the implementation of NMFS Southeast Region's *Protected Species Construction Conditions* (NMFS 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 are seen within 150 ft 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 would be more likely to see listed species, if present, and avoid interactions with them.

ESA-listed sea turtles may be injured due to entanglement in improperly discarded fishing gear resulting from future use of the private fishing pier after completion of the proposed action. We believe this route of effect is extremely unlikely to occur. To minimize the risk of entanglement in improperly discarded fishing gear, the applicant will install and maintain a fishing line recycling receptacle and trashcan with lid at the pier to keep debris out of the water, and we expect that anglers will appropriately dispose of fishing gear when a disposal bin is 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. Additionally, the NMFS educational sign *"Save Dolphins, Sea Turtles, Sawfish and Manta Ray,"* will be installed in visible locations at the fishing pier upon completion of the proposed action. We believe the placement of educational signs is a beneficial effect to ESA-listed sea turtles. 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.

ESA-listed sea turtles also may be injured by hook-and-line capture resulting from future use of the new fishing pier after completion of the proposed action. We believe incidental capture of these species is insignificant due to the size and limited accessibility of the proposed fishing pier at the expanded marina. Because of limited access to only guests or residents of the multi-use development, and the likelihood that guests and residential users not continuously fishing, the proposed fishing pier is not expected to have the constant fishing pressure that larger, public fishing structures will have. The applicant estimates that approximately 1 fisher per day will utilize the pier. Larger, public fishing structures tend to have people continuously on site with the sole purpose of fishing; therefore, there is a much greater chance that fishing lines, bait, or discarded fish carcasses will be in the water to potentially attract or entangle ESA-listed species, especially sea turtles.

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.

When an impact hammer strikes a pile, a pulse is created that propagates through the pile and radiates sound into the water, the ground substrate, and the air. Pulsed sounds underwater are typically high volume events that have the potential to cause hearing injury. 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. Please note that for vibratory pile driving, only behavioral sound measurement thresholds exist for fishes; NMFS does not recognize any injurious sound thresholds for fishes when vibratory pile driving is used.

We use the NMFS Multi-species Pile Driving Tool (dated May 2022) 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 reference above. The USACE proposes to permit impact pile driving of up to ten 14-in concrete piles per day during daylight hours only using a pile-cushion as noise abatement. Each pile will require approximately 55 strikes to install. Pile driving will occur in a confined space. We define a confined space as any area that has a solid, vertical structure (e.g., jetty or seawall) or natural shoreline that would effectively serve as a barrier or otherwise prevent an animal from exiting the area. That is, in order for the animal to move away from the noise source, the animal would be forced to pass through the radius of noise effects. Because multiple pile-types (i.e., 8-in diameter wood piles, pre-cast concrete panels, and 14-in square concrete piles) and installation methods (i.e., jetting and impact hammer) are proposed, the noise analysis in this consultation evaluates the pile-type and installation method with the greatest potential effects and largest potential effect radius (i.e., 14-in square concrete piles). Any potential effects of pile driving noise from other proposed pile types and methods would not exceed those described below. Therefore, the potential pile driving noise effects from the other proposed pile types and methods, if any, are expected to occur within a radius of that size or smaller and would result in, at most, the potential effects described below.

The installation of up to eighty-one 14-in square concrete piles by impact hammer using a cushion as noise abatement measures may cause PK injurious noise effects to sea turtles at a radius of up to 0.1 ft (0.0 m). We believe PK injurious noise effects are extremely unlikely to occur because this distance is within the 150-ft (46-m) "stop-work" radius defined in NMFS SERO's Protected Species Construction Conditions (revised 2021). Additionally, the SELcum may cause injury sea turtles at a radius of up to 22 ft (6.7 m) away from the pile-driving operations over a 24-hour period. We believe the SELcum injurious noise effects are unlikely to occur due to the mobility of these species. That is, we expect these species to move away from the noise disturbances before the exposure to the noise causes physical injury. Movement away from the injurious sound radius is a behavioral response, which is discussed below.

The installation of eighty-one 14-in square concrete piles by impact hammer could result in behavioral effects to sea turtles at a radius of up to 82.4 ft (25.1 m) away from the impact pile driving operations. Although we generally expect mobile species to move away from noise disturbances, the proposed action will occur in a confined space. If an animal remains within the project area, it could be exposed to behavioral noise effects during pile installations. Because pile installations will occur intermittently during daylight hours only, and a maximum of only 10 piles per day will be driven, these species will be able to resume normal activities during quiet periods between pile installations and at night.

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

The proposed project includes the expansion of an existing marina. The current capacity of the marina is 66 wet slips, and it is operating at about 75% of this capacity (i.e, 50 vessels). The proposed project will result in a total of 206 wet slips plus dry storage for up to 200 vessels, for a total of 406 vessels. This is an increase in total capacity of 340 vessels. Vessel sizes accommodated by the expanded marina range between 30 and 60 ft in length. A maximum of 39 slips will accommodate vessels up to 60 ft in length, with most wet slips accommodating vessels up to 40 ft in length.

Vessel traffic, both recreational and commercial, has been documented to adversely affect protected species such as sea turtles and giant manta ray. Sea turtles may spend a considerable amount of time on or near the surface of the water, which introduces the potential risk of collision from vessel traffic.

The potential threat moving vessels pose to sea turtles is not constant and is influenced by vessel type, vessel speed, and environmental conditions such as sea state and visibility (Barnette 2018). Within Charlotte Harbor, a water body shared by Charlotte and Lee Counties and located downriver of the project site, Sidman et al. (2005) calculated that 44% of all registered vessels within these 2 counties were open fishermen. Additionally, 32% of vessels were berthed at a home (private) dock, 25% at marina/dry storage, and 25% of vessels utilized a public boat ramp for access. Additionally, boaters utilizing Charlotte Harbor exhibit an extended peak season of vessel traffic during March through June. Sidman et al. (2005) reported that the peak month for vessel use in the study area was April.

The most recent available analyzed data series from 1986 through 2014 documented 10,962 sea turtle stranding records in Florida with a definitive or probable VSI (Foley et al. 2019). Based on this stranding data, an average of 392 sea turtles per year were calculated to have been injured or killed due to vessel strikes (10,962 sea turtles ÷ 28 years). This may be an under-representation to some degree, as a number of sea turtles struck by vessels will not be recorded in the stranding database because they sink and never wash ashore.

Barnette (2018) calculated a maximum projected total of 53.1 million potential vessel trips in Charlotte Harbor waters during the course of a year. Barnette (2018) assumed that each vessel trip possesses the same likelihood of resulting in a sea turtle strike. Utilizing an average of 392 vessel strikes per year based on documented strandings data, coupled with the high-effort average annual number of vessel trips observed in the Charlotte Harbor area (53,116,528), Barnette (2018) calculated that, on average, a vessel strike would occur every 135,501 vessel trips. Based on the annual average of 52 vessel trips per boater (4.35 trips/vessel/month × 12 months/year), an average boater would strike a sea turtle every 2,606 years.

Barnette (2018) also considered how to account for under-reporting of vessel strikes in stranding records due to carcasses not washing ashore. Epperly et al. (1996) evaluated beach strandings in North Carolina as an indicator of at-sea mortality of sea turtles in the summer flounder fishery. Assuming all strandings were fishery-related, Epperly et al. (1996) concluded only 7-13% of estimated fishery-induced mortalities (12 sea turtle strandings ÷ 181 estimated sea turtle mortalities = 0.066; 12 sea turtle mortalities ÷ 89 estimated sea turtle mortalities = 0.135) appeared in stranding records. Therefore, extrapolating out the conservative average of 392 annual vessel strikes to account for bias in stranding records yields a new estimated average of 3,015-5,600 sea turtles or giant manta ray subjected to vessel strikes annually (392 ÷ 0.13 = 3,015; 392 ÷ 0.07 = 5,600). Using this new ultra-conservative average to determine individual vessel statistics, results in, on average, a vessel strike every 9,485-17,617 trips when using the average of vessel trips observed in Charlotte Harbor (53,116,528). Therefore, based on this series of extrapolations and estimates, on average, an individual vessel would strike a sea turtle every 182 years at the low end (7% stranding return) and 339 years at the high end (13% stranding return) within Charlotte Harbor (mean of 261).

The proposed project will introduce up to 340 new vessels within the action area. As noted above, the current marina is only at 75% capacity. While the new marina might also not stay at full occupancy, the expanded mixed use development associated with the marina is expected to increase access to, and use of, the marina. The southwest coast of Florida has been experiencing rapid growth in the past decade, fueling expanded development such as the proposed action. Thus, for purposes of estimating take, it is reasonable to assume full occupancy of the additional 340 slips.

To estimate the number of potential mortalities of ESA-listed sea turtles and to account for the potential under-reporting of carcasses, we based our analysis for the proposed project on the extrapolated range of 3,015-5,600 sea turtles subjected to vessel strikes annually within Charlotte Harbor. Using the high-effort average estimate of 4.35 trips/vessel/month for Charlotte County, we estimate that the proposed marina expansion will result in a net total of 17,748 new vessel trips annually (340 new vessels × 4.35 trips/vessel/year × 12 months = 17,748 new vessel trips per year). This estimated net total of 17,748 trips from the 340 additional vessels would result in the vessel strike mortality of a sea turtle every 7,060-13,113 trips based on the 39,534,088 total annual trips estimated for Charlotte County (39,534,088 trips ÷ 5,600 turtle strikes = 7,059.6 trips/ strike; 39,534,088 trips ÷ 3,015 turtle strikes = 13,112.5 trips/strike). This would result in a project-related estimate of 1.4-2.5 sea turtle vessel strike mortalities per year based on the average vessel strike analysis of one every 7,060-13,113 trips. Rounding up these totals to the nearest whole number, we estimate that a minimum of 2 vessel strike mortalities of sea turtles and a maximum of 3 vessel strike mortalities of sea turtles will occur each year of operation of the expanded marina.

To determine how many of each ESA-listed sea turtle species present within the action area will comprise the estimated total of vessel strike mortalities, we looked at the STSSN Inshore Data for all activities in Zone 4 and Lee County, Florida (1981-2023; Table 5).

Table 5. Summary of STSSN Inshore Data for Zone 4 and Lee County, Florida (1981-2023).

Sea Turtle Species	Number of Known Sea Turtles Stranded or Salvaged (All Activities)	% of Total
Green Sea Turtle	325	34.3
Kemp's Ridley Sea Turtle	225	23.8
Loggerhead Sea Turtle	372	39.2
Hawksbill Sea Turtle	4	0.422
Unknown Species	21	2.22
Total	**947**	**100**

Although hawksbill sea turtle are represented in the STSSN data, as we discussed in Section 3.1, we believe the proposed action will have No Effect on hawksbill sea turtle. Hawksbill sea turtle primarily occurs in Florida and Texas waters, though this species is present in all the Gulf States. In Florida, hawksbill sea turtle occupy reefs off Palm Beach, Broward, Miami-Dade, and Monroe Counties. Adult hawksbill sea turtles occupy areas supporting reefs and other hardbottom habitats supporting sponges (especially the East Coast of Florida from Palm Beach County south to the Florida Keys, where there are established hawksbill home ranges). There are no corals and no hardbottom habitat present in the action area, which is located 19 river miles from the Gulf of Mexico.

Of the ESA-listed sea turtles within the STSSN Zone 4 and Lee County, Florida, data identifiable to species and which may be adversely affected by the proposed action (n=922), 34.3% were green (n=325), 23.8% were Kemp's ridley (n=225), and 39.2% were loggerhead (n=372). We will assume this is the same potential species composition for future vessel strike mortalities resulting from vessels originating from the proposed expanded marina because this is the best available data regarding the relative abundance of sea turtles that may be affected by vessel strikes in the action area. Table 6 estimates the maximum number of vessel strike mortalities by sea turtle species for any year based on our calculations for estimated vessel strike mortalities, above. To be conservative to the individual species, numbers of vessel strike mortalities 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 estimate, above, 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.

Table 6. Estimated Vessel Strike Mortalities of Sea Turtle Species per Year

Species	Vessel Strike Mortalities per Year
Green sea turtle (North Atlantic DPS)	2 (3 × 0.343 = 1.029)
Kemp's ridley sea turtle	1 (3 × 0.238 = 0.714)
Loggerhead sea turtle (Northwest Atlantic DPS)	2 (3 × 0.392 = 1.176)

6.3 Effects of the Proposed Action on Critical Habitat Considered for Further Analysis

The proposed action area is within the boundary of the CHEU of smalltooth sawfish designated critical habitat. The physical and biological features essential to the conservation of the U.S. DPS of smalltooth sawfish, which provide nursery area functions, are: (1) shallow, euryhaline habitats characterized by water depths between the MHW line and 3 ft (0.9 m) measured at MLLW, and (2) red mangroves. We believe the proposed action will affect the red mangrove essential feature of smalltooth sawfish designated critical habitat as outlined below.

Because the proposed action will occur either (1) at or above the MHW line (i.e., expansion of the marina basin and lagoon creation), or (2) at depths of 6 ft or deeper (i.e., dredging), there are no potential routes of adverse effects to the shallow, euryhaline essential feature of smalltooth sawfish designated critical habitat. In addition, there are no other potential indirect routes of effect to the shallow, euryhaline essential feature.

We believe the proposed action may affect the red mangrove essential feature of smalltooth sawfish critical habitat as outlined below. Some of those pathways are not likely to adversely affect the critical habitat and some are likely to result in adverse effects. We describe these routes of effect and the consequences to the red mangrove essential feature of smalltooth sawfish critical habitat in the following sections.

6.3.1 Routes of Effect that Are Not Likely to Adversely Affect Critical Habitat

Habitat creation is included as part of the proposed project, and approximately 47,430 ft^2 of mangroves will be planted along riprap revetments with each of the 4 new tidal lagoons. We believe the aquatic enhancement associated with the proposed action is a beneficial effect to the red mangrove essential feature of smalltooth sawfish designated critical habitat in the long term. While we do not know how long it may take for recruiting red mangroves to provide an ecological function, we believe that over time, the red mangrove plants will mature and provide a stable shoreline for the natural recruitment of red mangroves within the expanded marina.

6.3.2 Routes of Effect that Are Likely to Adversely Affect Critical Habitat

We believe the proposed action is likely to adversely affect smalltooth sawfish designated critical habitat due to the permanent removal of 75 lin ft (1,700 ft^2) of the red mangrove essential feature, which provides forage, shelter, or other nursery habitat functions for juvenile smalltooth sawfish. Typically, USACE reports project effects to red mangroves in both linear feet (denoting the amount of shoreline) and square feet (denoting the magnitude of the area). We use linear feet when calculating and tracking losses to the red mangrove essential feature of critical habitat. During the development of the smalltooth sawfish recovery plan (NMFS 2009), we estimated the amount of red mangrove shoreline in linear feet because we assumed that juvenile smalltooth sawfish were typically only able to access the waterward edges of red mangrove stands. Therefore, in the analyses below, losses to red mangroves will be reported in linear feet only. Using remote sensing data acquired from the FWC FWRI, we were able to compile information relating to the total area of this essential feature within smalltooth sawfish critical habitat. Based on that information, we estimated that the total amount of red mangrove shoreline in CHEU at the effective date of species listing (May 1, 2003) was approximately 5,512,320 lin ft. While the available red mangrove essential feature in the CHEU will be diminished, the proposed action is not severing or preventing juvenile smalltooth sawfish access to alternate habitat with this essential feature in the surrounding area. Still, some ecological function provided to juvenile smalltooth sawfish in terms of the red mangrove essential feature will be lost; therefore, we believe the project is likely to adversely affect critical habitat in the CHEU.

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 INTEGRATION AND SYNTHESIS

8.1 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 DPS), Kemp's ridley sea turtle, and loggerhead sea turtle (Northwest Atlantic DPS). In Section 6.0, 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 4.0), the Environmental Baseline (Section 5.0), and the Cumulative Effects (Section 7.0), 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.

8.1.1 Green Sea Turtle (North Atlantic DPS)

As discussed in Section 4.1.3, only individuals from the North Atlantic DPS and South Atlantic DPS may occur in waters under the purview of the NMFS Southeast Region, with South Atlantic DPS individuals only expected to occur in the U.S. Caribbean. The action area is located in the Caloosahatchee River, 19 river miles from the Gulf of Mexico; therefore, only individuals from the North Atlantic DPS are expected to be present. The proposed action may result in the lethal take of 2 green sea turtles from the North Atlantic DPS each year.

Survival
The potential lethal take of up to 2 green sea turtles from the North Atlantic DPS resulting from vessel strikes each year would reduce the species' population compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. A lethal take could also result in a potential reduction in future reproduction, assuming that at least some of the individuals taken are female and would have survived to reproduce in the future. For example, as discussed above, an adult green sea turtle can lay 3-4 clutches of eggs every 2-4 years, with approximately 110-115 eggs/nest, of which a small percentage is expected to survive to sexual maturity. Because of the location of the proposed project (i.e., 19 river miles from the Gulf of Mexico and not adjacent to a nesting beach) and because green sea turtles from the North Atlantic DPS generally have large ranges, 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. 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 (Seminoff et al. 2015). Tortuguero, Costa Rica is by far the predominant nesting site, accounting for an estimated 79% of nesting for the DPS (Seminoff et al. 2015). A recent long-term study spanning over 50 years of nesting at Tortuguero found that while nest numbers increased steadily over 37 years from 1971-2008, the rate of increase slowed gradually from 2000-2008. After 2008, the nesting trend has been downwards, with current nesting levels having reverted to that of the mid-1990's, and the overall long-term trend has now become negative (Restrepo, et al. 2023).

Florida accounts for approximately 5% of nesting for this DPS (Seminoff et al. 2015). 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, with another increase in 2022 still well below the 2019 high. While nesting in Florida has shown dramatic increases over the past decade, individuals from the Tortuguero, the Florida, and the other Caribbean and Gulf of Mexico populations in the North Atlantic DPS intermix and share developmental habitat. Therefore, threats that have affected the Tortuguero population as described previously, may ultimately influence the other population trajectories, including

Florida. Given the large size of the Tortuguero nesting population, which is currently in decline, its status and trend largely drives the status of North Atlantic DPS.

Aside from the long-term increasing nesting trend observed in Florida, the declining trend in nesting observed in Toruguero indicates a species in decline. However, since we anticipate 2 vessel strike mortalities each, which is only a small fraction of the reduced but still large overall nesting population, and we have no reason to believe nesting females will be disproportionately affected, we believe the potential mortality associated with the proposed action will have no detectable effect on current nesting trends.

Since we do not anticipate the proposed action will have any detectable impact on the population overall, or current nesting trends, we do not believe the proposed action will cause an appreciable reduction in the likelihood of survival of this species in the wild.

Recovery

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

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

According to data collected from Florida's index nesting beach survey from 1989-2021, 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, with another increase in 2022 still well below the 2019 high. This overall increasing trend in nesting at Florida's index beaches indicates that the first listed recovery objective is being met. There are no estimates specifically addressing changes in abundance of individuals on foraging grounds currently available. Given the clear increases in nesting, however, it is likely that numbers on foraging grounds have also increased, consistent with the criteria of the second listed recovery objective.

The potential lethal take of up to 2 green sea turtles from the North Atlantic DPS each year resulting from vessel strike mortalities will cause a reduction in numbers when it occurs. This take is unlikely to have any detectable influence on the recovery objectives and trends noted above, and will not result in an appreciable reduction in the likelihood of North Atlantic DPS green sea turtles' recovery in the wild even when considered in the context of the of the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion.

Conclusion
The lethal take of 2 green sea turtles from the North Atlantic DPS each year resulting from vessel strike mortalities 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 Kemp's Ridley Sea Turtles

The proposed action may result in the lethal take of 1 Kemp's ridley sea turtle each year.

Survival
The potential lethal take of up to 1 Kemp's ridley sea turtle each year resulting from vessel strike mortalities would reduce the species' population compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. The TEWG (Turtle Expert Working Group 1998b) estimates age at maturity from 7-15 years, females return to their nesting beach about every 2 years (Turtle Expert Working Group 1998b). The mean clutch size for Kemp's ridley sea turtle is 100 eggs/nest, with an average of 2.5 nests/female/season. As a result, lethal take could also result in a potential reduction in future reproduction, assuming at least some of the individuals lethally taken are female and would have otherwise survived to reproduce in the future. The loss of 1 Kemp's ridley sea turtle could preclude the production of hundreds of eggs and hatchlings, of which a fractional percentage would be expected to survive to sexual maturity. Thus, the death of any female would eliminate their contribution to future generations, and result in a reduction in sea turtle reproduction. Because of the location of the proposed project (i.e., 19 river miles from the Gulf of Mexico and not adjacent to a nesting beach) and because Kemp's ridley sea turtles generally have large ranges, no reduction in the distribution is expected from the take of these individuals over the life of the proposed action.

In the absence of any total population estimates for Kemp's ridley sea turtle, nesting trends are the best proxy for estimating population changes. Following a significant, unexplained 1-year decline in 2010, Kemp's ridley sea turtle nests in Mexico reached a record high of 21,797 in 2012 (Gladys Porter Zoo nesting database 2013). There was a second significant decline in Mexico nests 2013 through 2014; however, nesting in Mexico has increased 2015 through 2017 (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, followed by another decline to 11,090 in 2019 (Gladys Porter Zoo 2019). Nesting numbers rebounded in 2020 (18,068 nests), 2021 (17,671 nests), and 2022 (17,418) (CONAMP data, 2022).

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 [NPS data]. 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 2015-2017, and then a drop back down to 190 nests in 2019. Numbers rebounded again in 2020 with 262 nests, dropped in 2021 to 195 nests, then rebounded to 284 nests in 2022 (National Park Service data).

Given the 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 increase in Kemp's ridley sea turtles. With the recent increase in nesting data (2015-17) and recent declining numbers of nesting females (2013-14 and 2018-19), it is too early to tell whether the long-term trend line is affected. Recent years have seen nesting data plateau, and it is unknown whether the population is stabilizing or is likely to increase again.

While it is clear that the population has increased over the long-term, the future trajectory of nesting trends is unclear. We anticipate 1 vessel strike mortality of Kemp's ridley sea turtles each year, which is only a small fraction of the oscillating but still large overall nesting population, and we have no reason to believe nesting females will be disproportionately affected. We believe the potential mortality associated with the proposed action will have no detectable effect on current nesting trends.

Since we do not anticipate the proposed action will have any detectable impact on the population overall, or current nesting trends, we do not believe the proposed action will cause an appreciable reduction in the likelihood of survival of this species in the wild.

Recovery

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

> *Objective: A population of at least 10,000 nesting females in a season (as measured by clutch frequency/female/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.*

With respect to this recovery objective, the most recent nesting numbers in 2022 indicate there were a total of 17,418 nests on the main nesting beaches in Mexico. This number represents approximately 4,436 nesting females for the season based on 2.5 clutches/female/season. Although there has been a substantial increase in the Kemp's ridley population within the last few decades, the number of nesting females is still below the number of 10,000 nesting females per season required for downlisting (NMFS and USFWS 2015). Since we concluded that the potential loss of up to 1 Kemp's ridley sea turtle each year is not likely to have any detectable effect on nesting trends, we do not believe the proposed action will impede the progress toward achieving this recovery objective. Thus, we believe the proposed action will not result in an appreciable reduction in the likelihood of Kemp's ridley sea turtles' recovery in the wild.

Conclusion

The lethal take of 1 Kemp's ridley sea turtles each year resulting from vessel strike mortality is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the Kemp's ridley sea turtle in the wild.

8.1.3 Loggerhead Sea Turtles

The proposed action may result in the lethal take of 2 loggerhead sea turtles in the Northwest Atlantic DPS each year.

Survival
The potential lethal take of up to 2 loggerhead sea turtles in the Northwest Atlantic DPS each year resulting from vessel strike mortalities would reduce the species' population compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. A lethal take could also result in a potential reduction in future reproduction, assuming at least some of the individuals taken are female and would have survived to reproduce in the future. For example, an adult female loggerhead sea turtle can lay approximately 4 clutches of eggs every 3 years, with 100-126 eggs per clutch. While we have no reason to believe the proposed action will disproportionately affect females, the loss of even 1 adult female could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. Because of the location of the proposed project (i.e., 19 river miles from the Gulf of Mexico and not adjacent to a nesting beach) and because loggerhead sea turtles generally have large ranges, no reduction in the distribution is expected from the take of these individuals over the life of the proposed action.

Whether the reductions in loggerhead sea turtle numbers and reproduction attributed to the proposed action would appreciably reduce the likelihood of survival depends on what effect these reductions in numbers and reproduction would have on overall population sizes and trends (i.e., whether the estimated reductions, when viewed within the context of the environmental baseline, the status of the species and cumulative effects, are of such an extent that adverse effects on population dynamics are appreciable). In Section 4.1.5, we reviewed the status of this species in terms of nesting and female population trends and several assessments based on population modeling (i.e., Conant et al. 2009; NMFS 2009). Below we synthesize what that information means both in general terms and the more specific context of the proposed action.

Loggerhead sea turtles are a slow growing, late-maturing species. Because of their longevity, loggerhead sea turtles require high survival rates throughout their life to maintain a population. In other words, late-maturing species cannot tolerate much anthropogenic mortality without going into decline. Conant et al. (2009) concluded loggerhead natural growth rates are small, natural survival needs to be high, and even low- to moderate mortality can drive the population into decline. Because recruitment to the adult population is slow, population modeling studies suggest even small increased mortality rates in adults and subadults could substantially impact population numbers and viability (Chaloupka and Musick 1997; Crouse et al. 1987; Crowder et al. 1994; Heppell et al. 1995).

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

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

Florida accounts for more than 90% of U.S. loggerhead nesting. 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, dipping back to 49,100 in 2021, and then in 2022 reaching the second-highest number since the survey began, with 62,396 nests. 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).

However, since we anticipate 2 vessel strike mortalities each, which is only a small fraction of the reduced but still large overall nesting population, and we have no reason to believe nesting females will be disproportionately affected, we believe the potential mortality associated with the proposed action will have no detectable effect on current nesting trends.

Since we do not anticipate the proposed action will have any detectable impact on the population overall, or current nesting trends, we do not believe the proposed action will cause an appreciable reduction in the likelihood of survival of the Northwest Atlantic DPS of the loggerhead sea turtle in the wild.

Recovery

The loggerhead recovery plan for the Northwest Atlantic population of loggerhead sea turtles defines the recovery goal as "…ensur[ing] that each recovery unit meets its Recovery Criteria alleviating threats to the species so that protection under the ESA is no longer necessary" (NMFS and USFWS 2008). The plan then identifies 13 recovery objectives needed to achieve that goal. The recovery plan for the Northwest Atlantic population of loggerhead sea turtles (NMFS and USFWS 2008) lists the following recovery objectives that are relevant to the effects of the proposed action:

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

The recovery plan anticipates that, with implementation of the plan, the western North Atlantic population will recover within 50-150 years, but notes that reaching recovery in only 50 years would require a rapid reversal of the then-declining trends of the NRU, PFRU, and NGMRU. 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 (NMFS and USFWS 2008).

Nesting trends in most recovery units have been significantly increasing over several years. We do not believe the proposed action impedes the progress of the recovery program or achieving the overall recovery strategy because the amount of take expected to occur over a 150-year time period, as a result of the proposed action is not expected to be detectable on a population level or on nesting trends, and therefore it is not expected to affect population growth over the timeframe analyzed. We also indicated that the lethal take of 2 loggerhead sea turtles in the Northwest Atlantic DPS each year is minimal in relation to the overall population, and it would not impede achieving the Recovery Objectives, 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. For these reasons, we do not believe the proposed action will impede achieving the recovery objectives or overall recovery strategy.

Conclusion

The lethal take of 2 loggerhead sea turtles each year resulting from vessel strike mortalities 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.

8.2 Critical Habitat Destruction or Adverse Modification Analysis

NMFS's regulations define *destruction or adverse modification* to mean "a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02). Alterations that may destroy or adversely modify critical habitat may include impacts to the area itself, such as those that would impede access to or use of the essential features. NMFS will generally conclude that a federal action is likely to "destroy or adversely modify" critical habitat if the action results in an alteration of the quantity or quality of the essential physical or biological features of critical habitat and if the effect of the alteration is to appreciably diminish the value of critical habitat as a whole for the conservation of the species.

This analysis takes into account the geographic and temporal scope of the proposed action, recognizing that "functionality" of critical habitat necessarily means that the critical habitat must now and must continue in the future to support the conservation of the species and progress toward recovery. The analysis takes into account any changes in amount, distribution, or characteristics of the critical habitat that will be required over time to support the successful recovery of the species. Destruction or adverse modification does not depend strictly on the size or proportion of the area adversely affected, but rather on the role the action area and the affected critical habitat serves with regard to the function of the overall critical habitat designation, and how that role is affected by the action.

8.2.1 Protect and Restore Smalltooth Sawfish Habitat (Recovery Objective #2)

In establishing Recovery Objective #2, we recognized that recovery and conservation of smalltooth sawfish depends on the availability and quality of nursery habitats. Historically, juvenile sawfish were documented in mangrove and non-mangrove habitat in the southeastern United States. Due to the protections provided by the Ten Thousand Islands National Wildlife Refuge, Everglades National Park, and the Florida Keys National Marine Sanctuary, much of the historic juvenile smalltooth sawfish habitat in southwest Florida has remained high-quality juvenile habitat. Recovery Regions G, H, and I in southwest Florida extend from the Manatee River on the west coast of Florida, south through Everglades National Park and the Florida Keys to Caesar Creek on the southeast coast of Florida. The CHEU is in Recovery Region G. While much of the CHEU is protected by the CHPSP system and the Estero Bay Aquatic Preserve, it is also highly anthropomorphically influenced.

The recovery plan states that for the 3 recovery regions with remaining high-quality habitats (i.e., Recovery Regions G, H, and I), juvenile habitats "must be maintained over the long term at or above 95% of the acreage available at the time of listing" (NMFS, 2009). To ensure that a proposed action will not impede Recovery Objective #2, we determine whether the critical habitat unit will be able to maintain 95% of the areas containing each essential feature after taking into account project impacts in the context of the status of the critical habitat, the environmental baseline, and cumulative effects. While the CHEU is only a part of the larger Recovery Region G, and the 95% protection threshold applies across not just Recovery Region G, but also Recovery Regions H and I, the threshold is still useful for evaluating the impacts at the individual recovery region level and for sub-units of the recovery regions. The CHEU contains the only known nursery areas within Recovery Region G; thus, we believe it is appropriate to evaluate impacts at the level of the unit. In addition, functioning critical habitat contains either one or both of the essential features, and the essential features were selected based on their role in facilitating recruitment of juvenile animals into the adult population, which the recovery plan likewise seeks to conserve and protect. Consequently, we also believe it is appropriate to consider whether 95% of each of the essential features of critical habitat in the CHEU is maintained. Therefore, below we estimate the percent impact the proposed action will have on the red mangrove essential feature of critical habitat within the CHEU. As stated above, the proposed action will not affect the shallow euryhaline habitat essential feature of smalltooth sawfish critical habitat.

Red Mangrove Essential Feature Impacts
Remote sensing data from FWC FWRI indicated that approximately 5,512,320 lin feet of red mangrove shoreline (abbreviated RM throughout this section) was available in the CHEU at the effective date of species listing (i.e., May 1, 2003) (Table 7, Line 1). As described above, we must determine whether project impacts will interfere with long-term maintenance of this essential feature at or above 95% of the linear feet of habitat available at the time of listing; however, loss of critical habitat was not formally monitored until the effective date of critical habitat designation (i.e., October 2, 2009). Therefore, we must estimate habitat loss that occurred during the period between the effective date of species listing and the effective date of critical habitat designation (i.e., May 1, 2003 – October 2, 2009).

To do this, we use an 84-month dataset of our completed Section 7 consultations (October 3, 2009 – September 30, 2016), including yearly losses due to programmatic consultations, to generate a rate of loss that can then be used to back-calculate the loss of RM between the effective date of species listing and the effective date of critical habitat designation. We rely on this dataset because using approximately 7 years of information helps avoid over- or under-estimating the rate of habitat loss due to any potential inter-annual variability associated with economic growth and contraction that may have occurred in that time. Our consultations completed during this time indicate that 9,142.50 lin ft of RM in CHEU was lost due to federal agency actions.

Based on these losses, we estimate a monthly loss rate of RM using the following equation:

$$Monthly\ loss\ rate\ of\ RM\ (CHEU)$$
$$= RM\ lost\ through\ federal\ agency\ actions \div 84\ months$$
$$= 9{,}142.50\ lin\ ft \div 84\ months$$
$$= 108.84\ lin\ ft\ per\ month$$

Assuming the same monthly loss rates, we back-calculate the loss of RM in the 77 months between the effective date of species listing and the effective date of critical habitat designation (i.e., May 1, 2003 – October 2, 2009) in the CHEU using the following equation:

$$RM\ loss\ prior\ to\ critical\ habitat\ designation\ (CHEU)$$
$$= 108.84\ lin\ ft\ per\ month \times 77\ months$$
$$= 8{,}380.68\ lin\ ft\ \text{(Table 7}, Line\ 2)$$

Next, we determine the loss of RM since the effective date of critical habitat designation. Due to the high frequency of relatively small projects affecting smalltooth sawfish critical habitat, we update the losses to the red mangrove essential feature from federal actions every 6 months (i.e., January 1 and July 1). From the effective date of critical habitat designation through June 30, 2023, 28,650.17 lin ft of RM in the CHEU has been lost due to federal agency actions (Table 7, Line 3). While this amount of loss only takes into account projects with a federal nexus requiring ESA Section 7 consultation, there are very few projects without a federal nexus that could affect red mangrove shoreline in the CHEU as most in-water construction projects require federal authorization.

Using this information, we calculate the RM currently available in the CHEU using the following equation:

$$
\begin{aligned}
&RM\ currently\ available\ (CHEU) \\
&= RM\ at\ time\ of\ species\ listing - (RM\ loss\ prior\ to\ critical\ habitat\ designation \\
&\qquad + RM\ loss\ since\ critical\ habitat\ designation) \\
&= 5{,}512{,}320\ lin\ ft - (8{,}380.68\ lin\ ft + 28{,}650.17\ lin\ ft) \\
&= 5{,}475{,}289.15\ lin\ ft\ (\text{Table 7}, Line\ 4)
\end{aligned}
$$

We calculate the amount of RM that must be maintained in the CHEU using the following equation:

$$
\begin{aligned}
&RM\ that\ must\ be\ maintained\ (CHEU) \\
&= RM\ at\ time\ of\ species\ listing \times 95\% \\
&= 5{,}512{,}320\ lin\ ft \times 0.95 \\
&= 5{,}236{,}704\ lin\ ft\ (\text{Table 7}, Line\ 5)
\end{aligned}
$$

The proposed action would result in the loss of 75 lin ft of RM (Table 7, Line 6). Using the above results, we estimate the total amount of RM lost in the CHEU since species listing, including losses from the proposed action using the following equation:

$$
\begin{aligned}
&\%\ RM\ lost\ in\ CHEU\ since\ species\ listing \\
&= [(RM\ loss\ due\ to\ this\ project +\ RM\ lost\ prior\ to\ critical\ habitat\ designation \\
&\qquad + RM\ lost\ since\ critical\ habitat\ designation) \\
&\qquad \div Total\ RM\ in\ CHEU\ at\ time\ of\ species\ listing] \times 100 \\
&= [(75\ lin\ ft + 8{,}380.68\ lin\ ft + 28{,}650.17\ lin\ ft) \div 5{,}512{,}320\ lin\ ft] \times 100 \\
&= (37{,}105.85\ lin\ ft\ \div 5{,}512{,}320\ lin\ ft) \times 100 \\
&= 0.673144\%\ (\text{Table 7}, Line\ 7)
\end{aligned}
$$

Thus, we estimate the percent of RM remaining within the CHEU as:

$$
\begin{aligned}
&\%\ RM\ remaining\ (CHEU) \\
&= 100\% - \%\ RM\ lost\ since\ species\ listing\ (CHEU) \\
&= 100\% - 0.673144\% \\
&= 99.326856\%\ (\text{Table 7}, Line\ 8)
\end{aligned}
$$

Table 7. Summary of Impacts to the Red Mangrove Essential Feature

Red Mangrove Shoreline in the CHEU	Linear Feet
1. Available at the time of species listing	5,512,320
2. Losses prior to critical habitat designation	8,380.68
3. Losses since critical habitat designation	28,650.17
4. Available as of July 1, 2023	5,475,289.15
5. Linear feet that must be maintained per Recovery Plan	5,236,704 (95% of 5,512,320)
6. Affected by the proposed action	75
7. Affected since species listing (including the proposed action)	37,105.85 (0.673144% of 5,512,320)
8. Remaining	5,475,214.15 (99.326856% of 5,512,320)

Very small percentages of the essential features of smalltooth sawfish designated critical habitat have been affected by federal agency actions since the effective date of species listing. Including losses from the proposed action, 99.326856% of the RM essential feature (Table 7, Line 8) available at the time of species listing remain in the CHEU. Thus, the loss of the essential feature associated with the proposed action, in combination with losses since we listed the species, does not provide any impediment to effectively protecting 95% of juvenile habitat in the CHEU available at the effective date of species listing, and therefore will not be an impediment to Recovery Objective #2.

8.2.2 Ensure Smalltooth Sawfish Abundance Increases (Recovery Objective #3)

In establishing Recovery Objective #3, we recognized that it was important that sufficient numbers of juvenile 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. To meet this objective, Recovery Region G (i.e., CHEU) must support sufficiently large numbers of juvenile sawfish to ensure that the species is viable in the long-term and can maintain genetic diversity. Recovery Objective #3 requires that the relative abundance of small juvenile sawfish (< 200 cm) either increases at an average annual rate of at least 5% over a 27-year period, or juvenile abundance is at greater than 80% of the carrying capacity of the recovery region.

Assessing the effect of the proposed action on small juvenile abundance is made difficult by the state of available data. Since the designation of critical habitat and the release of the recovery plan in 2009, ongoing studies have been in place to monitor the U.S. DPS of smalltooth sawfish. FWC FWRI is conducting a study in the CHEU that is supported primarily with funding provided by NMFS through the ESA Section 6 Species Recovery Grants Program, while Florida State University and the NOAA NMFS Southeast Fisheries Science Center Panama City Laboratory have focused studies in the TTIEU. The intent of these studies is to determine the abundance, distribution, habitat use, and movement of smalltooth sawfish. Early indications are that juvenile sawfish are at least stable and likely increasing in the CHEU, due in large part to ESA-listing of the species and designation of critical habitat. While it may be too early to state definitively that juveniles within CHEU are surviving to adulthood, researchers consistently capture newborn smalltooth sawfish, particularly within "hotspots," indicating adult smalltooth sawfish are pupping within Recovery Region G. Available data from the adjacent Recovery Region H (i.e., TTIEU) indicate that adult smalltooth sawfish are also reproducing within this recovery region and that the juvenile population trend is at least stable and possibly increasing – though variability is high (Carlson and Osborne 2012; Carlson et al. 2007). With no other data to consider, the abundance trend in the TTIEU represents the best data available for assessing the population trends in the CHEU. Therefore, we do not believe the loss of habitat associated with the proposed action, in combination with the losses to date, will impede the 5% annual growth objective for the juvenile population within Recovery Region G.

9 CONCLUSION

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

The proposed action will result in the lethal take of up to 2 green sea turtle (North Atlantic DPS), 1 Kemp's ridley sea turtle, and 2 loggerhead sea turtle (Northwest Atlantic DPS) 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 DPS), Kemp's ridley sea turtle, or loggerhead sea turtle (Northwest Atlantic DPS).

We conclude that the permanent loss of 75 lin ft (1,700 ft^2) of the red mangrove essential feature of designated critical habitat for smalltooth sawfish due to the proposed action will not interfere with achieving the relevant habitat-based recovery objectives for smalltooth sawfish and will not impede the critical habitat's ability as a whole to support the conservation of smalltooth sawfish, despite permanent adverse effects. Therefore, given the nature of the proposed action and the information provided above, we conclude that the action, as proposed, is not likely to destroy or adversely modify the critical habitat of smalltooth sawfish.

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 applicant 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 applicant becomes aware of any take of an ESA-listed species under NMFS's purview that occurs during the proposed action, the applicant 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, Paradise Isle Marina Expansion, the issuance date, and ECO tracking number, SERO-2023-01928, 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

Based on the above information and analyses, NMFS believes that the proposed action is likely to adversely affect green sea turtle (North Atlantic DPS), Kemp's ridley sea turtle, and loggerhead sea turtle (Northwest Atlantic DPS). These effects will result from vessel strike mortalities. NMFS anticipates the following annual incidental take may occur as a result of the proposed action (**Table 8**).

Table 8. Anticipated Annual Incidental Take Related to the proposed action.

Species	Take
Green sea turtle (North Atlantic DPS)	2
Kemp's ridley sea turtle	1
Loggerhead sea turtle (Northwest Atlantic DPS)	2

Based on the best available data, we do not anticipate any non-lethal take of the species listed above. The level of incidental take resulting from vessel strike mortalities occurring annually is highly variable and influenced by fuel prices, vessel registrations, weather, vessel use and traffic patterns, and other factors that cannot be predicted. Further, reporting of incidental take resulting from vessels originating from the expanded marina is not likely to be consistent, accurate, or probable once vessels operated by private owners leave the marina. As a result, there is a high level of uncertainty in monitoring the take numbers listed in Table 8, above, and a more reliably monitored metric is needed as an additional reinitiation trigger.

To calculate take and estimate the annual number of vessel strike mortalities resulting from the proposed project, we assumed 100% occupancy of the expanded marina, and we used the net increase in the number of total vessel slips at the marina as the basis for our calculations (i.e., 340 vessels). Because the number of vessel slips forms the basis for our calculation of take, any future increase in vessel slips associated with the action will necessitate reinitiation of consultation. Thus, any increase in vessel slips within the marina, in addition to any reported take exceeding the numbers listed in Table 8, above, will be cause for reinitiation of consultation.

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 DPS), Kemp's ridley sea turtle, and loggerhead sea turtle (Northwest Atlantic 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 has a continuing duty to ensure compliance with the reasonable and prudent measures and terms and conditions included in this Incidental Take Statement. If USACE 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 must report the progress of the action and its impact on the species to NMFS 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 USACE must ensure that the applicant monitors and reports the impacts of its activities on listed species by including a special condition in its permit requiring the applicant to submit reports regarding all interactions with protected species at the proposed marina and fishing pier subject to consultation are forwarded to USACE and NMFS.
2. The USACE must ensure that the applicant minimizes the likelihood of injury or mortality to ESA-listed species resulting from vessel strike, capture, entanglement, or stranding at the marina or fishing pier by including a special condition in its permit requiring the applicant to install educational signage in visible locations at the marina and fishing pier, and to provide educational materials to customers utilizing the marina.
3. The USACE must ensure that the applicant conducts annual in-water and out-of-water marine debris removal (i.e., cleanup) activities at the marina and the fishing pier by including a special condition in its permit requiring the applicant to submit annual reports regarding total amount of debris collected.

10.5 Terms and Conditions

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

The following Terms and Conditions implement Reasonable and Prudent Measure #1:

- USACE shall include a special permit condition that directs the applicant to report all known vessel strike, capture, entanglement, stranding, or other take of ESA-listed species and any other takes of ESA-listed species at the Paradise Isle Marina to the NMFS PRD SERO.
  - If and when the applicant becomes aware of any known reported vessel strike, 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).
    - Emails must reference this Opinion by the NMFS tracking number (SERO-2023-01928 Paradise Isle Marina Expansion) and date of issuance.
    - This form shall be completed for each individual known reported vessel strike, capture, entanglement, stranding, or other take incident.
    - 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., vessel strike, 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.

- Every year, the applicant must submit a summary report of vessel strike, capture, entanglement, stranding, or other take of ESA-listed species to NMFS SERO PRD by email: nmfs.ser.esa.consultations@noaa.gov.
  - All emails and summary reports must reference this Opinion by the NMFS tracking number (SERO-2023-01928 Paradise Isle Marina Expansion) and date of issuance.
  - The summary report will contain the following information: the total number of ESA-listed species vessel strikes, captures, entanglements, strandings, or other take that was reported at or adjacent to the marina and pier included in this Opinion.
  - 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).
  - The summary report shall be submitted even when there have been no reported take of ESA-listed species.
  - 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.
  - The first summary report will be submitted by January 31 of the calendar year following the opening of facility operations. Thereafter, reports will be prepared every year, covering the prior calendar year, and emailed no later than January 31 of any year.
  - Copies of reports must be submitted to the USACE at: Fort Myers Field Office, Jacksonville District Corps of Engineers, Department of the Army, 1520 Royal Palm Square Boulevard, Suite 310, Fort Myers, Florida 33919.
  - Reports will include current photographs of signs and bins required in T&Cs No. 2 and 3 below.

The following Terms and Conditions implement Reasonable and Prudent Measure #2:

- USACE shall include a special permit condition that directs the applicant to install and maintain the following NMFS Protected Species Educational Signs:
  - *Save Dolphins, Sea Turtles, Sawfish and Manta Rays*
  - *Save Sawfish*
    - The signs will be posted at the entrance to and terminal end of the fishing structure, and on the exterior of the marina office.
    - Signs will be installed prior to opening the marina and fishing pier for resident and visitor use.
    - Photographs of the installed signs will be emailed to NMFS SERO PRD by email (takereport.nmfsser@noaa.gov) with the NMFS tracking number

for this Opinion (SERO-2023-01928 Paradise Isle Marina Expansion) and date of issuance.
    - Sign designs and installation methods are provided at the following website: http://sero.nmfs.noaa.gov/protected_resources/section_7/protected_species_educational_signs/index.html.
    - Additionally, current photographs of the signs will be included in each report required by T&C No. 1, above.

- USACE shall include a special permit condition that directs the applicant to install and maintain monofilament recycling bins and trash receptacles at the fishing pier to reduce the probability of trash and debris entering the water.
  - Monofilament recycling bins and trash receptacles will be installed prior to opening the marina and fishing pier for resident and visitor use.
  - Photographs of the installed bins will be emailed to NMFS SERO PRD by email (takereport.nmfsser@noaa.gov) with the NMFS tracking number for this Opinion (SERO-2023-01928 Paradise Isle Marina Expansion) and date of issuance.
  - The applicant must regularly empty the bins and trash receptacles and make sure they are functional and upright.
  - Additionally, current photographs of the bins will be included in each report required by T&C No. 1, above.
- USACE shall include a special permit condition that directs the applicant to provide and display copies of the NMFS *Protected Marine Species Identification Guide* in visible and accessible location within the marina office.
  - Copies of the NMFS *Protected Marine Species Identification Guide* will be printed and made available prior to the opening of the marina for use and operations.
  - Photographs of the display of available copies of NMFS *Protected Marine Species Identification Guide* will be emailed to NMFS SERO PRD by email (takereport.nmfsser@noaa.gov) with the NMFS tracking number for this Opinion (SERO-2023-01928 Paradise Isle Marina Expansion) and date of issuance.
  - The applicant must keep a regular supply of NMFS *Protected Marine Species Identification Guide* available and visible within the marina office.
  - Additionally, current photographs of the display of available copies of NMFS *Protected Marine Species Identification Guide* will be included in each report required by T&C No. 1, above.

The following Terms and Conditions implement Reasonable and Prudent Measure #3:

- USACE shall include a special permit condition that directs the applicant to:
  - Conduct an annual in-water and out-of-water cleanup to remove debris from the marina, and derelict fishing line and associated gear from the pier structure. A volunteer group may be contacted.
  - Submit a record of each cleaning event NMFS SERO PRD by email (takereport.nmfsser@noaa.gov) with the NMFS tracking number for this Opinion (SERO-2023-01928 Paradise Isle Marina Expansion) and date of issuance.

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 federal action agency:

Sea turtles:

- Conduct or fund research that investigates ways to reduce and minimize mortality of sea turtles from vessel strikes and 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.
- Provide relevant education and outreach materials about threats to protected species and how to report sightings or strandings along with issued permits and permit-associated materials.

Smalltooth sawfish:

- Continue public outreach and education on smalltooth sawfish and smalltooth sawfish critical habitat in an effort to minimize interactions, injury, and mortality.
- Provide funding to conduct directed research on smalltooth sawfish that will help further our understanding about the species (e.g., implement a relative abundance monitoring program which will help define how spatial and temporal variability in the physical and biological environment influence smalltooth sawfish) in an effort to predict long-term changes in smalltooth sawfish distribution, abundance, extent, and timing of movements.
- Fund surveys of detailed bathymetry and mangrove coverage within smalltooth sawfish critical habitat. Lee County and the USACE recently funded such surveys within the Cape Coral municipality. Data is needed from other municipalities within the CHEU to establish a more accurate baseline assessment of both critical habitat features (red mangroves and shallow-water areas).
- Fund and support restoration efforts that rehabilitate and create shallow, euryhaline and mangrove fringe habitats within the range of smalltooth sawfish.

All species:

- Provide to all applicants relevant education and outreach materials about threats to affected protected species and how to report sightings or strandings along with all issued permits and permit-associated materials.

To stay abreast of actions that minimize or avoiding adverse effects or benefit listed species or their habitat, we request notification of the implementation of any conservation recommendations.

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 or by the Service, 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 must immediately request reinitiation of formal consultation and project activities may only resume if the USACE establishes that such continuation will not violate Sections 7(a)(2) and 7(d) of the ESA.

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