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

06/20/2024

F/SER31:MT
SERO-2023-01665

Gretchen S. Ehlinger, Ph.D.,
Chief, Environmental Branch
Jacksonville District Corps of Engineers
Department of the Army
701 San Marco Boulevard
Jacksonville, Florida 32207-8915

Ref.: Tampa Harbor Navigation Improvement Study, Hillsborough and Pinellas Counties, Florida.

Dear Gretchen Ehlinger,

Please find enclosed for your review and comment a Biological Opinion (Opinion) responding to your request for consultation with us, the National Marine Fisheries Service (NMFS), pursuant to Section 7 of the Endangered Species Act (ESA), as amended (16 U.S.C. § 1531 et seq.) for the above referenced action. The Opinion has been given the NMFS tracking number SERO-2023-01665. Please use the NMFS tracking number in all future correspondence related to this action.

This Opinion considers the effects of U.S. Army Corps of Engineers' (USACE) proposal to authorize and carry out dredging to deepen ship channels, turning basins, and turn wideners throughout Tampa Bay, along with the disposal of the dredged materials at designated disposal sites and through beneficial use projects, on the following ESA-listed species and critical habitat: Green (North Atlantic Distinct Population Segment [DPS]), Kemp's ridley, leatherback, loggerhead (Northwest Atlantic DPS), and hawksbill sea turtles, giant manta ray, Gulf sturgeon, smalltooth sawfish (U.S. DPS), and proposed critical habitat for North Atlantic DPS green sea turtles. NMFS concludes that the proposed action is not likely to adversely affect hawksbill sea turtles, leatherback sea turtles, giant manta ray, or Gulf sturgeon, and is likely to adversely affect, but not likely to jeopardize the continued existence of green, Kemp's ridley, and loggerhead sea turtles, and smalltooth sawfish. NMFS also concludes that the proposed action is not likely to adversely affect proposed critical habitat for green sea turtles (North Atlantic 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 these actions. The Incidental Take Statement also specifies Terms and Conditions, including monitoring and reporting requirements with which the USACE must comply to carry out the reasonable and prudent measures.

USACE is conferring with the Services under ESA section 7(a)(4) on effects to critical habitat proposed for designation for green sea turtle (North Atlantic DPS). The conference is being conducted following the procedures for formal consultation.

This conference opinion may be adopted as the biological opinion when the critical habitat for green sea turtle (North Atlantic DPS) is designated, but only if no significant new information is developed (including that developed during the rulemaking process on the proposed listing or critical habitat designation) and no significant changes to the Federal action are made that would alter the content of the opinion.

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 Michael Tucker, Consultation Biologist, at (727) 209-5981, or by email at michael.tucker@noaa.gov.

Sincerely,

STRELCHECK.ANDREW.JAMES.1365863152
Digitally signed by STRELCHECK.ANDREW.JAMES.1365863152
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Andrew J. Strelcheck
Regional Administrator

Enclosure (s)
NMFS Biological Opinion SERO-2023-01665
cc: Kristen.L.Donofrio@usace.army.mil
File: 1514-22.f.4

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency: United States Army Corps of Engineers

Activity: Tampa Harbor Navigation Improvement Study, involving deepening ship channels, turning basins, and turn wideners throughout Tampa Bay, along with the disposal of dredged materials at designated disposal sites and through beneficial use projects

Location: Hillsborough and Pinellas Counties, Florida

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

Tracking Number SERO-2023-01665

Approved by: STRELCHECK.ANDREW.JAMES.1365863152 Digitally signed by STRELCHECK.ANDREW.JAMES.1365863152 Date: 2024.06.20 15:54:46 -04'00'

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

Date Issued: 06/20/2024

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ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

ac	acre(s)
BMP	Best Management Practice(s)
BUDM	Beneficial Use of Dredged Material
°C	degrees Celsius
CCL	curved carapace length
CFR	Code of Federal Regulations
CITES	Convention on International Trade in Endangered Species
cm	centimeter(s)
CPUE	catch per unit effort
CWA	Critical Wildlife Area
cy	cubic yard(s)
DDT	dichlorodiphenyltrichloroethane
DMMA	Dredged Material Management Area
DNA	deoxyribonucleic acid
DTRU	Dry Tortugas Recovery Unit
DWH	Deepwater Horizon
DPS	Distinct Population Segment
ENP	Everglades National Park
EPP	Environmental Protection Plan

ESA	Endangered Species Act
°F	degrees Fahrenheit
FDEP	Florida Department of Environmental Protection
FP	Fibropapillomatosis
FR	Federal Register
ft	foot/feet
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
GADNR	Georgia Department of Natural Resources
GCRU	Greater Caribbean Recovery Unit
GoM	Gulf of Mexico
GRBO	Gulf of Mexico Regional Biological Opinion
HARP	high-frequency acoustic recording package
HB	Hillsborough Bay
HMS	Highly Migratory Species
ICWW	Intracoastal Waterways
IMO	International Maritime Organization
in	inch(es)
IPCC	Intergovernmental Panel on Climate Change
ITS	Incidental Take Statement
kg	kilograms
km	kilometer(s)
kt	knot(s)
m	meter(s)
mcy	million cubic yards
MHW	Mean High Water
mi	mile(s)
MMPA	Marine Mammal Protection Act
mtDNA	mitochondrial DNA
NA	North Atlantic
NCWRC	North Carolina Wildlife Resources Commission
NGMRU	Northern Gulf of Mexico Recovery Unit
nm^2	square nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NRU	Northern Recovery Unit
NWA	Northwest Atlantic
OCS	Outer Continental Shelf
ODMDS	Ocean Dredged Material Disposal Site
O&M	Operations and Maintenance
Opinion	Biological Opinion
oz	ounce

PCB	polychlorinated biphenyls
PDC	Project Design Criteria
PFC	perfluorinated chemicals
PFRU	Peninsular Florida Recovery Unit
psi	pounds per square inch
PSO	Protected Species Observer
RAI	request for additional information
RCP	representative concentration pathway(s)
RPM	Reasonable and Prudent Measure
SA	South Atlantic
SARBO	South Atlantic Regional Biological Opinion for Dredging and Material Placement Activities in the Southeast United States
SCDNR	South Carolina Department of Natural Resources
SCL	straight carapace length
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
T&C	Terms and Conditions
TED	turtle excluder device
TEWG	Turtle Expert Working Group
TSP	Tentatively Selected Plan
UCS	unconfined compressive strength
U.S.	United States
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

1 INTRODUCTION

1.1 Overview

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

Consultation is required when a federal action agency determines that a proposed action “may affect” listed species or designated 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 or appropriate to minimize such impact of incidental take on the species, and lists the Terms and Conditions to implement those measures. An Opinion may also develop Conservation Recommendations that help benefit ESA-listed species. For species and critical habitat proposed for listing, each federal agency shall confer on any agency action that is likely to jeopardize the continued existence of any species proposed for listing or result in the destruction or adverse modification of proposed critical habitat (ESA section 7(a)(4)). Federal agencies may also request a conference on any proposed action that may affect proposed species or proposed critical habitat. Federal action agencies may request that the conference be conducted following the procedures for formal consultation and, subject to our agreement, the conference may be conducted formally.

A formal conference results in a Conference Biological Opinion in the same format and with the same content as a Biological Opinion. The Conference Biological Opinion may be adopted as the biological opinion when the species is listed or critical habitat is designated, but only if no significant new information is developed (including that developed during the rulemaking process on the proposed listing or critical habitat designation) and no significant changes to the Federal action are made that would alter the content of the opinion. An Incidental Take Statement provided with a conference opinion does not become effective unless we adopt the Opinion once the listing is final (50 CFR 402.10(d)).

This document represents NMFS's Opinion based on our review of potential effects of the USACE's proposal to authorize and carry out the deepening and/or expansion of ship channels, turning basins, and turn wideners throughout Tampa Bay, along with the disposal of dredged materials at designated disposal sites and through beneficial use projects in Hillsborough and Pinellas Counties, Florida, on the following ESA-listed species and critical habitat: Green (North Atlantic DPS), Kemp's ridley, leatherback, loggerhead (Northwest Atlantic DPS), and hawksbill sea turtles, giant manta ray, Gulf sturgeon, smalltooth sawfish, and proposed critical habitat for North Atlantic DPS green sea turtles. Our Opinion is based on information provided by the USACE and the published literature cited herein.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 Fed. Reg. 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the Act. 89 Fed. Reg. at 24268; 84 Fed. Reg. at 45015. We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been any different under the 2019 regulations or pre-2019 regulations.

1.2 Consultation History

The following is the consultation history for the NMFS ECO tracking number SERO-2023-01665, Tampa Harbor Navigation Improvement.

On December 21, 2021, NMFS received a request from the USACE to participate as a cooperating agency in the Tampa Harbor Navigation Improvement Study planning process. NMFS responded to this request in a letter dated January 24, 2022, affirming our participation as a cooperating agency for the project. Throughout 2022 and 2023, NMFS participated in several resource agency coordination meetings, and on July 19, 2023, NMFS received a written request from the USACE to initiate formal consultation under Section 7 of the ESA, for the subject project.

NMFS conducted a review of the documents submitted in support of the requested consultation, and on October 13, 2023, we requested additional information necessary to complete our analysis of the proposed project. On November 22, 2023, the USACE provided a response, which addressed each of the items NMFS requested.

On November 30, 2023, we requested one additional piece of information related to the take of ESA-listed sea turtles during previous dredging in the project area, and received a response with the requested information on that same day. Having received all of the necessary information, we initiated formal consultation on November 30, 2023.

2 PROPOSED ACTION

2.1 Project Details

2.1.1 Project Description

The USACE proposes to study and implement a plan that would result in deepening and/or expanding ship channels, turning basins, and turn wideners within Tampa Bay as part of the Tampa Harbor Navigation Improvement Study. As part of this proposed action, the USACE is also evaluating numerous alternatives for the placement of dredged material, including: open water disposal at a USEPA designated ODMDS; placement in the Tampa Bay DMMA, hardbottom habitat creation; island restoration at 2 sites; beach placement; dredged hole restoration; seagrass creation; upland placement; and expansion projects (i.e., in-water placement to raise elevations to be above the water line).

As depicted in Figure 1, plan specifics include the following.

Proposed Deepening
Incremental Deepening of Egmont Key Cut 1 and Egmont Key Cut 2 to 49 ft, and deepening of the rest of the Main Stem Channel (Mullet Key Cut to Hooker's Point) and Big Bend Channel to 47 ft. Specific channel segments to be deepened to 47 ft include, Mullet Key Cut, Cut A, Cut B, Cut C, Cut D, Cut E, Cut F, Gadsden Point Cut, Cut A (Hillsborough Bay [HB]), Cut C (HB), Cut D (HB), Port Sutton Channel, Port Sutton Turning Basin, and Big Bend Channel (including Big Bend East Channel, Big Bend Entrance Channel, and Big Bend Turning Basin).

Additionally, upper channel segments would be deepened as follows:
- Cut D (HB), Lower Sparkman Channel, and Upper Sparkman Channel to 41 ft;
- Ybor Channel and East Bay Extension Cuts 1 and 2 to 39 ft;
- and Port Sutton Terminal Channel to 42 ft.

Turn widener improvements are proposed for 3 locations: 1) Cut F-Gadsden Point Cut Widener; 2) Big Bend Widener; 3) Alafia Widener; and 4) Hooker's Point (Port Sutton Channel).

East Bay Turning Basin Expansion: Port Tampa Bay is proposing to expand the East Bay Turning Basin to a constructed diameter of 1,380 ft to provide additional space for the largest container vessels currently calling at the port to turn. Expansion of this area is necessary to accommodate safe maneuvering of these large vessels. The turning basin would be deepened to the Main Stem Channel depth (47 ft) and incorporated into the authorized federal channel.

East Bay Channel Extension 1: Port Tampa Bay previously constructed a 43-ft-deep channel segment adjacent to the East Bay channel (Extension 1) to allow continued access to berths in that location. This channel segment would be deepened with the Main Stem Channel to a depth of 47 ft and incorporated into the authorized federal channel.

Sparkman Channel Realignment: Increasingly larger cargo and cruise vessels have difficulty maneuvering safely around docked oil tankers in the existing Sparkman Channel. Port Tampa Bay widened this area westward by 65 ft to allow for safe transit, and to mitigate transit delays of these vessels through Sparkman Channel. The area previously widened by Port Tampa Bay will be incorporated into the authorized federal channel, and the channel will be proportionately shifted by 65 ft on the eastern side to maintain the authorized channel width (400 ft) in this area.

Entrance Channel Extension: Egmont Cut 1 currently extends into the GoM to the 47-ft isobath. Under the proposed action, Egmont Cut 1 would be deepened to 49 ft, and extended farther into the GoM by a maximum of 9,900 ft to connect the navigation channel to naturally deep water at the authorized depth.

Assumption of Maintenance (Big Bend and East Bay Extension 2): Port Tampa Bay previously constructed a 43-ft-deep channel segment extension of the Big Bend Channel. This channel segment would be deepened with the Big Bend Channel (to 47 ft) and incorporated into the authorized federal channel. Similarly, Port Tampa Bay previously constructed a channel segment adjacent to the East Bay channel (Extension 2) to 43 feet to access berths in that location. This channel segment would be deepened with the Main Stem Channel (to 47 feet) and incorporated into the authorized federal channel. The additional deepening of the channel segment would be conducted in combination with the deepening of the remainder of the Big Bend channel segments.

Required Overdepth and Advanced Maintenance: Initial construction would include the required project depths (described above) + 2 ft required overdepth + 1 ft additional allowable overdepth. Future maintenance would include the required project depth + 2 ft of allowable overdepth, except in Alafia Channel, which is +1 ft allowable overdepth. There is also authorized advance maintenance within Big Bend (+2 ft) and the Alafia Channel/Turning Basin (+1 ft).

The total estimated area of channel bottom to be disrupted by the dredging activities is 3,993 ac.

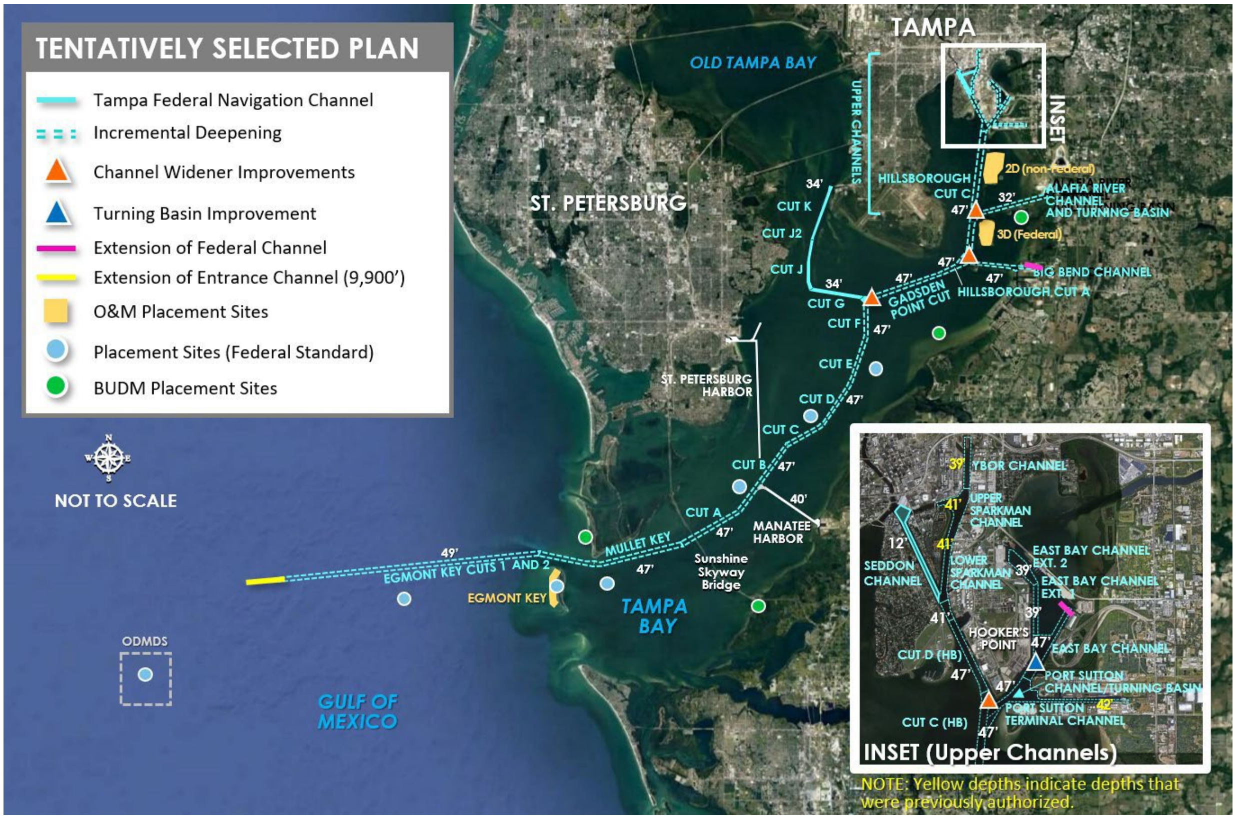

Figure 1. Overview of the Tentatively Selected Plan (TSP) for Tampa Harbor Navigation Improvement Study.

Proposed Dredged Material Placement Alternatives

Dredged material will be utilized in an array of placement options, including beneficial uses. Selection of a particular beneficial use option is based primarily on sediment characteristics, proximity to dredge site, and capacities of the available placement sites. The placement options include the following.

1. **Tampa ODMDS**: The Tampa ODMDS is in the GoM approximately 18 mi west of Egmont Key (Figure 1). The site covers 4 nm^2 with a bottom depth ranging from -70 to -90 ft. Material dredged from Tampa Harbor and Manatee Harbor has previously been disposed of in the Tampa ODMDS. A berm comprised of 3.4 mcy of dredged material from the 1984-85 deepening of Tampa Harbor is positioned horizontally across the center of the Tampa ODMDS. Due to the depth of water, the distance from landfall, and the proximity to the Loop Current, the berm, referred to as the "Briar Patch," has become covered by invertebrates and serves as a habitat for a variety of fish. Dredged material would be placed in a separate area within the Tampa ODMDS to avoid the "Briar Patch" and ensure protection of the resources found there.

2. **DMMAs**: DMMAs 2-D and 3-D were created between 1978 and 1982 during the

deepening of the Tampa Harbor Federal Navigation Project from 34 ft to 43 ft. The shorelines of both DMMAs are important American oystercatcher habitat; however, both shorelines are currently experiencing erosion that threatens this habitat. DMMA 2-D was nearing its capacity in the early 2000s and was subsequently enlarged by the Tampa Port Authority. Between the years 2014 and 2015, DMMA 3-D's containment dikes were raised to increase capacity using sandy material from inside the DMMA. The current capacity of DMMA 3-D is approximately 7.7 mcy. All of this capacity is required to ensure sufficient space to place material dredged to maintain the existing Tampa Harbor and channel dimensions for the next 20 years. Placing material from the proposed construction at DMMA 3-D would require raising the dike in approximately 2035 when the island reaches capacity.

3. **East Bay Port Expansion**: Port Tampa Bay is proposing to expand their facilities at East Bay to relieve congestion and accommodate current traffic levels. This site is currently open water adjacent to the East Bay Channel. Port Tampa Bay proposes to create additional port facilities and berths in this location. Rock material from the upper channel cuts (Figure 3) would be either hydraulically or mechanically excavated and placed in open water to provide fill material for the construction of this site. An anticipated volume of 3-4 mcy of fill is expected.

4. **MetroPort Port Expansion Upland Fill**: Port Tampa Bay is also planning to expand upland facilities in the Ybor Channel. Rock material from the upper cuts would be either hydraulically or mechanically excavated and placed in open water to provide fill material for the construction of a site at a former dry dock facility. Fill placement will convert open water into uplands. The anticipated volume of material required is approximately 500,000 cy. See Figure 2 for a plan view of the MetroPort Port Expansion site location.

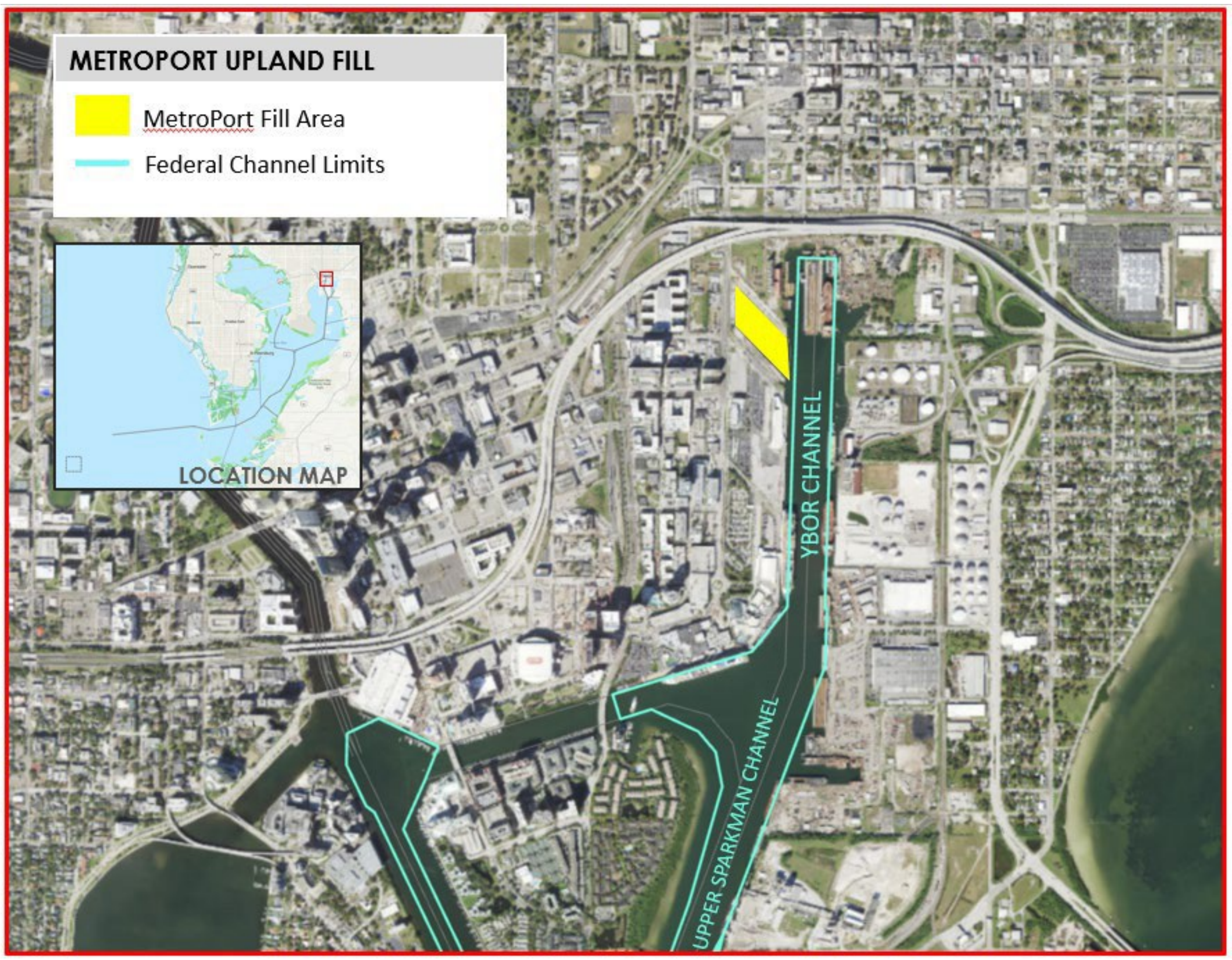

Figure 2 Plan view of Metroport BUDM placement site location.

5. **Manatee County Boat Ramp**: Manatee County is tentatively planning to construct a boat ramp with associated facilities along the southern approach to the Sunshine Skyway Bridge. Final plans and extents are still in development. Dredged material would be placed in open water as fill material (i.e., convert submerged lands to uplands) for the future construction of these facilities. Between 500,000 cy and 1 mcy of mixed sediments containing rock, sand, and some silt could be placed at this location.

6. **Hardbottom Creation (Offshore and In-Bay)**: A total of six hardbottom sites (one offshore site and five in-bay sites) are proposed as beneficial use sites (Figure 3). Up to 5 mcy of material could be placed at in-bay hardbottom creation sites, and up to an additional 2 mcy of material could be placed at an offshore hardbottom creation site. The material placed would comprise at least 50 percent consolidated material (primarily limestone).

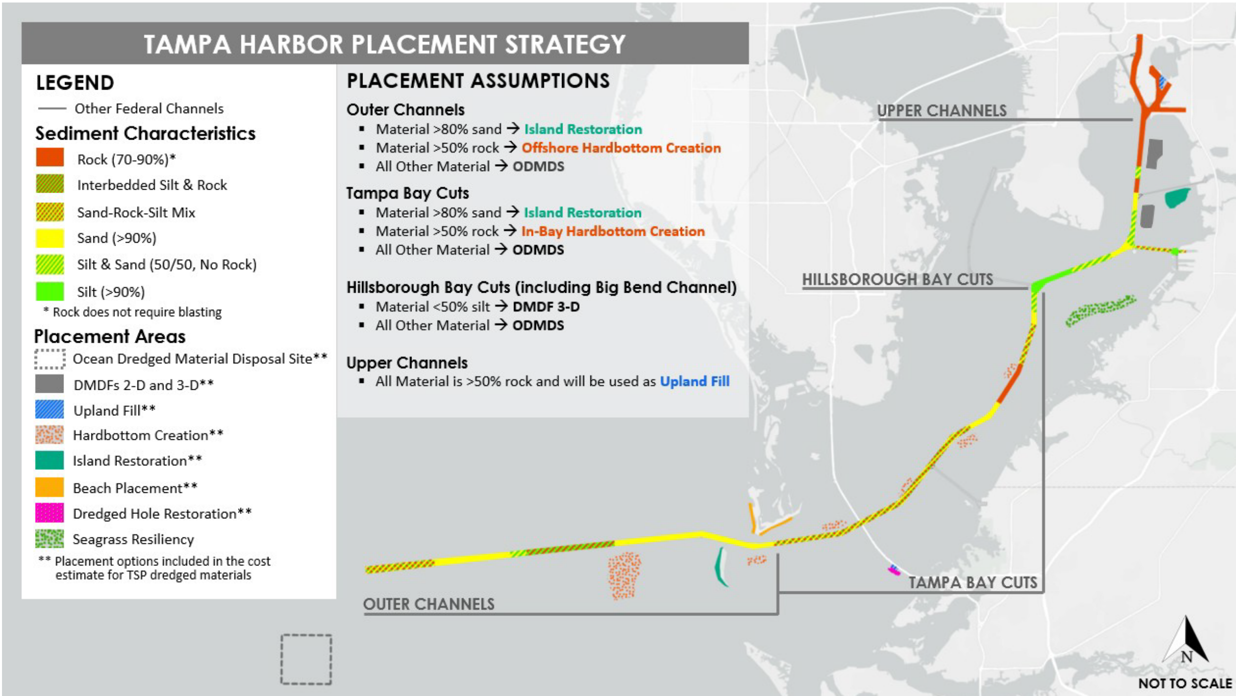

Figure 3 Sediment characteristics and placement strategy for dredged material resulting from the TSP.

7. **Egmont Key Island Restoration**: Egmont Key has eroded to almost half its original width since the 1970s. Every 4-6 years, USACE places sand and silty sand on the island sourced from maintenance dredging activities occurring from the Egmont Cut 1 north through Cut F (Tampa Bay). Current maintenance dredging events place between 500,000 cy and 1 mcy of sand on the island (primarily focused on the northern and central portions of the island). The proposed beneficial use option for Egmont Key would involve significant physical alterations to the island, including the restoration of full primary and secondary dune systems. This proposal includes the placement of 2 to 5 mcy of sand along the entirety of the island to return it to its 1950s dimensions. Placement will be focused more on the center of the island, which will likely reduce the amount of sediment infilling back into the federal channel to the north of Egmont Key.. Full restoration would include restoring the island to its approximate original dimensions, and creating upland habitat, dune, and beach berm features. The USACE would work with partners and stakeholders to install appropriate dune and back-dune vegetation. See Figure 4 and Figure 5 below describing this placement site. Operations and Management (O&M) placement would not occur during placement of material from the deepening since the source location for the construction dredging is the same as where maintenance material is typically dredged. It is expected that future shoaling would occur at similar frequency and volumes as historical shoaling (i.e., approximately 500,000 cy to 1 mcy every 4-5 years). Placement of material from the deepening is proposed

to occur at any time of the year.

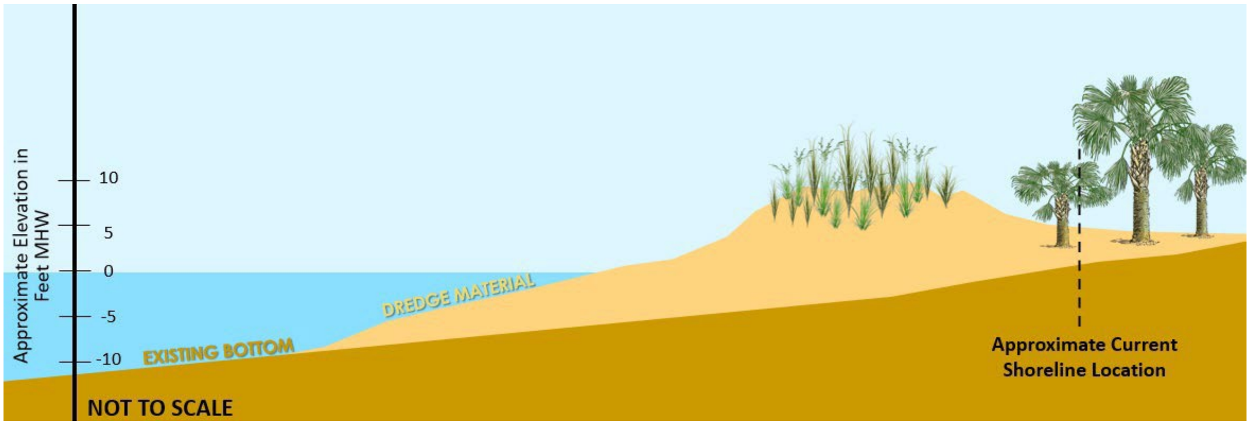

Figure 4. Conceptual cross-section of Egmont Key Island Restoration to include berm, dune, and back-dune features.

Figure 5. Proposed sand placement at Egmont Key.

8. **Ft. DeSoto/Mullet Key Beach Placement**: Fort De Soto beach area on Mullet Key is at the southernmost tip of Pinellas County. The beach experiences erosion due to

regular waves and currents as well as erosion induced by storms. Placement of nourishment material helps to protect the historic Fort De Soto itself as well as provide recreational areas and extend the life of the upland disposal areas. The site requires beach quality sand (less than 10 percent fine material). The site could accept up to 1 mcy of material both during initial construction and from future maintenance dredging events.

9. **Dredged Hole Restoration at the Sunshine Skyway**: During the construction of the Sunshine Skyway Bridge, material was dredged from Tampa Bay to create the southern approach. While portions of the dredged area may have previously supported seagrass habitat, the dredging left a hole approximately 55 ac in size that is too deep to allow for light penetration and seagrass growth. Filling the hole to the surrounding depths would allow for adjacent seagrasses to naturally recruit into this area. Between 750,000 cy and 1.5 mcy of mixed sand, silt, and rock would be used to fill the hole.

10. **Seagrass Resiliency/Habitat Creation**: Tampa Bay has experienced 6 in of sea level rise in the last 40 years. As water levels rise, areas that historically supported seagrass growth will become too deep for plants to receive sunlight. To allow for seagrass expansion into areas currently too deep to support them, rock from the Tampa Bay or Hillsborough Bay channel cuts would be placed at depths of approximately 12 ft MHW to form a perimeter. Top elevations of the rock would be between 4 and 6 ft MHW. Sand and silty sand would be placed hydraulically to fill the area between existing, continuous seagrasses and the rock perimeter feature. Approximately 500,000 cy to 1 mcy of sand and silty sand would be placed hydraulically to fill the area between existing, continuous seagrasses and the rock perimeter feature. Seagrasses would naturally recruit into the newly filled area. See Figure 6 for cross-section of the proposed placement site.

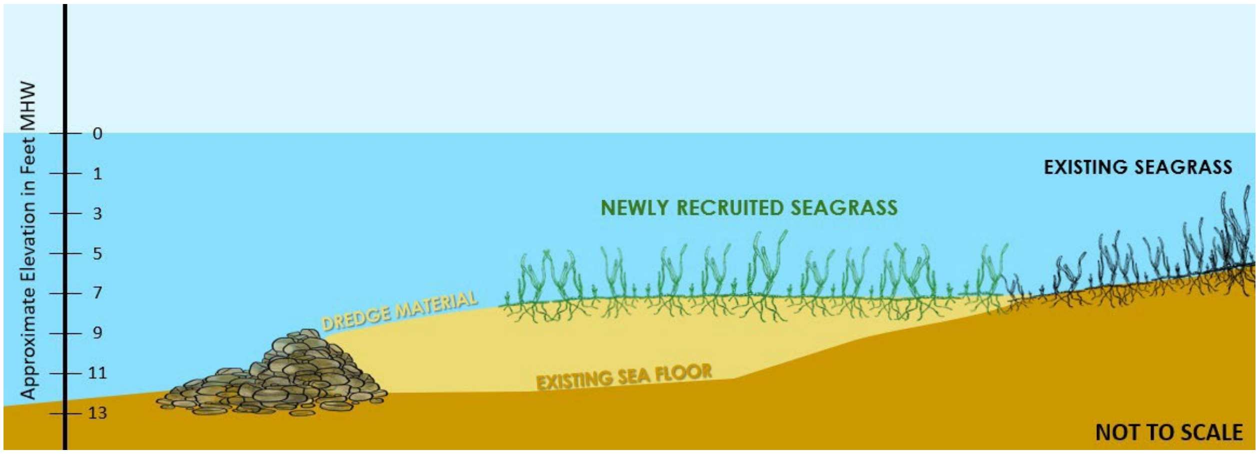

Figure 6. Cross-section showing conceptual placement of dredged material to provide habitat for seagrass recruitment into areas formerly too deep to support their growth

Alafia Banks Island Restoration: Dredged material from the proposed deepening (primarily sand or silty sand) would be used to expand the Alafia Bank Sanctuary Island in a design that maximizes shoreline length for nesting shorebirds (Figure 7). The island expansion could be constructed in combination with submerged features, such as shallow water habitat to support seagrasses and wading birds or hardbottom habitats. A volume of 500,000 cy to 1 mcy is anticipated for the island expansion. Rock material could be used in shallow water areas to act as a wave break to preserve the new shoreline and to provide nearshore hardbottom habitat for oyster recruitment. It would also provide containment to reduce turbidity during the placement of the remainder of the material. Coir logs may be used as another option for protecting the newly placed material from erosion until seagrasses recruit and stabilize the material. Either coir logs or rock materials could potentially be used depending on the availability of dredged rock material for this beneficial use site.

Figure 7. Conceptual design of the proposed habitat zones that would be created using dredged materials at the Alafia Banks Critical Wildlife Area.

The estimated total acreage of each placement area is listed in Table 1 below along with an estimated maximum area disturbed within that footprint assuming all sites are used.

Table 1. Estimated total acreage of each placement site and estimated maximum area disturbed within each site.

BUDM SITE	Total Site Size (ac)	Estimated Placement Area (ac)
Egmont Key Island Restoration	150	150
Hardbottom Creation (Offshore)	1800	250-400 (based on 5 ft depth)
Hardbottom Creation (In-Bay)	962	400-600 (based on 5 ft depth)
Ft. DeSoto Beach Placement	146	146
Dredged Hole Restoration	60	60
Manatee County Boat Ramp	32	32
Seagrass Resilience	1,084	100-200 (based on avg. 3 ft depth)
Alafia Banks Sanctuary	426	207 (based on avg. 3 ft depth)
East Bay Port Expansion	74	74
MetroPort Port Expansion	5	5
Offshore ODMDS	2,560	100
Total	**7,299**	**1,974**

Pre-Treatment of Substrate
The proposed harbor and channel improvements would remove about 21.3 mcy of limestone rock, sand, and silt from the federal channels. Figure 3 shows the characteristics of the sediment in the dredging profile for the TSP along with the placement assumptions for each sediment type. Rock material is shown in red. Limestone, sandstone, and siltstone of various conditions are present throughout Tampa Harbor. Conditions range from hard to soft, thick bedded to thin bedded, massive, or interbedded with sand, silt, and clay. Most of the limestone has solution holes and are porous. Historic knowledge from past deepening projects, and the review of the available data, indicate that the rock can be dredged using conventional dredging methods without blasting for pretreatment; however, the final determination on whether blasting needs to be included as a pre-treatment tool available for contractors will be made during the Preconstruction and Engineering Design phase once the new geotechnical exploration is performed and analyzed. If the USACE determines that blasting may be required based on new information obtained during the Preconstruction and Engineering Design phase, the USACE will reinitiate consultation with NMFS.

Pre-treatment of rock (e.g., ripping with a large excavator, hamming, or "rock chopping" with a large cutterhead dredge) will likely be needed for localized occurrences of hard rock in the Big Bend area. The UCS results at Big Bend channel included one sample with a rock strength of 7,400 psi indicating very hard rock at Big Bend. However, the area of the rock layer where the testing specimen was obtained was dredged with a larger cutterhead dredge during the most recent deepening in 2019. The remainder of the project area shows soft to moderately hard rock. Blasting as a pre-treatment for this rock is not expected based on the available geotechnical data.

2.1.2 Construction Methodology and Duration

The dredging of the project will be completed with a variety of dredge types, depending on the sediment at that location. Hopper dredges could be utilized for primarily sandy areas, and cutterhead and clamshell dredges could be utilized in areas where there is more rock present. Based on the sediment characteristics throughout the project area, there are up to 8 mcy of material that could be dredged utilizing a hopper dredge for the TSP. The duration of hopper dredging would be between 14 to 26 months. As described below in this section, and in Section 2.1.3 (Conservation Commitments), USACE will utilize relocation trawling or open-net (non-capture) trawling in association with hopper dredging activities, wherever it is logistically feasible and safe to do so, as an avoidance and minimization measure to reduce the risk of potential lethal take of ESA-listed species. To further minimize risk to sea turtles, and based on available incidental take data from previous O&M events, the USACE will only conduct hopper dredging activities from December 1 through September 30.

General Description of Dredging Methods

Mechanical Dredging

Mechanical dredges are characterized by the use of some form of bucket or clamshell that excavates material by scooping it from the bottom, then raising the bottom material and placing it onto a waiting barge or directly into a placement/disposal area (Figure 8). Mechanical dredges work best in consolidated, or hard-packed, substrate and can be used to clear rocks and debris. Dredging buckets have difficulty retaining loose, fine substrate, which can be washed from the bucket as it is raised through the water column. Mechanical dredges are rugged and can work in tightly confined areas. They vary in size from small equipment mounted on shallow-draft barges with limited bucket size (i.e., with capacities as small as 1 cy) to larger equipment arrays mounted on a large barges with bucket capacities up to 10 cy or more). Barges are towed to the dredging site, then secured in place by anchors or spuds. Mechanical dredges are often used in harbors, around docks and piers, and in relatively protected channels, but are not suited for areas of high traffic or rough seas.

Dipper dredges and clamshell dredges, named for the scooping buckets they employ, are the 2 most common types of mechanical dredges (Figure 8). A bucket dredge begins the digging operation by dropping the bucket in an open position from a point above the sediment. The bucket falls through the water and penetrates into the bottom material. The sides of the bucket are then closed and material is sheared from the bottom and contained in the bucket compartment. The bucket is raised above the water surface, swung to a point over the barge, and then released into the barge by opening the sides of the bucket. The dipper dredge is essentially a power shovel mounted on a barge. It can dig hard materials and has all the advantages of the bucket dredge, except for its deep digging and sea state capabilities. Similar to the bucket dredge operation, the dipper dredge places material into a barge, which is towed to a disposal area (USACE 1993).

Usually, 2 or more disposal barges are used in conjunction with the mechanical dredge. While 1 barge is being filled, another is being towed to the dumpsite by a tug and emptied. If a diked disposal area is used, the material must be unloaded using mechanical or hydraulic equipment. Using numerous barges, work can proceed continuously, interrupted only by changing dump barges or moving the dredge. This makes mechanical dredges particularly well-suited for dredging projects where the disposal site is many miles away.

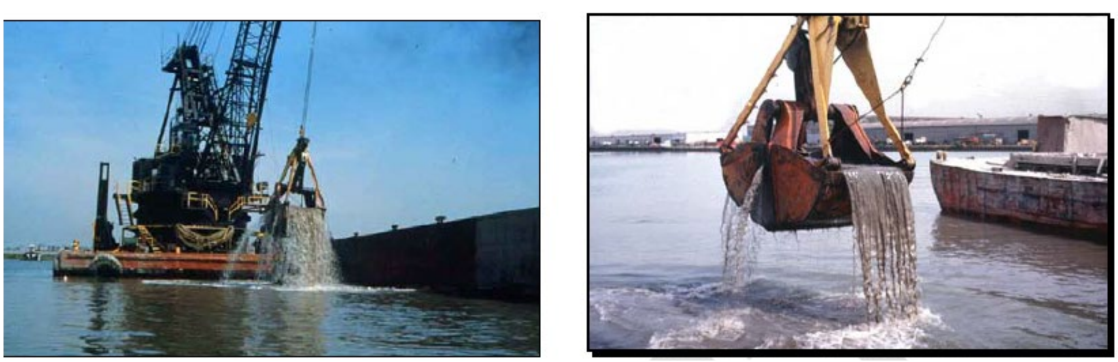

Figure 8. Mechanical dredge (clamshell bucket and barge).

Hydraulic Dredging

Hydraulic dredging (also referred to as cutterhead or pipeline dredging) is characterized by the use of a pump to dredge sediment and the transportation of the dredged material slurry and water to identified discharge areas (Figure 9). The ratio of water to sediment within the slurry mixture is controlled to maximize efficiency. The main types of hydraulic dredges are pipeline and cutterhead dredges.

Pipeline dredges are designed to handle a wide range of materials including clay, hardpan, silts, sands, gravel, and some types of rock formations without blasting. They are used for new work and maintenance in projects where suitable placement/disposal areas are nearby, and they operate in an almost continuous dredging cycle resulting in maximum production, economy, and efficiency. Pipeline dredges are capable of dredging in shallow or deep water, and have accurate bottom and side slope cutting capabilities. Limitations of pipeline dredges include relative lack of mobility, long mobilization and demobilization times, inability to work in high wave action and currents, and they are impractical in high traffic areas.

Pipeline dredges are rarely self-propelled, and typically must be transported to and from the dredge site by barge or tow. Pipeline dredge size is based on the inside diameter of the discharge pipe, which commonly ranges from 6-36 in. They require an extensive array of support equipment including the pipeline (floating, shore, and submerged), boats (crew, work, survey), barges, and pipe handling equipment. Most pipeline dredges have a cutterhead on the suction end. A cutterhead is a mechanical device that has rotating teeth to break up or loosen the bottom material so that it can be sucked through the dredge. Some cutterheads are rugged enough to break up rock for removal (Figure 9).

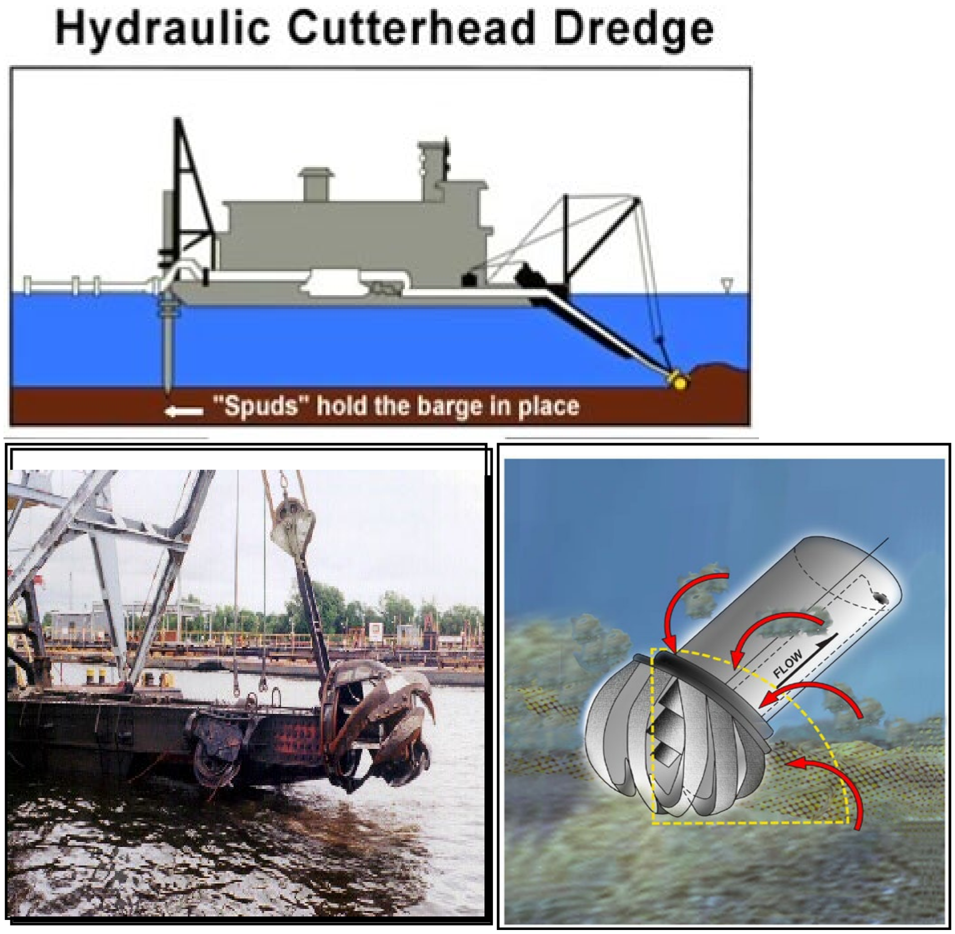

Figure 9. Cutterhead pipeline dredge schematic and representative photograph.

During the dredging operation, a cutterhead suction barge is held in position by 2 spuds at the stern of the dredge, only 1 of which can be on the bottom while the dredge swings. There are 2 swing anchors some distance from either side of the dredge, which are connected by wire rope to the swing winches. The dredge swings alternately between port and starboard, passing the cutter through the bottom material until the proper depth is achieved. The dredge advances by “walking” itself forward on the spuds. This is accomplished by anchoring the port spud in place and swinging the dredge to the port an appropriate distance, then the starboard spud is dropped and the port spud is raised. The dredge is then swung an equal distance to the starboard, the port spud is dropped again, and the dredge is settled in its new position.

Cutterhead pipeline dredges work best in large areas with deep shoals, where the cutterhead is buried in the bottom. A cutterhead removes dredged material through an intake pipe and then pushes it out the discharge pipeline directly to the placement/disposal site. Most, but not all, pipeline dredging operations involve upland placement/disposal of the dredged material. Therefore, the discharge end of the pipeline is connected to a shore pipe. When effective pumping distances to the placement/disposal site become too long, a booster pump is added to the pipeline to increase the efficiency of the dredging operation.

Hopper Dredging

The hopper dredge, or trailing suction dredge, is a self-propelled ocean-going vessel with a section of the hull separated into 1 or more hoppers. Fitted with powerful pumps, the dredges suck sediment from the surface of the seafloor through intake pipes, called dragarms, and store it in the hoppers. Normal hopper dredge configuration has 2 dragarms, one on each side of the vessel. A dragarm is a pipe suspended over the side of the vessel with a suction opening called a draghead for contact with the bottom (Figure 10). Depending on the hopper dredge, a slurry of water and sediment is generated from the plowing of the draghead "teeth," the use of high pressure water jets, and the suction velocity of the pumps. The dredged slurry is distributed within the vessels hopper allowing for solids to settle out and the water portion of the slurry to be discharged from the vessel during operations through its overflow system. When the hopper attains a full load, dredging stops, and the ship travels to either an in-water placement site, where the dredged material is discharged through the bottom of the ship by splitting the hull, or by opening doors in the bottom of the hull, or hooks up to an in-water pipeline, where the dredged material is transported to a shore placement site (e.g., beach nourishment).

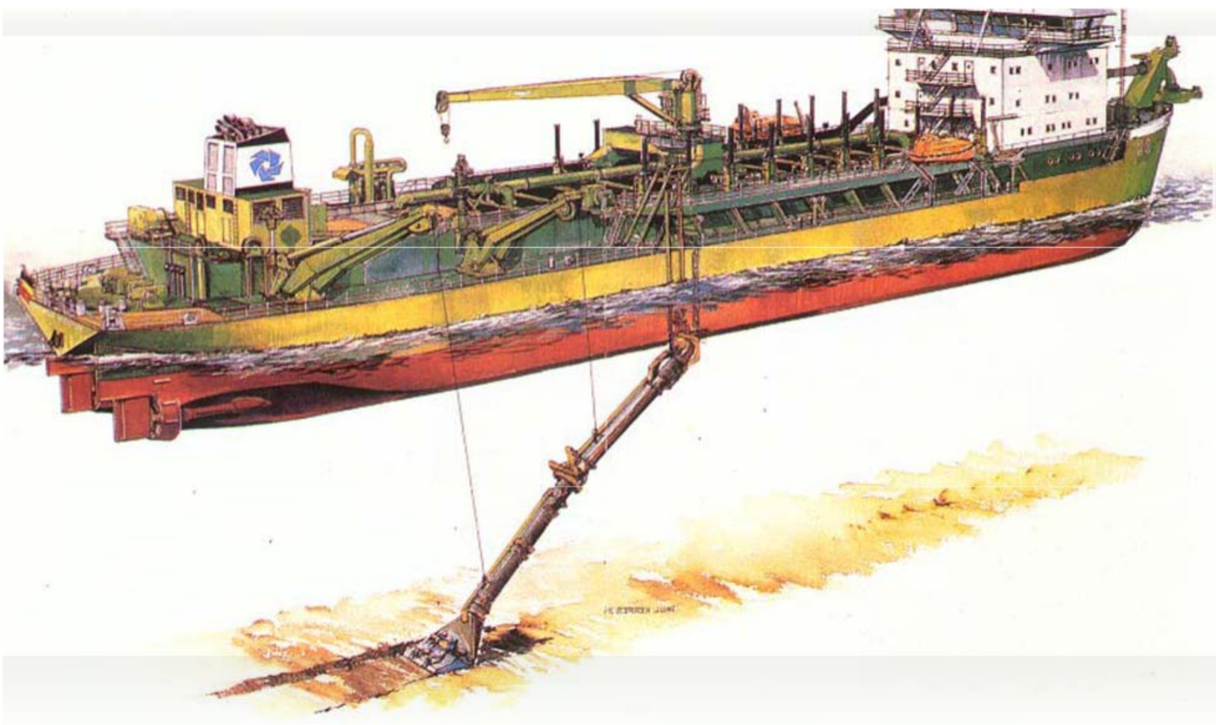

Figure 10. Hopper dredge illustration.

Hopper dredges are well-suited to dredging heavy sands. They can work in relatively rough seas but safety, effectiveness, and costs are a concern. Because they are mobile, they can be used in high-traffic areas. They are often used at ocean entrances and offshore, but cannot be used in confined or shallow areas due to their size and draft.

Hopper dredges can move quickly to disposal sites under their own power (maximum speed unloaded is ≤ 17 kt; maximum speed loaded is ≤ 16 kt). Because dredging stops during the transit to and from the disposal area, the operation loses efficiency if the haul distance is too far. Based on the review of hopper dredge speed data provided by the USACE Dredging Quality Management program (https://www.sam.usace.army.mil/Missions/Spatial-Data-Branch/Dredging-Quality-Management/Tools/Reports/DQM-Generated-Reports), the average speed for hopper dredges while dredging is between 1-3 kt, with most dredges never exceeding 4 kt.

Draghead Deflectors
In order to minimize the risk of incidental take of sea turtles, sea turtle deflectors are added to the dragheads used on hopper-dredging projects where the potential for sea turtle interactions exist and the dredging environment does not reduce the efficacy of the deflector or increase the risk for sea turtle interaction (Figure 11). The leading edge of the deflector is designed to have a plowing effect of at least 6-in depth when the drag head is being operated. Appropriate instrumentation is required on board the vessel to ensure that the critical "approach angle" is attained in order to satisfy the 6-in plowing depth requirement (USACE 1993).

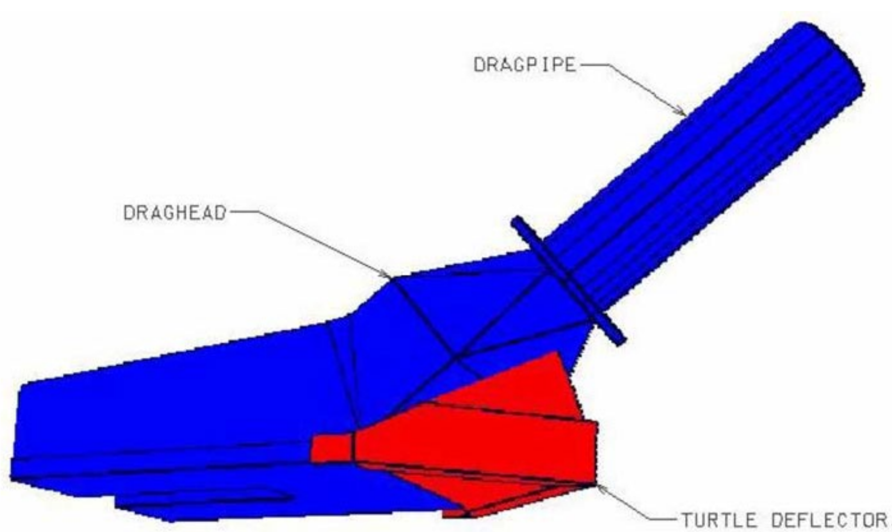

Figure 2. Illustration of a hopper dredge draghead with installed sea turtle deflector.

Inflow screening
Once material enters the draghead by suction generated at the pump positioned along the draghead arm, a slurry of water and sediment material passes through a screened inflow box on its way to the hopper (Figure 12). Generally, screening has 4-in by 4-in openings to optimize the inflow of material while still ensuring accountability of entrained species. The purpose of the inflow screening is for PSOs to monitor for entrained protected species and bycatch; however,

other debris (i.e., rock, clay, wood, trash, etc.) larger than the screen size may also be captured resulting in the potential for clogging the boxes. Changing the size of screening requires welding on a new screen and takes time, so limiting the number of changes in screen sizes is important.

Figure 12. Images of various inflow boxes that shows the variety in size and screening

Overflow screening
The dredged material slurry that collects in the hopper is dewatered by allowing for the water to overflow out of the hopper while coarser sediment is retained (Figure 13). Before the overflow water is released, it passes through an overflow screen to ensure additional observation and reporting of entrained species. This overflow may or may not be screened depending on the hopper dredge.

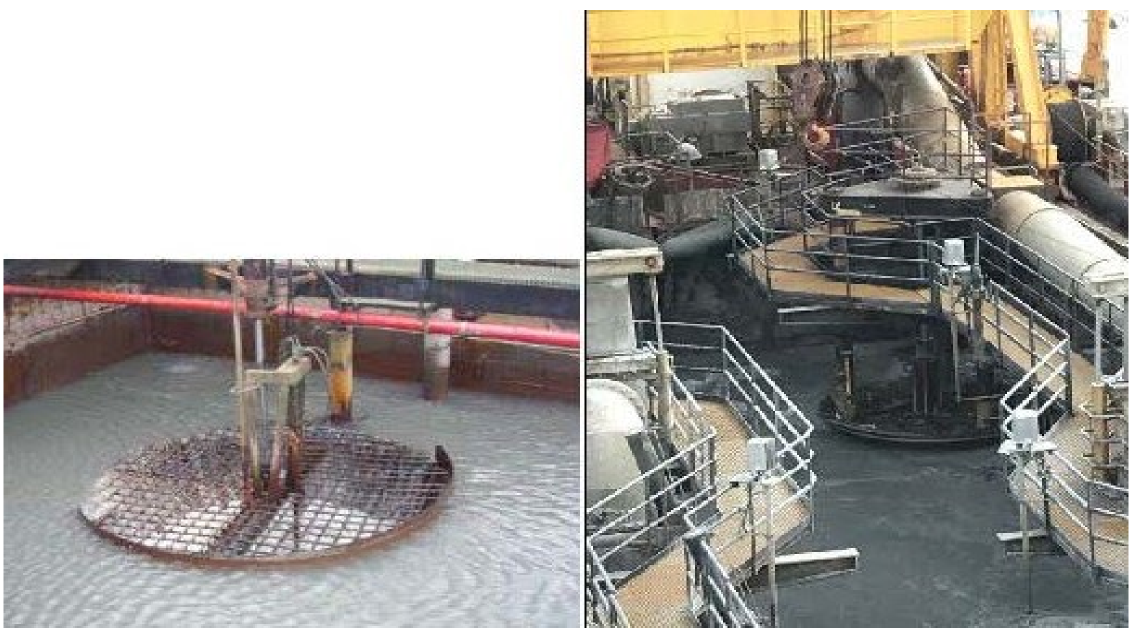

Figure 13. Examples of overflow screening

<u>Relocation Trawling</u>

The intentional capture of ESA-listed species by relocation trawling may be used to assess or reduce the abundance of ESA-listed species in a project location to minimize the risk of lethal encounters with a hopper dredging operation. Modified shrimp trawling equipment is used to sweep the sea floor to either startle ESA-listed species out of the area, with open net (no-capture) trawling, or to capture and relocate these species, through the use of closed net relocation trawling. This management technique was originally initiated in the early 1980s at Canaveral Harbor, Florida, and has continued to be used as a take minimization measure for dredging in the southeast.

Relocation trawling vessels must maintain a safe distance from the hopper dredge and other vessel traffic in the area. Therefore, the trawler is often not working directly in front of the hopper dredge, but is instead continuously working to remove ESA-listed species from the general dredging area. Relocation trawling vessels are also smaller than hopper dredges and therefore more restricted by the weather conditions in which they can safely operate.

Transportation Methodology

Methods of transporting dredged material to placement sites include self-propelled transport via barges or towing of loaded barges to disposal sites via tugboats. Tugboats may be used to move immobile equipment into place as well as tow loaded barges to the placement sites. Dredged material may also be transported by pipeline as described above under hydraulic dredging. Vessels associated with the proposed deepening will primarily utilize existing navigation channels due to their deeper drafts. Dredged material would be transported to placement sites using existing navigation channels where possible, taking the shortest and safest route for the scow and tug.

Material Placement Methodology

The following descriptions include the current expectations of material placement methodologies for each of the placement sites.

Tampa ODMDS: Placement would occur through bottom-dumping of hopper dredges and/or scows.

Hardbottom Creation (both offshore and in-bay) BUDM Placement Sites: Placement would occur through bottom-dumping of scows. Sites are located in water deep enough to support this type of placement while ensuring that final sediment elevations do not impede safe navigation of recreational vessels.

Egmont Key/Ft. DeSoto BUDM Placement Sites: Sand would be hydraulically pumped onto the beach/intertidal area. Construction equipment located on the beach would grade material to the specified elevations and slopes. Staging would occur on the beach. Operations would occur similarly to previous beach placement operations in these locations.

Dredged Hole Restoration BUDM Placement Site: All work would be done from the water. Sediment would either be bottom dumped from a scow (if depths allow) or hydraulically pumped into the dredged hole. Pipelines would either be floated to the location of the dredged hole or sunk to the bottom.

Manatee County Boat Ramp/East Bay Port Expansion/MetroPort Port Expansion BUDM Placement Sites: All work would be done from the water. Dikes would be created from sand and rock materials to contain the dredged materials. It is expected that all three of these placement sites would utilize similar placement methodologies.

Seagrass Resilience BUDM Placement Site: All work would be done from the water. Dikes would be created with rock (possibly mixed with sand) along the seaward perimeter of the site (shore-parallel, longshore bar-type feature) to contain the remainder of the sediment. Rock, sand, or silty sand would be hydraulically placed landward of the dike feature. The pipeline could be sunken or floating. Final elevations would be approximately 3-5 ft below MHW. No further grading of the material would occur following placement.

Alafia Banks Island Restoration BUDM Placement Site: All work would be done from the water. Sediment would be hydraulically placed. Pipelines could be floating or sunken, and they would be located to avoid existing seagrasses. The perimeter of the site would not be contained to allow material to fall into a natural shoreline slope, similar to beach placement. Construction equipment may be needed to grade material to the specified elevations and slopes and to move the pipe.

It is expected to take approximately 6-7 years to complete all of the proposed activities.

2.1.3 Conservation Commitments

All aspects of the proposed project will include environmental protection measures for the minimization of impacts to natural resources and ESA-listed species. The USACE will incorporate into the project plans the following BMPs, FDEP turbidity requirements, standard protection conditions, applicable GRBO (NMFS 2007) Terms and Conditions, and specifications to minimize and eliminate adverse impacts where possible.

- The USACE will implement the protective measures of NMFS SERO’s 2021 Protected Species Construction Conditions and NMFS SERO’s Vessel Strike Avoidance Measures and Reporting for Mariners.
- Construction activities will be managed to minimize interference with, disturbance of, and damage to fish and wildlife. Prior to the start of construction, the Contractor will submit to the USACE an EPP for review. The EPP will include protective measures for species that require specific attention.
- NMFS SERO’s 2021 Protected Species Construction Conditions and NMFS SERO’s Vessel Strike Avoidance Measures and Reporting for Mariners will be included in the Contractor’s EPP.

- Implementation of design and procedural controls will minimize the potential of oil, fuel, or other hazardous substances entering the air or water.
- All wastes and refuse generated by project construction will be removed and properly disposed.
- Contractors will implement a spill contingency plan for hazardous, toxic, or petroleum material.
- Turbidity will be monitored in compliance with state requirements, and an independent monitoring plan will be developed and coordinated with NMFS prior to implementation of dredging. Turbidity exceedances would result in all in-water work ceasing (i.e., dredge shutdown) until levels return to an acceptable level. Turbidity compliance levels from dredging must be no higher than 29 NTUs above background levels at the edge of a 150-m mixing zone, and 0 NTUs above background levels at the edge of a 150-m mixing zone within Outstanding Florida Waters unless FDEP directs otherwise in a Water Quality Certification.
- Use of National Dredging Quality Management and Operations and Dredging Endangered Species System Programs.
- To reduce potential disorientation effects on female sea turtles approaching nesting beaches and on sea turtle hatchlings making their way seaward from their natal beaches, while still adhering to minimum luminance requirements, light emanating from offshore equipment would be minimized through reduced wattage, shielding, lowering, and/or use of low-pressure sodium lights to the maximum extent practicable. Shielded low-pressure sodium vapor lights have been identified by the USFWS as the best available technology for balancing human safety and security and endangered species protection. They provide the most energy efficient, monochromatic, long-wavelength, dark sky friendly, environmentally sensitive light of the commercially available lights.
- During all hopper dredging operations, the following measures will be implemented:
    - All work will occur between December 1 through September 30.
    - PSOs will monitor for the presence of ESA-listed species. The dredge operator will maintain a safe working environment for the PSO to access and effectively monitor inflow screening, overflow screening, and dragheads for incidental take of ESA-listed species and associated bycatch after every load. All new hopper dredge vessels or modifications made to existing vessels must be designed to allow safe access to and/or visibility of all collected material in both the inflow box and overflow screening areas so that the PSO is able to inspect the contents after every load for evidence of ESA-listed species.
    - Upon completion of each load cycle, dragheads will be monitored as the draghead is lifted from the sea floor and placed on the saddle in order to assure that ESA-listed species that may be impinged within the draghead are observed and accounted for. The PSO, or designated dredge crew member under the guidance and supervision of the PSO when safety is of concern, will physically inspect dragheads for evidence of ESA-listed species take after every load.
    - Inflow screening will be designed to capture and retain material for the PSO to monitor for the presence of ESA-listed species. The screened area will be

accessible to the PSO to ensure 100% observer coverage. The PSO will inspect the contents of all inflow screening boxes after every load, including opening the box (where applicable and safely accessible) and looking inside at all contents for evidence of ESA-listed species entrainment. If the contents are not clearly visible and identifiable from a location outside of the box, then in limited instances, the PSO may be required to enter the inflow box to identify contents for evidence of ESA-listed species take.

- All hopper dredges will be required to have 100% inflow screening unless they must be removed for safety due to clogging. Any such modifications (removal) will be made only after additional consultation is completed with the NMFS.
- Hopper dredge operators will not open the hydraulic doors on the inflow boxes prior to inspection by the PSO for evidence of ESA-listed take.
- If the inflow box cannot be observed due to clogging, the box contents cannot be dumped or flushed unless overflow screening that captures contents for observation by the PSO is operational and monitored for evidence of take. Once overflow screening is operational, PSOs will also visually monitor box contents as they are dumped or flushed into the hopper.
- All hopper dredges are recommended to have operational overflow screening and monitor for take after each load. Overflow screening is required to be installed and monitored after each load if the inflow screening is removed or bypassed due to clogging.
- Overflow screening will be designed to capture and retain material larger than the screen size for the PSO to monitor for the presence of ESA-listed species. The screened area will be accessible to the PSO to inspect for evidence of ESA-listed species take.
- Screen size will start at 4-in by 4-in, but may be adjusted to a larger screen size if clogging reduces the ability for the PSO to monitor the screen for the presence of ESA-listed species or if clogging reduces dredging production and thereby expands the time dredging is required. All modifications will be made only after additional consultation is completed with the NMFS.
- To prevent impingement or entrainment of ESA-listed species within the water column, dredging pumps will be disengaged by the operator when the dragheads are not actively dredging and therefore working to keep the draghead firmly on the bottom. Pumps will be disengaged when lowering dragheads to the bottom to start dredging, turning, or lifting dragheads off the bottom at the completion of dredging. Hopper dredges may utilize a bypass or other system that would allow pumps to remain engaged but result in no suction passing through the draghead. This dredge modification (when employed) is commonly referred to as a turtle bypass valve. This precaution is especially important during the cleanup phase of navigation dredging operations to remove remaining high spots or when a shallow veneer of compatible sediment remains within a borrow area; thus limiting overdepth dredging and plowing efficacy of the turtle deflector. In these

example circumstances, the draghead may frequently come off the bottom and can suck in ESA-listed species resting or foraging in shallow depressions.
    - All waterport or other openings on the hopper dredge will be required to be screened to prevent ESA-listed species from entering the dredge.
    - A state-of-the-art solid-faced deflector that is attached to the draghead will be used on all hopper dredges at all times.
    - Pumping water through the dragheads is not allowed while maneuvering or during travel to/from the disposal or pump-out area. The dredge operator will ensure the draghead is embedded in sediment when pumps are operational, to the maximum extent practicable.
    - If munitions and explosives/unexploded ordinance screening is used, USACE will coordinate with NMFS prior to use.
- Bed-levelers used as part of the proposed action will be of a design that produces a sand wave in front of the leading face of the bed-leveling device such that it disturbs sea turtles off the sea/channel floor bottom. All support structures will be welded to prevent impingement or "pinch points" for passing ESA-listed species. The bed-leveler will be slowly lowered to the sea/channel bottom and the depth of the bed-leveler adjusted constantly to meet required depth and to compensate for tidal fluctuations. The bed-leveler will be towed/pushed along the bottom no faster than needed to move the material at the sea/channel bottom (approximately 1-2 kt).

- USACE will utilize relocation trawling and/or open net (non-capture) trawling in association with hopper dredging activities wherever it is logistically feasible and safe to do so. This measure is intended to reduce the risk of potential lethal take of ESA-listed species. USACE will coordinate with NMFS prior to mobilization of trawling.

2.2 Action Area

Tampa Bay is a large, natural Y-shaped harbor and shallow estuary connected to the GoM on the west-central coast of peninsular Florida, comprising Hillsborough Bay, McKay Bay, Old Tampa Bay, Middle Tampa Bay, and Lower Tampa Bay. The Tampa Harbor Federal Navigation Project includes roughly 70 mi of channels from the GoM entrance at the Egmont Bar north to the City of Tampa, including Hillsborough River, Alafia River, and the Upper Channels. The main stem channel leading into the Tampa Bay port system is approximately 42 mi long, 500 ft wide, and 43 ft deep. This single stem channel must be transited not only by vessels going to and from the Port of Tampa, but also by vessels going to and from Port Manatee, St. Petersburg Harbor, and Weedon Island. The single stem is composed of nine (9) cuts: Egmont Key 1, Egmont Key 2, Mullet Key, and Cuts A to F (Figure 1). The action area also includes the proposed hardbottom creation area offshore from Egmont Key, and extends out to the ODMDS, including the material transport vessel routes used to reach these offshore sites (Figure 3)

Hardbottom Habitat

Tampa Bay has areas of fossilized corals, limestone outcroppings (mainly those that have been exposed by dredging operations and have remained exposed through the swift tidal currents flowing in the channel), rubble (some of which has been placed within the right-of-way during previous bridge construction activities), and artificial reefs, collectively known as "hardbottom." These habitats may serve as critically important stop-offs for juvenile fish as they graduate from nursery areas in the bay to offshore habitats in the Gulf. Because the hard bottoms often have very low relief, they may be covered (or uncovered) by sand during heavy storms.

Hardbottom communities are benthic habitats dominated by epifaunal organisms such as sponges, hard and soft corals, hydroids, anemones, barnacles, bryozoans, decapod crustaceans, and gastropods. By nature, these organisms are sessile, and most are attached directly to the hard substrate. These habitats are important for ESA-listed species within the project area, such loggerhead, Kemps ridley, and hawksbill sea turtles that use these areas as foraging habitat.

While there are naturally occurring hardbottom habitats in Tampa Bay, habitat was also created during the initial dredging of the Tampa Harbor channels and during subsequent deepening events. Dredging the channel cut through the limestone bedrock underlying Tampa Bay and created ledge habitat along the channel edge. Dredged rocky materials placed at sites between 200-500 ft from the channel also created hardbottom rubble habitat.

Artificial reefs are located in the following locations within the action area.

(1) Old Tampa Bay near the Courtney Campbell and Howard Franklin bridges,
(2) Picnic Island;
(3) in Hillsborough Bay off Ballast Point;
(4) in Tampa Bay off Bahia Beach;
(5) Port Manatee; and,
(6) near Shell Island, east of Egmont Key.

Surveys conducted in 2010 (ANAMAR 2010) identified additional hardbottom habitats along the edges of the current channel. These hardbottom habitats include low-relief ledge, moderate-relief ledge, and non-ledge hardbottoms. USACE completed additional surveys in 2022 (side scan sonar) and 2023 (camera drops) to determine the presence or absence of hardbottom areas throughout the channel edges. The sidescan and video footage show areas of highly productive hardbottom adjacent to the channel. This information was used to assess potential impacts from widening these channels, and contributed to the decision to select the TSP, which does not include widening of the main channel areas that contain these channel edge hardbottom habitats. Upper reaches of the channel have poor visibility and poor light penetration along with strong currents. The sediment in the mid reaches of the channel is silty and not conducive to hardbottom habitat.

Submerged Aquatic Vegetation

Five (5) species of seagrasses are found in Tampa Bay, including widgeongrass (*Ruppia maritima*), manatee grass (*Syringodium filiforme*), shoalweed (*Halodule wrightii*), turtlegrass

(*Thalassia testudinum*), and star grass (*Halophila engelmannii*). Turtlegrass and shoalweed are the most abundant species. Widgeongrass dominates the northern portions of the bay, whereas shoalweed and turtlegrass dominate the southern portions. In the late 1800s, seagrasses covered approximately 75,000 ac of the bay. Seagrass beds in the Tampa Bay area declined between 1940 and 1963 due to declining water quality and shoreline modifications; these losses included Hillsborough Bay (94 percent), Old Tampa Bay (45 percent) and Tampa Bay proper (35 percent) (Schomer et al., 1990). Tampa Bay reached a low point in seagrass coverage in 1982 with around only 21,500 ac. Since 1982, seagrass cover has expanded throughout the bay because of improved water quality (Li and Nui, 2005; Sherwood, 2010). Tampa Bay met its recovery goal of expanding seagrasses in the bay to 1950s extents based on the seagrass survey conducted in 2014 (40,295 ac; Tampa Bay Estuary Program, 2015).

The Southwest Florida Water Management District conducts seagrass surveys approximately every two years in the Tampa Bay region. The surveys are conducted through interpretation of aerial imagery with limited ground truthing. Figure 14 shows recent imagery of seagrass locations in Tampa Bay.

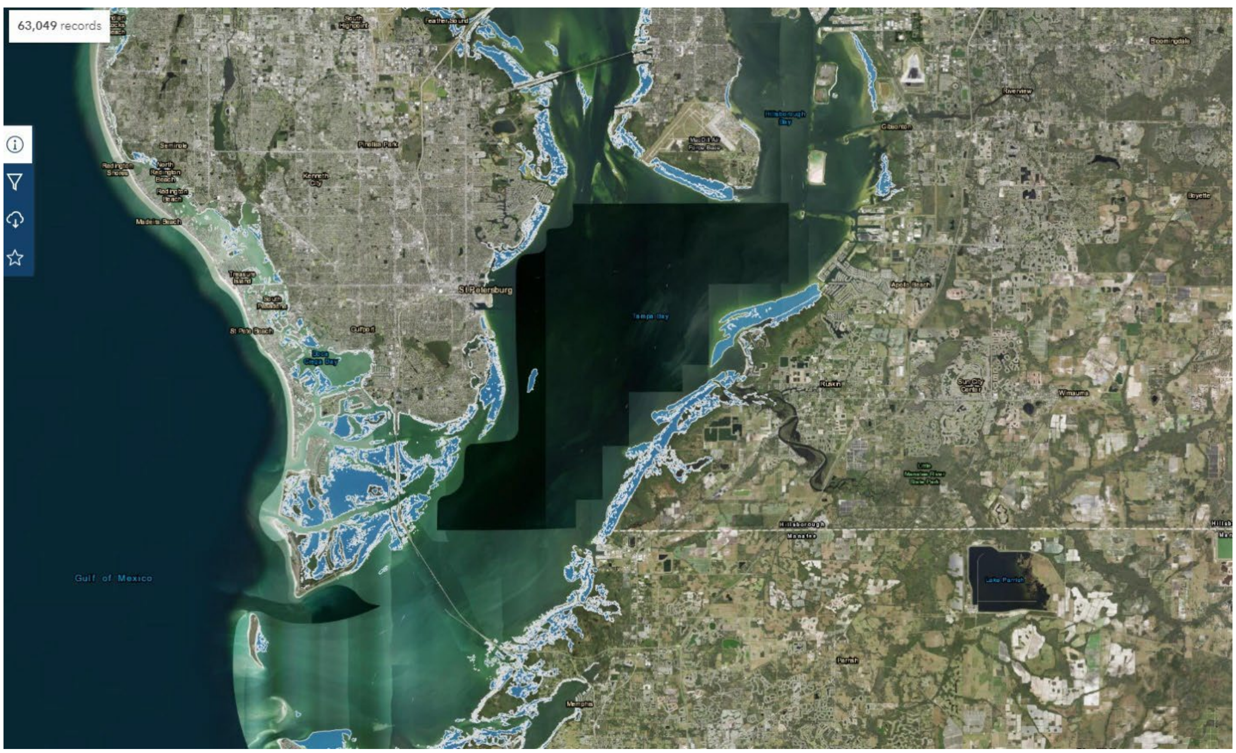

Figure 14. Seagrass Coverage in Tampa Bay

Federal Channel & Open Water

Tampa Bay is a large, open water bay system with heavily developed shorelines and a few beaches at the mouth of the bay. The depths in the bay average only 12 ft, with the channel being the deepest part at 42 and 43 ft. There are manmade reefs throughout the bay, hardbottom habitats adjacent to the channel, and large areas of seagrass. Large portions of the bay consist unconsolidated sediment with sandy bottom and no vegetation.

Fort De Soto/Mullet Key

Fort De Soto beach area on Mullet Key is at the southernmost tip of Pinellas County. The fort is a Spanish-American War era mortar battery used to defend the Tampa Bay area, and is on the National Register of Historic Places (NRHP). Fort De Soto Beach is at the southeast corner of the island, and directly adjacent to the fort and the entrance to Tampa Bay. The beach experiences erosion due to regular waves and currents as well as erosion induced by storms.

Egmont Key

Egmont Key is an island approximately 9,600 ft (1.82 mi) long and 1,400 ft (0.27 mi) wide located at the mouth of Tampa Bay, Hillsborough County, Florida. The federally maintained Tampa Harbor Channel into Tampa Bay, St. Petersburg, and Port Manatee is located immediately north of the island. The Southwest Passage Channel is located to the south of the island. The USFWS owns most of the island and established the Egmont Key National Wildlife Refuge as a sanctuary for nesting birds in 1974. The northern portion of the USFWS property is managed by the State of Florida Park Service as Egmont Key State Park. The northern end of the island also includes property owned by the United States Coast Guard that supports historic Fort Dade's three northern gun batteries, a lighthouse, and associated buildings. Hillsborough County owns 5 ac in the east central portion of the island, which are utilized by the Tampa Bay Pilots Association. Egmont Key was listed in the NRHP in 1978. Two historic properties, the Egmont Key Lighthouse Reservation and historic Fort Dade, are located on the island. The island has experienced extensive beach erosion over the years resulting in damage to historic structures, the beach and dune system, upland vegetation, and the island's beach-nesting wildlife. Other factors increasing the rate of erosion, including vessel traffic and tidal effects, may be contributing to the accelerated loss of beach material from the western and southern coastline of the island. See Figure 15 for the historic Egmont Key shoreline.

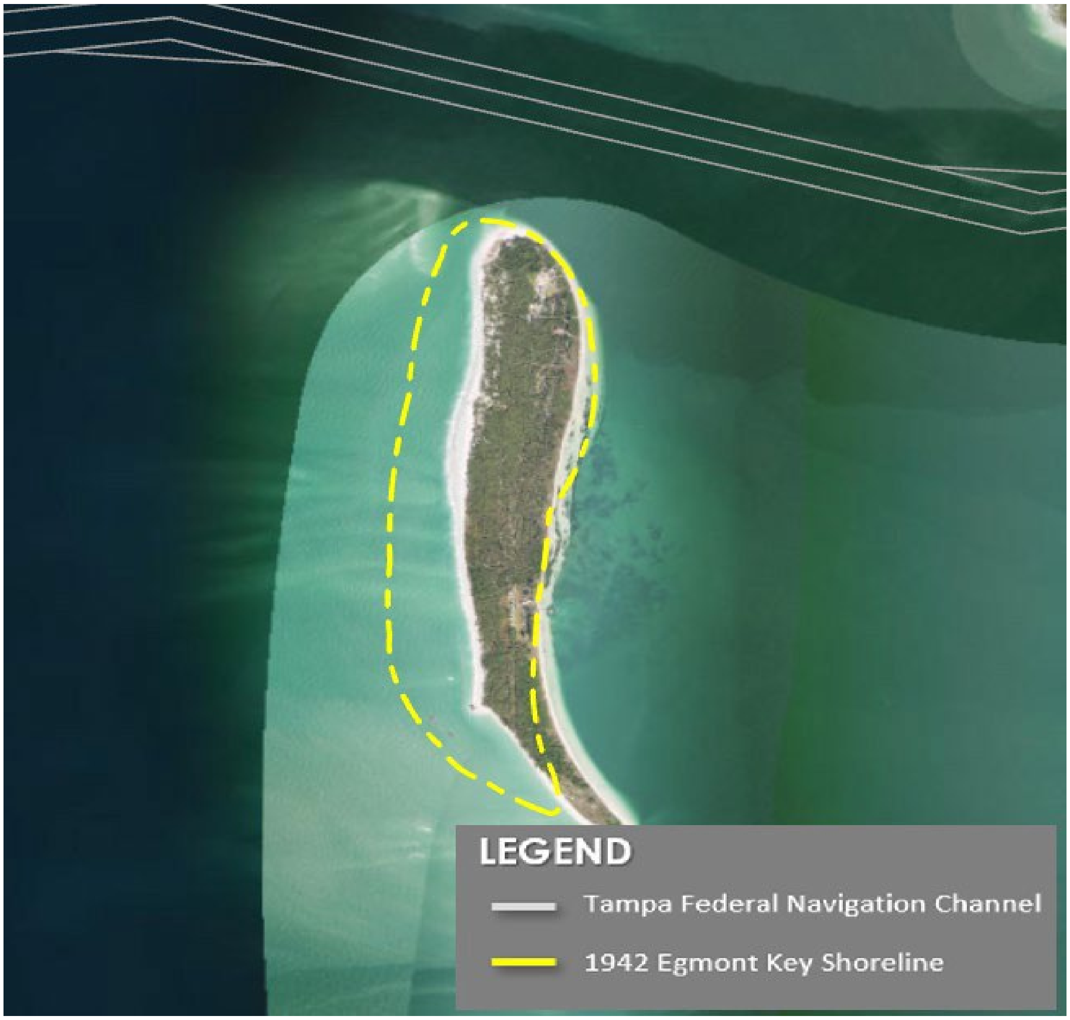

Figure 15. Historic Egmont Key Shoreline.

ODMDS and DMMAs

The Tampa ODMDS is in the GoM approximately 18 mi west of Egmont Key. The site covers 4 nm^2 with a bottom depth ranging from -70 to -90 ft. There are 2 regions of depth: one that averages around 75 ft, and an area of the "Briar Patch," which averages about 60 ft deep. Material dredged from Tampa Harbor and Manatee Harbor has been disposed of previously in the Tampa ODMDS after testing in compliance with MPRSA Section 103. The DMMAs (2-D and 3-D) are actively utilized for both federal O&M work as well as local, non-federal projects. The shorelines of both DMMAs are important American oystercatcher habitat; however, they are currently experiencing erosion that threatens this habitat.

Alafia Banks Sanctuary

Alafia Banks is a FWC designated Critical Wildlife Area (CWA) and is leased from and managed in collaboration with The Mosaic Company and Port Tampa Bay as a bird sanctuary.

This CWA includes 2 islands, known locally as Bird Island and Sunken Island. These islands were created through placement of dredged material when the Alafia River Channel was cut.

Alafia Banks CWA hosts thousands of birds during the nesting season and throughout the winter. Focal species include herons, egrets, ibis, roseate spoonbill, brown pelican, and the American oystercatcher. Both islands and the surrounding water buffer are closed to public access year-round. Over the years, erosion from ship wakes and storm events threatened these nesting sites. To stabilize the shoreline, Audubon began construction of a new living shoreline breakwater near the edge of Sunken Island in 2011 (SER-2011-01847; issued June 22, 2011). The concrete wave attenuation devices that make up the breakwater intercept incoming wave energy before it hits the shoreline, slowing or even stopping erosion altogether. Phases 1 and 2 (encompassing 1,000 lin ft near the shore of Sunken Island) were completed in 2014. An additional 5,000 ft of additional living shoreline along both Bird and Sunken Islands was installed in 2019 bringing the total area of protected coastline to over 6,000 lin ft.

3 EFFECTS DETERMINATIONS

Please note the following abbreviations are used only in Table 2 and Table 3 and are not, therefore, included in the list of acronyms: E = endangered; T = threatened; NLAA = may affect, not likely to adversely affect; LAA = likely to adversely affect.

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	ESA Listing Status	Listing Rule/Date	Most Recent Recovery Plan/Outline Date	Action Agency Effect Determination	NMFS Effect Determination
Sea Turtles					
Green sea turtle (NA DPS)	T	81 FR 20057/ April 6, 2016	October 1991	LAA	LAA
Green sea turtle (SA DPS)	T	81 FR 20057/ April 6, 2016	October 1991	LAA	NE
Kemp's ridley sea turtle	E	35 FR 18319/ December 2, 1970	September 2011	LAA	LAA

Species	ESA Listing Status	Listing Rule/Date	Most Recent Recovery Plan/Outline Date	Action Agency Effect Determination	NMFS Effect Determination
Leatherback sea turtle	E	35 FR 8491/ June 2, 1970	April 1992	NLAA	NLAA
Loggerhead sea turtle (Northwest Atlantic DPS)	T	76 FR 58868/ September 22, 2011	December 2008	LAA	LAA
Hawksbill sea turtles	E	35 FR 8491/ June 2, 1970	December 1993	LAA	NLAA
Fish					
Smalltooth sawfish (U.S. DPS)	E	68 FR 15674/ April 1, 2003	January 2009	NLAA	LAA
Gulf sturgeon (Atlantic sturgeon, Gulf subspecies)	T	56 FR 49653/ September 30, 1991	September 1995	NLAA	NLAA
Giant manta ray	T	83 FR 2916/ January 22, 2018	2019	NLAA	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. 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). In addition, an as-yet published genetic analysis of samples from various coastal areas in the GoM 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).

In Section 3.1.2 below, we discuss potential routes of effect for ESA-listed species that are not likely to be adversely affected by the proposed action. In Section 6 below, we discuss potential routes of effect for ESA-listed species that are likely to be adversely affected by the proposed action.

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

Leatherback and hawksbill sea turtles, Gulf sturgeon, and giant manta rays may be physically injured if struck or entrained during hopper dredging or relocation trawling activities. We believe hopper dredging and associated relocation trawling activities are not likely to adversely affect these species. While extensive hopper dredging and relocation trawling have occurred in the Tampa Bay region in recent years (described further in Section 5 below), there are no reports of take of leatherback sea turtles, hawksbill sea turtles, Gulf sturgeon, or giant manta rays from hopper dredging or associated relocation trawling in the action area. Hawksbill sea turtles are generally not vulnerable to entrainment due to their association with reef habitat where hopper dredging will not occur under the proposed action. Leatherback sea turtles are generally not vulnerable to entrainment due to their large size and pelagic, offshore life histories. The Tampa Bay area is generally considered to be the southern extent of the current range of Gulf sturgeon. Documented encounters with this species in the Bay area are relatively rare (generally occurring during the winter months), and the nearest known spawning habitat is approximately 120 mi to the north in the Suwannee River (Sulak and Clugston 1999). While extensive dredging and material placement activities have occurred in the Tampa Bay area over many decades, there have been no documented injuries or other types of interactions with Gulf sturgeon related to any of these activities. Giant manta rays are also rarely documented in Tampa Bay. While there are reports of mantas caught as bycatch in shrimp fisheries along the northeast Atlantic coast (unpublished NEFOP data from 2001-2015), there are no documented reports of captures or injuries of mantas from hopper dredging or associated relocation trawling anywhere in the GoM including extensive dredging and trawling that has occurred in the action area since giant mantas were listed as threatened in 2018. Based on the lack of reported interactions, and the low likelihood of these species presence in areas proposed for hopper dredging activities, we believe that the proposed hopper dredging and relocation trawling activities are not likely to adversely affect leatherback sea turtle, hawksbill sea turtles, Gulf sturgeon, or giant manta rays.

Leatherback and hawksbill sea turtles, Gulf sturgeon, and giant manta rays may be physically injured if struck or entrained during other (non-hopper) dredging activities. We believe the potential for this effect to occur is extremely unlikely. Because these species are highly mobile, we expect them to move away from the noise and disturbance created by the slow-moving mechanical and hydraulic dredging equipment. Additionally, NMFS has previously determined in dredging Biological Opinions that, while hopper-type dredges may lethally entrain ESA-listed species, non-hopper type dredging methods, such as mechanical and hydraulic cutterhead dredging proposed in this project, are slower and extremely unlikely to adversely affect these species (NMFS 2020).

Leatherback and hawksbill sea turtles, Gulf sturgeon, and giant manta rays could be physically injured if struck by project-related vessels, construction equipment, or dredged materials. We believe the potential for this effect to occur is extremely unlikely due to the species' mobility and the requirement for all project-related vessels to adhere to NMFS SERO's *Vessel Strike*

Avoidance Measures and Reporting for Mariners. Mobile species are able to avoid the slow-moving equipment and vessels proposed for use in this project (excluding hopper dredging equipment), as well as the placement of dredged material. In addition, the implementation of NMFS SERO's *Protected Species Construction Conditions* will require all personnel to observe in-water activities for the presence of these species. Operation of any mechanical equipment shall cease immediately if a protected species is seen within 150 ft of operations. Activities may not resume until the animal has departed the project area of its own volition.

Leatherback and hawksbill sea turtles, Gulf sturgeon, and giant manta rays may avoid the in-water dredging and dredge spoil placement areas due to turbidity and noise resulting from dredging and material placement activities. We believe any potential effects on these species from temporary avoidance of these disrupted areas would be insignificant, as most are open water areas surrounded by large expanses of similar habitats that would remain unaffected by the proposed activities. Impacts from dredging and material placement will not occur simultaneously throughout the action area, but instead will be spread out, both temporally (over the 6- to 7-year implementation period) and spatially (in discrete work zones around Tampa Bay and nearshore Gulf waters). While the overall area expected to be disturbed through dredging and material placement activities is fairly large (5,867 ac), the day-to-day activities will be occurring in relatively small, discrete areas, which will quickly return to background noise and turbidity levels once in-water activities are completed in those areas. The turbidity monitoring and control measures described above in Section 2.1.3 will help to minimize and contain turbidity within a relative small area of the habitat available to ESA-listed fish and sea turtles.

Leatherback and hawksbill sea turtles, Gulf sturgeon, and giant manta rays may be affected by the disturbance of benthic habitat due to dredging and dredged material placement, as these areas could be used for foraging, resting, and other essential behaviors. We believe the effect on these species from the potential impacts resulting from the disturbance of benthic habitats will be insignificant. As discussed above, dredging is expected to temporarily affect 3,993 ac of bottom habitat, most of which has been previously dredged. Material placement is expected to affect up to 1,974 ac of benthic habitat. Over 60% of those material placement areas would be used to create enhanced habitat conditions (up to 1,000 ac of new hardbottom habitat and 260 ac of new/restored seagrass habitat; Table 1), which is expected to eventually result in enhanced foraging conditions for ESA-listed species.

Dredging activities may remove rock and sediments colonized or otherwise inhabited by prey species and other food sources commonly utilized by leatherback and hawksbill sea turtles, Gulf sturgeon, and giant manta rays, including crustaceans, mollusks, and benthic invertebrates. These effects will be temporary, as benthic prey species are expected to re-colonize the disturbed areas over time. Additionally, the areas of impacts will be small compared to the remaining in-Bay and nearshore areas that support these prey species, and all of the potentially affected ESA-listed species are highly mobile and able to easily move to undisturbed areas to forage. Thus, we believe that ESA-listed species will be able to find foraging resources outside of the areas affected by the project, until the disturbed areas are recolonized by the various forage species.

Leatherback and hawksbill sea turtles, Gulf sturgeon, and giant manta rays may become entangled in flexible materials in the water, such as buoy lines used to mark hydraulic pipelines or turbidity curtains. We believe entanglement from flexible materials in the water associated with the proposed activities is extremely unlikely to occur. NMFS SERO's *Protected Species Construction Conditions* include specific guidance on the use of in-water lines (e.g., rope, chain, and cable), and require that all line used will be stiff, taut, and non-looping to minimize the risk of entanglement. If flexible lines are used, they must be enclosed in plastic or rubber sleeves/tubes that add rigidity and prevent the line from looping and tangling. The construction conditions also require turbidity curtains and in-water equipment to be placed in a manner that does not entrap species within the construction area or block access for them to navigate around the construction area. We are unaware of any reports of ESA-listed species that have been entangled in turbidity curtains or stiff, taut, non-looping in-water lines or flexible lines enclosed in plastic or rubber sleeves, which supports the conclusion that the use of these materials minimizes the risk of entanglement and makes any injury 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 ridley sea turtle, loggerhead sea turtle, and smalltooth sawfish (U.S. DPS) are likely to be adversely affected by the proposed action and thus require further analysis. Injury related to hopper dredging and capture related to relocation trawling activities are the only sources of adverse effects expected to result from the proposed action for these species. We provide greater detail on the potential effects to these species from the proposed action in the Effects of the Action (Section 6) and whether those effects, when considered in the context of the Status of the Species (Section 4), the Environmental Baseline (Section 5), and the Cumulative Effects (Section 7), are likely to jeopardize the continued existence of these ESA-listed species in the wild.

3.2 Effects Determinations for Critical Habitat

3.2.1 Agency Effects Determinations

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

Table 3. Proposed Critical Habitat in the Action Area and Effect Determinations

Species (DPS)	Critical Habitat Proposed Rule/Date	USACE Effect Determination	NMFS Effect Determination
Green Sea Turtle (NA DPS)	88 FR 46572/ July 19, 2023	NLAA	NLAA

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

Dredging and material placement activities will occur in green sea turtle proposed critical habitat. The following features that are essential to the conservation of this species are present in the action area:

• *Benthic foraging/resting essential features:* From the mean high water line to 20 m depth, underwater refugia and food resources (*i.e.,* seagrasses, macroalgae, and/or invertebrates) of sufficient condition, distribution, diversity, abundance, and density necessary to support survival, development, growth, and/or reproduction.

• *Migratory features*: From the mean high water line to 20 m depth, sufficiently unobstructed waters that allow for unrestricted transit of reproductive individuals between benthic foraging/resting areas and reproductive areas.

• *Surface-pelagic foraging/resting essential features:* Convergence zones, frontal zones, surface-water downwelling areas, the margins of major boundary currents, and other areas that result in concentrated components of the *Sargassum*-dominated drift community, as well as the currents which carry turtles to *Sargassum*-dominated drift communities, which provide sufficient food resources and refugia to support the survival, growth, and development of post-hatchlings and surface-pelagic juveniles, and which are located in sufficient water depth (at least 10 m) to ensure offshore transport via ocean currents to areas which meet forage and refugia requirements.

A fourth essential feature of the proposed green sea turtle critical habitat is the *reproductive feature*, which includes waters adjacent to nesting beaches designated as critical habitat by USFWS (from the mean high water line to 20 m depth). There are no waters adjacent to nesting beaches designated as critical habitat by USFWS within the action area, and no potential routes of effect on the reproductive essential feature from the proposed action.

While the outermost portions of the action area include surface-pelagic foraging/resting essential features, we believe the proposed action will have no effect on these features. None of the proposed activities have the potential to affect ocean currents that help carry hatchling turtles out to *Sargassum*-dominated drift communities, or to affect offshore convergence zones, frontal zones, or surface-water downwelling areas that result in concentrated components of the Sargassum-dominated drift community. For these reasons, we believe that the proposed action will have no effect on the surface-pelagic foraging/resting essential feature of proposed green sea turtle critical habitat.

Benthic foraging/resting habitat features are essential for the conservation of green sea turtles, as they provide the security and energy required for juveniles to mature and for adults to migrate and reproduce. Foraging includes locating and consuming food resources (*e.g.,* seagrasses, macroalgae, and/or invertebrates). Resting includes the use of underwater refugia for digestion, protection from predators, thermoregulation, and recuperation. Food resources and refugia are often located in adjacent areas, and turtles must move between these areas. Without successful foraging/resting, the DPS cannot recover.

Proposed green sea turtle critical habitat may be affected by the disturbance of benthic habitat due to dredging and dredged material placement, as these areas could be used for foraging, resting and other essential behaviors. We believe the effects on these essential features from the temporary disturbance of benthic habitats will be insignificant. As discussed above, dredging is expected to affect a total of 3,993 ac of habitat, most of which has been previously dredged. These isolated areas of disturbance will be spread out across the Bay, and across a 6-7 year time-span. None of the areas proposed for dredging contain seagrasses or other aquatic vegetation that make up the majority of the forage base for the neritic juvenile and adult green sea turtles that are expected to be present in the action area.

The deep-channel habitats that will be disturbed are likely to provide resting habitat used by green sea turtles for digestion, protection from predators, thermoregulation, and recuperation. However, the area being disturbed at any given time will be small compared to the available deep-channel habitats throughout the bay, and green sea turtles are highly mobile and will be able to easily move to undisturbed areas throughout the deep-channel system within and outside of the Bay. Additionally, the disturbance of any given area will be temporary, and once the dredging has been completed in that area, the habitat will quickly return to conditions suitable to supporting resting behaviors for green sea turtles.

Material placement is expected to affect up to 1,974 ac of benthic habitat. These placement areas are generally comprised of open, unconsolidated sediment, devoid of aquatic vegetation or other essential features of green sea turtle proposed critical habitat. Over 60% of these material placement areas would be used to create enhanced habitat conditions (up to 1,000 ac of new hardbottom habitat and 260 ac of new/restored seagrass habitat; Table 1). These beneficial use areas are expected to eventually result in enhanced foraging and resting habitat conditions for green sea turtles.

The migratory essential feature is essential to the conservation of green sea turtles because it is required for connectivity between areas used by adults for foraging/resting and areas used for reproduction. Without successful migration, individuals could not survive and reproduce, which are both essential for recovery.

Turbidity and noise from the proposed dredging and material placement activities could temporarily obstruct the transit of reproductive individuals between benthic foraging/resting areas and reproductive areas, in those locations and time periods where the proposed activities are underway. We believe that the extent of any such obstruction would be extremely limited in both size and duration, and would therefore cause an insignificant effect on the proposed critical habitat's ability to provide safe and unobstructed connectivity between areas used by adults for foraging/resting and areas used for reproduction.

Based on the analysis above, we believe that any effects from the proposed action on proposed green sea turtle critical habitat will be insignificant, and may eventually result in improved habitat conditions within the action area.

4 STATUS OF ESA-LISTED SPECIES CONSIDERED FOR FURTHER ANALYSIS

4.1 Status of Sea Turtles

There are 3 species of sea turtles (green [North Atlantic DPS], Kemp's ridley, and loggerhead [Northwest Atlantic DPS]) that could occur within the action area and are likely to be adversely affected by the proposed action.

Section 4.1.1will address the general threats that confront all sea turtle species. The remainder of Section 4.1 (Sections 4.1.2-4.1.4) will address information on the distribution, life history, population structure, abundance, population trends, and unique threats to each species of sea turtle that are likely to be adversely affected by the proposed action.

4.1.1 General Threats Faced by All Sea Turtle Species

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

Fisheries

Incidental bycatch in commercial fisheries is identified as a major contributor to past declines, and threat to future recovery, for all of the sea turtle species (NMFS and USFWS 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 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 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 DWH oil rig affected sea turtles in the GoM. An assessment has been completed on the injury to GoM marine life, including sea turtles, resulting from the spill (DWH Trustees 2015). Following the spill, juvenile Kemp's ridley, green, and loggerhead sea turtles were found in *Sargassum* algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil, or had ingested oil, or both. The spill resulted in the direct mortality of many sea turtles and may have had sublethal effects or caused environmental damage that will impact other sea turtles into the future. Information on the spill impacts to individual sea turtle species is presented in the Status of the Species sections for each species.

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

Climate Change

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

Climate change impacts on sea turtles currently cannot be predicted with any degree of certainty; however, significant impacts to the hatchling sex ratios of sea turtles may result (NMFS and USFWS 2007d). 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 2007d).

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 2007f). 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. 2006a; 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. 2006a).

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.

4.1.2 Green Sea Turtle (Information Relevant to All DPSs)

The green sea turtle was originally listed as threatened under the ESA on July 28, 1978, except for the Florida and Pacific coast of Mexico breeding populations, which were listed as endangered. On April 6, 2016, the original listing was replaced with the listing of 11 DPSs (81 FR 20057 2016) (Figure 16). 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 SE Region, with South Atlantic DPS individuals only expected to occur in the U.S. Caribbean.

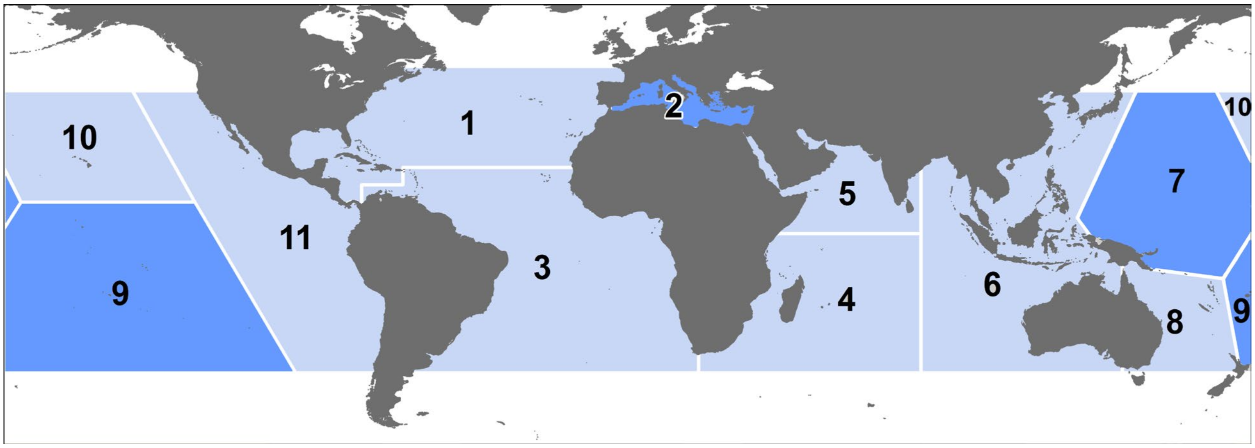

Figure 16. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific

Species Description and Distribution

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

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

The North Atlantic DPS boundary is illustrated in Figure 16. 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 GoM 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 GoM 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 oz (25 g). Survivorship at any particular nesting site is greatly influenced by the level of man-made stressors, with the more pristine and less disturbed nesting sites (e.g., along the Great Barrier Reef in Australia) showing higher survivorship values than nesting sites known to be highly disturbed (e.g., Nicaragua) (Campell and Lagueux 2005; Chaloupka and Limpus 2005).

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

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

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 NA DPS is the largest of the 11 green turtle DPSs, with an estimated nester abundance of over 167,000 adult females from 73 nesting sites. Overall this DPS is also the most data rich. Eight of the sites have high levels of abundance (i.e., <1000 nesters), located in Costa Rica, Cuba, Mexico, and Florida.

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 2007g). 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 2007b). 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 17). 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 17). While nesting in Florida has shown dramatic increases over the past decade, individuals from the Tortuguero, the Florida, and the other Caribbean and GoM 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 the entire North Atlantic DPS.

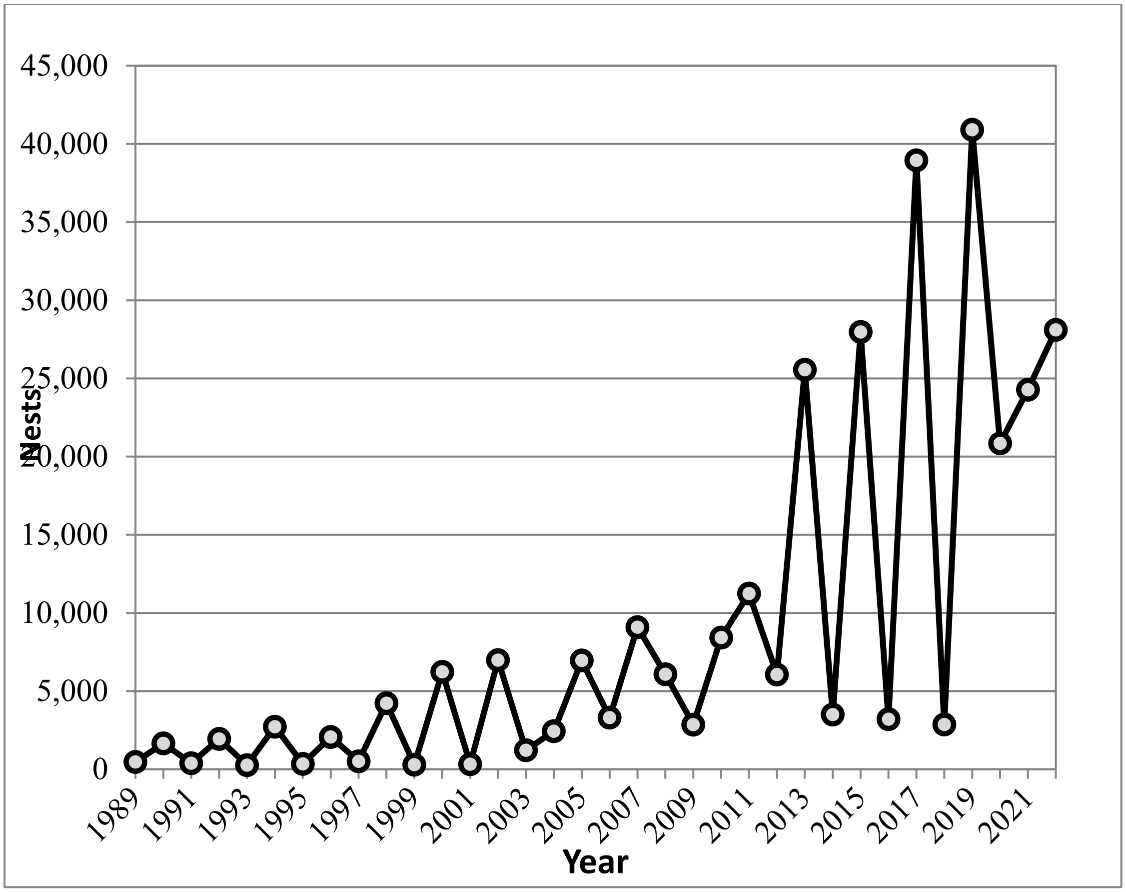

Figure 17. Green sea turtle nesting at Florida index beaches since 1989

Similar to the nesting trend found in Florida, in-water studies in Florida have also recorded increases in green turtle captures at the Indian River Lagoon site, with a 661 percent increase over 24 years (Ehrhart et al. 2007), and the St Lucie Power Plant site, with a significant increase in the annual rate of capture of immature green turtles (SCL<90 cm) from 1977 to 2002 or 26 years (3,557 green turtles total; M. Bressette, Inwater Research Group, 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 GoM 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 4.1.2, specific impacts of the DWH spill on green sea turtles are considered here. Impacts to green sea turtles occurred to offshore small juveniles only. A total of 154,000 small juvenile greens (36.6% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. A large number of small juveniles were removed from the population, as 57,300 small juveniles greens are estimated to have died as a result of the exposure. A total of 4 nests (580 eggs) were also translocated during response efforts, with 455 hatchlings released (the fate of which is unknown) (DWH Trustees 2015b). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and dispersants, or both, and loss of foraging resources, which could lead to compromised growth and reproductive potential.

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

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

4.1.3 Kemp's Ridley Sea Turtle

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

Species Description and Distribution
The Kemp's ridley sea turtle is the smallest of all sea turtles. Adults generally weigh less than 100 lb (45 kg) and have a carapace length of around 2.1 ft (65 cm). Adult Kemp's ridley shells are almost as wide as they are long. Coloration changes significantly during development from the grey-black dorsum and plastron of hatchlings, a grey-black dorsum with a yellowish-white plastron as post-pelagic juveniles, and then to the lighter grey-olive carapace and cream-white or yellowish plastron of adults. There are 2 pairs of prefrontal scales on the head, 5 vertebral scutes, usually 5 pairs of costal scutes, and generally 12 pairs of marginal scutes on the carapace. In each bridge adjoining the plastron to the carapace, there are 4 scutes, each of which is perforated by a pore.

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

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

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

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

Population Dynamics
Of the 7 species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nest on the beaches of Rancho Nuevo, Mexico (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the mid-1980s, however, nesting numbers from Rancho Nuevo and adjacent Mexican beaches were below 1,000, with a low of 702 nests in 1985. Yet, nesting steadily increased through the 1990s, and then accelerated during the first decade of the twenty-first century (Figure 18), which indicates the species is recovering.

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

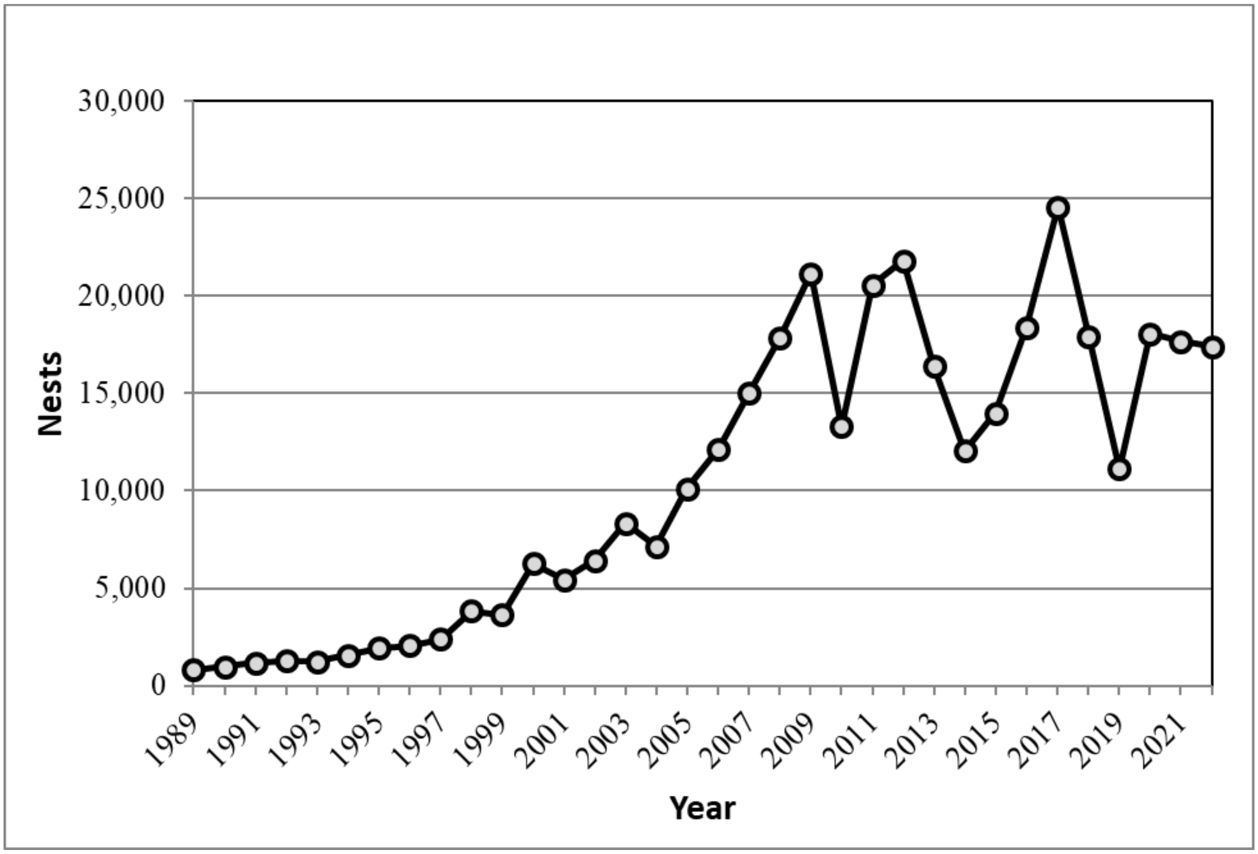

Figure18. Kemp's ridley nest totals from Mexican beaches (Gladys Porter Zoo nesting database 2019 and CONAMP data 2020-2022)

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

Threats

Kemp's ridley sea turtles face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (plastics, petroleum products, petrochemicals, etc.), ecosystem alterations (nesting beach development, beach nourishment and shoreline stabilization, vegetation changes, etc.), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 4.1.1; 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 GoM, particularly throughout the Mississippi Sound area. For example, in the first 3 weeks of June 2010, over 120 sea turtle strandings were reported from Mississippi and Alabama waters, none of which exhibited any signs of external oiling to indicate effects associated with the DWH oil spill event. A total of 644 sea turtle strandings were reported in 2010 from Louisiana, Mississippi, and Alabama waters, 561 (87%) of which were Kemp's ridley sea turtles. During March through May of 2011, 267 sea turtle strandings were reported from Mississippi and Alabama waters alone. A total of 525 sea turtle strandings were reported in 2011 from Louisiana, Mississippi, and Alabama waters, with the majority (455) having occurred from March through July, 390 (86%) of which were Kemp's ridley sea turtles. During 2012, a total of 384 sea turtles were reported from Louisiana, Mississippi, and Alabama waters. Of these reported strandings, 343 (89%) were Kemp's ridley sea turtles. During 2014, a total of 285 sea turtles were reported from Louisiana, Mississippi, and Alabama waters, though the data is incomplete. Of these reported strandings, 229 (80%) were Kemp's ridley sea turtles. These stranding numbers are significantly greater than reported in past years; Louisiana, Mississippi, and Alabama waters reported 42 and 73 sea turtle strandings for 2008 and 2009, respectively. It should be noted that stranding coverage has increased considerably due to the DWH oil spill event.

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

In response to these strandings, and due to speculation that fishery interactions may be the cause, fishery observer effort was shifted to evaluate the inshore skimmer trawl fisheries beginning in 2012. During May-July of that year, observers reported 24 sea turtle interactions in the skimmer trawl fisheries. All but a single sea turtle were identified as Kemp's ridleys (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 ridleys 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 GoM 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 ridleys 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 ridleys for several reasons. All Kemp's ridleys in the GoM belong to the same population (NMFS et al. 2011a), so total population abundance could be calculated based on numbers of hatchlings because all individuals that enter the population could reasonably be expected to inhabit the northern GoM throughout their lives (DWH Trustees 2016).

A total of 217,000 small juvenile Kemp's ridleys (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 ridleys 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 ridleys 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.

4.1.4 Loggerhead Sea Turtle – Northwest Atlantic DPS

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

Species Description and Distribution

Loggerheads are large sea turtles. Adults in the southeast United States average about 3 ft (92 cm) long, measured as 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 GoM, eastern Yucatán Peninsula, at Cay Sal Bank in the eastern Bahamas (Addison 1997; Addison and Morford 1996), off the southwestern coast of Cuba (Moncada Gavilan 2001), and along the coasts of Central America, Colombia, Venezuela, and the eastern Caribbean Islands.

Non-nesting, adult female loggerheads are reported throughout the U.S. Atlantic, GoM, 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 GoM, and 5% in the western GoM (TEWG 1998).

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

The recovery plan for the Northwest Atlantic population of loggerhead sea turtles concluded that there is no genetic distinction between loggerheads nesting on adjacent beaches along the Florida Peninsula. It also concluded that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the recovery plan uses a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, to identify recovery units. The recovery units are as follows: (1) the Northern Recovery Unit (Florida/Georgia border north through southern Virginia), (2) the Peninsular Florida Recovery Unit (Florida/Georgia border through Pinellas County, Florida), (3) the Dry Tortugas Recovery Unit (islands located west of Key West, Florida), (4) the NGMRU (Franklin County, Florida, through Texas), and (5) the Greater Caribbean Recovery Unit

(Mexico through French Guiana, the Bahamas, Lesser Antilles, and Greater Antilles) (NMFS and USFWS 2008a). The recovery plan concluded that all recovery units are essential to the recovery of the species. Although the recovery plan was written prior to the listing of the Northwest Atlantic DPS, the recovery units for what was then termed the Northwest Atlantic population apply to the Northwest Atlantic DPS.

Life History Information

The Northwest Atlantic Loggerhead Recovery Team defined the following 8 life stages for the loggerhead life cycle, which include the ecosystems those stages generally use: (1) egg (terrestrial zone), (2) hatchling stage (terrestrial zone), (3) hatchling swim frenzy and transitional stage (neritic zone - nearshore marine environment from the surface to the sea floor where water depths do not exceed 200 meters), (4) juvenile stage (oceanic zone), (5) juvenile stage (neritic zone), (6) adult stage (oceanic zone), (7) adult stage (neritic zone), and (8) nesting female (terrestrial zone) (NMFS and USFWS 2008a). Loggerheads are long-lived animals. They reach sexual maturity between 20-38 years of age, although age of maturity varies widely among populations (Frazer and Ehrhart 1985; NMFS 2001). The annual mating season occurs from late March to early June, and female turtles lay eggs throughout the summer months. Females deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984), but an individual female only nests every 3.7 years on average (Tucker 2010). Each nest contains an average of 100-126 eggs (Dodd Jr. 1988) which incubate for 42-75 days before hatching (NMFS and USFWS 2008a). Loggerhead hatchlings are 1.5-2 inches 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. 2009b; Witherington 2002). Oceanic juveniles grow at rates of 1-2 inches (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 GoM(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 GoM. 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 GoM, comprise important inshore habitat. Along the Atlantic and GoMshoreline, essentially all shelf waters are inhabited by loggerheads (Conant et al. 2009b).

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. 2009b).

Offshore, adults primarily inhabit continental shelf waters, from New York south through Florida, The Bahamas, Cuba, and the GoM. 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. 2009b; Heppell et al. 2003; NMFS-SEFSC 2009a; NMFS 2001; NMFS and USFWS 2008a; TEWG 1998; TEWG 2000; TEWG 2009) have examined the stock status of loggerheads in the Atlantic Ocean, but none have been able to develop a reliable estimate of absolute population size.

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

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

In addition to the total nest count estimates, the FWRI uses an index nesting beach survey method. The index survey uses standardized data-collection criteria to measure seasonal nesting and allow accurate comparisons between beaches and between years. FWRI uses the standardized index survey data to analyze the nesting trends (Figure 19) (https://myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals/). Since the beginning of the index program in 1989, 3 distinct trends were identified. From 1989-1998, there was a 24% increase that was followed by a sharp decline over the subsequent 9 years. A large increase in loggerhead nesting has occurred since, as indicated by the 71% increase in nesting over the 10-year period from 2007 and 2016. Nesting in 2016 also represented a new record for loggerheads on the core index beaches. While nest numbers subsequently declined from the 2016 high FWRI noted that the 2007-2021 period represents a period of increase. FWRI examined the trend from the 1998 nesting high through 2016 and found that the decade-long post-1998 decline was replaced with a slight but non-significant increasing trend. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability between 2012-2016 resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose again each year through 2020, reaching 53,443 nests before dipping back to 49,100 in 2021, 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).

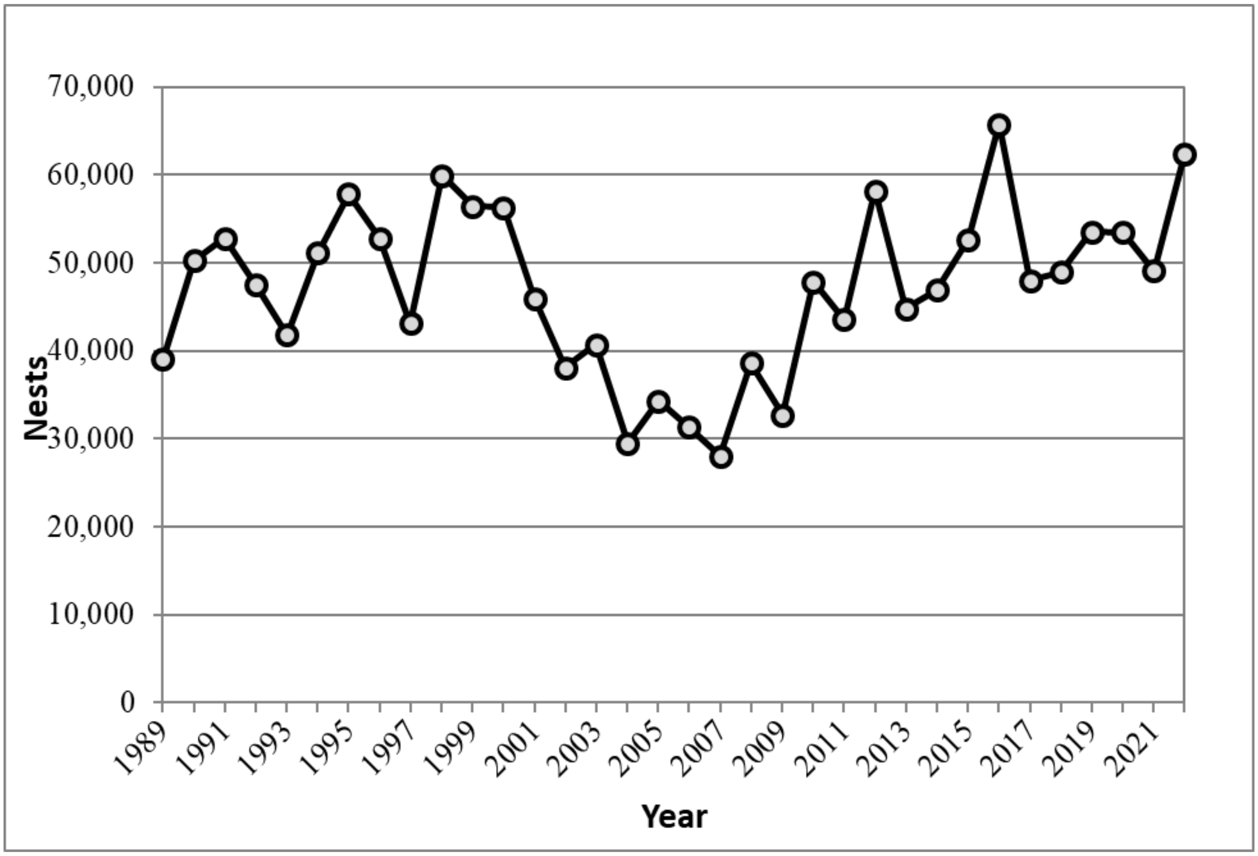

Figure 19. Loggerhead sea turtle nesting at Florida index beaches since 1989

<u>Northern Recovery Unit</u>

Annual nest totals from beaches within the NRU averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (GADNR unpublished data, 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 2021, and then a rebound to the second highest level on record in 2022 (Figure 20).

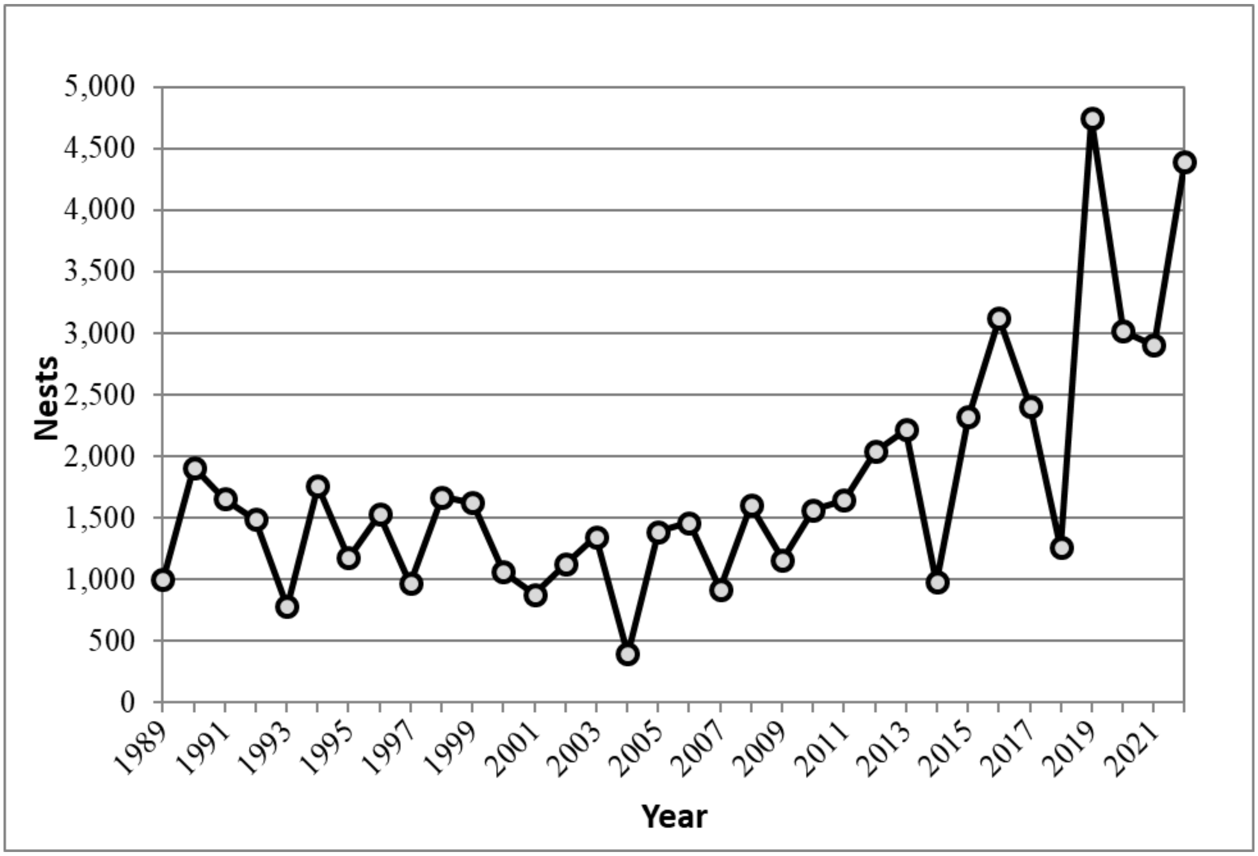

Figure 20. South Carolina index nesting beach counts for loggerhead sea turtles (data provided by SCDNR)

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

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 2008a). 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 2008a). Zurita et al. (2003) found a statistically significant increase in the number of nests on 7 of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. Nonetheless, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008a).

In-water Trends

Nesting data are the best current indicator of sea turtle population trends, but in-water data also provide some insight. In-water research suggests the abundance of neritic juvenile loggerheads is steady or increasing. Although Ehrhart et al. (2007) found no significant regression-line trend in a long-term dataset, researchers have observed notable increases in CPUE (Arendt et al. 2009; Ehrhart et al. 2007; Epperly et al. 2007). Researchers believe that this increase in CPUE is likely linked to an increase in juvenile abundance, although it is unclear whether this increase in abundance represents a true population increase among juveniles or merely a shift in spatial occurrence. Bjorndal et al. (2005), cited in NMFS and USFWS (2008a), caution about extrapolating localized in-water trends to the broader population and relating localized trends in neritic sites to population trends at nesting beaches. The apparent overall increase in the abundance of neritic loggerheads in the southeastern United States may be due to increased abundance of the largest oceanic/neritic juveniles (historically referred to as small benthic juveniles), which could indicate a relatively large number of individuals around the same age may mature in the near future (TEWG 2009). In-water studies throughout the eastern United States, however, 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 2009a). The model uses the range of published information for the various parameters including mortality by stage, stage duration (years in a stage), and fecundity parameters such as eggs per nest, nests per nesting female, hatchling emergence success, sex ratio, and remigration interval. Resulting trajectories of model runs for each individual recovery unit, and the western North Atlantic population as a whole, were found to be very similar. The model run estimates from the adult female population size for the western North Atlantic (from the 2004-2008 time frame), suggest the adult female population size is approximately 20,000-40,000 individuals, with a low likelihood of females' numbering up to 70,000 (NMFS-SEFSC 2009a). A less robust estimate for total benthic females in the western North Atlantic was also obtained, yielding approximately 30,000-300,000 individuals, up to less than 1 million (NMFS-SEFSC 2009a). A preliminary regional abundance survey of loggerheads within the northwestern Atlantic continental shelf for positively identified loggerhead in all strata estimated about 588,000 loggerheads (interquartile range of 382,000-817,000). When correcting for unidentified turtles in proportion to the ratio of identified turtles, the estimate increased to about 801,000 loggerheads (interquartile range of 521,000-1,111,000) (NMFS-NEFSC 2011).

Threats (Specific to Loggerhead Sea Turtles)
The threats faced by loggerhead sea turtles are well summarized in the general discussion of threats in Section 4.1.1. Yet the impact of fishery interactions is a point of further emphasis for this species. The joint NMFS and USFWS Loggerhead Biological Review Team determined that the greatest threats to the Northwest Atlantic DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009b).

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 2015b). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil or dispersants, or both, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

Unlike Kemp's ridley sea turtles, the majority of nesting for the Northwest Atlantic DPS occurs on the Atlantic coast and, thus, loggerheads were impacted to a relatively lesser degree. However, it is likely that impacts to the 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 NGMRU), 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 loggerheads, the proportion of the population that is expected to have been exposed to and directly impacted by the DWH oil spill event is relatively low. Thus we do not believe a population-level impact occurred due to the widespread distribution and nesting location outside of the GoM for this species.

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

4.2 Status of Smalltooth Sawfish

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

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

Although this species is reported throughout the tropical Atlantic, NMFS identified smalltooth sawfish from the Southeast United States as a DPS, due to the physical isolation of this population from others, the differences in international management of the species, and the significance of the U.S. population in relation to the global range of the species (see 68 FR15674). Within the United States, smalltooth sawfish have historically been captured in estuarine and coastal waters from North Carolina southward through Texas, although peninsular Florida has been the region of the United States with the largest number of recorded captures (NMFS 2018). Recent records indicate there is a resident reproducing population of smalltooth sawfish in south and southwest Florida from Charlotte Harbor through the Florida Keys, which is also the last U.S. stronghold for the species (Poulakis and Seitz 2004; Seitz and Poulakis 2002; Simpfendorfer and Wiley 2005). Water temperatures (no lower than 8-12°C) and the availability of appropriate coastal habitat (shallow, euryhaline waters and red mangroves) are the major environmental constraints limiting the northern movements of smalltooth sawfish in the western North Atlantic. Most specimens captured along the Atlantic coast north of Florida are large juveniles or adults (over 10 ft) that likely represent seasonal migrants, wanderers, or colonizers from a historical Florida core population to the south, rather than being members of a continuous, even-density population (Bigelow and Schroeder 1953).

Life History Information

Smalltooth sawfish mate in the spring and early summer (Grubbs unpubl. data; Poulakis unpubl. data). Fertilization is internal and females give birth to live young. Evidence suggests a gestation period of approximately 12 months and females produce litters of 7-14 young (Gelsleichter unpubl. data; Feldheim et al. 2017; Smith et al. 2021). Females have a biennial reproductive cycle (Feldheim et al. 2017) and parturition (act of giving birth) occurs nearly year round though peaking in spring and early summer (March – July)(Poulakis et al. 2011, Carlson unpubl. data). Smalltooth sawfish appear to exhibit parturition site fidelity, returning to the same general nursery sites to give birth each cycle (Feldheim et al. 2017, Smith et al. 2021).

Smalltooth sawfish are approximately 26–31 in (64–80 cm) at birth (Poulakis et al. 2011; Bethea et al. 2012) and may grow to a maximum length of approximately 16 ft (500 cm) (Grubbs unpubl. data, Brame et al. 2019). Simpfendorfer et al. (2008) report rapid juvenile growth for smalltooth sawfish for the first 2 years after birth, with stretched total length increasing by an average of 25–33 in (65–85 cm) in the first year and an average of 19–27 in (48–68 cm) in the second year. Uncertainty remains in estimating post-juvenile growth rates and age at maturity; yet, recent advances indicate maturity at 7–11 years (Carlson and Simpfendorfer 2015) at lengths of approximately 11 ft (340 cm) for males and 11.5–12 ft (350–370) cm for females (Gelsleichter unpublished data).

There are distinct differences in habitat use based on life history stage as the species shifts use through ontogeny. Juvenile smalltooth sawfish less than 7.2 ft (220 cm), inhabit the shallow euryhaline waters (i.e., variable salinity) of estuaries and can be found in sheltered bays, dredged canals, along banks and sandbars, and in rivers (NMFS 2000). These juveniles are often closely associated with muddy or sandy substrates, and shorelines containing red mangroves, *Rhizophora mangle* (Simpfendorfer 2001; Simpfendorfer 2003; Simpfendorfer et al. 2010; Poulakis et al. 2011; Poulakis et al. 2013; Hollensead et al. 2016; Hollensead et al 2018). Simpfendorfer et al. (2010) indicated the smallest juveniles (young-of-the-year juveniles measuring < 100 cm in length) generally used the shallowest water (depths less than 0.5 m (1.64 ft)), had small home ranges (4,264–4,557 m^2), and exhibited high levels of site fidelity. Although small juveniles exhibit high levels of site fidelity for specific nursery habitats for periods of time lasting up to 3 months (Wiley and Simpfendorfer 2007), they do undergo small movements coinciding with changing tidal stages. These movements often involve moving from shallow sandbars at low tide to within red mangrove prop roots at higher tides (Simpfendorfer et al. 2010)—behavior likely to reduce the risk of predation (Simpfendorfer 2006). As juveniles increase in size, they begin to expand their home ranges (Simpfendorfer et al. 2010; Simpfendorfer et al. 2011), eventually moving to more offshore habitats where they likely feed on larger prey as they continue to mature.

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

The juvenile "hotspots" may be of further significance as NMFS expects parturition sites align closely with the juvenile "hotspots" given the high fidelity shown by the smallest size/age classes of sawfish to specific nursery areas. Therefore, disturbance within the high-use areas (hotspots) could have wide-ranging effects on the sawfish population if it were to disrupt future parturition or juvenile survival within the nursery.

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

Status and Population Dynamics

Based on the contraction of the species' geographic range, we expect that the population to be a fraction of its historical size. However, few long-term abundance data exist for the smalltooth sawfish, making it very difficult to estimate the current population size. Despite the lack of scientific data, recent encounters with young-of-the-year, older juveniles, and sexually mature smalltooth sawfish indicate that the U.S. population is currently reproducing (Seitz and Poulakis 2002; Simpfendorfer 2003, Grubbs unpublished. data, Feldheim et al. 2017). The abundance of juveniles publically encountered by anglers and boaters, including very small individuals, suggests that the population remains viable (Simpfendorfer and Wiley 2004), and data analyzed from Everglades National Park as part of an established fisheries-dependent monitoring program (angler interviews) indicated a slightly increasing trend in juvenile abundance within the park over the past decade (Carlson and Osborne 2012; Carlson et al. 2007). Similarly, preliminary results of juvenile smalltooth sawfish sampling programs in both ENP and Charlotte Harbor indicate the juvenile population is at least stable and possibly increasing (Poulakis unpubl. data, Carlson unpublished data).

Using a demographic approach and life history data for smalltooth sawfish and similar species from the literature, Simpfendorfer (2000) estimated intrinsic rates of natural population increase for the species at 0.08–0.13 per year and population doubling times from 5.4–8.5 years. These low intrinsic rates[1] of population increase, suggest that the species is particularly vulnerable to excessive mortality and rapid population declines, after which recovery may take decades. Carlson and Simpfendorfer (2015) constructed an age-structured Leslie matrix model for the U.S. population of smalltooth sawfish, using updated life history information, to determine the species' ability to recover under scenarios of variable life history inputs and the effects of bycatch mortality and catastrophes. As expected, population growth was highest (λ=1.237 yr^{-1}) when age-at-maturity was 7 yr and decreased to 1.150 yr^{-1} when age-at-maturity was 11 yr. Despite a high level of variability throughout the model runs, in the absence of fishing mortality or catastrophic climate effects, the population grew at a relatively rapid rate approaching carrying capacity in 40 years when the initial population was set at 2250 females or 50 years with an initial population of 600 females. Carlson and Simpfendorfer (2015) concluded that smalltooth sawfish in U.S. waters appear to have the ability to recover within the foreseeable future based on a model relying upon optimistic estimates of population size, lower age-at-maturity and the lower level of fisheries-related mortality. Another analysis was less optimistic based on lower estimates of breeding females in the Caloosahatchee River nursery (Chapman unpubl. data). Assuming similar numbers of females among the 5 known nurseries, that study would suggest an initial breeding population of only 140–390 females, essentially half of the initial population considered by Carlson and Simpfendorfer (2015). A smaller initial breeding population would extend the time to reach carrying capacity.

Threats

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

<u>Bycatch Mortality</u>

Bycatch mortality is cited as the primary cause for the decline in smalltooth sawfish in the United States (NMFS 2010). While there has never been a large-scale directed fishery, smalltooth sawfish easily become entangled in fishing gears (gill nets, otter trawls, trammel nets, and seines) directed at other commercial species, often resulting in serious injury or death (NMFS 2009). This has historically been reported in Florida (Snelson and Williams 1981),

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

Louisiana (Simpfendorfer 2002), and Texas (Baughman 1943). For instance, one fisherman interviewed by Evermann and Bean (1897) reported taking an estimated 300 smalltooth sawfish in just one netting season in the Indian River Lagoon, Florida. In another example, smalltooth sawfish landings data gathered by Louisiana shrimp trawlers from 1945–1978, which contained both landings data and crude information on effort (number of vessels, vessel tonnage, number of gear units), indicated declines in smalltooth sawfish landings from a high of 34,900 lbs in 1949 to less than 1,500 lbs in most years after 1967. The Florida net ban passed in 1995 has led to a reduction in the number of smalltooth sawfish incidentally captured, "…by prohibiting the use of gill and other entangling nets in all Florida waters, and prohibiting the use of other nets larger than 500 square feet in mesh area in nearshore and inshore Florida waters"[2] (Fla. Const. art. X, § 16). However, the threat of bycatch currently remains in commercial fisheries (e.g., Southeast U.S. shrimp fishery, federal shark fisheries of the South Atlantic, and the GoM reef fish fishery). A recent study assessed three federal fisheries and determined the southeastern U.S. shrimp fishery posed the greatest threat to sawfish given spatio-temporal overlap (Graham et al. 2022).

In addition to incidental bycatch in commercial fisheries, smalltooth sawfish have historically been and continue to be captured by recreational anglers. Encounter data (U.S. Sawfish Recovery Database) and past research (Caldwell 1990) document that rostra are sometimes removed from smalltooth sawfish caught by recreational anglers. Sawfish without rostra are expected to die due to starvation (Morgan et al. 2016). While the current threat of mortality associated with recreational fisheries is expected to be low given that possession of the species in Florida has been prohibited since 1992, bycatch in recreational fisheries remains a potential threat to the species.

Habitat Loss

Modification and loss of smalltooth sawfish habitat, especially nursery habitat, is another contributing factor in the decline of the species. Activities such as agricultural and urban development, commercial activities, dredge-and-fill operations, boating, erosion, and diversions of freshwater runoff contribute to these losses (SAFMC 1998). Large areas of coastal habitat were modified or lost between the mid-1970s and mid-1980s within the United States (Dahl and Johnson 1991). Since then, rates of loss have decreased, but habitat loss continues. From 1998–2004, approximately 64,560 ac of coastal wetlands were lost along the Atlantic and Gulf coasts of the United States, of which approximately 2,450 acres were intertidal wetlands consisting of mangroves or other estuarine shrubs (Stedman and Dahl 2008). Further, Orlando et al. (1994) analyzed 18 major southeastern estuaries and recorded over 703 mi of navigation channels and 9,844 mi of shoreline with modifications. In Florida, coastal development often involves the removal of mangroves and the armoring of shorelines through seawall construction. Changes to the natural freshwater flows into estuarine and marine waters through construction of canals and other water control devices have had other impacts: altered the temperature, salinity, and nutrient

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

regimes; reduced both wetlands and submerged aquatic vegetation; and degraded vast areas of coastal habitat utilized by smalltooth sawfish (Gilmore 1995; Reddering 1988; Whitfield and Bruton 1989). While these modifications of habitat are not the primary reason for the decline of smalltooth sawfish abundance, it is likely a contributing factor and almost certainly hampers the recovery of the species. Juvenile sawfish and their nursery habitats are particularly likely to be affected by these kinds of habitat losses or alternations, due to their affinity for shallow, estuarine systems. Prohaska et al. (2018) showed that juvenile smalltooth sawfish within the anthropogenically altered Charlotte Harbor estuary have higher metabolic stress compared to those collected from more pristine nurseries in the Everglades. Although many forms of habitat modification are currently regulated, some permitted direct and/or indirect damage to habitat from increased urbanization still occurs and is expected to continue to threaten survival and recovery of the species in the future.

Life History Limitations

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

Stochastic Events

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

Current Threats

The 3 major factors that led to the current status of the U.S. DPS of smalltooth sawfish—bycatch mortality, habitat loss, and life history limitations—continue to be the greatest threats today. All the same, other threats such as the illegal commercial trade of smalltooth sawfish or their body parts, predation, and marine pollution and debris may also affect the population and recovery of smalltooth sawfish on smaller scales (NMFS 2010). A rising threat involves entanglement in small bungee cords used to secure boat house canopies, which can lead to disfigurement and may affect both feeding and respiration. We anticipate that all of these threats will continue to affect the rate of recovery for the U.S. DPS of smalltooth sawfish.

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

5 ENVIRONMENTAL BASELINE

5.1 Overview

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

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

Focusing on the impacts of the activities in the action area specifically, allows us to assess the prior experience and state (or condition) of the endangered and threatened individuals that occur in an action area, that will be exposed to effects from the action under consultation. This 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

As described in Section 2.2 (Action Area), the Tampa Harbor Federal Navigation Project includes roughly 70 mi of channels from the GoM entrance at the Egmont Bar north to the City of Tampa, including Hillsborough River, Alafia River, and the Upper Channels. Effects from proposed dredging is expected to occur throughout most of those channel areas, and dredged material placement effects are expected in several other areas of Tampa Bay and outside the mouth of the Bay, as far as 18 mi out into the GoM (Figure 3). Descriptions of the various habitat types and conditions that can be found in the action area are also described in Section 2.2.

The status of species in the action area that are likely to be adversely affected by the proposed action, as well as the threats to these species, is supported by the species accounts in Section 4 (Status of Species).

5.2.1 Sea Turtles

The three species of sea turtles that are likely to be adversely affected by the proposed project, green (North Atlantic DPS), Kemp's ridley, and loggerhead (Northwest Atlantic DPS), are all highly migratory. We do not expect that any individual sea turtle is likely to be a permanent resident of the action area, although some individuals may be present at any given time. These same individuals will migrate into offshore waters of the GoM, Caribbean Sea, and other areas of the North Atlantic Ocean at certain times of the year, and thus may be affected by activities occurring throughout these areas. Therefore, the statuses of these species 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 Species).

5.2.2 Smalltooth Sawfish

Smalltooth sawfish have been documented throughout the state of Florida; however, the majority of encounters occur in Lee, Charlotte, and Monroe counties. Between 2015 and 2023, NMFS PRD has received reports of 44 smalltooth sawfish encounters (some of which included multiple fish), including a total of 49 individual fish within Tampa Bay and the nearshore waters outside the mouth of the Bay, where project effects may occur. NMFS believes that no individual smalltooth sawfish is likely to be a permanent resident of the action area, although some individuals may be present at any given time, and may be adversely affected by relocation trawling that will occur in association with the proposed hopper dredging activities. Individuals that occur in the action area are likely to eventually migrate into coastal and offshore waters of the GoM, and thus may be affected by activities occurring there. Therefore, the status of smalltooth sawfish in the action area is considered to be the same as those discussed in Section 4.

5.3 Additional Factors Affecting Species within the Action Area

5.3.1 Federal Actions

Based on a review of the NMFS SERO PRD's completed ESA Section 7 consultation database by the consulting biologist on February 8, 2024, NMFS has conducted 23 ESA Section 7 consultations in the action area, 17 of which were informal consultations in which NMFS determined the proposed actions were not likely to adversely affect any ESA-listed species or critical habitat. The remaining 6 formal consultations included 4 fishing pier construction or repair projects, 1 artificial reef construction project, and 1 scientific sampling project, as detailed below.

Public Fishing Piers

Take of ESA-listed sea turtles and sawfish has been documented at numerous public fishing piers throughout Florida. Sea turtles and sawfish may be caught, injured or even killed by being hooked or entangled in actively fished, or improperly discarded fishing gear. There are 4 public fishing piers in the action area that have undergone formal ESA Section 7 consultation. In each biological opinion, incidental take was estimated for each species. The average annual take for all 4 piers combined was estimated to be approximately 3 green, 4 Kemp's ridley, and 7 loggerhead sea turtles, and 6 smalltooth sawfish per year. All 4 biological opinions came to the conclusion that the adverse effects resulting from recreational fishing at these piers were not likely to jeopardize the continued existence of any of these species.

Artificial Reefs

Fishing activities on artificial reefs invariably result in the loss of monofilament and anchor lines that get fouled on the reef material, broken off, and left attached to the reef. Over time, with significant fishing pressure, monofilament and other lines can accumulate on these structures, which eventually presents a threat to sea turtles utilizing artificial reefs as resting and foraging habitat. Sea turtles foraging in the crevasses formed by artificial reefs or wedging themselves under the structures to rest may encounter lost monofilament or anchor lines, which become wrapped around their flippers, neck, or shell. If the line is fouled securely into the reef material, the sea turtle may become effectively anchored to the bottom, unable to surface and breathe, and ultimately drown.

The effects analysis for the Manatee County Bridge Reef Project determined that entanglement in the reef would result in the lethal take of 209 loggerhead, 196 green, and 46 Kemps ridley sea turtles over the 150-year life of the reef. Smalltooth sawfish have not been documented to become entangled on artificial reefs and are therefore not expected to be adversely affected by the project. The analysis found that these expected effects would not jeopardize the continued existence of any of these ESA-listed species.

Scientific Monitoring and Research
The FWC conducts fishery independent monitoring surveys throughout coastal Florida, including in and around Tampa Bay. During this scientific monitoring, ESA-listed sea turtles and sawfish are occasionally captured in the sampling gear. Throughout the history of this monitoring program, all ESA-listed species that have been captured have been quickly removed and released alive and uninjured from the sampling gear.

The 2019 formal consultation conducted on this monitoring program found that up to 62 green, 5 loggerhead, and 8 Kemps ridley sea turtles, and 3 smalltooth sawfish were expected to be captured and released throughout the state of Florida, over any consecutive 3-year period of monitoring. Only a small (undefined) portion of these captures would be expected to occur within the action area for the proposed project. This consultation determined that the proposed monitoring program was not likely to jeopardize the continued existence of any ESA-listed species.

Federal Maintenance Dredging Activities
Marine dredging for maintenance of federal navigation channels is common within the action area. Mechanical dredging, hydraulic suction dredging, and hopper dredging have all been used in the maintenance of federal navigation channels throughout Tampa Bay in the past. Although the underwater noises from dredge vessels are typically continuous in duration (for periods of days or weeks at a time) and strongest at low frequencies, they are not believed to have any long-term effect on sea turtles or smalltooth sawfish. Still, the construction and maintenance of federal navigation channels and dredging in sand mining sites (borrow areas) have been identified as sources of sea turtle mortality. Hopper dredges are capable of moving relatively quickly compared to sea turtle swimming speed and can thus overtake, entrain, and kill sea turtles as the suction draghead(s) of the advancing dredge overtakes the resting or swimming turtle. Entrained sea turtles rarely survive. Comprehensive monitoring and reporting requirements for all hopper dredging activities have been in place for several decades, and throughout this period, there have been no documented instances of other ESA-listed species (fish or marine mammals) entrained or injured by hopper dredging activities within the action area.

To reduce impacts to sea turtles, relocation trawling may be utilized to capture and relocate sea turtles. In relocation trawling, a boat equipped with nets precedes the dredge to capture turtles and then releases the animals out of the dredge pathway, thus avoiding lethal take. Both sea turtles and smalltooth sawfish have been captured during past relocation trawling in the action area.

In 2003, NMFS completed formal consultation on the impacts of federal maintenance-dredging operations in the GoM (revised and updated in 2007; NMFS 2007). This Opinion concluded that

GoM hopper dredging would adversely affect sea turtles and smalltooth sawfish, but would not jeopardize their continued existence. The GRBO considers maintenance dredging and sand mining operations only. It does not cover “improvements” to federal channels, such as making them deeper or wider than was previously authorized, as is proposed in the current project under consultation.

Federally Authorized Vessel Activity
Large ocean-going vessels are a major contributor to underwater noise in Tampa Bay, and have the potential to interact with sea turtles though direct impacts with the vessels or their propellers. Sound levels and tones produced are generally related to vessel size and speed. Larger vessels generally emit more sound than smaller vessels, and vessels underway with a full load, or those pushing or towing a load, are noisier than unladen vessels. Vessels operating at high speeds have the potential to strike sea turtles. The agencies that authorize and/or operate large vessels in the action area include the U.S. DoD, BOEM, USCG, NOAA, and USACE. We have conducted Section 7 consultations with all of these agencies, analyzing effects of federal vessel operation in the GoM (including the action area). Many of these consultations required or confirmed the implementation of conservation measures for vessel operations, designed to avoid or minimize adverse effects to listed species. At the present time, federal vessel operation in the action area continue to present the potential for harassment and injury to ESA-listed species in the action area, but none of these activities have been found to be likely to jeopardize the continued existence of any ESA-listed species.

ESA Permits and Cooperative Agreements
Sea turtles are the focus of research activities authorized by Section 10 permits under the ESA. The ESA allows the issuance of permits to take listed species for the purposes of scientific research and enhancement (Section 10(a)(1)(A)). Prior to issuance of these authorizations, the proposal must be reviewed for compliance with Section 7 of the ESA. In addition, the ESA allows for NMFS to enter into cooperative agreements with states, developed under Section 6 of the ESA, to assist in recovery actions of listed species. Activities conducted under the cooperative agreements also must be reviewed for compliance with Section 7 of the ESA.

Per a search of the NOAA Fisheries Authorizations and Permits for Protected Species (APPS; https://apps.nmfs.noaa.gov/) database by the consulting biologist on April 2, 2024, there were 2 active Section 10(a)(1)(A) scientific research permits applicable to smalltooth sawfish within the action area. These permits allow the capture, handling, and release of smalltooth sawfish (all life stages) for the purpose of research and monitoring of this species. There was also 1 active Section 10(a)(1)(A) scientific research permit applicable to green, loggerhead and Kemp’s ridley sea turtles within the action area. This permit allows the capture, handling, sampling, and release of these turtle species (all life stages except hatchlings), for the purpose of demographic and life history studies of sea turtle populations in the Atlantic Ocean and Gulf of Mexico.

5.3.2 State and Private Actions

Commercial and Private Fisheries

There is a relatively small amount of commercial fishing activities that take place within the state-managed waters that make up the action area. These are primarily conducted by small vessels fishing for bait-shrimp, blue crabs and striped mullet (pers. com. Michael Larkin NMFS, from Chris Bradshaw FWC, 4/18/2024). In addition to the commercial activities, there is a significant amount of recreational fishing that takes place in and around Tampa Bay, as this is one of the most densely populated areas in Florida, with numerous public fishing piers and boat ramps, along with thousands of private docks and boat slips.

Lost traps, nets, and fishing line ("ghost gear") are a well-documented source of human-caused mortality in sea turtles (Barnette 2017). Materials entangled tightly around a body part may cut into tissues, enable infection, and severely compromise an individual's health (Derraik 2002). Entanglements also make animals more vulnerable to additional threats (e.g., predation and vessel strikes) by restricting agility and swimming speed. The majority of ESA-species that die from entanglement in fishing gear likely sink to the bottom rather than strand ashore, making it difficult to accurately determine the extent of such mortalities.

Sea turtles and sawfish may also be injured or killed by being directly hooked by recreational anglers. Hooking can occur as a result of a variety of scenarios, some depending on the foraging strategies and diving and swimming behavior of the species affected. Sea turtles are either hooked externally in the flippers, head, shoulders, armpits, or beak, or internally inside the mouth or throat, when the animal has swallowed the bait (Balazs et al. 1985). Reductions in fish populations, whether natural or human-caused from activities such as fishing, may affect the survival and recovery of ESA-listed species that feed on these fish including smalltooth sawfish. While it is difficult to pinpoint the specific effects of commercial and recreational fisheries on sea turtles and sawfish in the action area, it has been estimated that worldwide, 447,000 sea turtles are killed each year from bycatch in commercial fisheries (Wallace et al. 2010). In addition to commercial bycatch, recreational hook-and-line data compiled by the Florida Sea Turtle Stranding and Salvage Network shows that along the coast of the Southeast U.S., from 2007-2015 approximately 300 sea turtles were reported as having recreational hook-and-line interactions (Florida Sea Turtle Stranding and Salvage Network, unpublished data).

Vessel Traffic

Vessels have the potential to affect sea turtles and smalltooth sawfish through strikes, sound, and disturbance associated with their physical presence and can affect these species habitat through propeller scarring, propeller wash, and accidental groundings, as discussed in Section 3 of this Opinion. Vessel strikes are considered a serious and widespread threat to ESA-listed species. This threat is increasing as private and commercial vessel traffic increases in the Tampa Bay area. As vessels become faster and more widespread, an increase in vessel interactions with ESA-listed species is to be expected.

5.3.3 Marine Debris and Contaminant Spills

The discharge of debris into the marine environment is a continuing threat to ESA-listed species in the action area, regardless of whether the debris is discharged intentionally or accidentally. Marine debris may originate from a variety of sources, though specific origins of debris are difficult to identify. A 1991 report (GESAMP 1990) indicates that up to 80 percent of marine debris is considered land-based and a worldwide review of marine debris identifies plastic as the primary form (Derraik 2002). Debris can originate from a variety of marine industries including fishing, oil and gas, and shipping. Many of the plastics discharged to the sea can withstand years of saltwater exposure without disintegrating or dissolving.

Marine debris has the potential to impact ESA-listed species through ingestion or entanglement (Gregory 2009). Both of these effects could result in reduced feeding, reduced reproductive success, and potential injury, infection, or death. All sea turtles are susceptible to ingesting marine debris, which may block the digestive tract or remain in the stomach for extended periods, thereby reducing the feeding drive, causing ulcerations and injury to the stomach lining, or perhaps even providing a source of toxic chemicals (Laist 1987; Laist 1997). Weakened animals are then more susceptible to predators and disease and are also less fit to migrate, breed, or, in the case of turtles, nest successfully (Katsanevakis 2008; McCauley and Bjorndal 1999).

Pollution from a variety of sources including atmospheric loading of pollutants such as PCBs, stormwater from coastal or river communities, and discharges from ships and industries may affect sea turtles and smalltooth sawfish in the action area. Sources of marine pollution are often difficult to attribute to specific federal, state, local or private actions.

There are studies on organic contaminants and trace metal accumulation in green, leatherback, and loggerhead sea turtles (Aguirre et al. 1994; Caurant et al. 1999; Corsolini et al. 2000). McKenzie et al. (1999) measured concentrations of chlorobiphenyls and organochlorine pesticides in sea turtles tissues collected from the Mediterranean (Cyprus, Greece) and European Atlantic waters (Scotland) between 1994 and 1996. Omnivorous loggerhead turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles (Storelli et al. 2008). It is thought that dietary preferences were likely to be the main differentiating factor among species. Decreasing lipid contaminant burdens with sea turtle size were observed in green turtles, most likely attributable to a change in diet with age. (Sakai et al. 1995) documented the presence of metal residues occurring in loggerhead sea turtle organs and eggs. Storelli et al. (1998) analyzed tissues from 12 loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that characteristically, mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals, and porpoises (Law et al. 1991). No information on detrimental threshold concentrations is available and little is known about the consequences of exposure of organochlorine compounds to sea turtles and sawfish. Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in these species.

The development of marinas, docks, and other infrastructure around Tampa Bay can negatively impact aquatic habitats. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and shoreline habitats. Fuel oil spills could affect animals directly or indirectly through the food chain. Fuel spills involving private vessels are common events, though these spills typically involve small amounts of contaminants. Larger contaminant spills may result from accidents, although these events would be rare. No direct adverse effects on listed species resulting from fishing vessel fuel spills have been documented.

The Piney Point wastewater spill was a massive emergency release of nutrient-rich wastewater, primarily composed of phosphorus and nitrogen, into Tampa Bay, that occurred at the Piney Point phosphate plant in April 2021. The release was initiated after a breach was detected in one of the walls of the containment reservoir, in order to prevent a complete failure of the containment structure and minimize the size of the release, and its environmental impacts. Following the release, efforts were made to contain and clean up the wastewater. Additionally, measures were taken to stabilize the remaining infrastructure at the Piney Point site to prevent future incidents.

The large release of the nutrient-rich wastewater into Tampa Bay is thought to have disrupted the balance of the marine ecosystem, and may have provided fuel for the harmful algal blooms, known as red tide, which occurred in Tampa Bay and nearby coastal areas in the months following the spill. These harmful algal blooms resulted in impacts to aquatic plants, and negatively affect other marine organisms, including fish, shellfish, and benthic invertebrates. It is unknown if any ESA-listed species were directly impacted by the spill and subsequent red tide bloom, but it is highly likely that they were impacted by the general disruption and loss of function of the fragile ecosystems throughout the action area.

5.3.4 Climate Change

In addition to the information on climate change presented in the Section 4 (Status of the Species), the discussion below presents further background information on global climate change as well as past and predicted future effects of global climate change we expect within the GoM and Tampa Bay. The potential effects to ESA-listed species and their habitats are the result of slow and steady shifts or alterations over a long time-period, and forecasting any specific critical threshold that may occur at some point in the future (e.g., several decades) is fraught with uncertainty. As a result, for the purposes of this Opinion we have elected to view the effects of climate change on affected species on a relatively manageable and predictable 10-year time period due to this reality. While climate change is also relevant to the Cumulative Effects section of this Opinion (Section 7), we are synthesizing all additional information here rather than include partial discussions in other sections of this Opinion.

In order to evaluate the implications of different climate outcomes and associated impacts throughout the 21st century, many factors have to be considered. The amount of future greenhouse gas emissions is a key variable. Developments in technology, changes in energy generation and land use, global and regional economic circumstances, and population growth must also be considered.

A set of four scenarios was developed by the IPCC to ensure that starting conditions, historical data, and projections are employed consistently across the various branches of climate science. The scenarios are referred to as representative concentration pathways (RCPs), which capture a range of potential greenhouse gas emissions pathways and associated atmospheric concentration levels through 2100 (IPCC 2014). The RCP scenarios drive climate model projections for temperature, precipitation, sea level, and other variables: RCP2.6 is a stringent mitigation scenario; RCP2.5 and RCP6.0 are intermediate scenarios; and RCP8.5 is a scenario with no mitigation or reduction in the use of fossil fuels. The IPCC future global climate predictions (2014 and 2018) and national and regional climate predictions included in the Fourth National Climate Assessment for U.S. states and territories (2018) use the RCP scenarios.

The increase of global mean surface temperature change by 2100 is projected to be 0.3 to 1.7°C under RCP 2.6, 1.1 to 2.6°C under RCP 4.5, 1.4 to 3.1°C under RCP 6.0, and 2.6 to 4.8°C under RCP8.5 with the Arctic region warming more rapidly than the global mean under all scenarios (IPCC 2014). The Paris Agreement aims to limit the future rise in global average temperature to 2°C, but the observed acceleration in carbon emissions over the last 15 to 20 years, even with a lower trend in 2016, has been consistent with higher future scenarios such as RCP8.5 (Hayhoe et al. 2018).

The globally-averaged combined land and ocean surface temperature data, as calculated by a linear trend, show a warming of approximately 1.0°C from 1901 through 2016 (Hayhoe et al. 2018). The IPCC Special Report on the Impacts of Global Warming noted that human-induced warming reached temperatures between 0.8 and 1.2°C above pre-industrial levels in 2017, likely increasing between 0.1 and 0.3°C per decade. Warming greater than the global average has already been experienced in many regions and seasons, with most land regions experiencing greater warming than over the ocean (Allen et al. 2018). Annual average temperatures have increased by 1.8°C across the contiguous U.S. since the beginning of the 20th century with Alaska warming faster than any other state and twice as fast as the global average since the mid-20th century (Jay et al. 2018). Global warming has led to more frequent heatwaves in most land regions and an increase in the frequency and duration of marine heatwaves (Allen et al. 2018). Average global warming up to 1.5°C as compared to pre-industrial levels is expected to lead to regional changes in extreme temperatures, and increases in the frequency and intensity of precipitation and drought (Allen et al. 2018).

According to the best available information, the GoM, appears to be warming faster than all other ocean basins except perhaps the southern oceans (Cheng et al. 2017). Additional consequences of climate change include increased ocean stratification, decreased sea-ice extent, altered patterns of ocean circulation, and decreased ocean oxygen levels (Doney et al. 2012). Since the early 1980s, the annual minimum sea ice extent (observed in September each year) in the Arctic Ocean has decreased at a rate of 11 to 16 percent per decade (Jay et al. 2018). Further, ocean acidity has increased by 26 percent since the beginning of the industrial era. A study by (Polyakov et al. 2009) suggests that the GoM has been experiencing a general warming trend over the last 80 years. Climate change is also expected to increase the frequency of extreme weather and climate events including, but not limited to, cyclones, tropical storms, heat waves, and droughts (IPCC 2014).

Climate change has the potential to impact species abundance, geographic distribution, migration patterns, and susceptibility to disease and contaminants, as well as the timing of seasonal activities and community composition and structure (MacLeod et al. 2005; Robinson et al. 2005). Climate change has the potential to impact species abundance, geographic distribution, migration patterns, and susceptibility to disease and contaminants, as well as the timing of seasonal activities and community composition and structure (Evans and Bjørge 2013; IPCC 2014; Kintisch 2006; Learmonth et al. 2006; MacLeod et al. 2005; McMahon and Hays 2006; Robinson et al. 2005).

Though predicting the precise consequences of climate change on highly mobile marine species is difficult (Simmonds and Isaac 2007), recent research has indicated a range of consequences already occurring. For example, 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 to 35°C (Ackerman 1997). Increases in global temperature could skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007aa; NMFS and USFWS 2007fb; NMFS and USFWS 2013aa; NMFS and USFWS 2013bb; NMFS and USFWS 2015). These impacts will be exacerbated by sea level rise. The loss of habitat because 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 or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006; Baker et al. 2006b).

Changes in the marine ecosystem caused by global climate change (e.g., ocean acidification, salinity, oceanic currents, dissolved oxygen levels, nutrient distribution) could influence the distribution and abundance of lower trophic levels (e.g., phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish), ultimately affecting primary foraging areas of ESA-listed species including marine mammals, sea turtles, and fish. Marine species ranges are expected to shift as they align their distributions to match their physiological tolerances under changing environmental conditions (Doney et al. 2012). Hazen et al. (2012) examined top predator distribution and diversity in the Pacific Ocean in light of rising sea surface temperatures using a database of electronic tags and output from a global climate model. They predicted up to a 35 percent change in core habitat area for some key marine predators in the Pacific Ocean, with some species predicted to experience gains in available core habitat and some predicted to experience losses.

This review provides some examples of impacts to ESA-listed species and their habitats that may occur as the result of climate change. While it is difficult to accurately predict the consequences of climate change to a particular species or location (such as Tampa Bay), a range of consequences are expected that are likely to change the status of the species and the condition of their habitats.

5.3.5 Stochastic Events

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

5.3.6 Conservation and Recovery Actions Shaping the Environmental Baseline

BOEM's Environmental Studies Program
BOEM funds research projects specifically to inform policy decisions regarding development of Outer Continental Shelf energy and mineral resources. Some of these studies may benefit marine fauna by providing more information towards understanding those resources. For example, BOEM collects emissions information related to offshore operations and has established a Gulf-wide emission inventory. BOEM is currently conducting a study to perform dispersion and photochemical modelling for the U.S. portion of the GoM to verify effectiveness of existing air quality emissions exemption thresholds and to ensure annual and short-term National Ambient Air Quality Standards are being met (https://opendata.boem.gov/BOEM-ESP-Ongoing-Study-Profiles-2017-FYQ1/BOEM-ESP-GM-14-01.pdf; BOEM 2014).

There are also summaries for current studies on assessing the effects of anthropogenic stressors on sea turtles in the GoM. All of the BOEM studies are available through an online system called the Environmental Studies Program Information System found at https://marinecadastre.gov/espis/#/.

Sea Turtles Conservation and Recovery Actions
NMFS has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles from commercial fisheries in the GoM. These include sea turtle release gear requirements for the GoM reef fish fisheries, and TED requirements for the Southeast shrimp trawl fishery. In addition to regulations, outreach programs have been established and data on sea turtle interactions with recreational fisheries has been collected through the Marine Recreational Information Program.

Reducing Threats from Hook-and-Line Fisheries
NMFS published the Final Rules to implement sea turtle release gear requirements and sea turtle careful release protocols in the GoM reef fish fishery (August 9, 2006; (71 FR 45428). These measures require owners and operators of vessels with federal commercial or charter

vessel/headboat permits for Gulf reef fish to comply with sea turtle (and smalltooth sawfish) release protocols and have on board specific sea turtle release gear.

Revised Use of TEDs in Trawl Fisheries

NMFS has also implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles in commercial shrimp trawl fisheries. In particular, NMFS has required the use of TEDs in southeast United States shrimp trawls since 1989. It has been estimated that TEDs exclude 97 percent of the sea turtles caught in such trawls. These regulations have been refined over the years to ensure that TED effectiveness is maximized through more widespread use, and proper placement, installation, configuration (e.g., width of bar spacing), and floatation. The NMFS continues to work towards development of new, more effective gear specific to fishery needs.

Placement of Fisheries Observers to Monitor Sea Turtle Captures

On August 3, 2007, NMFS published a Final Rule that required selected fishing vessels to carry observers on board to collect data on sea turtle interactions with fishing operations, to evaluate existing measures to reduce sea turtle captures, and to determine whether additional measures to address prohibited sea turtle captures may be necessary (72 FR 43176). This Rule also extended the number of days NMFS observers could be placed aboard vessels, from 30 to 180 days, in response to a determination by the NMFS Assistant Administrator that the unauthorized take of sea turtles may be likely to jeopardize their continued existence under existing regulations.

State Conservation and Recovery Actions

Under Section 6 of the ESA, state agencies may voluntarily enter into cooperative research and conservation agreements with NMFS to assist in recovery actions of listed species. NMFS currently has an agreement with Florida, and all other states along the GoM. Prior to issuance of these agreements, the proposals were reviewed for compliance with Section 7 of the ESA.

Other Conservation Efforts

<u>Sea Turtle Handling and Resuscitation Techniques</u>

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

<u>Outreach and Education, Sea Turtle Entanglement, and Rehabilitation</u>

The STSSN has extensive participant coverage along the Atlantic and GoM coasts. The network not only collects data on dead sea turtles, but also rescues and rehabilitates live stranded sea turtles.

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

NMFS has also been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. As well as making this information widely available to all fishermen, NMFS recently conducted a number of workshops with Atlantic HMS pelagic longline fishers to discuss bycatch issues including protected species, and to educate them regarding handling and release guidelines. NMFS intends to continue these outreach efforts and hopes to reach all fishers participating in the Atlantic HMS pelagic longline fishery.

Recovery Plans and Reviews

The second revision to the recovery plan for the loggerhead sea turtle was completed January 11, 2009 (NMFS and USFWS 2009). The recovery plan for the Kemp's ridley sea turtle was published 2011 (NMFS et al. 2011a). Recovery teams comprised of sea turtle experts have been convened and are currently working towards revising these plans based upon the latest and best available information. Five-year status reviews were completed in 2015 for green and Kemp's ridley sea turtles. A review of the loggerhead sea turtle's status was conducted in 2009 (Conant et al. 2009a). These reviews were conducted to comply with the ESA mandate for periodic status evaluation of listed species to ensure that their threatened or endangered listing status remains accurate.

NMFS published the first Smalltooth Sawfish Recovery Plan in 2009 (https://www.fisheries.noaa.gov/resource/document/recovery-plan-smalltooth-sawfish-pristis-pectinata) and is currently updating it to incorporate new information. The 2009 plan provided 3 primary objectives to recover the U.S. DPS of smalltooth sawfish:

1. Minimize human interactions and associated injury and mortality
2. Protect and/or restore smalltooth sawfish habitats
3. Ensure smalltooth sawfish abundance increases substantially and the species reoccupies areas from which it had previously been extirpated.

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 but that are not part of the 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 actions on listed species that are likely to be adversely affected. The analysis in this section forms the foundation for our jeopardy analysis in Section 8. The quantitative and qualitative analyses in this section are based upon the best available commercial and scientific data on species biology and the effects of the action.

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

In Section 3.1.2, we analyzed potential effects of the proposed action that we determined are not likely to adversely affect leatherback and hawksbill sea turtles, Gulf sturgeon, and giant manta rays. Due to the similarities between those species and green (North Atlantic DPS), Kemp's ridley, and loggerhead sea turtles, and smalltooth sawfish, we have determined that the analyses provided in Section 3.1.2 would also apply to these species. We have therefore determined that the following routs of effects from the proposed action are not likely to adversely affect green, Kemp's ridley, and loggerhead sea turtles, and smalltooth sawfish:

Mechanical and Hydraulic Dredging
Vessel Strike
Entrainment and Impingement
Dredged Material Placement
Entanglement
Dredging-Related Turbidity
Reduced Access

See Section 3.1.2 for detailed analyses and conclusions on the potential for these project elements to affect ESA-listed species.

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

We believe that the only activities covered under this Opinion that are likely to result in adverse effects to ESA-listed species are hopper dredging, which is expected to result in lethal take of sea turtles (green, Kemp's ridley, and loggerhead), and relocation trawling, which is expected to result in non-lethal take of sea turtles (green, Kemp's ridley, and loggerhead), and smalltooth sawfish.

To evaluate the effects and calculate take from hopper dredging and relocation trawling covered under this Opinion, data from previous Tampa Harbor O&M hopper dredging projects were analyzed to determine the effects to sea turtles and sawfish (Table 5). Thirty-six sea turtles (and 0 smalltooth sawfish) were documented/observed as taken in hopper dredges during these five (5) dredging events between 2014-2023 (https://dqm.usace.army.mil/odess/).

Table 5. Tampa Harbor O&M Hopper Dredge Incidental Take Data.

Year/Time of Year	Loggerhead	Kemp's Ridley	Unknown	Total Volume Dredged
2023/Winter	10	0	0	435,587 cy
2022/Winter	8	2	0	316,760 cy
2019/Summer	1	0	1	327,166 cy
2018/Winter	3	3	0	107,934 cy
2014-2015/Winter	2	6	0	623,496 cy
Total	**24**	**11**	**1**	**1,810,943cy**

Data from previous relocation trawling efforts conducted in conjunction with hopper dredging operations are detailed in Table 6 below.

Table 6. Tampa Harbor O&M Relocation Trawling Data.

Year/Time of Year	Loggerhead	Kemp's Ridley	Green	Smalltooth Sawfish	Total Volume Dredged
2023/Winter	20	7	0	0	435,587 cy
2022/Winter	2	1	0	0	316,760 cy
2019/Summer	34	7	2	4	327,166 cy
Total	**56**	**15**	**2**	**4**	**1,079,513**

6.2.2.1 Expected Observed Mortality From Hopper Dredging

Based on the estimated maximum volume of sediments that may be dredged using hopper dredging throughout the duration of proposed project (8 mcy), we can use the monitoring results shown above (Table 5) to estimate the observed number of each species that may be taken (assumed killed) during the hopper dredging for this proposed project.

Because 0 smalltooth sawfish have been documented as killed by hopper dredging activities in the action area, we do not anticipate any smalltooth sawfish mortalities resulting from hopper dredging associated with the proposed project.

A total of 24 loggerhead sea turtles were taken through dredging of 1,810,943 cy of material in the action area. Based on this ratio, we would expect 106 loggerheads to be taken during the dredging of 8,000,000 cy, under the proposed project.

24 loggerhead sea turtles/1,810,943 cy = X loggerhead sea turtles/8,000,000 cy
0.00001325 loggerhead sea turtles/cy = X loggerhead sea turtles/8,000,000 cy
106.0 loggerhead sea turtles = X

A total of 11 Kemp's ridley sea turtles were taken through dredging of 1,810,943 cy of material in the action area. Based on this ratio, we would expect 48.6 Kemp's ridley to be taken during the dredging of 8,000,000 cy, under the proposed project. Because it is impossible to take a fraction of a sea turtle, we will round this number up to 49 Kemp's ridley sea turtles.

11 Kemp's ridley sea turtles/1,810,943 cy = X Kemp's ridley sea turtles /8,000,000 cy
0.000006074 Kemp's ridley sea turtles = X Kemp's ridley sea turtles /8,000,000 cy
48.6 Kemp's ridley sea turtles = X

We will assume that the unknown species of sea turtle that was taken during the summer of 2019 was a green turtle, based on the fact that 2 green sea turtles were captured in the relocation trawling during this time period, and this was the only time that green turtles were taken throughout the previous dredging/trawling efforts. Under this assumption, a total of 1 green sea turtle was taken through dredging of 1,810,943 cy of material in the action area. Based on this ratio, we would expect 4.4 greens to be taken during the dredging of 8,000,000 cy, under the proposed project. Because it is impossible to take a fraction of a sea turtle, we will round this number up to 5 green sea turtles.

1 green sea turtle/1,810,943 cy = X green sea turtles/8,000,000 cy
0.000000552 green sea turtle/cy = X green sea turtles/8,000,000 cy
4.4 green sea turtle = X

6.2.2.2 Expected Unobserved Mortalities from Hopper Dredging

Dredged material screening by observers on hopper dredges is only partially effective, and observed interactions are expected to document only 50% of sea turtles entrained and killed by a hopper dredge. The exact percentage of sea turtles that are taken by hopper dredging, but not observed, is unknown. Historically, NMFS has estimated that only 50% of the take that occurs during hopper dredging is observed, and we have no new information to modify this estimate. Thus, the anticipated observed and unobserved lethal take of sea turtles by the proposed action is 212 loggerhead sea turtles (i.e., 106 observed loggerhead sea turtle mortalities × 2), 98 Kemp's ridley sea turtles, and 10 green sea turtles (North Atlantic DPS).

6.2.2.2 Relocation Trawling

The effects of relocation trawling and subsequent handling are expected to be non-lethal to captured sea turtles and smalltooth sawfish. All sea turtles and smalltooth sawfish captured via relocation trawling are released unharmed in a nearby area that contains the same habitat as the areas where the trawling occurs; therefore, any habitat displacement effects associated with the relocation trawling capture are considered to be insignificant. Capturing the species and relocating it, however, is an effect to the species, which is evaluated below.

Estimated Take of Sea Turtles from Relocation Trawling
Based on the estimated maximum volume of sediments that may be dredged using hopper dredging throughout the proposed project (8,000,000 cy), we can use the monitoring results shown above (Table 6) to estimate the number of each species of sea turtle that may be taken (assumed captured and released unharmed) during the relocation trawling for this proposed project.

A total of 56 loggerhead sea turtles were taken through relocation trawling associated with the dredging of 1,079,513 cy of material in the action area. Based on this ratio, we would expect 415 loggerheads to be taken through relocation trawling associated with the dredging of 8,000,000 cy, under the proposed project.

56 loggerhead sea turtles/1,079,513 cy = X loggerhead sea turtles/8,000,000 cy
0.0000519 loggerhead sea turtles/cy = X loggerhead sea turtles/8,000,000 cy
415.0 loggerhead sea turtles = X

A total of 15 Kemp's ridley sea turtles were taken through relocation trawling associated with the dredging of 1,079,513 cy of material in the action area. Based on this ratio, we would expect 111.2 Kemp's ridleys to be taken during relocation trawling associated with the dredging of 8,000,000 cy, under the proposed project. Because it is impossible to take a fraction of a sea turtle, we will round this number up to 112 Kemp's ridley sea turtles.

15 Kemp's ridley sea turtles /1,079,513 cy = X Kemp's ridley sea turtles /8,000,000 cy
0.0000139 Kemp's ridley sea turtles/cy = X Kemp's ridley sea turtles /8,000,000 cy
111.2 Kemp's ridley sea turtles = X

A total of 2 green sea turtles were taken through relocation trawling associated with the dredging of 1,079,513 cy of material in the action area. Based on this ratio, we would expect 14.8 green sea turtles to be taken during relocation trawling associated with the dredging of 8,000,000 cy, under the proposed project. Because it is impossible to take a fraction of a sea turtle, we will round this number up to 15 green sea turtles.

2 green sea turtles/1,079,513 cy = X green sea turtles/8,000,000 cy
0.000001853 green sea turtles/cy = X green sea turtles/8,000,000 cy
14.8 green sea turtles = X

The effects of capture and handling during relocation trawling can result in raised levels of stressor hormones and can cause some discomfort during tagging procedures. Based on past observations obtained during similar research trawling for sea turtles (i.e., small-scale trawling, not the type associated with large-scale maintenance dredging), these effects are expected to dissipate within a day (Stabenau and Vietti 2003). Since sea turtle recaptures are not common, and recaptures that do occur typically happen several days to weeks after initial capture, cumulative adverse effects of recapture are not expected. The reasoning behind this is sea turtles that are non-lethally taken by a closed-net trawl, which is observing trawl speed and tow-time limits, will be safely relocated to an area outside of the trawl area (typically 3-5 mi). If the sea turtle is captured again, the sea turtle will have had ample time to recover from the stress of the experience of the trawl net. This project differs from larger maintenance dredging projects, which would likely use larger relocation vessels with larger nets that can accommodate heavier catches and could potentially result in internal and external injuries to sea turtles, leading to the potential for post-release mortalities. Because of the size relocation vessels and nets, and for the other reasons stated here, we do not anticipate any mortalities of healthy sea turtles associated with relocation trawling. Relocation trawling could injure or kill sea turtles with impaired health, but we do not anticipate this to occur.

Estimated Take of Smalltooth Sawfish from Relocation Trawling
A total of 4 smalltooth sawfish were taken through relocation trawling associated with the dredging of 1,079,513 cy of material in the action area. Based on this ratio, we would expect 29.6 sawfish to be taken during relocation trawling associated with the dredging of 8,000,000 cy, under the proposed project. Because it is impossible to take a fraction of a sawfish, we will round this number up to 30 smalltooth sawfish.

4 smalltooth sawfish/1,079,513 cy = X smalltooth sawfish /8,000,000 cy
0.000003705 smalltooth sawfish/cy = X smalltooth sawfish /8,000,000 cy
29.6 smalltooth sawfish = X

While the effects of capture and handling during relocation trawling can result in raised levels of lactate and HCO_3 in smalltooth sawfish (Prohaska et al. 2018), the level of post-release mortality is thought to be very low when smalltooth sawfish are handled and released properly. Based on information from ongoing tagging and telemetry studies, smalltooth sawfish appear resilient to the effects of capture and handling, and post-release survival is expected to be high (Brame et al. 2019).

7 CUMULATIVE EFFECTS

ESA Section 7 regulations require NMFS to consider cumulative effects in formulating its Opinions (50 CFR 402.14). Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion (50 CFR 402.02).

During this consultation, we searched for information on future state, tribal, local, or private (non-federal) actions reasonably certain to occur in the action area that would have effects on green sea turtles (North Atlantic DPS), Kemp's ridley sea turtles, loggerhead sea turtles

(Northwest Atlantic DPS), and smalltooth sawfish. We did not find any information about non-federal actions being planned or under development in the action area other than the actions described in the *Environmental Baseline* (Section 5), which we expect will continue into the future. Non-federal activities anticipated to continue into the future include recreational fishing, scientific research, marine noise generating activities, activities affecting climate change, and activities generating marine debris and pollution, as well as the vessel traffic associated with these activities.

An increase in these activities could increase the effects of these activities on ESA-listed resources. For some of these activities, an increase in the future is considered reasonably certain to occur. Given current trends in local and global population growth, threats associated with climate change, pollution, fisheries, vessel strikes and approaches, and sound are likely to continue to increase in the future, although any increase in effect may be somewhat countered by an increase in conservation and management activities. For the remaining activities and associated threats identified in the *Environmental Baseline* (Section 5), and other unforeseen threats, the magnitude of increase and the significance of any anticipated effects remain unknown. The best scientific and commercial data available provide little specific information on any long-term effects of these potential sources of disturbance on ESA-listed species. Thus, this consultation assumes effects in the future from ongoing human activities within the action area will be similar to those in the past and, therefore, are reflected in the anticipated trends described in the *Status of Species* and *Environmental Baseline* (Section 4 and Section 4).

8 JEOPARDY ANALYSIS

To "jeopardize the continued existence of…" means to "engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Thus, in making this determination for each species, we must look at whether the proposed actions directly or indirectly reduce the reproduction, numbers, or distribution of a listed species. Then if there is a reduction in 1 or more of these elements, we evaluate whether it would be expected to cause an appreciable reduction in the likelihood of both the survival and the recovery of the species.

The NMFS and USFWS's ESA Section 7 Handbook (USFWS and NMFS 1998) defines survival and recovery, as they apply to the ESA's jeopardy standard. Survival means "the species' persistence…beyond the conditions leading to its endangerment, with sufficient resilience to allow recovery from endangerment." 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 a listed species to the point at which listing is no longer appropriate under the criteria set out in Section 4(a)(1) of the Act." Recovery is the process by which species' ecosystems are restored or threats to the species are removed so self-sustaining and self-regulating populations of listed species can be supported as persistent members of native biotic communities.

The 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, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (U.S. DPS). In Section 6, we outlined how the proposed action can adversely affect these species. Now we turn to an assessment of the species response to these impacts, in terms of overall population effects, and whether those effects of the proposed action, when considered in the context of the Status of the Species (Section 4), the Environmental Baseline (Section 5), and the Cumulative Effects (Section 7), will jeopardize the continued existence of the affected species. For any species listed globally, our jeopardy determination must evaluate whether the proposed action will appreciably reduce the likelihood of survival and recovery at the species' global range. For any species listed as DPSs, a jeopardy determination must evaluate whether the proposed action will appreciably reduce the likelihood of survival and recovery of that DPS.

8.1 Sea Turtles

As discussed in the *Status of Species* (Section 4) and *Environmental Baseline* (Section 5) sections, the major anthropogenic stressors that contributed to the sharp decline of ESA-listed sea turtle populations in the past include habitat degradation, direct harvest, commercial fisheries bycatch, and marine debris. While sea turtle populations are still at risk, efforts made over the past few decades to reduce the impact of these threats have slowed the rate of decline for many populations. Bycatch reduction devices have reduced the incidental take of sea turtles in many commercial U.S. fisheries. TEDs, which are required in southeast United States shrimp trawl fisheries, are estimated to have reduced mortality of sea turtles by approximately 95% (NMFS 2014). Mitigation measures required in other federal and state fisheries (e.g., gill net, pelagic longline, pound nets) have also resulted in reduced sea turtle interactions and mortality rates. Increased conservation awareness at the international scale has led to greater global protection of sea turtles. While vessel strikes, recreational fishing, dredging, and pollutants still represent sources of mortality, sea turtle mortalities resulting from these activities within the action area are expected to either remain at current levels, or decrease with additional research efforts, conservation measures, and the continued implementation of existing environmental regulations. Based on our *Cumulative Effects* analysis (Section 6), some current threats to sea turtles are expected to increase in the future. These threats include global climate change, oil and gas development, marine debris, and habitat degradation. However, predicting the magnitude of these types of threats in the future or their impact on sea turtle populations is difficult.

All sea turtle life stages are important to the survival and recovery of the species but one life stage may not be equivalent to other life stages. For example, the take of male juveniles may affect survivorship and recruitment rates into the reproductive population in any given year, but is unlikely to significantly reduce the reproductive potential of the population. For sea turtles, a very low percent of hatchlings is typically expected to survive to reproductive age. Therefore, the loss of hatchlings from a population level standpoint is not as significant with respect to the survival and recovery of the species as the loss of sexually mature life stages. The death of mature, breeding females can have an immediate effect on the reproductive rate of the species. Sublethal effects on adult females may also reduce reproduction by hindering foraging success, as sufficient health and energy reserves are necessary for producing multiple clutches of eggs in a breeding year.

8.1.1 Green Sea Turtle (North Atlantic DPS)

Survival

The proposed action is expected to result in take of up to 25 green sea turtles (10 lethal, 15 non-lethal) from the North Atlantic DPS over a 26-month period. Any non-lethal captures are not expected to have a measurable impact on the reproduction, numbers, or distribution of the species. The individuals may experience stress and minor injuries, but are expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. The non-lethal captures will occur in the action area, which encompass a small portion of the overall range or distribution of green sea turtles within the North Atlantic DPS. Any incidentally caught animals would be released within the general area where caught and no change in the distribution of North Atlantic DPS green sea turtles would be anticipated.

The potential lethal take of 10 individuals would reduce the number of North Atlantic DPS green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. The lethal take would also result in a reduction in future reproduction, assuming some of the individuals were female and would have survived otherwise to reproduce. For example, as discussed in this Opinion, an adult green sea turtle can lay up to 7 clutches (usually 3-4) of eggs every 2-4 years, with a mean clutch size of 110-115 eggs per nest, of which a small percentage would be expected to survive to sexual maturity. The potential lethal captures are expected to occur in a small, discrete area, and green sea turtles in the North Atlantic DPS generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

Whether the reductions in numbers and reproduction of this species would appreciably reduce the species likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species (Section 4.1.3), we presented the status of the North Atlantic DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline (Section 5), we outlined the past and present impacts of all state, federal, or private actions and other human activities in or having effects in the action area that have affected and continue to affect the North Atlantic DPS. In the

Cumulative Effects (Section 7), we discussed the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In Section 4.1.3, we summarized the available information on number of green sea turtle nesters and nesting trends at North Atlantic DPS beaches. The NA DPS is the largest of the 11 green turtle DPSs, with an estimated nester abundance of over 167,000 adult females from 73 nesting sites. We believe these nesting estimates are indicative of a species with a high number of sexually mature individuals. Based on the large number of mature, reproductive females in this population, we believe the potential lethal take of up to 10 green sea turtles from the North Atlantic DPS attributed to the proposed action will not have any measurable effect on the overall survival of this DPS. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe that the hopper dredging associated with the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the green sea turtle (North Atlantic DPS) in the wild.

Recovery

The North Atlantic DPS of green sea turtles does not have a separate recovery plan at this time. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991) does exist. Since the animals within the North Atlantic DPS all occur in the Atlantic Ocean and would have been subject to the recovery actions described in that plan, we believe it is appropriate to continue using 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:

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

According to data collected from Florida's index nesting beach survey from 1989-2021, 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 increased over the 2020 nesting, with another increase in 2022 still well below the 2019 high. This indicates that the first recovery objective is currently being met. There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the clear increases in nesting, however, it is likely that numbers on foraging grounds have also increased, consistent with the criteria of the second listed recovery objective.

The potential lethal take of up to 10 individuals will result in a reduction in numbers; however, it is unlikely to have any detectable influence on the recovery objectives and trends noted above, even when considered in the context of the of the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. Any non-lethal captures would not affect the adult female nesting population or number of nests per nesting season. Thus, the proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of North Atlantic DPS green sea turtles' recovery in the wild.

Conclusion
The combined potential lethal and non-lethal captures of 25 green sea turtles from the North Atlantic DPS associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the North Atlantic DPS of green sea turtle in the wild.

8.1.2 Kemp's ridley Sea Turtle

Survival
The proposed action is expected to result in the take of up to 210 Kemp's ridley sea turtles (98 lethal, 112 non-lethal) during a 26-month period. Any potential non-lethal capture is not expected to have any measurable impact on the reproduction, numbers, or distribution of the species. The individuals suffering non-lethal injuries or stresses are expected to fully recover such that no reductions in reproduction or numbers of Kemp's ridley sea turtles are anticipated. The non-lethal captures will occur in the action area, which encompasses a small portion of this species overall range/distribution. Any captured animal would be released within the general area where caught and no change in the distribution of Kemp's ridley sea turtles would be anticipated.

The potential lethal take of 98 individuals during a 26-month period 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 (1998) estimates age at maturity from 7-15 years for this species. Females return to their nesting beach about every 2 years (TEWG 1998). The mean clutch size for Kemp's ridley sea turtle is 100 eggs per nest, with an average of 2.5 nests per female per season. The lethal capture could also result in a potential reduction in future reproduction, assuming some of these individuals would be female and would have survived to reproduce in the future. The loss could preclude the production of thousands of eggs and hatchlings, of which a fractional percentage would be expected to survive to sexual maturity. Thus, the death of any females would eliminate their contribution to future generations, and result in a reduction in sea turtle reproduction. However, the potential lethal take is expected to occur in a small, discrete area and Kemp's ridley sea turtle generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

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

In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. It is important to remember that with significant inter-annual variation in nesting data, sea turtle population trends necessarily are measured over decades and the long-term trend line better reflects the population trend. In Section 4.1.4, we summarized available information on number of Kemp's ridley sea turtle nesters and nesting trends. 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. We believe these nesting numbers are indicative of a species with a high number of sexually mature individuals, and that the potential lethal take of 98 individuals will not have any measurable effect on the overall population. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the species, we believe the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of Kemp's ridley sea turtles 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:

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

The recovery plan states the average number of nests per female is 2.5; it sets a recovery goal of 10,000 nesting females associated with 25,000 nests. Recent data indicates 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) (Mexican National Commission of Protected Natural Areas 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 numbers of nests indicates that equilibrium point, or if nesting will decline or increase in the future. Currently, we can conclude only that the population has dramatically rebounded from the lows seen in the 1980's and 1990's, and we cannot ascertain a current population trend or trajectory.

The potential lethal take of 98 individuals will result in a reduction in numbers and reproduction; however, it is unlikely to have any detectable influence on the nesting trends. Given annual nesting numbers are in the thousands, the projected loss is not expected to have any discernable impact to the species. Any non-lethal capture would not affect the adult female nesting population. Thus, proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of the Kemp's ridley sea turtles' recovery in the wild.

Conclusion

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

8.1.3 Loggerhead Sea Turtle (Northwest Atlantic DPS)

Survival

The proposed action is expected to result in the take of up to 627 loggerhead sea turtles (212 lethal, 415 non-lethal) from the Northwest Atlantic DPS during a 26-month period. Any potential non-lethal captures are not expected to have a measurable impact on the reproduction, numbers, or distribution of the species. The individuals suffering non-lethal injuries or stresses are expected to fully recover such that no reductions in reproduction or numbers of loggerhead sea turtles are anticipated. All non-lethal captures will occur in the action area, which encompass a small portion of the overall range or distribution of loggerhead sea turtles within the Northwest Atlantic DPS. Any captured animals would be released within the general area where caught and no change in the distribution of Northwest Atlantic DPS of loggerhead sea turtles would be anticipated.

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

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

In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. Abundance estimates in the western North Atlantic indicate the population is large (i.e., several hundred thousand individuals). In Section 4.1.5, we summarized available information on number of loggerhead sea turtle nesters and nesting trends. Nesting trends across all of the recovery units have been steady or increasing over several years against the background of the past and ongoing human and natural factors that have contributed to the current status of the species. Additionally, in-water research suggests the abundance of neritic juvenile loggerheads is steady or increasing.

While the potential lethal take of 212 loggerhead sea turtles will affect the population, in the context of the overall population's size and current trend, we do not expect this loss to result in a detectable change to the population numbers or increasing trend. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the Northwest Atlantic DPS of loggerhead sea turtle in the wild.

Recovery

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

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

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

In Section 4.1.5, we summarized available information on number of loggerhead sea turtle nesters and nesting trends. Nesting trends across all of the recovery units have been steady or increasing over several years against the background of the past and ongoing human and natural factors that have contributed to the current status of the species. 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). In-water research suggests the abundance of neritic juvenile loggerheads is also steady or increasing.

The potential lethal take of up to 212 loggerhead sea turtles during a 26-month period is so small in relation to the overall population, even when considered in the context of the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. We believe this is true for both nesting and juvenile in-water populations. The potential non-lethal captures would not affect the adult female nesting population, number of nests per nesting season, or juvenile in-water populations. Thus, the proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of Northwest Atlantic DPS of loggerhead sea turtles' recovery in the wild.

Conclusion

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

8.2 Smalltooth Sawfish (U.S. DPS)

The proposed action is expected to result in the capture of up to 30 smalltooth sawfish over a 26-month period. We expect all captures to be non-lethal with no associated post-release mortality.

Survival
The potential non-lethal capture of smalltooth sawfish is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. The individuals captured are expected to fully recover such that no reductions in reproduction or numbers of this species are anticipated. Since these captures may occur in the discrete action area and individuals would be released within the general area where caught, no change in the distribution of smalltooth sawfish is anticipated. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to smalltooth sawfish discussed in this Opinion, we believe the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of smalltooth sawfish in the wild.

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

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

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

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

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

NMFS is currently funding several actions identified in the Recovery Plan for smalltooth sawfish: adult satellite tagging studies, the SSRIT data, and monitoring take in commercial fisheries to name a few. Additionally, NMFS has developed safe-handling guidelines for the species. Because the proposed action will not affect the population of reproductive adult females, we do not expect it to affect Recovery Objective #3, above, which focuses on ensuring abundance increases. The proposed action also will not interfere with Recovery Objective #1. Despite the ongoing threats from recreational fishing, we have seen a stable or slightly increasing trend in the population of this species. Thus, the proposed action is not likely to impede the Recovery Objective #2 and will not result in an appreciable reduction in the likelihood of the U.S. DPS of smalltooth sawfish's recovery in the wild. NMFS must continue to monitor the status of the population to ensure the species continues to recover.

The potential non-lethal capture of 30 smalltooth sawfish will not affect the population of reproductive adult females. Thus, the proposed action will not result in an appreciable reduction in the likelihood of smalltooth sawfish recovery in the wild.

Conclusion

The potential non-lethal capture of up to 30 smalltooth sawfish over a 26-month period is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. Thus, the proposed action will not result in an appreciable reduction in the likelihood of smalltooth sawfish U.S. DPS recovery in the wild.

8.4 Summary of Conclusions

Table 7 below summarizes conclusions for ESA-listed species determined to be adversely affected by the proposed action. The proposed action is not likely to jeopardize the continued existence of any ESA-listed species.

Table 7. Summary of Integration and Synthesis for ESA-Listed Species Likely to Be Adversely Affected

Species	Non-Lethal Captures in Relocation Trawls	Lethal Entrainment in Hopper Dredge	Jeopardy
Green Sea Turtle (North Atlantic DPS)	15	10	No
Kemp's Ridley Sea Turtle	112	98	No
Loggerhead Sea Turtle (Northwest Atlantic DPS)	415	212	No
Smalltooth Sawfish	30	0	No

9 CONCLUSION

We reviewed the Status of the Species, the Environmental Baseline, and the Cumulative Effects using the best available data. The proposed action will result in the take of green sea turtle (North Atlantic DPS), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (U.S. DPS). Given the nature of the proposed actions and the information provided above, we conclude that the action, as proposed, is not likely to jeopardize the continued existence of the green sea turtle (North Atlantic DPS), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), or smalltooth sawfish (U.S. DPS).

10 INCIDENTAL TAKE STATEMENT

10.1 Overview

Section 9 of the ESA and protective regulations issued pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. *Take* is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct (ESA Section 2(19)). *Incidental take* refers to takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that would otherwise be considered prohibited under Section 9 or Section 4(d) but which is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the Reasonable and Prudent Measures and the Terms and Conditions of the Incidental Take Statement of the Opinion.

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

As soon as USACE 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 capture, entanglement, stranding, or other take incident. Information provided via this form shall include the title, *Tampa Harbor Navigation Improvement Study*, the issuance date, and ECO tracking number, SERO-2023-01665, 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)(4)).

10.2 Amount of Extent of Anticipated Incidental Take

In Section 6, we developed an estimate of the total number of anticipated lethal and non-lethal take by species expected to result from the implementation of the proposed action. The take limits shown in Table 8 are our best estimates of the numbers of green sea turtle (North Atlantic DPS), Kemp's ridley sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), and smalltooth sawfish (U.S. DPS) expected to be taken over the entire period of implementation for the proposed action.

Table 8. Anticipated Incidental Take Related to the Proposed Actions

Species	Total Lethal Take (Observed + Unobserved)	Total Non-Lethal Take	Total Incidental Take
Green sea turtle (North Atlantic DPS)	10	15	25
Kemp's ridley sea turtle	98	112	210
Loggerhead sea turtle (Northwest Atlantic DPS)	212	415	627
Smalltooth sawfish	0	30	30

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, loggerhead sea turtle (Northwest Atlantic DPS), or smalltooth sawfish (U.S. DPS) if the project is implemented 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 or appropriate 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" refer to those actions the Director considers necessary or appropriate to minimize the impacts of the incidental take on the species (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 the 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 SERO PRD as specified in the Incidental Take Statement [50 CFR 402.14(i)(4)].

The Conservation Commitments described in the USACE Project Description (Section 2.1.3) are designed to minimize and monitor take, including those measures provided to ensure the ability to observe take by hopper dredging. However, several of these Conservation Commitments are taken directly from the Terms and Conditions of the 2003 GRBO (as amended in 2007; NMFS 2007). These GRBO Terms and conditions are outdated, and NMFS has used the most recent, and best available scientific information to update these protective measures in the 2020 SARBO, which addresses dredging and material placement activities in the southeast United States.

In light of these updates, NMFS has determined that the PDCs related to hopper dredging and relocation trawling in the 2020 SARBO include the measures necessary and appropriate to minimize the impact of incidental take for the proposed action. Therefore, we include as Reasonable and Prudent Measures and terms and conditions, specific PDCs found in Appendix B (2020 SARBO General PDCs) and Appendix H (Handling and Reporting Protocol for ESA-listed Species Observed or Encountered and Protected Species Observer Roles and Responsibilities) of the 2020 SARBO. The 2020 SARBO, including these appendices can be found on NMFS Southeast Region website at the following link: https://media.fisheries.noaa.gov/dam-migration/sarbo_acoustic_revision_6-2020-opinion_final.pdf

NMFS has determined that the following Reasonable and Prudent Measures are necessary or 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 will have measures in place to minimize and avoid interactions with any protected species resulting from the proposed action, as appropriate.
2. Relocation trawling is authorized and will be used wherever it is logistically feasible and safe to do so, to reduce lethal take from hopper dredging.
3. USACE must ensure that the relocation trawling crews minimize the likelihood of injury or mortality to protected species resulting from relocation trawling and subsequent handling of animals.

10.5 Terms and Conditions

In order to be exempt from the prohibitions established by Section 9 of the ESA, the USACE must comply with the following Terms and Conditions.

1. All equipment will be operated according to the applicable PDCs listed in Appendix B, Sections 2 and 3 of the 2020 SARBO relating to direct efforts to monitor, minimize, or avoid impacts on ESA-listed species (RPM 1).
2. All personnel associated with the proposed project will be educated regarding the requirements to avoid and minimize effects to ESA-listed species and critical habitat, consistent with the applicable PDCs listed in Appendix B, Sections 2 and 3, and Appendix H of the 2020 SARBO (RPM 1 & 3).
3. Reporting requirements necessary to document take of ESA-listed species will be met by following the applicable PDCs listed in Appendix H of the 2020 SARBO (RPM 1).
4. Relocation trawling will be conducted according to the applicable PDCs listed in Appendix H and Appendix I of the 2020 SARBO (RPM 2).
5. A PSO will monitor for the presence of ESA-listed species on hopper dredges and relocation trawling vessels and will be responsible for handling, tagging, collecting genetic samples, and recording the details of the capture in accordance with the applicable PDCs listed in Appendix H and Appendix I of the 2020 SARBO (RPM 3).

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. In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

Dredge Equipment and Species Interactions

1. NMFS recommends the USACE conduct studies to evaluate differences in species take by different hopper dredge designs to determine whether some designs may result in lower likelihood of take. This should include an evaluation of the design of both the hopper dredging and the draghead deflector shield and options to minimize take in challenging locations such as areas with high debris and uneven bottom surfaces.
2. NMFS recommends the USACE evaluate the feasibility of installing video or other remote-sensing equipment (e.g., GoPro) on the dragarm or draghead to determine whether visibility is sufficient to monitor for interactions with species. If installing such equipment is feasible, and visibility is sufficient to observe and identify species encounters, the USACE should design a study to test species reactions to the dredge or the disturbance radius from the hopper dredge draghead.
3. NMFS recommends the USACE examine different inflow and overflow screening and box configurations to minimize the risk of clogging during dredging while maximizing the ability for PSOs to easily, and safely inspect all of the contents collected in the boxes for evidence of take. Possibilities include different placement within the hopper dredge that are more easily viewable, various box sizes and shapes that improve visibility without entering the box, and various screening designs and materials that reduce clogging. Improved technological solutions such as video monitoring capability may also prove useful in reducing the need for PSOs to enter the boxes to inspect the contents.
4. NMFS recommends the USACE continue to support the development of innovative new dredging methods/practices and dredge designs that will further minimize listed species interactions and mortalities. This could include a study to observe listed species reactions to dredging to understand how the species react to the oncoming draghead (e.g., disturbance radius, behavioral response) in different conditions (e.g., bottom topography, temperature).
5. NMFS recommends the USACE develop standard procedures to remove marine debris excavated during dredging operations. Marine debris creates an entanglement risk and pose risk to listed species when consumed. Standard procedures should be developed and implemented by action agencies to necessitate surface marine debris removal during dredging operations.
6. NMFS recommends the USACE conduct or support research that evaluates known, commonly used biomarkers for physiological stress (e.g., stress hormone levels) or other sublethal impacts of listed species taken during relocation activities. This information could help us better determine the condition of listed species post release and more accurately assess post-release mortality that will inform future consultations.
7. NMFS recommends the USACE explore the aggregate impacts of their activities through the development of Population Consequence of Disturbance models for listed species. Population Consequence of Disturbance models simulate the cumulative effects of sublethal stressors across individuals to characterize the population consequences of anthropogenic activities including sound exposure, pollutants, and reduced habitat access. The Population Consequence of Disturbance modeling framework typically uses a

bioenergetic model as a transfer function between stressors (e.g., behavioral disturbance) and their impacts on vital rates (i.e., growth, reproduction).

8. NMFS recommends the USACE design pilot studies and support literature searches to parameterize bioenergetic models for listed species. We recommend that the USACE design pilot studies to develop dose-response function for modeling the effects of sublethal stressors (e.g., what is the probability of a behavioral response at different levels of sound exposure). This will support the development of Population Consequence of Disturbance models for listed species.
9. NMFS recommends the USACE further examine hopper dredge designs currently in use to determine what features and practices could allow entrainment from a point not associated with the drag head. Past examples of occasional sea turtles found unharmed in the hopper indicates that some individuals may enter the hopper without having passed through the draghead.
10. NMFS recommends the USACE consider testing the feasibility of innovative techniques (e.g., side scan sonar) to improve observing or identify if sea turtles or other ESA-listed species are present in the path of dredging or trawling activities. If effective, results could identify times and locations when dredging or relocation trawling should or should not be used. This could reduce take if dredging in high density locations can be delayed to another time or reduce cost of relocation trawlers if the area has a low risk of species interaction.
11. NMFS recommends the USACE consider making the data collected as part of any required surveys (field, species, habitat, etc.) as well as required monitoring and reporting available to the public and scientific community in an easily accessible online database (such as ODESS) that can be queried to aggregate data across required reports. Access to such data will help to better understand the biology of listed species (e.g., their range), as well as inform future consultations and authorizations by providing information on the effectiveness of the conservation measures and the impact of dredging activity on listed species.

12 REINITIATION OF CONSULTATION

This concludes formal consultation on the proposed actions. As provided in 50 CFR 402.16, reinitiation of formal consultation is required and shall be requested by the USACE, where discretionary federal action agency involvement or control over the action has been retained, or is authorized by law, and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this Opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this Opinion, or (4) 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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