UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
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04/12/2022

F/SER31:KBD
SERO-2021-03157

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Ref.: SAJ-1997-01891 Bay County Tourist Development Council, Shoreline Stabilization and Protection, Bay County, Florida

Dear Ms. Reynolds and Mr. Kizlauskas:

The enclosed Biological Opinion (Opinion) was prepared in response to your December 10, 2021, request for reinitiation of consultation with us, the National Marine Fisheries Service (NMFS), pursuant to Section 7(a)(2) of the Endangered Species Act (ESA). This Opinion is a reinitiation of an Opinion issued in 2013 (SER-2012-03646). The reinitiated Opinion considers the effects of dredging and relocation trawling associated with beach nourishment activities conducted by the Bay County Tourist Development Council on recently listed species, namely the giant manta ray and the North Atlantic (NA) and South Atlantic (SA) distinct population segments (DPSs) of green sea turtles. The reinitiation also addresses the effects on Gulf sturgeon critical habitat of expanding the beach nourishment activities addressed in the 2013 Opinion to include an additional 1-mile area and updates the effects and jeopardy analysis for the Northwest Atlantic DPS of loggerhead sea turtles from the 2013 Opinion. Effects to Kemp's ridley sea turtles, leatherback sea turtles, hawksbill sea turtles, Gulf sturgeon, and smalltooth sawfish associated with the proposed project are encompassed within the Biological Opinion on Dredging of Gulf of Mexico Navigation Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287, issued November 19, 2003 (GRBO), as revised June 24, 2005 and January 9, 2007), and that opinion constitutes the consultation on effects to those species. Any take of those species from the proposed action is covered by the Incidental Take Statement (ITS) in GRBO, to the extent GRBO anticipated take of those species.

NMFS concludes that the proposed continuation and expansion of the project is not likely to adversely affect giant manta ray. The proposed continuation and expansion of the project is likely to adversely affect the NA and SA DPSs of green sea turtle and the Northwest Atlantic (NWA) DPS of loggerhead sea turtle, but it is not likely to jeopardize their continued existence. Finally, the proposed action is likely to adversely affect but will not destroy or adversely modify Gulf sturgeon critical habitat.

NMFS is not providing a separate ITS for the NA and SA DPSs of green sea turtle or the NWA DPS of loggerhead sea turtle. Green and loggerhead sea turtle takes are covered by the ITS in GRBO. GRBO is a regional biological opinion that analyses effects to ESA-listed species associated with certain expected dredging projects in the Gulf of Mexico region and includes an ITS for anticipated take. The anticipated take in GRBO accounts for dredging and relocation trawling associated with beach nourishment projects, including the Bay County project. We do not anticipate different effects or additional take of green sea turtles or loggerhead sea turtles from the Bay County project beyond those contemplated in GRBO, as a programmatic opinion on the effects of multiple projects. NMFS issued GRBO before revising the green sea turtle listing to list green sea turtles as eleven DPSs and before revising the loggerhead sea turtle listing to list loggerhead sea turtles as nine DPSs. The green sea turtles evaluated in GRBO and covered by that ITS include the individuals that are now considered part of the NA and SA DPSs and the loggerhead sea turtles are now considered part of the NWA DPS. The GRBO ITS for green sea turtles, therefore, represents the anticipated amount of take from the NA and SA DPSs, combined, and the GRBO ITS for loggerhead sea turtles represents the anticipated amount of take from the NWA DPS, for dredging projects in the Gulf of Mexico region, including the proposed action. Therefore, we are not including separate take limits for the NA and SA DPSs of green sea turtles or for the NWA DPS of loggerhead sea turtles from the proposed action; however, jeopardy analyses are included in the enclosed Opinion for the NA and SA DPSs of green sea turtle and the NWA DPS of loggerhead sea turtles. NMFS expects these DPSs to be addressed in GRBO once it is reinitiated.

The project has been assigned the tracking number SERO-2021-03157 in our new NMFS Environmental Consultation Organizer (ECO). Please use the ECO number in all future inquiries regarding this consultation. Please direct questions regarding this Opinion to Kay Davy, Consultation Biologist, by phone at (727) 415-9271, or by email at Kay.Davy@noaa.gov.

Sincerely,

STRELCHECK.ANDREW.JAMES.1365863152
Digitally signed by STRELCHECK.ANDREW.JAMES.1365863152
Date: 2022.04.12 11:36:50 -04'00'

Andrew J. Strelcheck
Regional Administrator

Enc.: Biological Opinion
File: 1514-22.f.4

Endangered Species Act - Section 7 Consultation
Reinitiated Biological Opinion

Action Agency:	United States Army Corps of Engineers, Jacksonville District (Regulatory) and Mobile District (Civil Works)
Applicant:	Bay County Tourist Development Council Permit Number SAJ-1997-01891
Activity:	Reinitiation of the 2013 Biological Opinion (Consultation Number, SER-2012-03646) for the beach nourishment between Phillips Inlet and St. Andrews Inlet, Bay County, Florida
Consulting Agency:	National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida Tracking Number SERO-2021-03157
Approved by:	STRELCHECK.ANDREW.JAMES.1365863152 Digitally signed by STRELCHECK.ANDREW.JAMES.1365863152 Date: 2022.04.12 11:39:43 -04'00' Andrew J. Strelcheck, Regional Administrator NMFS, Southeast Regional Office St. Petersburg, Florida
Date Issued:	04/12/2022

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Acronyms and Abbreviations

BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
DPS	Distinct Population Segment
DWH	*Deepwater Horizon* oil spill of 2010
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FR	Federal Register
GRBO	Gulf of Mexico Regional Biological Opinion
NA	North Atlantic
NLAA	Not Likely to Adversely Affect
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
MRIP	Marine Recreational Information Program
MRFSS	Marine Recreational Fisheries Statistics Survey
SA	South Atlantic
STSSN	Sea Turtle Stranding and Salvage Network
USACE	U.S. Army Corp of Engineers
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USN	U.S. Navy

Units of Measurement

ac	acre(s)
ft	foot/feet
g	gram(s)
in	inch(es)
km	kilometer(s)
km^2	square kilometers
m	meter(s)
mm	millimeter(s)
mi	mile(s)

Introduction

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 et seq.), requires that each federal agency ensure that any action authorized, funded, or carried out by 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 National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) share responsibilities for administering the ESA.

Consultation is required when a federal action agency determines that a proposed action "may affect" listed species or designated critical habitat. Informal consultation is concluded after NMFS determines that the action is not likely to adversely affect listed species or critical habitat. Formal consultation is concluded after NMFS issues a Biological Opinion (Opinion) that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat, in which case reasonable and prudent alternatives to the action as proposed must be identified to avoid these outcomes. The Opinion states the amount or extent of incidental take of the listed species that may occur, develops measures (i.e., reasonable and prudent measures) to reduce the effect of take, and recommends conservation measures to further the recovery of the species.

This document represents NMFS's reinitiated Biological Opinion (Opinion) for the proposed dredging and relocation trawling associated with beach nourishment located between Phillips Inlet and St. Andrews Inlet in Bay County, Florida and is based on our review of recent dredging-related activities in or near the project area, among other information. This Opinion analyzes the proposed action's effects on listed species and designated critical habitat in accordance with Section 7 of the ESA as described below.

REINITIATION OF JULY 18, 2013, BIOLOGICAL OPINION

1 CONSULTATION HISTORY

The following is the consultation history for NMFS Environmental Consultation Organizer (ECO) tracking number SERO-2021-03157, Bay County Tourist Development Council Shoreline Stabilization.

On December 10, 2021, the USACE requested reinitiation of a 2013 Opinion (SER-2012-03646) to consider the effect of dredging and relocation trawling associated with beach nourishment activities conducted by the Bay County Tourist Development Council on recently listed species, namely the giant manta ray and the NA and SA DPSs of green sea turtles. The USACE also requested reinitiation to address the effects to Gulf sturgeon critical habitat associated with expanding the proposed beach nourishment activities.

The 2013 Opinion concerned a 15-year dredging and beach nourishment project, which was authorized on July 1, 2014, and ends on June 30, 2029. The beach nourishment was planned for 17.5 miles of beach located between Phillips Inlet (monument R-1) and St. Andrews State Park (monument R-92) along Panama City Beach. In September 2020, the USACE informed NMFS that the Bay County Tourist Development Council had proposed to expand the beach nourishment activities to include an additional 1-mile area. The 2013 Opinion found that the proposed action, prior to the modification, was likely to adversely affect but not likely to jeopardize the continued existence of green sea turtles, Kemp's ridley sea turtles, the NWA DPS of loggerhead sea turtles, and Gulf sturgeon, and it included an incidental take statement for those species. NMFS also concluded that the proposed action was likely to adversely affect but not likely to destroy or adversely modify Gulf sturgeon critical habitat. Finally, NMFS concluded that the proposed action was not likely to adversely affect leatherback sea turtles, hawksbill sea turtles, and smalltooth sawfish.

In the 2013 Opinion, NMFS completed an independent analysis of effects to sea turtles, Gulf sturgeon, and smalltooth sawfish, rather than relying on the analysis in GRBO[1], which is a regional biological opinion on the effects of certain anticipated dredging projects in the Gulf of Mexico. At that time, NMFS determined that the Bay County project would not fall under GRBO because the project activities occur within Gulf sturgeon critical habitat and effects to the Gulf sturgeon critical habitat for this type of project are not addressed in GRBO. Since NMFS issued the 2013 Opinion, the USACE and NMFS have revised the process for consulting on projects within the scope of GRBO. For projects within the scope of GRBO, the USACE has relied on GRBO as the consultation on effects to species and critical habitat addressed therein. For projects occurring within Gulf sturgeon critical habitat, where the effects to critical habitat are not addressed in GRBO, the USACE has requested and NMFS and the USACE have engaged in separate consultation on effects to Gulf sturgeon critical habitat. This reinitiation follows that revised approach.

By letter dated December 9, 2021, NMFS outlined for the USACE an approach to consultation that would stack the GRBO with a reinitiation of the 2013 Opinion. On December 10, 2021, the USACE withdrew a May 2017 request for reinitiation (SER-2017-18641), described below, and requested consultation under the stacking approach. The USACE requested limited reinitiation (SERO-2021-03157) to consider the effects of dredging and expanded beach nourishment activities to Gulf sturgeon critical habitat that are not addressed or analyzed in GRBO[2], and to the NA and SA DPSs of green sea turtles and giant manta ray, which are not addressed or analyzed in the 2013 Opinion or GRBO. The USACE requested to rely on GRBO as the Opinion for the analysis of effects to and for the ITS for take of Kemp's ridley sea turtles, loggerhead sea turtles, leatherback sea turtles, hawksbill sea turtles, Gulf sturgeon, and smalltooth sawfish, as applicable[3]. On December 17, 2021, NMFS provided a letter to USACE to confirm the stacking approach and the information NMFS will rely on in preparing this Opinion. NMFS also

[1] Biological Opinion on Dredging of Gulf of Mexico Navigation Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts (AKA Gulf of Mexico Regional Biological Opinion or GRBO), 2003 version, SER-2000-01287; GRBO Revision 1, SER-2004-02187; GRBO Revision 2, SER-2006-01096/SER-2006-02953.

[2] USACE-permitted "new" dredging or placement of material within Gulf sturgeon critical habitat is not part of the proposed action under GRBO. Maintenance dredging of navigational channels within Gulf sturgeon critical habitat under GRBO is limited to maintaining the dimensions of channels (i.e. length, width, and depth) at the time of the original 2003 GRBO regardless of previous authorization.

[3] GRBO, as revised, does not anticipate take of smalltooth sawfish and does not include take of smalltooth sawfish in an ITS.

requested clarification on USACE's determination for project effects on listed species. USACE responded to NMFS on December 20, 2021, and NMFS initiated consultation that same day. Thereafter, NMFS contacted the USACE to explain that because GRBO does not address effects to the NWA DPS of loggerhead sea turtles, but rather evaluates effects to loggerhead sea turtles under their prior global listing, NMFS will reevaluate the potential for the proposed action to jeopardize the continued existence of NWA DPS. The 2013 Opinion found the proposed action (the original project scope) is likely to adversely affect but not likely to jeopardize the continued existence of the NWA DPS of loggerhead sea turtles. We are updating that analysis in light of additional information on interactions with the species from recent dredging projects.

Because the USACE and NMFS are stacking this consultation with GRBO, in their December 2021 request for reinitiation, the USACE withdrew a May 11, 2017 request for reinitiation of the 2013 Opinion. In 2017, the USACE requested reinitiation of the 2013 Opinion in light of the non-lethal take of a leatherback sea turtle during relocation trawling. The take occurred on May 6, 2017, during the first dredging event under the 15-year permit analyzed in the 2013 Opinion. NMFS had not anticipated adverse effects to or take of leatherback sea turtles in the 2013 Opinion, and thus the take-triggered reinitiation. Under the stacking approach, however, GRBO provides the analysis of effects to leatherback sea turtles, including the determination that the actions contemplated under GRBO are likely to adversely affect but will not jeopardize the continued existence of leatherback sea turtles. Leatherback sea turtle takes are anticipated from relocation trawling and are included in the GRBO ITS.[4] No new information is available to alter the analysis and conclusion in GRBO concerning leatherback sea turtles. Therefore, reinitiation of the 2013 Opinion to consider the potential for leatherback interactions is not necessary.

In preparing this Opinion, NMFS relied on information submitted during the initial consultation that culminated with the 2013 Opinion, the 2017 reinitiation, and additional information submitted with and following the December 10, 2021 request for reinitiation, including updated information on the scope of the beach renourishment activities. In particular, on September 28, 2020, the USACE requested that the 2017 reinitiation be expanded to consider the effects of altering the project to include an additional one mile of beach nourishment at St. Andrews State Park. NMFS requested additional information on the details of that addition on October 6, 2020 and December 17, 2020. The USACE responded on December 17, 2020, and June 15, 2021. On February 10, 2022, the USACE also provided additional information on species take associated with the Bay County dredging. NMFS considered this information in formulating this Opinion.

This Opinion documents our analysis of the USACE's information, tiers off of our 2013 Opinion, adds an analysis of ESA-listed species listed after 2013 (giant manta ray), updates the analysis for green sea turtles given the listing of the NA and SA DPSs of green sea turtles and also for loggerhead sea turtles given the listing of the NWA DPS of loggerhead sea turtles, and updates the analysis of Gulf sturgeon critical habitat in the project area.

[4] The 2007 revision of GRBO anticipates and includes in the ITS the following non-lethal take associated with relocation trawling per fiscal year: Three hundred (300) sea turtles, of any combination of species (Kemp's ridley, green, loggerhead, leatherback, and hawksbill), and eight (8) Gulf sturgeon, across all the USACE districts and hopper dredging projects.

2 DESCRIPTION OF THE PROJECT ACTION AND ACTION AREA

Project Action

On July 1, 2014, the applicant (Bay County Tourist Development Council) received a 15-year permit for the Panama City Beach Erosion Control and Storm Damage Reduction Project to continue the existing protection. According to the USACE, the advantage of a 15-year nourishment interval is that a longer interval allows time to combine the routine nourishment with an emergency project caused by a major storm, and place sufficient yardage in hot spots to last 15 years. The purpose of the permit is to provide a mechanism to renourish Panama City's beaches and other unincorporated beaches within Bay County that have been severely eroded from hurricanes and tropical storms, and to be prepared to restore losses from future storms (Figure 1).

The original scope of the project was to perform beach nourishment over 17.5 mi of beach located between Phillips Inlet (monument R-1) and St. Andrews State Park (monument R-92) in Bay County, Florida (Figure 2). On September 28, 2020, the applicant requested to add an additional area for nourishment, which would extend the beach nourishment along the shoreline at St. Andrews State Park from R-92 to R-97 (Figure 3). The coordinates for monument R-1 are 30.2671° North, 85.9876° West, and for monument R-92, they are 30.1333° North and 85.7443° West. The coordinates for R-97 are 30.1225° North and 85.7385° West. The 17.5 mi of beach nourishment includes approximately 16.5 mi of beach along the shoreline of Panama City Beach and unincorporated shoreline of Bay County, an approximate 1-mile reach along Carillon Beach and Pinnacle Port, and a 948-ft taper that extends onto St. Andrews State Park. The new addition includes approximately 1 mi of beach nourishment along St. Andrews State Park and ends at St. Andrews Inlet. The project includes three phases. Phase I would include routine nourishment in intervals using fully permitted borrow areas. Phase II would include emergency nourishment in response to major storm erosion to be supplemented with contingency borrow areas. Phase III would include small "hot spot" nourishment using upland sand sources.

Figure 1. Project location in Bay County, Florida, with beach nourishment area indicated by the red line (©2021 Google)

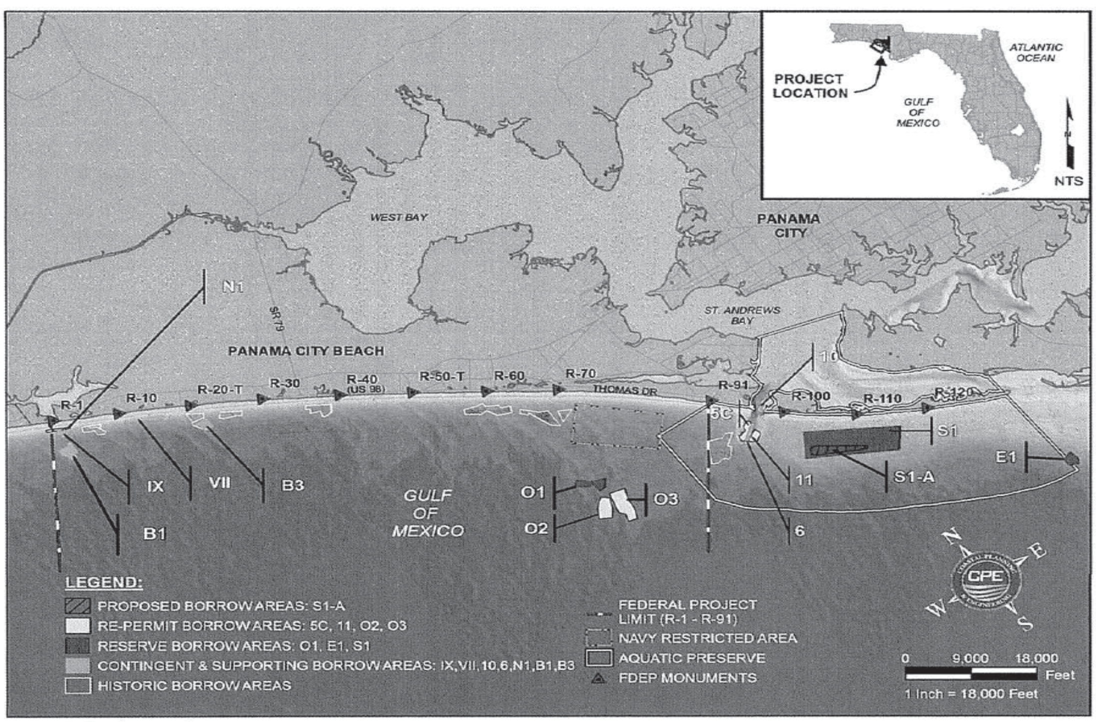

Figure 2. Original 17.5-mile project location in Bay County, Florida. (Coastal Planning and Engineering 2013)

Phase I of the project will occur between R-1 and R-92 and will include a design volume of 3,000,000 cubic yards (yd^3). There are five borrow areas that are previously approved or have been investigated for permitting to support Phase I. The project design for the Phase II emergency nourishment will be a combination of storm loss replacement and routine nourishment. The volume required for Phase II will vary between 1,500,000 and 4,000,000 yd^3 for an estimated total of up to 7,000,000 yd^3 dredged from borrow areas for the project across Phases I and II. The new addition at St. Andrews State Park would include a design volume of 650,000 yd^3 and would fall under the design volumes of either Phase I or Phase II. The overall permitted dredge volume would not need to be modified by the addition of the area at St. Andrews State Park, and the total potential dredge volume would not exceed 7,000,000 yd^3 (Tracey Wheeler, USACE, pers. Comm. to Kay Davy, NMFS Protected Resources Division [PRD] on October 18, 2021). "Hot spots" larger than approximately 200,000 yd^3 are included in Phase II. In addition to the borrow areas approved for Phase I, there are five contingency borrow areas proposed for Phase II. Phase III will use upland sand sources and will address small "hot spot" areas.

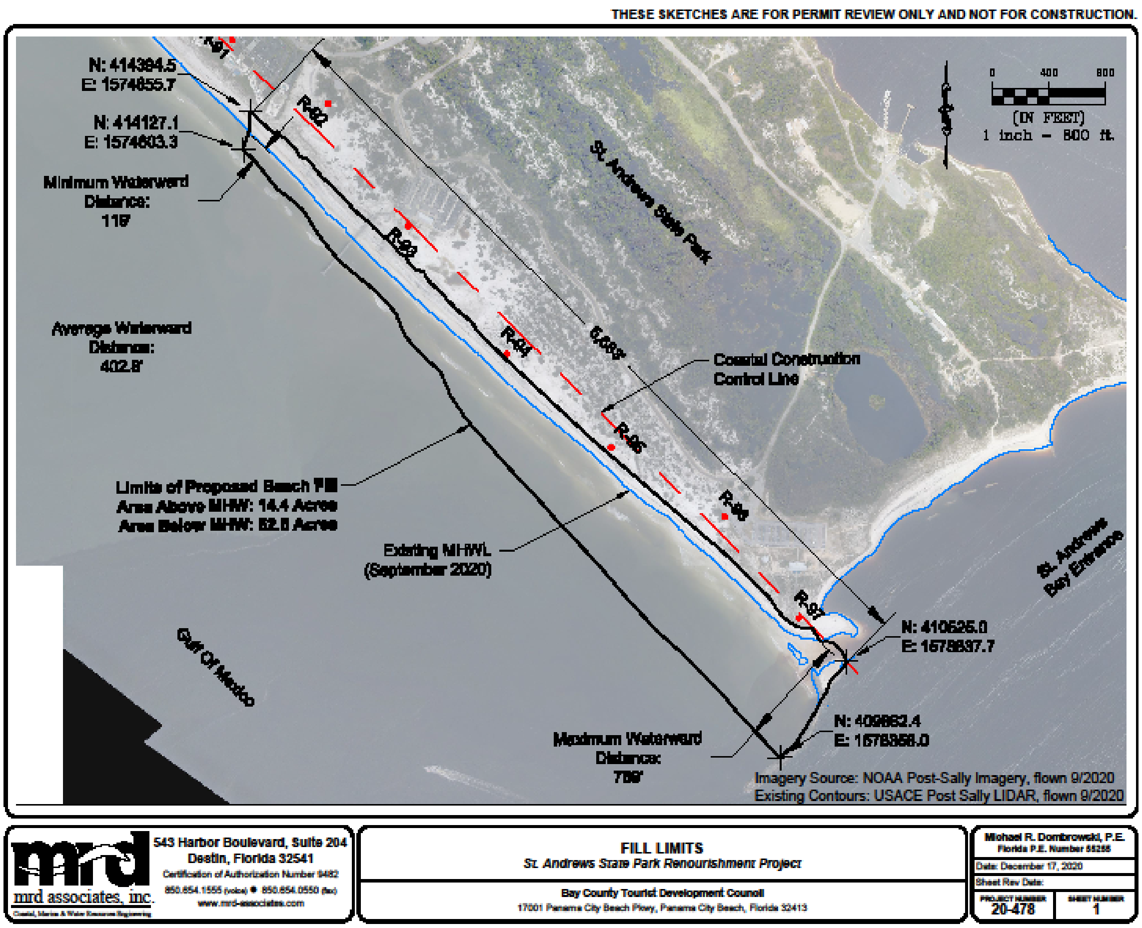

Figure 3. One-mile additional beach nourishment area for St. Andrews State Park added by applicant in 2020 (MRD Associates, Inc. 2020)

All fill material placed will be sand that is similar to that already existing at the beach site in both coloration and grain size distribution and will be suitable for sea turtle nesting. The sand that will be dredged from offshore and placed on the beach has been selected so that the mean grain size and carbonate content of the sediment from the permitted borrow area(s) will meet the requirements of Florida Administrative Code 62B-41.007(2)(j), ensuring that the fill material will be compatible with the existing beach sand. The USACE has been conducting investigations for beach compatible sand since the 1980s and the most recent detailed sand searches were conducted in 2005 and 2008. The percent silt for the borrow areas to be used as sand sources ranges from 0.84 to 2.29 percent, in comparison to the 2009 native beach sands with 0.89 percent silt. The grain sizes are also comparable ranging from 0.22 to 0.4 mm, where the 2009 native beach was 0.28 mm. Based on contaminant testing conducted in the borrow areas during December 2010, there is no discernible evidence that sediment quality has been impacted by the Deepwater Horizon (DWH) oil spill (EA Engineering, Science, and Technology, Inc., 2012).

Sand is removed from the borrow sites via hopper dredging or hydraulic cutterhead dredging. According to the Biological Assessment prepared for the project, hopper dredging is the best method due to the distant location of the primary sand sources from the beach. Hydraulic cutterhead dredging would be used when the sand source is near the beach. Hopper dredging equipment utilized for this project follows the terms and conditions in the GRBO (NMFS 2007), which include the use of screens/observers, drag head deflectors, and relocation trawling within the active borrow areas. A submerged pipeline will be used to bring sand onto the beach. The submerged pipeline will be extended parallel to the beach as construction progresses and moved when maximum pumping distance is reached. It will be submerged in water depths deep enough to preclude causing a migration barrier for nesting and hatching sea turtles. Small sand dikes will be constructed to help sand settlement and to minimize turbidity.

The GRBO did not assess potential effects associated with disposal activities in Gulf sturgeon critical habitat. Activities that are consistent with the scale and scope of the GRBO, but involve dredging or disposal activities in Gulf sturgeon critical habitat not addressed in GRBO, may be "stacked" with that Opinion. Stacking means the use of one Biological Opinion (Opinion 1) by reference to cover the majority of the action in a separate Opinion (Opinion 2), and addressing the portions of the action not covered in Opinion 1 within the stacked Opinion 2 to avoid authorization of duplicate takes or impacts to ESA-managed resources. NMFS must differentiate between projects that are consistent with the nature and scope of the GRBO and may be "stacked" from those projects that are not appropriate for stacking. For the future dredging activities described above, we intend to stack this consultation on the GRBO. Therefore, the current consultation will only evaluate the effects of the proposed action on ESA-listed species and designated critical habitat not included in GRBO, i.e., giant manta ray, the NA and SA DPSs of green sea turtle, the NWA DPS of loggerhead sea turtle, and Gulf sturgeon critical habitat. If a new GRBO is finalized within the timeframe of this project, the terms and conditions of the new GRBO will be implemented and apply to the proposed action.

The construction schedule for each beach nourishment event is estimated to take approximately six months to one year. Year-round, continuous construction is proposed within designated Gulf sturgeon critical habitat in Unit 11 (Florida Nearshore Gulf of Mexico). Dredging and beach nourishment under the permit first took place in 2017. Dredging did not occur during 2018 due to the destruction caused by Hurricane Michael, a Category 5 hurricane, which affected the project area on October 10, 2018 (Tracey Wheeler, USACE, pers. Comm. to Kay Davy, NMFS

Protected Resources Division [PRD] on July 19, 2019). There was also no dredging during 2019-2020 (Tracey Wheeler, USACE, pers. Comm. to Kay Davy, NMFS Protected Resources Division [PRD] on July 21, 2021). Dredging and beach nourishment commenced again during September 2021, utilizing funds that resulted from an assessment of the destruction caused by Hurricane Michael. The 2021 dredging and nourishment event is being conducted by the USACE Mobile District Civil Works with sea turtle and Gulf sturgeon takes covered under the GRBO ITS.

Action Area

The action area is defined by regulation as all areas to be affected by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). Figure 1 shows the location of all project activities. Effects of the action are not expected to extend beyond the immediate project area because the sandy material being dredged and placed in the nourishment areas will generate very little turbidity. No submerged aquatic vegetation is present within the beach placement areas. Both dredging and placement of the dredged sand will occur entirely within Gulf sturgeon critical habitat Unit 11. The federal project extends approximately 18.5 mi, including a 17.5-mile segment from R-1 to R-92, and a one-mile addition to R-97, extending the project area to St. Andrews Inlet.

The St. Andrews Bay Aquatic Preserve, found within the project area, extends over three miles offshore to 65-ft water depths. The aquatic preserve area contains borrow areas, including new sand source borrow area S1, which has the best quality sand for nourishment found in the region. A portion of S1 will be used for this project. Additional borrow areas include four previously permitted borrow areas (5c, 11, 02, and 03) and five contingent sand sources (VII, IX, 10, 6, and N1). Two contingent backfill sand sources (Backfill B1 and Backfill B3) are identified but not expected to be used.

In total, the action area consists of an 18.5-mile shoreline (and berm) and ten borrow areas (approximately 315 ac) within Bay County, Florida.

3 STATUS OF LISTED SPECIES AND CRITICAL HABITAT

3.1 Species and Critical Habitat

Table 1 provides the effect determinations for ESA-listed species that the USACE and NMFS believe may be affected by the proposed action. Table 2 provides the effects determination for the designated critical habitat that the USACE and NMFS believe may be affected by the proposed action.

Table 1. Effects Determination for Species the USACE and NMFS Believe May Be Affected by the Proposed Action

Species	ESA Listing Status	Action Agency Effect Determination	NMFS Effect Determination
Sea Turtles			
North Atlantic (NA) distinct population segment (DPS) of green sea turtle	T	LAA	LAA
South Atlantic (SA) DPS of green sea turtle	T	LAA	LAA
Northwest Atlantic (NWA) DPS of loggerhead sea turtle	T	LAA	LAA
Fish			
Giant manta ray	T	NLAA	NLAA
T = threatened; NLAA = may affect, not likely to adversely affect; LAA = likely to adversely affect			

Table 2. Effects Determinations for Designated Critical Habitat the USACE and NMFS Believe May Be Affected by the Proposed Action

Species	Critical Habitat Unit	USACE Effect Determination	NMFS Effect Determination
Gulf sturgeon	Unit 11	LAA	LAA

3.2 Species Not Likely to be Adversely Affected

Since NMFS issued the 2013 Opinion and the most recent GRBO revision in 2007, the giant manta ray was listed as a threatened species under the ESA. An analysis of the proposed action's effects on giant manta ray is provided below.

Giant Manta Ray

NMFS determined that potential effects on giant manta ray from the proposed action are limited to the following: injury from potential interactions with a cutterhead or hopper dredge vessel while in transit or while dredging, a relocation trawler while in transit or while trawling, or other support vessels, and temporary avoidance of the area during offshore dredge operation and relocation trawling.

Vessels can strike giant manta rays, leading to injury or death. NMFS believes that it is highly unlikely that a dredge vessel, relocation trawler, or other support vessel will strike a giant manta ray. Vessel collisions with giant manta rays from the proposed action are not expected due to the slow speed of the dredge (e.g., 3.5 kt or less while dredging), relocation trawlers, and support vessels; the avoidance behavior of giant manta rays to slow moving vessels; and the presence of NMFS-approved observers on board every dredge and relocation trawler to watch for ESA-listed species in the area. While giant manta rays can be frequently observed traveling just below the surface and will often approach or show little fear toward vessels, few instances of confirmed or suspected strandings of giant manta ray are attributed to vessel strike injury. Giant manta rays appear to be able to be fast and agile enough to avoid most moving vessels, as is anecdotally evidenced by videos showing high-speed vessels passing over giant manta rays and the ray being able to avoid the interaction. Vessels covered under this Opinion will be traveling slowly while working and giant manta rays are mobile species that appear to be able to be responsive to activity in the area and able to move out of the way of at least slow moving equipment. In addition, we do not expect this species to be present in abundance in the project area, and there have been no reports of giant manta rays in the project area. Due to the very limited reports of vessel interactions, and ability to avoid moving vessel traffic outside of confined spaces, we think it is extremely unlikely that vessels associated with the proposed project will encounter giant manta rays while working or while transiting.

Due to the low number of encounters of giant manta ray in the project area and the species' likely low abundance in the project area, we believe direct contact from the operation of the relocation trawler on giant manta ray is extremely unlikely. There have been no reports of giant manta rays in the project area and only one giant manta ray has been encountered during 20 years of relocation trawling in all of the Gulf of Mexico (Chris Slay, Coastwise Consulting, pers. Comm. to Nicole Bonine, NMFS Protected Resources Division [PRD] on August 7, 2018). However, it is unclear whether the encounter was an actual capture in the trawl net or if it was seen alongside the trawler while trawling. In addition, although we note that giant manta rays have been observed in trawls used in fisheries the New England region, we do not believe such interactions are likely from use of the relocation trawls in the action area, given the differences in the trawls and how they are used. The use of small trawlers with small nets for relocation trawling associated with the proposed action decreases the chances of catching a giant manta ray. Large rays can be 29 ft in wingspan width with the average around 14 ft-wide. The trawl nets used for relocation trawling are usually much smaller than the nets used by commercial fishers in the northeast, which do occasionally catch giant manta ray in their nets. It is also important to note that the dredging and relocation trawling will be conducted over barren sand bottom in borrow areas and not over fish habitat like that targeted by commercial fishers. It is expected that giant manta ray would be more likely to be found over fish habitat in search of prey and would be competing with other fish species for the same prey, thus increasing the odds of them being encountered by commercial fishing gear in the northeast. In addition, NMFS-approved observers will be on board every relocation trawler to watch for ESA-listed species in the area.

We believe cutterhead and hopper dredging activities will result in no effect to giant manta ray from entrainment and impingement from dredging. This conclusion is supported by our decades of experience with reporting of take from hopper dredging (since the 1980s), and a review of the available scientific literature, which revealed no known reports of hopper dredging entrainment to this species. Furthermore, giant manta rays are not expected to be entrained due to their large size and ability to avoid the suction created by a hopper dredge. In addition, giant manta ray are a pelagic species and would not be expected to be found on the bottom and therefore are not likely to have an encounter with a cutterhead or hopper dredge while dredging.

Giant manta rays may be affected by being temporarily unable to access the project area for foraging, due to their avoidance of dredging activities. Although giant manta rays may be temporarily unable to use the construction area, we believe these effects will be insignificant as this is an open-water area with similar surrounding habitat.

All potential effects from the proposed action to giant manta rays were found to be extremely unlikely to occur or insignificant. Therefore, this species will not be discussed further in this Opinion.

3.3 Critical Habitat Likely to be Adversely Affected in the Action Area

The term "critical habitat" is defined in Section 3(5)(A) of the ESA as (i) the specific areas within the geographic area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (1) essential to the conservation of the species and (2) that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" is defined in Section 3(3) of the ESA as "…the use of all methods and procedures that are necessary to bring any endangered or threatened species to the point at which listing under the ESA is no longer necessary."

The project is located in Gulf sturgeon critical habitat, Unit 11: Florida Nearshore Gulf of Mexico. Effects to this critical habitat were analyzed in the 2013 Opinion for the original 17.5 mi project area, and it was determined that essential features potentially affected by the dredging and beach nourishment include water quality, sediment quality, migratory pathways, and prey abundance, but NMFS expected the effects of the proposed action will have only insignificant effects on water quality, sediment quality, and migratory pathways for the following reasons: 1) Effects to water quality are expected to be localized, temporary, and minimal, with suspended particles settling out within a short time frame without measurable effects. In addition, water quality will be monitored to ensure it does not exceed required nephelometric turbidity units above background levels at the sand discharge sites along the beach, 150 m down-current from the dredge, and 1,000 m down current from the dredge within the mixing zone for the dredged borrow areas; 2) Effects on sediment quality are expected to be minimal since the sand to be removed from the borrow areas is consistent with the existing beach sediments; and 3) Effects to migratory pathways are expected to be minimal since the nourishment work would only effect approximately 1,000 to 1,500 ft of shoreline at any one time, the project area is in open water and would allow sufficient opportunity for Gulf sturgeon to utilize the area as a migratory pathway. The request to extend the nourishment an additional mile of beach does not alter these conclusions. The sediments still are expected to settle quickly and water quality will continue to be monitored as described. The applicant is proposing to use the same sand borrow areas. Likewise, the work will continue in 1,000 to 1,500 ft segments. However, NMFS does expect the proposed action (including the extension of the project area) will directly impact the benthos by removal and burial of sandy substrate, which can temporarily impact prey availability and abundance. Therefore, the potential project impacts relative to Gulf sturgeon prey availability and abundance are presented in the Effects of the Action Section.

3.3.1 Status of Gulf Sturgeon Critical Habitat

NMFS and USFWS jointly designated Gulf sturgeon critical habitat on April 18, 2003 (*see,* 50 CFR 226.214). The agencies designated seven riverine areas (Units 1-7) and seven estuarine/marine areas (Units 8-14) as critical habitat based on the physical and biological features that support the species. Critical habitat units encompass a total of 2,783-river km and 6,042 km^2 of estuarine and marine habitats (Figure 4; Table 3). NMFS's jurisdiction encompasses the seven units in marine and estuarine waters (Units 8-14), though NMFS's consultation responsibilities for projects in estuarine waters are limited to specific action agencies.

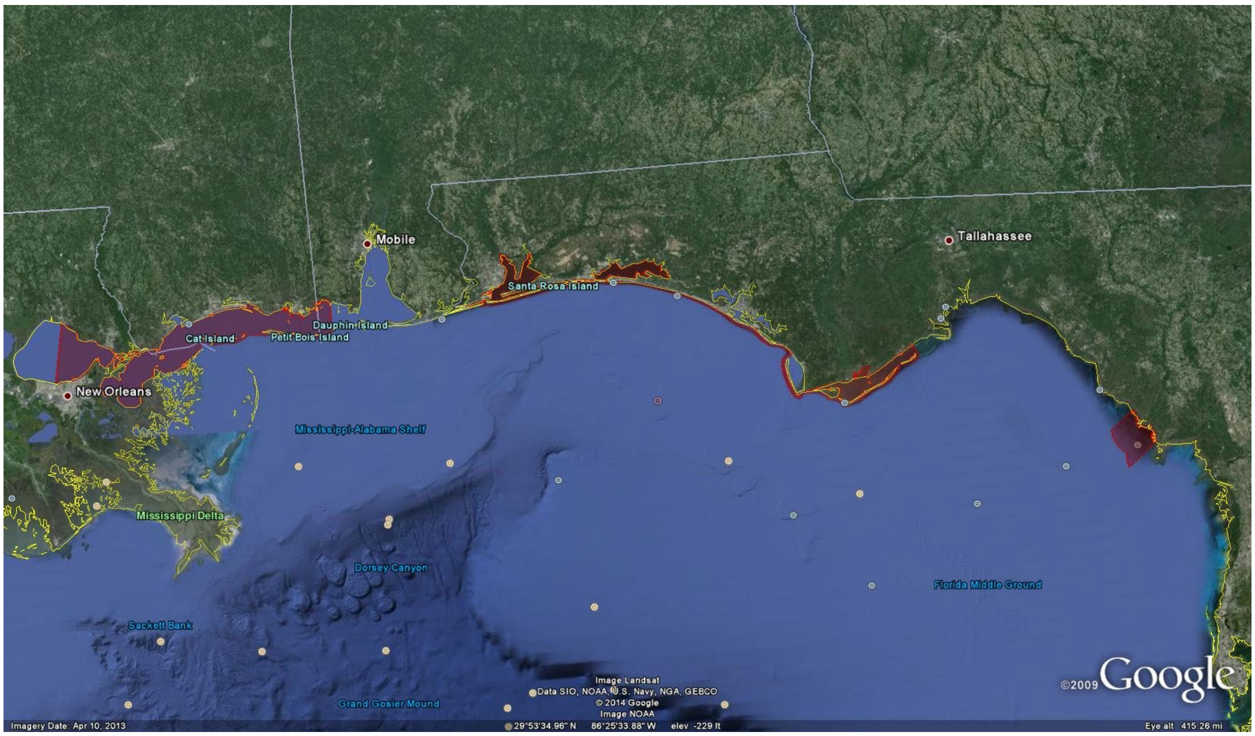

Figure 4. Gulf sturgeon critical habitat in estuarine and marine waters (Units 8-14) from Florida to Louisiana shown shaded in red (©2009 Google)

Table 3. Approximate Area of the Estuarine and Marine Critical Habitat Units for Gulf Sturgeon

Critical Habitat Unit	State	Km^2
8. Lake Borgne	Louisiana/Mississippi/Alabama	718
Little Lake		8
Lake Pontchartrain		763
Lake St. Catherine		26
The Rigolets		13
Mississippi Sound		1,879
MS nearshore Gulf		160
9. Pensacola Bay		381
10. Santa Rosa Sound		102

Critical Habitat Unit	State	Km^2
11. Near Shore Gulf of Mexico	Florida	442
12. Choctawhatchee Bay		321
13. Apalachicola Bay		683
14. Suwannee Sound		546
Total		6,042

Gulf sturgeon use rivers for spawning, larval and juvenile feeding, adult resting and staging, and to move between the areas that support these components. Gulf sturgeon use the lower riverine, estuarine, and marine environment during winter months primarily for feeding and for inter-river migrations. Within Florida estuaries, Gulf sturgeon are typically found in waters 2-4 m deep and use depths outside this range less than expected based on availability (Fox et al. 2002). Further, the 2-4-m deep habitats where Gulf sturgeon are typically found have sediments with a high percentage (> 80%) of sand (Fox et al. 2002). Gulf sturgeon in Mississippi estuaries appear to occupy habitats with lower percentages of sand (typically < 75% sand) but similar depth ranges (Michael Anders, USM, unpublished data). Adult sturgeon appear to spend extended periods of time in specific areas of the estuary and then travel relatively quickly to other areas where they again spend extended amounts of time (Edwards et al. 2007; Edwards et al. 2003). (Sulak et al. 2012) believe Gulf sturgeon feed continuously during these periods, which may last for 1-3 months. Additionally, it appears that there may be certain areas where Gulf sturgeon concentrate. USFWS discovered nearshore areas of concentrated feeding activity for adults from multiple riverine systems in the waters near Tyndall Air Force Base/Panama City Beach, Florida, and waters from Perdido, Florida, to Gulf Shores, Alabama (USFWS 2004; USFWS 2005; USFWS 2006; USFWS 2007). Estuaries and bays adjacent to riverine areas provide unobstructed passage of sturgeon from feeding areas to spawning grounds.

Critical Habitat Unit Impacted by this Action

This project is located in Unit 11 of Gulf sturgeon critical habitat (Near Shore Gulf of Mexico).

Unit 11 is a portion of the Gulf of Mexico along the shoreline of the Florida Panhandle (Figure 5). The western boundary is the line of longitude 87°20.0′W (approximately 1 nmi (1.9 km) west of Pensacola Pass) from its intersection with the shore to its intersection with the southern boundary. The northern boundary is the MHW of the mainland shoreline and the 72 COLREGS line at passes as defined at 30 CFR 80.810 (a–g). The southern boundary of the unit is 1 nmi (1.9 km) offshore of the northern boundary; the eastern boundary is the line of longitude 85°17.0′W from its intersection with the shore (near Money Bayou between Cape San Blas and Indian Peninsula) to its intersection with the southern boundary.

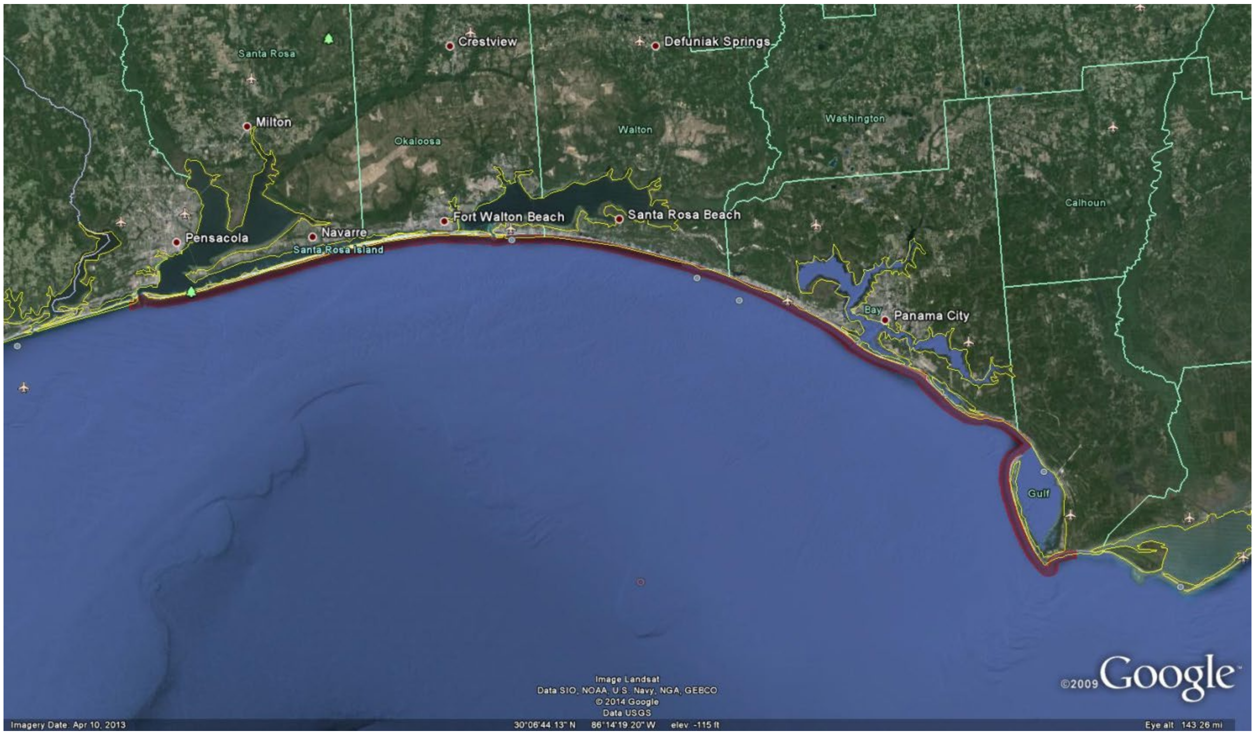

Figure 5. Gulf sturgeon critical habitat Unit 11 (©2009 Google)

Unit 11 includes winter feeding and migration habitat for Gulf sturgeon from the Yellow River, Choctawhatchee River, and Apalachicola River subpopulations. Telemetry relocation data suggest that these subpopulations feed in nearshore Gulf of Mexico waters between their natal river systems (Fox et al. 2002), Parauka, pers. comm., 2002). Gulf sturgeon from the Choctawhatchee River subpopulation have been documented both east and west of Choctawhatchee Bay (Fox et al. 2002), F. Parauka, pers. comm., 2002).

During the winter of 2001-2002, personnel from both USGS and FWS attached pop-up satellite tags to 20 Gulf sturgeon (12 from the Suwannee River, 4 from the Choctawhatchee River, 2 from the Apalachicola River, and 2 from the Yellow River) to identify winter feeding areas in the Gulf of Mexico. These data suggest that Gulf sturgeon from the Yellow River, Choctawhatchee River, and Apalachicola River remain within 1.6 km (1 mi) of the coastline between these river systems (F. Parauka, pers. comm., 2002). Examination of bathymetry data along the Gulf of Mexico coastline between the Pensacola Bay and Apalachicola Bay reveals that depths of less than 6 m (19.7 ft), where Gulf sturgeon are generally found, are all contained within 1 nmi (1.9 km) from shore. Gulf nearshore substrate contains unconsolidated, fine-medium grain sands which support crustaceans such as mole crabs, sand fleas, various amphipod species, and lancelets. Based on movement patterns, it appears the Gulf sturgeon were feeding in the nearshore Gulf of Mexico on route to their natal rivers. Given this information, we included the nearshore (up to 1 nmi [1.9 km]) Gulf of Mexico waters in this unit between Pensacola and Apalachicola Bays.

Essential Features of Critical Habitat

NMFS and USFWS identified seven habitat features essential for the conservation of Gulf sturgeon. Four of these features are found in the marine and estuarine units of critical habitat:

1. Abundant food items, such as detritus, aquatic insects, worms, and/or mollusks, within riverine habitats for larval and juvenile life stages; and abundant prey items, such as amphipods, lancelets, polychaetes, gastropods, ghost shrimp, isopods, mollusks and/or crustaceans, within estuarine and marine habitats and substrates for subadult and adult life stages
2. Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages
3. Sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages
4. Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., an unobstructed river or a dammed river that still allows for passage)

Status of Critical Habitat
Activities associated with coastal development have been and continue to be the primary threat to marine and estuarine units of Gulf sturgeon critical habitat. These activities generally include dredge and fill projects, freshwater withdrawals, and storm water drainage systems. Although many coastal development activities are currently regulated, some permitted direct or indirect damage to habitat from increased urbanization still occurs and is expected to continue in the future.

Threats to Critical Habitat
As stated in the Final Rule designating Gulf Sturgeon critical habitat, the following activities, when authorized, funded or carried out by a federal agency, may destroy or adversely modify critical habitat:

- Actions that would appreciably reduce the abundance of riverine prey for larval and juvenile sturgeon, or of estuarine and marine prey for juvenile and adult Gulf sturgeon, within a designated critical habitat unit, such as dredging, dredged material disposal, channelization, in-stream mining, and land uses that cause excessive turbidity or sedimentation
- Actions that would alter water quality within a designated critical habitat unit, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, such that it is appreciably impaired for normal Gulf sturgeon behavior, reproduction, growth, or viability, such as dredging; dredged material disposal; channelization; impoundment; in-stream mining; water diversion; dam operations; land uses that cause excessive turbidity; and release of chemicals, biological pollutants, or heated effluents into surface water or connected groundwater via point sources or dispersed non-point sources
- Actions that would alter sediment quality within a designated critical habitat unit such that it is appreciably impaired for normal Gulf sturgeon behavior, reproduction, growth, or viability, such as dredged material disposal; channelization; impoundment; in-stream mining; land uses that cause excessive sedimentation; and release of chemical or biological pollutants that accumulate in sediments

- Actions that would obstruct migratory pathways within and between adjacent riverine, estuarine, and marine critical habitat units, such as dams, dredging, point-source-pollutant discharges, and other physical or chemical alterations of channels and passes that restrict Gulf sturgeon movement (68 FR 13399-13400)

Unit 11 is impacted by a number of activities including dredging, shoreline armoring, installation of breakwaters, and construction of docks, piers, marinas, and artificial reefs. Some of these projects are not expected to adversely affect the essential features of Unit 11 as any effects are extremely unlikely to occur.

3.4 Status of Species Likely to be Adversely Affected by the Proposed Action

The following subsections are synopses of the best available information on the status of each species likely to be adversely affected by one or more components of the proposed action, including information on the distribution, population structure, life history, abundance, population trends of each species, and threats to each species. The biology and ecology of these species, as well as their status and trends, inform the effects analysis for this Opinion. Additional background information on the status of these species can be found in a number of published documents, including: proposed and final listing rules, recovery plans, 5-year status reviews, stock assessments, and biological reports. These can all be found on NMFS's Endangered Species Conservation website: http://www.fisheries.noaa.gov/topic/endangeredspecies-conservation.

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

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

In addition to domestic fisheries, sea turtles are subject to direct as well as incidental capture in numerous foreign fisheries, further impeding the ability of sea turtles to survive and recover on a global scale. For example, pelagic stage sea turtles, especially 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 incidents or incomplete records by foreign fleets make it difficult to characterize the total impact that international fishing pressure is having on listed sea turtles. Nevertheless, international fisheries represent a continuing threat to sea turtle survival and recovery throughout their respective ranges.

Non-Fishery In-Water Activities
There are also many non-fishery impacts affecting the status of sea turtle species, both in the ocean and on land. In nearshore waters of the U.S., the construction and maintenance of federal navigation channels has been identified as a source of sea turtle mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move relatively rapidly and can entrain and kill sea turtles (NMFS 1997). Sea turtles entering coastal or inshore areas have also been affected by entrainment in the cooling-water systems of electrical generating plants. Other nearshore threats include harassment or injury resulting from private and commercial vessel operations, military detonations and training exercises, in-water construction activities, and scientific research activities. Artificial lighting on board ship is also a concern to newly emergent hatchlings as they enter the water and concentrate around the light source rather than continue their swim out to sea resulting in exhaustion and becoming susceptible to predation.

Coastal Development and Erosion Control
Coastal development can deter or interfere with nesting, affect nesting success, and degrade nesting habitats for sea turtles. Structural impacts to nesting habitat include the construction of buildings and pilings, beach armoring and renourishment, and sand extraction (Bouchard et al. 1998; Lutcavage et al. 1997). These factors may decrease the amount of nesting area available to females and change the natural behaviors of both adults and hatchlings, directly or indirectly, through loss of beach habitat or changing thermal profiles and increasing erosion, respectively (Ackerman 1997; Witherington et al. 2003; Witherington et al. 2007). In addition, coastal development is usually accompanied by artificial lighting, which can alter the behavior of nesting adults (Witherington 1992) and is often fatal to emerging hatchlings that are drawn away from the water (Witherington and Bjorndal 1991). In-water erosion control structures such as breakwaters, groins, and jetties can impact nesting females and hatchling as they approach and leave the surf zone or head out to sea by creating physical blockage, concentrating predators, creating longshore currents, and disrupting of wave patterns.

Environmental Contamination
Multiple municipal, industrial, and household sources, as well as atmospheric transport, introduce various pollutants such as pesticides, hydrocarbons, organochlorides (e.g.,

dichlorodiphenyltrichloroethane [DDT], polychlorinated biphenyls [PCBs], and perfluorinated chemicals [PFCs]), and others that may cause adverse health effects to sea turtles (Garrett 2004; Grant and Ross 2002; Hartwell 2004; Iwata et al. 1993). Acute exposure to hydrocarbons from petroleum products released into the environment via oil spills and other discharges may directly injure individuals through skin contact with oils (Geraci 1990), inhalation at the water's surface, and ingesting compounds while feeding (Matkin and Saulitis 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability in the action area.

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

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

Climate Change

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

Climate change impacts on sea turtles currently cannot be predicted with any degree of certainty; however, significant impacts to the hatchling sex ratios of sea turtles may result (NMFS and USFWS 2007b). In sea turtles, sex is determined by the ambient sand temperature (during the middle third of incubation) with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007b).

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

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

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

Diseases, toxic blooms from algae and other microorganisms, and cold stunning events are additional sources of mortality that can range from local and limited to wide-scale and impacting hundreds or thousands of animals. Cold stunning is defined as "the state that turtles enter when they are suddenly exposed to very cold water (<16 °C). They become lethargic and begin to float on the surface of the water. In this state, they are susceptible to predators, accidental boat strikes, and even death if water temperatures continue to drop."

3.4.1 Green Sea Turtle (NA and SA DPSs)

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

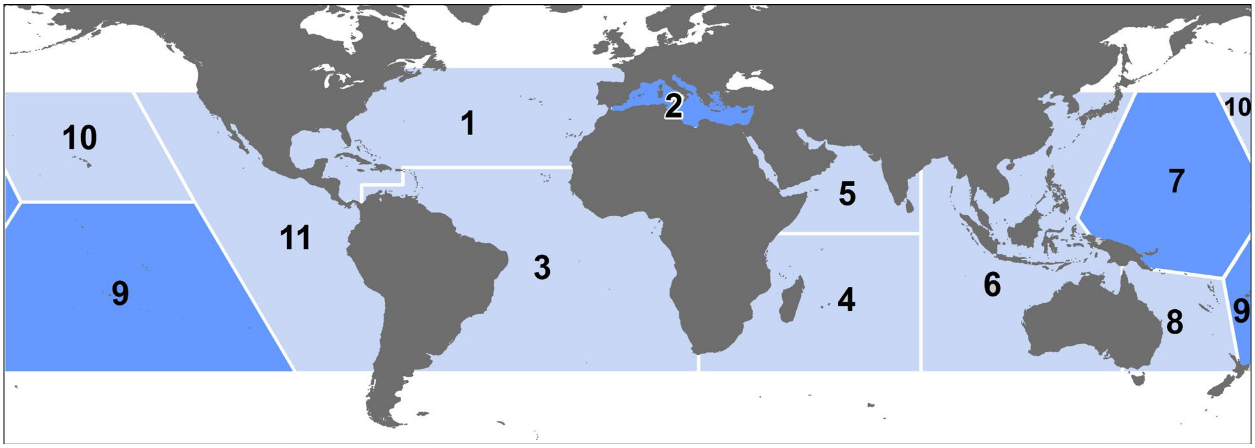

Figure 6. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11.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

Species Description and Distribution

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

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

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

North Atlantic DPS Distribution

The NA DPS boundary is illustrated in Figure 6. Four regions support nesting concentrations of particular interest in the NA DPS: Costa Rica (Tortuguero), Mexico (Campeche, Yucatan, and Quintana Roo), U.S. (Florida), and Cuba. By far the most important nesting concentration for green turtles in this DPS is Tortuguero, Costa Rica. Nesting also occurs in the Bahamas, Belize, Cayman Islands, Dominican Republic, Haiti, Honduras, Jamaica, Nicaragua, Panama, Puerto Rico, Turks and Caicos Islands, and North Carolina, South Carolina, Georgia, and Texas, U.S.A. In the eastern North Atlantic, nesting has been reported in Mauritania (Fretey 2001).

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

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

South Atlantic DPS Distribution

The SA DPS boundary is shown in Figure 6, and includes the U.S. Virgin Islands in the Caribbean. The SA DPS nesting sites can be roughly divided into four regions: western Africa, Ascension Island, Brazil, and the South Atlantic Caribbean (including Colombia, the Guianas, and Aves Island in addition to the numerous small, island nesting sites).

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

Life History Information

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

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

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

Status and Population Dynamics

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

North Atlantic DPS

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

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

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

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

Florida accounts for approximately 5% of nesting for this DPS (Seminoff et al. 2015). In Florida, index beaches were established to standardize data collection methods and effort on key nesting beaches. Since establishment of the index beaches in 1989, the pattern of green sea turtle nesting has generally shown biennial peaks in abundance with a positive trend during the 10 years of regular monitoring (Figure 7). According to data collected from Florida's index nesting beach survey from 1989-2019, green sea turtle nest counts across Florida have increased dramatically, from a low of 267 in the early 1990s to a high of 40,911 in 2019. Two consecutive years of nesting declines in 2008 and 2009 caused some concern, but this was followed by increases in 2010 and 2011. The pattern departed from the low lows and high peaks in 2020 and 2021 as well, when 2020 nesting only dropped by half from the 2019 high, while 2021 nesting only increased by a small amount over the 2020 nesting (Figure 7).

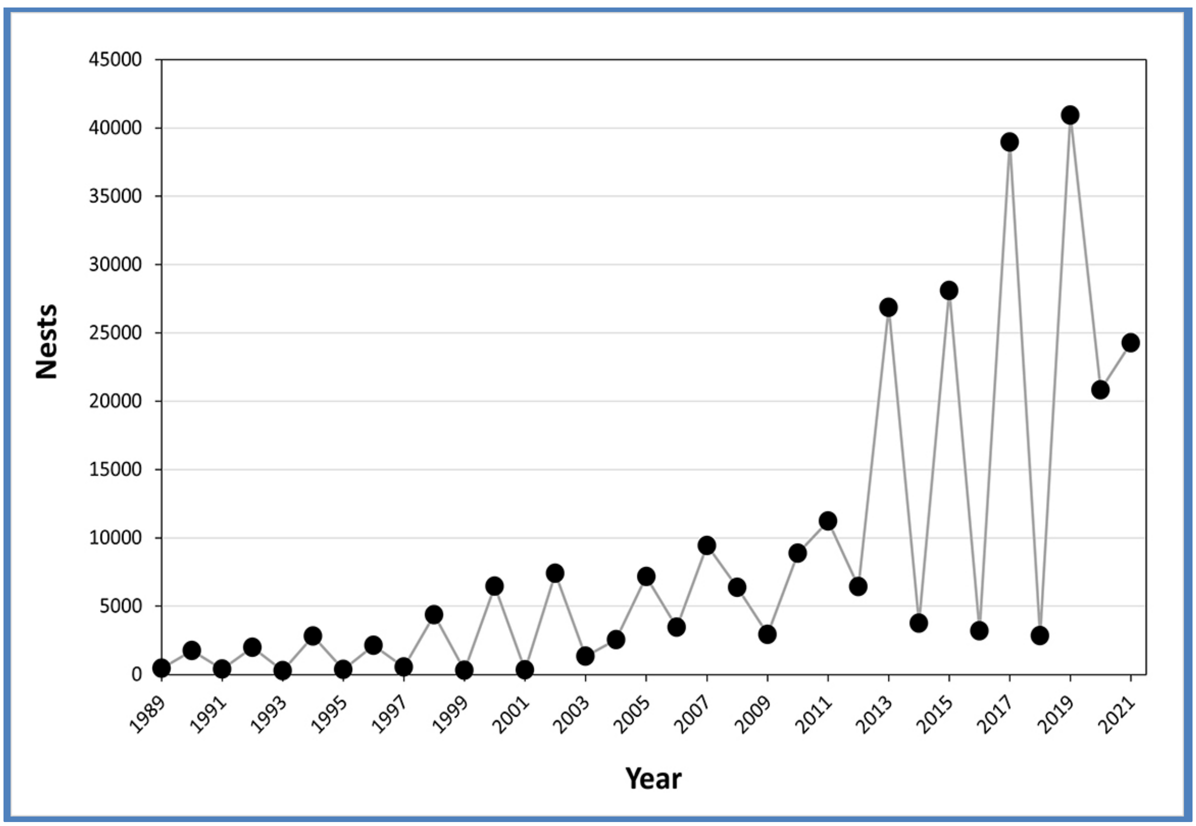

Figure 7. Green sea turtle nesting at Florida index beaches since 1989

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).

South Atlantic DPS

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

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

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of the species for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern 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 4.2.1.

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

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

Whereas oil spill impacts are discussed generally for all species in Section 4.4, specific impacts of the DWH spill on green sea turtles are considered here. Impacts to green sea turtles occurred to offshore small juveniles only. A total of 154,000 small juvenile greens (36.6% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. A large number of small juveniles were removed from the population, as 57,300 small juveniles greens are estimated to have died as a result of the exposure. A total of 4 nests (580 eggs) were also translocated during response efforts, with 455 hatchlings released (the fate of which is unknown) (DWH Trustees 2015). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil or dispersants, and loss of foraging resources, which could lead to compromised growth and reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

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

3.5.1 Loggerhead Sea Turtle (NWA 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 nine DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011, and effective October 24, 2011). This rule listed the following DPSs: (1) Northwest Atlantic Ocean (threatened), (2) Northeast Atlantic Ocean (endangered), (3) South Atlantic Ocean (threatened), (4) Mediterranean Sea (endangered), (5) North Pacific Ocean (endangered), (6) South Pacific Ocean (endangered), (7) North Indian Ocean (endangered), (8) Southeast Indo-Pacific Ocean (endangered), and (9) Southwest Indian Ocean (threatened). The Northwest Atlantic (NWA) DPS is the only one that occurs within the action area, and therefore it is the only one considered in this Opinion.

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

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

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

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

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

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

Life History Information

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

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

convergence zones (Carr 1986; Conant et al. 2009; 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 Gulf of Mexico (Witzell 2002).

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

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

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

Status and Population Dynamics

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

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

Peninsular Florida Recovery Unit

The Peninsular Florida Recovery Unit (PFRU) is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census (all beaches including index nesting beaches) undertaken from 1989 to 2007 showed an average of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008). The statewide estimated total for 2020 was 105,164 nests (FWRI nesting database).

In addition to the total nest count estimates, the Florida Fish and Wildlife Research Institute (FWRI) uses an index nesting beach survey method. The index survey uses standardized data-collection criteria to measure seasonal nesting and allow accurate comparisons between beaches and between years. FWRI uses the standardized index survey data to analyze the nesting trends (Figure 8) (https://myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals/). Since the beginning of the index program in 1989, 3 distinct trends were identified. From 1989-1998, there was a 24% increase that was followed by a sharp decline over the subsequent 9 years. A large increase in loggerhead nesting has occurred since, as indicated by the 71% increase in nesting over the 10-year period from 2007 and 2016. Nesting in 2016 also represented a new record for loggerheads on the core index beaches. While nest numbers subsequently declined from the 2016 high FWRI noted that the 2007-2021 period represents a period of increase. FWRI examined the trend from the 1998 nesting high through 2016 and found that the decade-long post-1998 decline was replaced with a slight but non-significant increasing trend. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability between 2012-2016 resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose again each year through 2020, reaching 53,443 nests before dipping back to 49,100 in 2021. It is important to note that with the wide confidence intervals and uncertainty around the variability in nesting parameters (changes and variability in nests/female, nesting intervals, etc.) it is unclear whether the nesting trend equates to an increase in the population or nesting females over that time frame (Ceriani, et al. 2019).

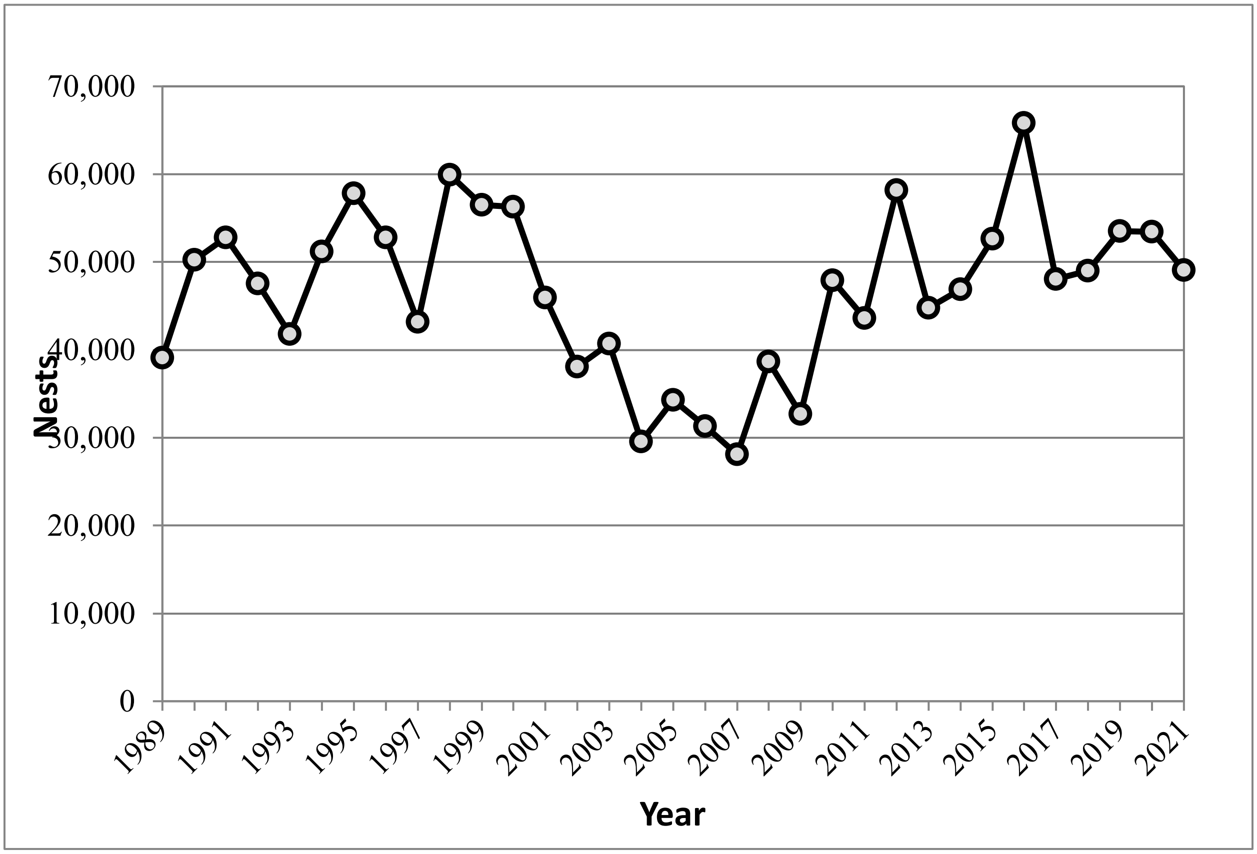

Figure 8. Loggerhead sea turtle nesting at Florida index beaches since 1989

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

Data since that analysis (Table 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.

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**

South Carolina also conducts an index beach nesting survey similar to the one described for Florida. Although the survey only includes a subset of nesting, the standardized effort and locations allow for a better representation of the nesting trend over time. Increases in nesting were seen for the period from 2009-2013, with a subsequent steep drop in 2014. Nesting then rebounded in 2015 and 2016, setting new highs each of those years. Nesting in 2017 dropped back down from the 2016 high, but was still the second highest on record. After another drop in 2018, a new record was set for the 2019 season, with a return to 2016 levels in 2020 and 2021 (Figure 9).

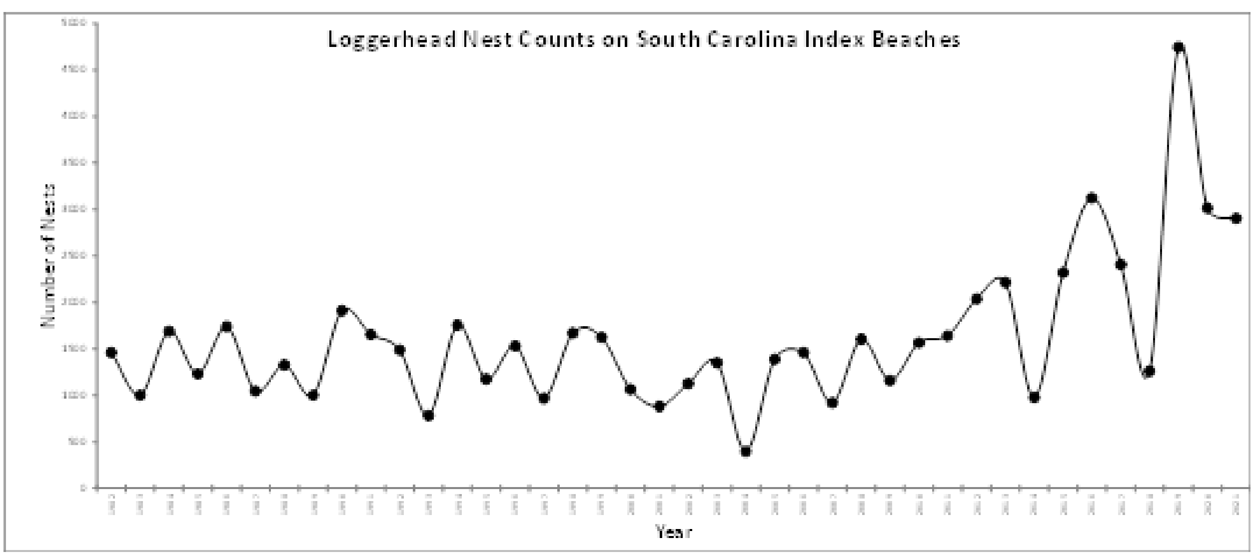

Figure 9. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website: https://www.dnr.sc.gov/seaturtle/ibs.htm)

Other Northwest Atlantic DPS Recovery Units

The remaining 3 recovery units—Dry Tortugas (DTRU), Northern Gulf of Mexico (NGMRU), and Greater Caribbean (GCRU)—are much smaller nesting assemblages, but they are still considered essential to the continued existence of the species. Nesting surveys for the DTRU are conducted as part of Florida's statewide survey program. Survey effort was relatively stable during the 9-year period from 1995-2004, although the 2002 year was missed. Nest counts ranged from 168-270, with a mean of 246, but there was no detectable trend during this period (NMFS and USFWS 2008). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. Analysis of the 12-year dataset (1997-2008) of index nesting beaches in the area shows a statistically significant declining trend of 4.7% annually. Nesting on the Florida Panhandle index beaches, which represents the majority of NGMRU nesting, had shown a large increase in 2008, but then declined again in 2009 and 2010 before rising back to a level similar to the 2003-2007 average in 2011. From 1989-2018 the average number of NGMRU nests annually on index beaches was 169 nests, with an average of 1100 counted in the statewide nesting counts (Ceriani et al. 2019). Nesting survey effort has been inconsistent among the GCRU nesting beaches, and no trend can be determined for this subpopulation (NMFS and USFWS 2008). Zurita et al. (2003) found a statistically significant increase in the number of nests on 7 of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. Nonetheless, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008).

In-water Trends

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

Population Estimate

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

Threats (Specific to Loggerhead Sea Turtles)

The threats faced by loggerhead sea turtles are well summarized in the general discussion of threats in Section 4.4. Yet the impact of fishery interactions is a point of further emphasis for this species. The joint NMFS and USFWS Loggerhead Biological Review Team determined that the greatest threats to the NWA DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009).

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

While oil spill impacts are discussed generally for all species in Section 4.4, specific impacts of the Deepwater Horizon (DWH) oil spill event on loggerhead sea turtles are considered here. Impacts to loggerhead sea turtles occurred to offshore small juveniles as well as large juveniles and adults. A total of 30,800 small juvenile loggerheads (7.3% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. Of those exposed, 10,700 small juveniles are estimated to have died as a result of the exposure. In contrast to small juveniles, loggerheads represented a large proportion of the adults and large juveniles exposed to and killed by the oil. There were 30,000 exposures (almost 52% of all exposures for those age/size classes) and 3,600 estimated mortalities. A total of 265 nests (27,618 eggs) were also translocated during response efforts, with 14,216 hatchlings released, the fate of which is unknown (DWH Trustees 2016). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

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

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

4 ENVIRONMENTAL BASELINE

This section describes the effects of past and ongoing human and natural factors contributing to the current status of the species and critical habitat in the action area. The environmental baseline describes the species' and critical habitat's health based on information available at the time of this consultation. The environmental baseline does not include the effects of the action under review in this Opinion.

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

Focusing on the impacts of the activities in the action area specifically allows us to assess the prior experience and state (or condition) of the endangered and threatened individuals and current state of critical habitat. This consideration is important because in some states or life history stages, or areas of their ranges, listed individuals will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be in other states, stages, or areas within their distributions. These localized stress responses or stressed baseline conditions may increase the severity of the adverse effects expected from the proposed action. It is also important because in some areas critical habitat features will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be in other areas, or may have been exposed to unique or disproportionate stresses. These localized stress responses or stressed baseline conditions may increase the severity of the adverse effects expected from the proposed action.

The following subsections are synopses of the actions and the effects these actions have had or are having on Gulf sturgeon critical habitat.

4.1 Status of the Critical Habitat within the Action Area

The status of Gulf sturgeon critical habitat in the action area, as well as the threats to this critical habitat, are supported by the critical habitat account in Section 3. As discussed above, this Opinion focuses on an activity occurring in Unit 11 of Gulf sturgeon designated critical habitat.

4.2 Factors Affecting Critical Habitat within the Action Area

4.2.1. Federal Dredging Activity

In 2003, NMFS completed a Regional Opinion on the impacts of USACE's hopper-dredging operations in the Gulf of Mexico (GRBO). Subsequent revisions were provided in 2005 and 2007 (NMFS 2003; NMFS 2005; NMFS 2007). In GRBO, NMFS determined that (1) Gulf of Mexico hopper dredging would adversely affect Gulf sturgeon and 5 sea turtle species (i.e., green, hawksbill, Kemp's ridley, leatherback, and loggerheads), but would not jeopardize their continued existence, and (2) dredging in the Gulf of Mexico would not adversely affect smalltooth sawfish, or ESA-listed large whales. An ITS for those species adversely affected was issued. USACE-permitted "new" dredging or placement of material within Gulf sturgeon critical habitat is not covered by the GRBO. Maintenance dredging of navigational channels within Gulf sturgeon critical habitat is limited to maintaining the dimensions of channels (i.e. length, width, and depth) at the time of the original 2003 GRBO regardless of previous authorization.

The GRBO considers maintenance dredging, beach renourishment, and sand mining operations. Numerous other Opinions have been produced that analyzed hopper dredging projects that did not fall (partially or entirely) under the scope of actions contemplated by GRBO. Two such projects are located adjacent to the action area, East Pass dredging, Destin, Florida to USACE in 2009 (NMFS 2009) and dredging of City of Mexico Beach canal inlet to USACE in 2012 (NMFS 2012). Each of these Opinions has its own ITS and determined that hopper dredging during the proposed action is not likely to jeopardize any species of sea turtles or other listed species, or destroy or adversely modify critical habitat of any listed species, including Gulf sturgeon critical habitat.

4.2.2 Deepwater Horizon (DWH) Legacy Effects on Gulf Sturgeon Critical Habitat

According to an analysis conducted by NMFS on the DWH spill oiling legacy (M. Press, NMFS, memo to D. Bernhart, NMFS, December 8, 2014), indirect impacts to water quality could occur if dredging disturbed a submerged oil mats (SOMs) remnant of the DWH spill. Contributors to Operational Science Advisory Team (OSAT III) report have stated that while there is a possibility that dredging activities could re-suspend oil into the water column in certain areas, the likelihood of this happening is low. Additionally, an analysis of the matrix of material (oil plus sand) stranded in mats revealed that SOMs were composed mostly of sand: 83.2%-90.6% sand and 9.4%-16.8% oil (OSAT II). The effects of suffocation of infaunal organisms and toxicity of substrate would impact potential foraging areas within Gulf sturgeon critical habitat through the displacement or reduction of prey items; however, indirect impacts to sediment quality and direct effects to prey abundance would be insignificant. The likelihood of any re-suspended DWH oil being toxic is low, and should also not have measurable effects on water quality (or on listed species directly) (W. Bryant, OSAT III Science Team Lead, pers. comm. to M. Press, NMFS, July 31, 2014). NMFS concluded that the project activities were not likely to adversely affect Gulf sturgeon critical habitat.

4.2.3 Climate Change

As discussed earlier in this Opinion, there is a large and growing body of literature on past, present, and future impacts of global climate change. Potential effects commonly mentioned include changes in sea temperatures and salinity (due to melting ice and increased rainfall), ocean currents, storm frequency and weather patterns, and ocean acidification. These changes have the potential to affect species behavior and ecology including migration, foraging, reproduction (e.g., success), and distribution. For example, large-scale factors impacting riverine water quality and quantity that likely exacerbate habitat threats to Gulf sturgeon include drought, and intra- and inter-state water allocation. For sturgeon, altered precipitation patterns cause increases or decreases in rainfall distribution that can dramatically impact river habitat (flow, bottom habitat, predator/prey interactions, habitat niche partitioning, nutrient flow, pollutant dispersal, and important abiotic factors). The seasonal timing and precipitation pattern changes (e.g., summer flooding) for anadromous fish like Gulf sturgeon may undermine the functionality of critical habitat and the successful spawning or embryo survival for that spawning season. Female Gulf sturgeon may spawn every two to five years, so the potential loss of an entire reproductive effort can profoundly impact species recovery.

4.2.4 Stochastic Events

Stochastic events such as hurricanes are relatively common in and around Gulf sturgeon critical habitat (Unit 11). These events are unpredictable and their effect on the ability of the essential features to function properly is variable but can be significant. Gulf sturgeon mortalities in the Apalachicola River in Florida were directly attributed to Hurricane Michael and a severe hypoxic event from that storm (Dula et al. 2020)) where the dissolved oxygen (DO) concentrations dropped so low (i.e., 0.2 mg/L) that water quality became uninhabitable, resulting in the death of thousands of fish including multiple sturgeon. Historically, Gulf sturgeon, were disproportionally negatively affected by hurricanes (Category 3 or above) in the western Gulf of Mexico (GOM) versus the eastern GOM) (Rudd et al. 2014). Predicted increases in the frequency and severity of hurricanes may be attributed to climate change and pose additional and recognized threats to sturgeon movement/recruitment patterns. Tropical storm events also lead to post-hurricane hypoxic and anoxic in-river conditions leading to sturgeon mortality events of all life-stages. Stochastic events such as the ones discussed here are certainly possible within the range of the Gulf sturgeon critical habitat Unit 11. More information is needed to continue to assess the impacts of stochastic events on Gulf sturgeon critical habitat.

4.3 Status of the Species within the Action Area

We believe the hopper dredging and relocation trawling components of the proposed action are likely to adversely affect the NA and SA DPSs of green sea turtles and the NWA DPS of loggerhead sea turtles as described in Section 5. The species of sea turtles that are expected to occur in the action area are highly migratory. Therefore, the status of the DPSs of green of sea turtles and the NWA DPS of loggerhead sea turtles 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 the Status of Species Section.

4.4 Factors Affecting Sea Turtles in the Action Area

The following analysis examines actions that may affect the NA and SA DPSs of green sea turtle and the NWA DPS of loggerhead sea turtle within the action area.

4.4.1 Federal Actions

NMFS has undertaken a number of Section 7 consultations to address the effects of federally permitted dredging and other federal actions on threatened and endangered sea turtle species, and when appropriate, has authorized the incidental taking of these species. Each of those consultations sought to minimize the adverse effects of the action on sea turtles. The summary below of federal actions and the effects these actions have had on sea turtles includes only those federal actions in the action area that have already concluded or are currently undergoing formal Section 7 consultation.

4.4.1.1 Federal Dredging Activity

Marine dredging vessels are common within U.S. coastal waters. 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. 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. While they usually move very slowly, hopper dredges in the dredging mode are capable of moving relatively quickly compared to a sea turtle in normal swimming speed (non-burst 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. Within the action area, there is a federal navigation channel adjacent to the R-97 project marker. The channel is also located in between two of the borrow areas to be used in this project (6 and 11).

To reduce take of listed species, relocation trawling may be utilized to capture and move sea turtles. In relocation trawling, a boat equipped with nets precedes the dredge to capture sea turtles and then releases the animals out of the dredge pathway, thus avoiding lethal take. Relocation trawling has been successful and routinely moves sea turtles in the Gulf of Mexico. Between April 2016 and June 2016, relocation trawling captured and successfully moved 212 sea turtles near Navarre Beach, Florida with no mortalities (Coastwise Consulting 2016). In GRBO, NMFS determined that (1) Gulf of Mexico hopper dredging would adversely affect Gulf sturgeon and five sea turtle species (i.e., green, hawksbill, Kemp's ridley, leatherback, and loggerheads), but would not jeopardize their continued existence. An ITS for those species adversely affected was issued. USACE-permitted "new" dredging or placement of material within Gulf sturgeon critical habitat is not covered by the GRBO and requires separate consultation. Maintenance dredging of navigational channels within Gulf sturgeon critical habitat is limited to maintaining the dimensions of channels (i.e. length, width, and depth) at the time of the original 2003 GRBO regardless of previous authorization. This project is operating under the dredging and relocation trawling guidelines provided by GRBO. Using the stacking approach described previously, the beach nourishment portion of this project is addressed in this Opinion. The Opinion also evaluates the potential for the proposed dredging and relocation trawling to jeopardize the continued existence of the NA and SA DPS of green sea turtles and the NWA DPS of loggerhead sea turtles.

While GRBO considers maintenance dredging, beach renourishment, and sand mining operations, other Opinions have been produced that analyzed hopper dredging projects that did not fall (partially or entirely) under the scope of actions contemplated by GRBO. Two such projects (also previously mentioned) are located adjacent to the action area, East Pass dredging, Destin, Florida to USACE in 2009 (NMFS 2009a) and dredging of City of Mexico Beach canal inlet to USACE in 2012 (NMFS 2012a). Each of these Opinions has its own ITS and determined that hopper dredging during the proposed action is not likely to jeopardize any species of sea turtles or other listed species, or destroy or adversely modify critical habitat of any listed species.

4.4.1.2 Federal Vessel Activity

Watercraft are the greatest contributors to overall noise in the sea and have the potential to interact with sea turtles though direct impacts or propellers. Sound levels and tones produced are generally related to vessel size and speed. Larger vessels generally emit more sound than smaller vessels, and vessels underway with a full load, or those pushing or towing a load, are noisier than unladen vessels. Vessels operating at high speeds have the potential to strike sea turtles. Potential sources of adverse effects from federal vessel operations in the action area include operations authorized or conducted by the Bureau of Ocean Energy Management (BOEM), Federal Energy Regulatory Commission (FERC), U.S. Coast Guard (USCG), NOAA, and USACE. For example, regarding vessels associated with projects funded, authorized, or permitted by federal agencies can have effects in the action area, commercial fishing vessels operating in federally managed fisheries likely traverse through the area on their way to federal waters.

NMFS has also conducted Section 7 consultations related to energy projects in the Gulf of Mexico (BOEM and FERC) to implement conservation measures for vessel operations. Through the Section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these vessel operations to avoid or minimize adverse effects to listed species. At the present time, they present the potential for some level of adverse effects.

Other potential sources of adverse effects from federal vessel activity and operations in the action area include operations of the United States Navy (USN) and USGC. Through the Section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. Refer to the Biological Opinions for the USCG (NMFS 1995; NMFS 1996) and the USN (NMFS 1996; NMFS 1997a; NMFS 2013) for details on the scope of vessel operations for these agencies and conservation measures implemented as standard operating procedures.

4.4.1.3 Oil and Gas Exploration and Extraction

Federal and state oil and gas exploration, production, and development are expected to result in some sublethal effects to protected species, including impacts associated with the explosive removal of offshore structures, seismic exploration, marine debris, oil spills, and vessel operation. Many Section 7 consultations have been completed on BOEM oil and gas lease activities. Until 2002, these Opinions concluded only one sea turtle take may occur annually due to vessel strikes. Opinions issued on July 11, 2002 (NMFS 2002d), November 29, 2002 (NMFS 2002a), August 30, 2003 (Lease Sales 189 and 197 (NMFS 2003b), and June 29, 2007 (2007-2012 Five-Year Lease Plan (NMFS 2007a) have concluded that sea turtle takes may also result from vessel strikes, marine debris, and oil spills. Oil drilling cannot be conducted closer than 125 miles off the Florida panhandle, but oil drilling may affect the action area and species in the action area, for example, if tar balls wash ashore or if there was a spill offshore. The effects of the Deepwater Horizon oil spill on sea turtles is discussed above and in the following subsection.

Impact of Deepwater Horizon Oil Spill on Status of Sea Turtles
The April 20, 2010, explosion of the *Deepwater Horizon* (DWH) oil rig affected sea turtles in the Gulf of Mexico. An assessment has been completed on the injury to Gulf of Mexico marine life, including sea turtles, resulting from the spill (DWH Trustees 2015a). Following the spill, juvenile Kemp's ridley, green, and loggerhead sea turtles were found in *Sargassum* algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil or had ingested oil. 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.

4.4.1.4 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) database[6] by the consulting biologist on February 10, 2022, there were 10 active Section 10(a)(1)(A) scientific research permits applicable to green sea turtles and loggerhead sea turtles within the action area. These permits allow the capture, handling, sampling, and release of these turtle species (all life stages except hatchlings) and range in purpose from reducing bycatch in commercial fisheries to gaining better scientific knowledge.

4.4.2 State or Private Actions

4.4.2.1 State Fisheries

Various fishing methods used in state commercial and recreational fisheries, including gillnets, fly nets, trawling, pot fisheries, pound nets, and vertical line are all known to incidentally take sea turtles, but information on these fisheries is sparse (NMFS 2001). Most of the state data are based on extremely low observer coverage, or sea turtles were not part of data collection; thus, these data provide insight into gear interactions that could occur but are not indicative of the magnitude of potential impacts.

Gillnet Fisheries
A detailed summary of the gillnet fisheries currently operating along the Gulf of Mexico, which are known to incidentally capture loggerhead sea turtles, can be found in the TEWG reports (1998; 2000).

Trawl Fisheries
On December 20, 2019 (84 FR 70048), we published a final rule to require all skimmer trawl vessels 40 feet and greater in length to use TEDs in their nets. The effective date of this final rule was ultimately delayed until August 1, 2021 (86 FR 16676; March 31, 2021). Subsequently, a preliminary injunction delayed implementation of the skimmer trawl TED requirements in Louisiana inshore waters until February 1, 2022. On April 20, 2021, we published an advance notice of proposed rulemaking to consider the expansion of TED requirements to skimmer trawl vessels less than 40 feet in length operating in the southeast U.S. shrimp fisheries (86 FR 20475). If we ultimately conclude additional TED requirements are necessary for the conservation and recovery of threatened and endangered sea turtle species, we will publish a proposed and final rule in the Federal Register at a future date.

Recreational Fisheries
Beyond commercial fisheries, observations of state recreational fisheries have shown that loggerhead, leatherback, Kemp's ridley, and green sea turtles are known to bite baited hooks, and loggerheads and Kemp's ridleys frequently ingest the hooks. Data reported through Marine Recreational Information Program (MRIP), Marine Recreational Fisheries Statistics Survey (MRFSS), and Sea Turtle Stranding and Salvage Network (STSSN) show recreational fishers have hooked sea turtles when fishing from boats, piers, and beach, banks, and jetties.

[6] https://apps.nmfs.noaa.gov/

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

4.4.2.2 Vessel Traffic

Commercial traffic and recreational boating pursuits can have adverse effects on sea turtles via propeller and boat strike damage. The STSSN includes many records of vessel interactions (propeller injury) with sea turtles in the Gulf of Mexico. The area in and around the action area is known as a fishing haven and there are many fleets of charter boats and headboats that operate out of the navigational channel located adjacent to the action area.

Data show that vessel traffic is one cause of sea turtle mortality (Hazel and Gyuris 2006; Lutcavage et al. 1997; MSS 2003). Stranding data for the Gulf of Mexico coast show that vessel-related injuries are noted in stranded sea turtles (STSSN 2016). Data indicate that live- and dead-stranded sea turtles showing signs of vessel-related injuries continue in a high percentage of stranded sea turtles in coastal regions of the southeastern United States.

4.4.3 Other Potential Sources of Impacts in the Environmental Baseline

4.4.3.1 Marine Debris

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). The number of oil drilling rigs operating in the Gulf of Mexico make the prevalence of tar balls on beaches in the action area an ongoing problem. Adult and juvenile sea turtles may consume tar balls while they are foraging in the water and hatchlings on the beach may become entangled and trapped in the tar balls as the tar balls soften and melt in the sun.

4.4.3.2 Marine Pollution and Environmental Contamination

Sources of pollutants along the action area include atmospheric loading of pollutants such as PCB, stormwater runoff from coastal towns and cities into rivers and canals emptying into bays and the ocean, and groundwater and other discharges. Nutrient loading from land-based sources such as coastal community discharges is known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effects on larger embayments are unknown. Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986), the impacts of many other man-made toxins have not been investigated.

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

4.4.4 Summary and Synthesis of Environmental Baseline for Sea Turtles

In summary, several factors adversely affect sea turtles in the action area. These factors are ongoing and are expected to occur contemporaneously with the proposed action. Previous dredging in the action area likely had the greatest adverse impacts on sea turtles in the mid- to late-80s, when most maintenance dredge activity was being conducted without current conservation measures. Since the late-90s, the impacts associated with maintenance dredging have been reduced through the Section 7 consultation process and regulations implementing effective conservation strategies. Other environmental impacts including effects of fishing operations, vessel operations, permits allowing take under the ESA, private vessel traffic, and marine pollution have also had and continue to have adverse effects on sea turtles in the action area in the past.

5 EFFECTS OF THE ACTION ON LISTED SPECIES AND CRITICAL HABITAT

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

5.1 Gulf Sturgeon Critical Habitat

The proposed action area is within the boundary of the Gulf sturgeon designated critical habitat Unit 11. Of the seven possible habitat features essential for the conservation of Gulf sturgeon, four of these features are found in the marine and estuarine units of critical habitat. While Unit 11 of Gulf sturgeon critical habitat contains four essential features, only one of which may be adversely affected by the proposed action. The four essential features that are in Gulf sturgeon critical habitat Unit 11 are the following: (1) prey abundance; (2) water quality; (3) sediment quality; and (4) migratory pathways, but only prey abundance is likely to be adversely affected by the proposed action. We determined the proposed action may affect, but is not likely to adversely affect the other essential features.

The remaining essential features are not present in the action area and in Unit 11 – these are: (5) river spawning sites and substrates suitable for egg deposition; (6) Riverine aggregation areas, also known as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, usually located in holes within riverbeds in fresh water; and, (7) flow regime in fresh water habitat necessary for normal behavior, growth and survival of all life stages in the riverine environment.

Prey Abundance (Essential Feature 1)

When evaluating the effects to Gulf sturgeon prey abundance (Essential Feature 1), NMFS has considered the following factors[7]: Gulf sturgeon sub-populations using affected critical habitat, mean generation time, foraging behavior, prey items, benthic community structure, potential Gulf sturgeon prey in the action area, and benthos recovery after burial. NMFS has determined that all of the aforementioned factors are relevant to the proposed action and hence are analyzed in this opinion.

5.1.1 Gulf sturgeon sub-populations using affected critical habitat

Both adult and subadult Gulf sturgeon from the Yellow River, Choctawhatchee River, and Apalachicola River likely use the action area for feeding. Since the beach nourishment is being conducted in phases, individuals from these sub-populations will have ample alternative foraging habitat during construction and post-construction.

5.1.2 Mean Generation Time

Mean generation time (mean period elapsing between the birth of the parents and the birth of the offspring) is a useful tool to estimate the period of time for a population to increase in size. While mean generation time is unknown for the Gulf sturgeon, it has been calculated for the shortnose sturgeon (*A. brevirostrum*), a congener, to be between 10 and 30 years (NMFS 1998). A self-sustaining Gulf sturgeon population has been defined as one where the average rate of natural recruitment is at least equal to the average mortality rate in a 12-year period; 12 years is the approximate age at maturity for a female Gulf sturgeon (USFWS et al. 1995). Mean generation time is evaluated respective to the proposed action as it provides an estimated time frame to expect an increase in population size. Given current measures to protect individuals, subpopulations, and habitat, NMFS is hopeful that the number of Gulf sturgeon will increase as many threats have been reduced with the protection afforded via Section 7 of the ESA. Given the long time frame of the project and the large width of the project (18.5 miles), there may be a temporary effect that may affect some cohorts utilizing the project area during the project period, but we do not expect the proposed action to affect overall population trends or mean generation time.

[7] NMFS has considered these factors in consultations on barrier island restoration activities (NMFS Opinions SER-2011-05667, SER-2012-09304, SERO-2018-00258) as well as in consultations on artificial reef placement (SERO-2018-19361).

5.1.3 Foraging Behavior

Gulf sturgeon possess a highly protrusible mouth that extends downward to vacuum up sediments containing their prey (i.e., infaunal macroinvertebrates). This suction feeding requires an expandable mouth cavity and a relatively narrow mouth through which to funnel water and food items (Westneat 2001). Success of suction feeding relies on the ability of the predator's mouth to protrude into the proximity of prey (Westneat 2001); the suction tube of the sturgeon's mouth must be able to maintain contact with the benthos their prey inhabit. Findeis (1997) described sturgeon as exhibiting evolutionary traits adapted for cruising the benthos in search of prey. Notably, their caudal fin morphology has presumably been adapted for benthic cruising; the hypochordal lobe is often reduced to allow sweeping of the tail while close to the substrate (Findeis 1997).

Research supports that Gulf sturgeon are typically found foraging in depths greater than 1 m. Lower energy areas, where water depth is greater than 1 to 2 m, would likely assist foraging success given their feeding biology and the dissipation of wave energy. The protrusible mouth of these suction feeders must make contact with the benthos in order to vacuum prey out of the sediments while benthic cruising. The slightly deeper depths (2 to 4 m) the sturgeon seem to prefer would have less wave energy at the substrate compared to the shallower swash zone. Downward cycloidal movement of waves dissipates energy through the water column (i.e., wave energy is exponentially dissipated with depth). A sturgeon attempting to forage in a high-energy, shallow-water environment (i.e., the swash zone) would likely be challenged to retain position and maintain contact with the benthos. Therefore, Gulf sturgeon foraging success would likely be greater in the slightly deeper, lower energy areas compared to the high-energy swash zone.

As benthic cruisers, sturgeon forage extensively in an area, presumably until preferred prey is depleted or reduced, at which point they relocate and resume foraging. Tracking observations by (Edwards et al. 2003; Fox et al. 2002; Sulak and Clugston 1999) support that individual Gulf sturgeon move over an area until they encounter suitable prey type and density, at which time they forage for extended periods of time. Individual Gulf sturgeon often remain in localized areas (less than 1 km^2) for extended periods of time (greater than two weeks) and then move rapidly to another area where localized movements occurred again (Fox et al. 2002). Edwards et al. (2007) also discussed mixing of Gulf sturgeon from different populations and overlap of winter habitat utilization. Gulf sturgeon tagged in seven Florida panhandle river systems were monitored from Carrabelle, Florida, to Mobile Bay, Alabama, during the winter period in the coastal waters of the Gulf of Mexico; Gulf sturgeon from different river systems were located occupying the same area of marine habitat (Ross et al. 2009). While the exact amount of benthic area required to sustain Gulf sturgeon health and growth is unknown (and likely dependent on fish size and reproductive status), Gulf sturgeon have been known to travel long distances (greater than 161 km) during their winter feeding period. This supports the likelihood that any Gulf sturgeon in the project area will find appropriate and abundant prey in the areas adjacent to the project location, as the coastal deposits flanking the Apalachicola-Choctawhatchee coastal area are predominantly beach-ridges comprised of oxidized quartz sands of Pleistocene age. Therefore, an abundance of sandy habitat is available nearby the project area for foraging.

5.1.4 Prey Items

Prey availability is essential for development of different life stages of Gulf sturgeon using critical habitat in the action area. Both adult and subadult Gulf sturgeon are known to lose up to 30 percent of their total body weight while over-summering in the rivers, and subsequently compensate the loss during winter feeding in estuarine and marine areas (Carr 1983; Clugston et al. 1995; Heise et al. 1999; Morrow et al. 1998; Ross et al. 2000; Sulak and Clugston 1999; Wooley and Crateau 1985). Therefore, once Gulf sturgeon leave the river after having spent at least six months fasting, it is presumed that they immediately begin feeding. Upon exiting the rivers, Gulf sturgeon concentrate around the mouths of their natal rivers in lakes and bays (depth less than 20 ft). These areas are very important for the Gulf sturgeon as they offer the first foraging opportunity upon exiting the rivers. Gulf sturgeon have been described as opportunistic and indiscriminate benthivores; their guts generally contain benthic marine invertebrates including amphipods, lancelets, polychaetes, gastropods, shrimp, isopods, molluscs, and crustaceans (Carr et al. 1996; Fox et al. 2000; Fox et al. 2002; Huff 1975; Mason and Clugston 1993). Generally, Gulf sturgeon prey are burrowing species (e.g., annelids, polychaetes, oligochaetes, amphipods, isopods, and lancelets) that feed on detritus and suspended particles, and inhabit sandy substrate. The project area is not an entrance to a river, lake or bay and is therefore not utilized by sturgeon exiting a river after months of fasting. Rather, the project area is utilized by Gulf sturgeon during their winter foraging period. Prey items may not be abundant in areas that have been recently dredged or where beach nourishment has recently occurred; however, these areas are expected to recover fairly quickly and sturgeon would also be able to move to adjacent foraging sites that have not been disturbed. Before the prey items recover completely, prey availability and Gulf sturgeon foraging areas are likely to be temporarily adversely affected.

5.1.5 Benthic Community Structure

NMFS is not aware of any research or surveys to fully describe benthic composition in or nearby the proposed project area. Data collected nearby within Choctawhatchee Bay (Fox and Hightower 1998, Fox et al. 2002, Parauka et al. 2001) indicate that Gulf sturgeon show a preference for sandy shoreline habitats with the majority of fish being located in areas lacking seagrass. Craft et al. (2001) found that Gulf sturgeon in Pensacola Bay prefer shallow shoals with non-vegetated, fine- to medium-grain sand habitats such as sandbars and subtidal energy zones resulting in sediment sorting and a preponderance of sand supporting a variety of prey items. Habitats used with the project area tend to have a clean sand substrate and all benthic samples from the area contained lancelets (Ross et al. 2001). Other nearshore Gulf of Mexico locations where Gulf sturgeon are often located (via telemetry and tag returns) consist of unconsolidated, fine-medium grain sand habitats, including natural inlets and passes that are known to support Gulf sturgeon prey items (Menzel 1971, Abele and Kim 1986). Tagging studies have shown that Gulf sturgeon are foraging in these sandy areas where they are repeatedly located, as this habitat supports their prey (see preceding “Prey items” for specifics). Beach nourishment conducted in this area is performed in small sections at a time, which would only affect a limited number of prey items for a short time. Adjacent sections would be unaffected and prey abundance in those areas would not change. The applicant proposes to use sand of similar quality from nearby borrow areas to renourish the beach, so overall benthic community structure is not likely to change, though temporary adverse effects are likely before the areas are recolonized.

5.1.6 Potential Gulf Sturgeon Prey in Action Area

The sandy substrate of the intertidal swash zone (where placement of dredged material will occur) provides habitat for benthic and infaunal communities characterized by low species diversity. Saloman and Naughton (1984) investigated benthic macroinvertebrate assemblages inhabiting the swash zone at Panama City Beach, Florida. Sampling data showed four dominant species representing four families: *Donax texasianus*, a burrowing bivalve; *Scolelepis squamata*, a polychaete worm; *Haustorius* sp., an amphipod; and *Emerita talpoida*, an anomuran crab. Saloman and Naughton concluded that benthic communities inhabiting the swash zone of Panama City Beach were typical of other sandy northern Gulf of Mexico beaches. Similar benthic communities in this zone should exist along all of the beaches in Bay County, Florida.

As with most sandy beaches in Northwest Florida, the nearshore zone (the location of both the dredge and disposal sites) along this region consists of two distinct longshore sandbars. For Florida's northwest beaches, the first and second sandbars are typically located approximately 50 to 80 ft and 425 to 460 ft offshore (Wolfe et al. 1988). These sandbars and associated troughs provide habitat for a diverse benthic community. Investigations by Saloman and Naughton (1984) of benthic faunal populations inhabiting the nearshore zone off Panama City Beach, Florida, show that a variety of crabs, marine worms, clams, cumaceas, and sand hoppers dominate the nearshore zone. *Donax texasianus*, a burrowing bivalve, commonly occurred on both sandbars and troughs in between. Other dominant species found on the first offshore bar include *Haustorius* sp. (an amphipod), *Mancocuma* sp. (a cumacean), and *Scolelepis squamata* (a polychaete worm). Additional dominant species found on the second sandbar and adjacent landward trough includes the haustoriid amphipods. The project will temporarily impact Gulf sturgeon prey, but they are expected to recover, though complete recovery may not be equal in all areas or with all species initially; however, the project area should equalize over time and return to its pre-project status eventually.

5.1.7 Recovery of Benthic Biota

Dredging and placement of the beach-quality sand on Panama City Beach will sporadically continue to disturb designated Gulf sturgeon critical habitat in Unit 11 during the fifteen-year life of the permit. Sediments will be continuously removed from up to nine borrow areas and placed on the nearby beaches. Beach-quality sand is ubiquitous through the project area and sediment removed will be homogenous with those that will remain. Therefore, no alteration of sediment composition will occur. However, prey abundance and diversity may be adversely affected until the disturbed areas are able to be recolonized.

Benthic prey removed from the borrow areas may survive the sediment transfer through the hydraulic pipeline and subsequently recolonize when deposited in the nearshore habitat. Benthic prey will most likely recolonize the borrow areas given the sporadic dredging activity that has occurred so far in the life of the permit. There have been several occasions during which the areas have not been disturbed for a year or more and have allowed sediment composition and depth to remain consistent, which is required for recolonization (Nelson 1989 and 1993;

Rakocinski et al. 1996). The applicant has a 15-year permit to continue the Panama City Beach Erosion Control and Storm Damage Reduction Project, the habitat perturbation that will occur is expected to continue to be sporadic. Prey species are expected to return to areas that have been disturbed, but there will be a lag time before areas are completely recolonized, so Gulf sturgeon foraging areas are likely to be temporarily adversely affected.

5.2 NA and SA DPSs of Green Sea Turtle and NWA DPS of Loggerhead Sea Turtle

NMFS believes that the hopper dredging and relocation trawling components of the proposed action are likely to adversely affect the NA and SA DPSs of green sea turtles and the NWA DPS of loggerhead sea turtles. The DPSs of green sea turtles and loggerhead sea turtles were not analyzed in GRBO as they had not been listed yet, so they are included in this Opinion. However, a separate ITS for the DPSs is not being provided in this Opinion because green sea turtle and loggerhead sea turtle take is covered by GRBO. At the time GRBO and the two GRBO revisions were issued, green sea turtles and loggerhead sea turtles were listed globally. Thereafter, NMFS revised the listing to identify and list distinct population segments (DPSs). The green sea turtles analyzed in GRBO are individuals that are part of the NA and SA DPSs alone, so the take in GRBO represents the anticipated amount of take of individuals from the NA and SA DPSs, combined. Likewise, the loggerhead sea turtles analyzed in GRBO are individuals that are part of the NWA DPS alone, so the take in GRBO represents the anticipated amount of take of individuals from the NWA DPS only. We are evaluating the effects of the proposed action on the DPSs to evaluate the potential for the proposed action to jeopardize the continued existence of these species. Since these species were not listed as DPSs at the time GRBO was issued, GRBO does not evaluate the potential for the proposed action to result in jeopardy to these species.

5.2.1 Hopper Dredging

A typical hopper dredge vessel operates with two trailing, suction dragheads simultaneously, one on each side of the vessel. Sand will be dredged from the borrow areas and transported to the nearshore waters adjacent to the beach. There it will be dispersed via pump and pipeline from the hopper dredge.

5.2.1.1 *Effects of Hopper Dredging*

It has been previously documented in NMFS Biological Opinions that hopper dredges have captured, injured, and killed sea turtles. Available data indicates that in the Gulf Region (Texas, Louisiana, Mississippi, Alabama, and Florida), approximately 67 green sea turtles have been documented killed from 2004 to February 10, 2022. All but one of these lethal takes occurred during dredging operations in Brazos Island Harbor and Freeport Harbor in Texas. The other documented lethal take occurred in Tampa Harbor, Florida. During the same time period of 2004 to February 2022, there were 87 lethal takes of loggerhead sea turtles that occurred throughout the Gulf Region. Hopper dredges are equipped with large centrifugal pumps similar to those employed by other hydraulic dredges. Dredged material is raised by dredge pumps through suction pipes (dragarms) connected to the intake (drag) in contact with the channel bottom and discharged into hoppers built in the vessel. Dragarms are hinged on each side of the vessel with the drag extending downward toward the stern of the vessel. The dragarm is moved along the bottom as the vessel moves forward at speeds up to 3-5 miles per hour (mph). The dredged material is sucked up the pipe, deposited, and stored in the hoppers of the vessel.

Most sea turtles are able to escape from the oncoming draghead. However, hopper dredges can entrain and kill sea turtles if the drag arm(s) of the moving dredge overtakes a slower moving or stationary sea turtle. Entrainment refers to the animal being sucked through the draghead into the hopper. Turtles can also be entrained if suction is created in the draghead by current flow while the device is being placed or removed, or if the dredge is operating on an uneven or rocky substrate and rises off the bottom. Reports based on dredge take during USACE navigation channel maintenance projects suggest that the risk of entrainment is highest when the bottom terrain is uneven or when the dredge is conducting “cleanup” operations at the end of a dredge cycle when the bottom is trenched and the dredge is working to level out the bottom. In these instances, it is difficult for the dredge operator to keep the draghead buried in the sand, thus sea turtles near the bottom may be more vulnerable to entrainment. In addition to entrainment, interactions with a hopper dredge result from crushing when the draghead is placed on the bottom or when an animal is unable to escape from the suction of the dredge and becomes stuck on the draghead (impingement). Mortality most often occurs when animals are sucked into the dredge draghead, pumped through the intake pipe and then killed as they cycle through the centrifugal pump and into the hopper.

Interactions with the draghead can also occur if the suction is turned on while the draghead is in the water column (i.e., not seated on the bottom). USACE implements procedures to minimize the operation of suction when the draghead is not properly seated on the bottom sediments, which reduce the risk of these types of interactions. In addition, during dredging operations, protected species observers will live aboard the dredge, monitoring every load, 24 hours a day, for evidence of dredge-related impacts to protected species, particularly sea turtles and sturgeon. When the dredge is transiting, observers will maintain a bridge watch for protected species and keep a logbook noting the date, time, location, species, number of animals, distance and bearing from dredge, direction of travel, and other information, for all sightings.

Because entrainment is believed to occur primarily while the draghead is operating on the bottom, it is likely that only those species feeding or resting on or near the bottom would be vulnerable to entrainment. Within the action area, we expect effects to green sea turtles and loggerhead sea turtles from hopper dredge operations as these species are likely to be feeding on or near the bottom of the water column and thus are vulnerable to entrainment in the suction draghead of the hopper dredge.

5.2.1.2 *Estimated Mortality from Hopper Dredging Impingement and Entrainment*

The project is under the Jacksonville District’s regulatory authority and the Mobile District’s civil works jurisdiction. We analyzed the number of turtles killed by hopper dredging in previous hopper dredge projects to include the total area under the Mobile District and the area where the Jacksonville District’s regulatory authority and the Mobile District’s civil works authority overlap to estimate take from the proposed action. The total area under the Mobile District extends from Apalachee Bay near Tallahassee, Florida to near the Mississippi/Louisiana border at the Pearl River. This partially overlaps with the area under the Jacksonville District's authority. This area is a smaller area than the entire Gulf Region (Texas, Louisiana, Mississippi, Alabama, and Florida) that we discuss in the previous section. The USACE has posted reported sea turtle takes from hopper dredging activities for operations within the Mobile District and the Jacksonville District between 2004 and February 10, 2022.[8] For the recorded activity between 2004 and February 10, 2022 within the Mobile District and the area of overlapping authority between the Jacksonville District's regulatory authority and the Mobile District's civil works authority, there have been 41 projects that have required a hopper dredge. During that time period, the project site-specific available data on sea turtle interactions with hopper dredges shows that zero green sea turtles have been documented as killed by hopper dredging activities. Based on this information, we do not anticipate any lethal takes of green sea turtles associated with the remaining years under this project permit from hopper dredging. During the same time period (2004-February 10, 2022) and in the same combined jurisdictional area shared by both Districts, there have been 24 loggerhead sea turtles that have been documented as killed by hopper dredging activities.

To estimate the number of sea turtles that may be killed by the proposed action, we examined the ratio of sea turtles killed to the total volume of dredged material previously removed by hopper dredging associated with this project. We are using project-specific information, rather than extrapolating from the data in the broader area discussed above because relying on the data above could underestimate potential interactions.

Approximately, 2,585,705 yd^3 of dredged material has been removed by hopper dredge during the 2017 dredging event (948,978 yd^3) and the dredging event that began in 2021 and continued through the beginning of February 2022 (1,636,727 yd^3).[9] Only one turtle (a loggerhead) has been documented by onboard observers as killed by hopper dredge in association with these two dredging events. If we divide the total yd^3 dredged by the total number of sea turtles observed as killed by hopper dredge, this equals one *observed* sea turtle mortality for every 2,585,705 yd^3 dredged. The proposed action would dredge up to 7,000,000 yd^3 under the 15-year permit. Based on the calculations above, we might estimate that three loggerhead sea turtles would be observed as killed by the proposed action. Therefore, NMFS believes that the proposed action will result in three *observed* killed turtles (by hopper dredge) for the estimated 7,000,000 yd^3 dredged over the 15-year life of the permit.

As discussed above, dredged material screening by observers on hopper dredges is only partially effective, and observed interactions are expected to document only 50 percent of sea turtles entrained and killed by a hopper dredge. Thus, the anticipated lethal take of loggerhead sea turtles by the proposed action is six turtles.

In addition to the sea turtle interactions by hopper dredge, project-required relocation trawling is reported. This information is discussed below, in our analysis of the effect of relocation trawling.

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[8] USACE. 2018. Operations and Dredging Endangered Species System. http://dqm.usace.army.mil/odess/#/home.
[9] This dredging event is ongoing, but we are including the data on interactions and dredge volume that has occurred through February 10, 2022. This is the best available information on project-related dredging impacts as of the date of the consultation.

It also helps us anticipate which species are likely to be within the action area, in the absence of specific population data (e.g., nesting, migration), and their relative abundances.

5.2.2 Relocation Trawling

Relocation trawling is a proven method of reducing the density of ESA-listed species in front of an advancing hopper dredge and very likely results in reduced lethal take from hopper dredging (NMFS 2007). Relocation trawling is conducted only when it can be done safely. Nets are pulled along the sea bottom for 30 minutes or less before each retrieval and re-setting. During relocation trawling, protected species observers live aboard the trawlers, monitor all tows for endangered and threatened species, and record water temperatures, bycatch information, and any sightings of protected species in the area. Any sea turtle or sturgeon captured during relocation trawling are photographed, measured, biopsied for genetics, tagged, and relocated at least 3 nautical miles (nmi) away. During all phases of relocation trawling, the applicant is required to abide by established harm avoidance and minimization measures.

5.2.2.1 *Effects of Relocation Trawling*

The effects of relocation trawling are expected to be nonlethal to captured sea turtles. All sea turtles 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 from Relocation Trawling

We consulted the USACE Mobile District and Jacksonville District project managers for information on the number of turtles captured during relocation trawling that has previously occurred in the project area. From 2017 through February 10, 2022, a total of 228 sea turtles were safely trawl-captured and released. During this time approximately 2,585,705 yd^3 of material was dredged. The likely future captures are calculated based on the previous amount of material dredged while the relocation trawler was working ahead of the dredge to relocate sea turtles. This equates to an average of 0.00008818 sea turtles relocated per yd^3 dredged (228 ÷ 2,585,705 yd^3 dredged). We conservatively assume that 7,000,000 yd^3 over the 15-year life of the project will be obtained by hopper dredge. Therefore, we estimate that the proposed action will result in the relocation (non-lethal take) of 618 sea turtles (Kemp's ridley, loggerhead, green, leatherback) (0.00008818 × 7,000,000 yd^3 dredged, rounded up to the nearest whole number) during relocation trawling for the 15-year life of the permit for the Bay County beach nourishment project.

To estimate the number of loggerhead and green sea turtles expected to be relocated, we rely on information on species interactions associated with the proposed action to date. According to the USACE reports for this project (Bay County Tourist Development Council Shoreline Stabilization), 2 green sea turtles and 9 loggerhead sea turtles were relocated during the 2017 dredging event and 3 green sea turtles and 83 loggerhead sea turtles have already been relocated during the 2021/2022 dredging operations through February 10, 2022 (Table 5). Applying the species ratios for the relocated turtles, and rounding up to the whole number, we estimate that the proposed action will result in the non-lethal take of 14 green sea turtles (2.2% of 618) and 250 loggerhead sea turtles (40.4% of 618) during the life of the permit. This represents a different approach than what was used in the 2013 Opinion, in which we looked at the number of turtles taken per project. At that time, very little information on dredging and sea turtle interactions was available in the action area. Looking at the volume of dredge material instead of the number of dredge events allows us to better understand the potential for interactions for a project of this size. However, these are only estimations.

Table 5. Sea Turtle Relocation Trawling Data Panama City 2017-2022*

Year	Green	Loggerhead	Kemp's ridley	Leatherback	Total Relocated Sea Turtles (all species)
2017	2	9	19	1	31
2018	-	-	-	-	-
2019	-	-	-	-	-
2020	-	-	-	-	-
2021	0	38	49	0	87
2022	3	45	62	0	110
Total	**5**	**92**	**130**	**1**	**228**
%	**2.2%**	**40.4%**	**57%**	**0.4%**	**100%**

*no trawling occurred off Panama City during 2018-2020

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 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 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 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 miles). If the turtle is captured again, the 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 smaller scale of this project, including the smaller 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. However, relocation trawling could injure or kill sea turtles with impaired health, but we do not anticipate this to occur.

6 CUMULATIVE EFFECTS

Cumulative effects include the effects of *future* state or private activities, not involving Federal activities, that are reasonably certain to occur in the action area considered in this Opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA (50 CFR 402.02).

Actions that are reasonably certain to occur would include actions that have some demonstrable commitment to their implementation, such as funding, contracts, agreements or plans.

Within the action area, major future changes are not anticipated to the ongoing human activities described in the environmental baseline. The present, major human uses of the action area are expected to continue at the present levels of intensity in the near future. Cumulative effects from unrelated, non-federal actions occurring in the area may affect sea turtles and their habitats and Gulf sturgeon critical habitat. Stranding data indicate sea turtles in Gulf of Mexico waters die of various natural causes, including cold stunning and hurricanes, as well as human activities, such as incidental capture in state fisheries, ingestion of and/or entanglement in debris, ship strikes, and degradation of nesting habitat. The cause of death of most sea turtles recovered by the stranding network is unknown.

In addition to fisheries, NMFS is not aware of any proposed or anticipated changes in other human-related actions (e.g., habitat degradation) or natural conditions (e.g., changes in oceanic conditions, etc.) that would substantially change the impacts that each threat has on the sea turtles covered by this opinion. Therefore, NMFS expects that the levels of interactions with sea turtles described above will continue at similar levels into the foreseeable future.

Due to the number of offshore oil drilling rigs in the Gulf of Mexico, oil spills have been known to occur unexpectedly. The extent, time, and location of potential future oil spills are not fully known at this time. Routes of exposure associated with oil spills are generally believed to be: 1) suffocation of infaunal organisms, and 2) toxicity of substrate. Both of these effects would impact potential foraging areas within Gulf sturgeon critical habitat through the displacement and reduction of prey items.

Coastal runoff and river discharges carry large volumes of petrochemical and other contaminants from agricultural activities, cities, and industries into the Gulf of Mexico. The coastal waters of the Gulf of Mexico have more sites with high contaminant concentrations than other areas of the coastal United States due to the large number of waste discharge point sources. Chemicals and metals such as chlordane, dichlorodiphenyldichloroethylene, dichlorodiphenyltrichloroethane, dieldrin, polychlorinated biphenyl (PCBs), cadmium, mercury, and selenium settle to the substrate and are later incorporated into the food web as they are consumed by benthic feeders, such as sturgeon or macroinvertebrates. Some of these compounds may affect the surrounding environment by reducing DO, altering pH, and altering other water quality properties. Although little is known about contaminant effects on Gulf sturgeon critical habitat general studies on sturgeon habitats indicate that the effects of contaminants and pollution contribute to lost habitat (Barannikova 1995; Shagaeva et al. 1995; Verina and Peseridi 1979).

7 DESTRUCTION OR ADVERSE MODIFICATION ANALYSIS

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

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

According to the USACE, the combined area of impact within Unit 11 is the dredging of approximately 315 ac of borrow areas and the direct placement of sand on 18.5 mi of shoreline. So far, during the first few years of the 15-year permit, not all of the nourishment events have occurred annually thus providing sufficient time for each area to recover between impacts. The sporadic timing of nourishment events is expected to continue. Prey will be affected as sand removed from the borrow areas will also remove existing benthic macroinvertebrates. However, given the sporadic frequency of the previous nourishment events in the project are, it is likely that the frequency of the sand removal will not preclude natural recolonization of benthic prey from occurring. In addition, some of these Gulf sturgeon prey items may survive transport into the nearshore given the immediate release of the sand in a slurry of homogenous sands deposited in a thin layer. Even though sand deposited into the nearshore area may suffocate some existing benthic macroinvertebrates, it is expected that some of the existing infauna will survive, given the thin-layer deposition of sand, thereby allowing existing macroinfauna to migrate upward into aerobic habitat. Deposited sands are expected to be quickly distributed by natural currents and the system will rapidly return to equilibrium.

As previously discussed, Gulf sturgeon are opportunistic feeders that forage over large distances, and thus will be able to locate prey throughout nearby portions of Unit 11 should localized prey density be reduced by this action; therefore, Gulf sturgeon will be able to traverse and forage in the remaining unaffected areas. Given that sturgeon forage opportunistically while benthic cruising, they can easily locate prey and fulfill nutritional requirements in available sandy areas adjacent to those impacted. The proposed dredging within the borrow areas is not expected to reduce the ability of critical habitat Unit 11 to support the Gulf sturgeon's conservation in the short or long term. NMFS bases this determination upon consideration of the current population estimates, specifics of the project and area, and Gulf sturgeon foraging mechanics and behavior.

Finally, the proposed action will not interfere with recovery objectives, actions, or tasks identified in the Gulf sturgeon recovery plan (USFWS et al. 1995). NMFS concludes that the effects of the 15-year authorization for nourishment of beaches in Bay County, Florida will not discernibly impact the ecological function of critical habitat Unit 11, and thus critical habitat as a whole, and that it will continue to serve its intended conservation role for Gulf sturgeon.

8 JEOPARDY ANALYSIS

The analyses conducted in the previous sections of this Opinion provide the basis on which we determine whether the proposed action would be likely to jeopardize the continued existence of green sea turtles. In the effects of the action section, we outlined how the proposed action would affect these species at the individual level and the magnitude of those effects based on the best available data. Next, we assessed the species' response to the effects of the proposed action in terms of overall population effects and whether those effects will jeopardize their continued existence in the context of the status of the species, the environmental baseline, and the cumulative effects.

It is the responsibility of the action agency to "insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species…" (ESA Section 7(a)(2)). Action agencies must consult with and seek assistance from NMFS to meet this responsibility. NMFS must ultimately determine in a Biological Opinion whether the action jeopardizes listed species. To *jeopardize the continued existence of* is defined as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). The following jeopardy analysis first considers the effects of the action to determine if we would reasonably expect the action to result in reductions in reproduction, numbers, or distribution of the NA and SA DPSs of green sea turtles and the NWA DPS of loggerhead sea turtles. The analysis next considers whether any such reduction would in turn result in an appreciable reduction in the likelihood of survival of the NA and SA DPSs of green sea turtles and the NWA DPS of loggerhead sea turtles in the wild, and the likelihood of recovery of the NA and SA DPSs of green sea turtles and the NWA DPS of loggerhead sea turtles in the wild.

Most hopper dredging events (and associated relocation trawling, when applicable) would be up to 150 days per year and will avoid sea turtle nesting season. The timing and frequency of dredging events is not predictable as the need to perform beach nourishments usually follows significant storms. We would usually consider evaluating take on an annual basis; however, because the project permit would be for 15 years and could result in few or many dredging events either occurring close or far apart. Instead, our jeopardy analysis evaluates anticipated take over the 15-year time frame of the proposed action. This approach also accounts for some anticipated variability in the level of take over the life of the permit.

Green Sea Turtle (NA and SA DPSs)

As discussed in the Section 4 of this Opinion, individuals from both the green sea turtle NA and SA DPSs can be found on foraging grounds in the Gulf of Mexico region, and we expect individuals from both DPSs to be found in waters in the action area for the proposed project. To analyze effects in a precautionary manner, we will conduct two jeopardy analyses, one for each DPS (i.e., assuming animals would be taken from both DPSs). An analysis of cold-stunned green turtles in St. Joseph Bay, Florida (northern Gulf of Mexico) found approximately 4% of individuals came from nesting stocks in the SA DPS (specifically Suriname, Aves Island, Brazil, Ascension Island, and Guinea Bissau) (Foley et al. 2007). Based on that analysis, for this

Opinion, we will assume 96% of the takes would come from the NA DPS, while 4% may come from the SA DPS. From our analysis, 14 nonlethal green sea turtle takes from relocation trawling during the 15-year life of the project might occur. While all of the nonlethal takes are likely to come from the NA DPS, it is possible that one (4% of 14, rounded up) might come from the SA DPS; therefore, we will analyze the potential for non-lethal take of up to 14 individuals from the NA DPS and 1 from the SA DPS.

Green Sea Turtle NA DPS

The potential nonlethal capture of up to 14 green sea turtle from the NA DPS (relocation trawling) during the 15-year life of the project is not expected to have any measurable impact on the reproduction, numbers, or distribution of these species. The individuals suffering nonlethal injuries or stress are expected to fully recover such that no reductions in reproduction or numbers of green sea turtles from the NA DPS are anticipated. The captures may occur anywhere in the action area, which encompasses only a tiny portion of green sea turtles' overall range and distribution within the NA DPS. Any animal incidentally caught during relocation trawling would be released within the general area where caught, no change in the distribution of NA DPS green sea turtles is anticipated. Because the proposed action is not likely to affect the numbers, reproduction, or distribution of the NA DPS of green sea turtles, the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the species in the wild.

Green Sea Turtle NA DPS Recovery

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

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

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

According to data collected from Florida's index nesting beach survey from 1989-2021, green sea turtle nest counts across Florida have increased dramatically, from a low of 267 in the early 1990s to a high of 40,911 in 2019. Two consecutive years of nesting declines in 2008 and 2009 caused some concern, but this was followed by increases in 2010 and 2011. The pattern departed from the low lows and high peaks in 2020 and 2021 as well, when 2020 nesting only dropped by half from the 2019 high, while 2021 nesting increased over the 2020 nesting, indicating 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.

We do not expect the nonlethal take of up to 14 green sea turtles from the NA DPS to have any detectable influence on the recovery objectives. Thus, the proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of NA DPS green sea turtles' recovery in the wild.

Green Sea Turtle NA DPS Conclusion
The anticipated nonlethal take of green sea turtles from the NA DPS associated with the proposed action is not expected to cause a reduction in the likelihood of either the survival or recovery of the NA DPS of green sea turtle in the wild.

Green Sea Turtle SA DPS
The potential nonlethal capture of up to one green sea turtle from the SA DPS (relocation trawling) during the 15-year life of the project is not expected to have any measurable impact on the reproduction, numbers, or distribution of these species. The individual suffering nonlethal injuries or stress is expected to fully recover such that no reductions in reproduction or numbers of green sea turtles from the SA DPS are anticipated. The capture may occur anywhere in the action area, which encompasses only a tiny portion of green sea turtles' overall range and distribution within the SA DPS. Any animal incidentally caught during relocation trawling would be released within the general area where caught, no change in the distribution of SA DPS green sea turtles is anticipated. Because the proposed action is not likely to affect the numbers, reproduction, or distribution of the SA DPS of green sea turtles, the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the species in the wild.

Green Sea Turtle SA DPS Recovery
In certain instances, an action that does not appreciably reduce the likelihood of a species' survival might affect its likelihood of recovery or the rate at which recovery is expected to occur to an extent that the species' continued existence is jeopardized. NMFS has determined that the proposed action will not reduce the likelihood that the SA DPS of green sea turtles will survive in the wild. Here, NMFS considers the potential for the action to reduce the likelihood of recovery. Like the NA DPS, the SA DPS of green sea turtles does not have a separate recovery plan in place at this time. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991) does exist. Since the animals within the SA DPS all occur in the Atlantic Ocean and would have been subject to the recovery actions described in that plan, we believe it is appropriate to continue using that Recovery Plan as a guide until a new plan, specific to the SA DPS, is developed. In our analysis for the NA DPS, we stated that the Atlantic Recovery Plan lists the following relevant recovery objectives over a period of 25 continuous years:

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

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

The nesting recovery objective is specific to the NA DPS (since it specifies Florida nesting), but demonstrates the importance of increases in nesting to recovery. As previously stated, nesting at the primary SA DPS nesting beaches appears to have been increasing over the course of the decades. There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the apparent increases in nesting abundance, however, it is likely that numbers on foraging grounds have also increased.

Nonlethal capture of sea turtles would not affect the adult female nesting population or number of nests per nesting season. Thus, the proposed action will not impede achieving the recovery objectives above and will not result in a reduction in the likelihood of the SA DPS of green sea turtles' recovery in the wild.

Green Sea Turtle SA DPS Conclusion
The nonlethal take of green sea turtles from the SA DPS associated with the proposed action is not expected to cause a reduction in the likelihood of either the survival or recovery of the SA DPS of green sea turtle in the wild.

Loggerhead Sea Turtle (NWA DPS)

The potential nonlethal capture and release of 250 loggerhead sea turtles during the 15-year life of the project is not expected to have a measurable impact on the reproduction, numbers, or distribution of this species. The individuals suffering nonlethal injuries are expected to fully recover such that no reductions in reproduction or numbers of loggerhead sea turtles are anticipated. The captures may occur anywhere in the action area, and the action area encompasses a tiny portion of the overall range and distribution of the NWA DPS of loggerhead sea turtles. Since any incidentally caught animal would be released within the general area where caught, no change in the distribution of loggerhead sea turtles is anticipated.

The lethal take of six loggerhead sea turtle (three observed, three not observed) during the 15-year life of the project represents a reduction in numbers. The lethal take may also result in a future reduction in reproduction as a result of lost reproductive potential, as these individuals may be females who would have survived other threats and reproduced in the future, thus eliminating the female individual's contribution to future generations. For example, an adult female loggerhead sea turtle can lay three or four clutches of eggs every 2-4 years, with 100-130 eggs per clutch. Thus, the loss of a six adult female sea turtles could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. A reduction in the distribution of loggerhead sea turtles is not expected from lethal take attributed to the proposed action. Because all the potential interactions are expected to occur at random throughout the proposed action area, which accounts for a tiny fraction of the species' overall range, the distribution of loggerhead sea turtles is expected to be unaffected.

Whether or not the reduction in loggerhead sea turtle numbers and reproduction attributed to the proposed action would appreciably reduce the likelihood of survival for loggerheads depends on what effect these reductions in numbers and reproduction would have on overall population sizes and trends, i.e., whether the estimated reductions, when viewed within the context of the environmental baseline, status of the species, and cumulative effects are of such an extent that adverse effects on population dynamics are appreciable. In Section 4, we reviewed the status of the species in terms of nesting and female population trends and several of the most recent assessments based on population modeling. Below, we synthesize what that information means in general terms and in the more specific context of the proposed action.

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

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

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

Florida accounts for more than 90% of U.S. loggerhead nesting. FWRI examined the trend from the 1998 nesting high through 2016 and found that the decade-long post-1998 decline was replaced with a slight but non-significant increasing trend. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability from 2012-2016 resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose slightly again to 48,983 in 2018 and then to 53,507 in 2019, which is the third highest total since 2001. However, it is important to note that with the wide confidence intervals and uncertainty around the variability in nesting parameters (changes and variability in nests/female, nesting intervals, etc.); it is unclear whether the nesting trend equates to an increase in the population of nesting females over that time frame (Ceriani, et al. 2019).

The proposed action is expected to remove six individuals during the 15-year life of the project. The removed individual represents approximately 0.00102% (6 divided by 588,439) of the

NMFS (2011) estimate that reflects a subset of the entire loggerhead population in the western North Atlantic Ocean. While the loss of six individuals during the 15-year life of the project is an impact to the population, in the context of the overall population's size and current trend, it would not be expected to result in a detectable change to the population numbers or trend. After analyzing the magnitude of the effects of the proposed action, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the NWA DPS of loggerhead sea turtle in the wild.

Loggerhead Sea Turtle Recovery

In certain instances, an action that does not appreciably reduce the likelihood of a species' survival might affect its likelihood of recovery or the rate at which recovery is expected to occur to an extent that the species' continued existence is jeopardized. NMFS has determined above, that the proposed action will not appreciably reduce the likelihood that the NWA DPS of loggerhead sea turtles will survive in the wild. Here, NMFS considers the potential for the action to reduce the likelihood of recovery. The loggerhead recovery plan defines the recovery goal as "…ensur[ing] that each recovery unit meets its Recovery Criteria alleviating threats to the species so that protection under the ESA is no longer necessary" (NMFS and USFWS 2008b). The plan then identifies 13 recovery objectives needed to achieve that goal. We do not believe the proposed action impedes the progress of the recovery program or achieving the overall recovery strategy.

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

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

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

We indicated that the potential lethal take of six loggerhead sea turtles during the 15-year life of the project is so small in relation to the overall population, that it would be hardly detectable, even when considered in the context of the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. We believe this is true for both nesting and juvenile in-water populations.

The nesting trend over the last two decades appears to be evidence of an increasing population against the background of the past and ongoing human and natural factors that have contributed to the current status of the species. For these reasons, we do not believe the proposed action will impede achieving recovery.

Loggerhead Sea Turtle Conclusion
The lethal and nonlethal captures of loggerhead sea turtles associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the NWA DPS of the loggerhead sea turtle in the wild.

9 CONCLUSION

After reviewing the current status of the NA and SA DPSs of green sea turtle and of the NWA DPS of loggerhead sea turtle, and the current status of Gulf sturgeon critical habitat in Unit 11, the Environmental Baseline, the Effects of the Proposed Action, and the Cumulative Effects, it is our Opinion that the proposed action will not reduce the likelihood of survival and recovery of the NA and SA DPSs of green sea turtles or the NWA DPS of loggerhead sea turtles or the critical habitat's ability to support Gulf sturgeon conservation, despite adverse effects. Given the nature of the proposed action and the information provided above, we conclude that the action, as proposed, is not likely to jeopardize the continued existence of the NA or SA DPSs of green sea turtles or the NWA DPS of loggerhead sea turtles. We also conclude that the action is likely to adversely affect, but is not likely to destroy or adversely modify, Gulf sturgeon critical habitat.

10 INCIDENTAL TAKE STATEMENT

NMFS anticipates that the proposed action will incidentally take individuals from the NA and SA DPSs of green sea turtles and the Northwest Atlantic DPS of loggerhead sea turtles; however, since green and loggerhead sea turtle takes are covered by the ITS in GRBO, no additional take is authorized in this Opinion. NMFS issued GRBO before revising the green sea turtle listing to list green sea turtles as 11 DPSs and before revising the loggerhead sea turtle listing to list loggerhead sea turtles as 9 DPSs. We do not anticipate different effects or additional take of green sea turtles or loggerhead sea turtles from the Bay County project beyond those contemplated in GRBO, as a programmatic opinion on the effects of multiple projects. In addition, those green and loggerhead sea turtles are individuals that are now considered part of the NA and SA DPS of green sea turtles and the Northwest Atlantic DPS of loggerhead sea turtles. The GRBO ITS for green sea turtles, therefore, represents the anticipated amount of take from the NA and SA DPSs, combined, and the GRBO ITS for loggerhead sea turtles represents the anticipated amount of take from the Northwest Atlantic DPS from dredging projects in the Gulf of Mexico region, including the proposed Bay County project. Therefore, we do not need separate take limits for the NA and SA DPSs of green sea turtles or for the Northwest Atlantic DPS of loggerhead sea turtles from the proposed action. Nonetheless, any take of an ESA-listed species shall be immediately reported to takereport.nmfsser@noaa.gov. Refer to the present

Opinion by title, Bay County Tourist Development Council Shoreline Stabilization, issuance date, NMFS tracking number, SERO-2021-03157, and USACE permit number, SAJ-1997-01891.

11 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations identified in Biological 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 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:

1) Gather data describing community structure of the benthos in and nearby the project area that would help determine local Gulf sturgeon prey availability and thereby assist in future assessments of impacts to designated critical habitat.

NMFS requests notification if the conservation measure is implemented. This will assist us with evaluating future project effects on Gulf sturgeon or designated Gulf sturgeon critical habitat.

12 REINITIATION OF CONSULTATION

This concludes NMFS's formal consultation on the proposed action. As provided in 50 CFR 402.16, reinitiation of formal consultation is required 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. Pursuant to Section 7(o)(2) of the ESA and 50 CFR 402.14(i)(5), any taking which is subject to an ITS and which is in compliance with the Terms and Conditions is not a prohibited taking under the ESA.

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