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

F/SER31:MET

JUL 26 2018

MEMORANDUM FOR: F/HC3 – Rachel Sweeney

FROM: F/SE – Roy E. Crabtree, Ph.D.

SUBJECT: Deepwater Horizon-Alabama Trustee Implementation Group, Endangered Species Act Section 7 Consultations for 3 public park/fishing pier projects on the Gulf Coast of Alabama

Enclosed is the National Marine Fisheries Service's (NMFS) Biological Opinion issued in accordance with Section 7 of the Endangered Species Act (ESA) of 1973. The National Oceanic and Atmospheric Administration Restoration Center (NOAA RC), on behalf of *Deepwater Horizon* Trustees, proposes to create or restore 3 public parks along the Gulf coast in Mobile and Baldwin Counties, Alabama. Each park will include 1 or more public fishing piers, among other recreational amenities. The applicant for the project is the Alabama Department of Conservation and Natural Resources (ADCNR).

Project Name	SER Numbers	Project Type
Laguna Cove Little Lagoon Natural Resource Protection Project	SER-2017-18553	Public Park & Fishing Pier Development and Operation
Fort Morgan Pier Rehabilitation Project	SER-2017-18552	Fishing Pier Restoration and Operation
Dauphin Island Eco-Tourism and Environmental Education Area	SER-2017-18544	Public Park & Fishing Pier Development and Operation

The Biological Opinion ("Opinion") analyzes the project's effects on 3 species of sea turtles and Gulf sturgeon. There is no critical habitat in the action area and no potential routes of effects for these projects to impact critical habitat. This Opinion is based on project-specific information provided by the NOAA RC, the ADCNR, and our review of published literature. It is NMFS' Opinion that the action, as proposed, will not affect leatherback or hawksbill sea turtles, and may affect, but is not likely to adversely affect Gulf sturgeon. It is also our Opinion that the action is likely to adversely affect loggerhead, green, and Kemp's ridley sea turtles, but is not likely to jeopardize the continued existence of these species.

No taking of marine mammals, whether listed under the ESA or not, is authorized. Incidental taking of marine mammals must be authorized under Section 101(a)(5)(E) of the Marine

Mammal Protection Act (MMPA). If NOAA RC believes marine mammals may be taken by their proposed action or wishes to discuss requirements for obtaining MMPA take authorization, NOAA RC should contact the Office of Protected Resources, at (301) 427-8400.

We look forward to further cooperation with you on other NOAA RC projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this consultation, please contact Mike Tucker, Consultation Biologist, at (727) 209-5981, or by email at michael.tucker@noaa.gov.

Sincerely,

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

File: 1514-22.C

JUL 26 2018

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency: NOAA Restoration Center, on behalf of *Deepwater Horizon* Trustees

Activity: Development and restoration of 3 public parks on the Alabama Gulf coast.

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

Consultation Numbers SER-2017-18552; SER-2017-18553; and SER-2017-18544

Approved by: ______________________________

Roy E. Crabtree, Ph.D., Regional Administrator
NMFS, Southeast Regional Office
St. Petersburg, Florida

Date Issued: JUL 26 2018

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Acronyms and Abbreviations

ADCNR	Alabama Department of Conservation and Natural Resources
AMRD	Alabama Marine Resources Division
BMP	Best management practice
BA	Biological Assessment
CFR	Code of Federal Regulations
CPUE	Catch Per Unit Effort
cSEL	Cumulative Sound Exposure Level
DPS	Distinct Population Segment
DWH	*Deepwater Horizon*
DTRU	Dry Tortugas Recovery Unit
ESA	Endangered Species Act
FP	Fibropapillomatosis disease
FWRI	Fish and Wildlife Research Institute
GADNR	Georgia Department of Natural Resources
GCRU	Greater Caribbean Recovery Unit
ITS	Incidental Take Statement
MRIP	Marine Recreational Information Program
NA	North Atlantic
NMFS	National Marine Fisheries Service
NCWRC	North Carolina Wildlife Resources Commission
NGMRU	Northern Gulf of Mexico Recovery Unit
NOAA	National Oceanic and Atmospheric Association
NRU	Northern Recovery Unit
NWA	Northwest Atlantic
PRM	Post-release mortality
RC	Restoration Center
RPMs	Reasonable and Prudent Measures
SA	South Atlantic
SCDNR	South Carolina Department of Natural Resources
SCL	Straight carapace length
SEFSC	Southeast Fisheries Science Center
STSSN	Sea Turtle Stranding and Salvage Network
TEDs	Turtle Exclusion Devices
TEWG	Turtle Expert Working Group
USFWS	U.S. Fish and Wildlife Service
WGS84	World Geodetic System 1984

Units of Measurement

°C	Degrees Celsius
°F	Degrees Fahrenheit
cm	Centimeter(s)

ft	Feet
lin ft	Linear feet
ft^2	Square feet
in	Inch(es)
g	Grams
kg	Kilograms
lb	Pound(s)
mi	Mile(s)
mi^2	Square mile(s)

Background

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 shall 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 on any action that "may affect" listed species or designated critical habitat. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibilities for administering the ESA. Consultations on most listed marine species and their designated critical habitat are conducted between the action agency and NMFS.

Consultation is concluded after NMFS determines the proposed action is not likely to adversely affect listed species or their critical habitat, or issues a Biological Opinion ("Opinion") that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. The Opinion states the amount or extent of incidental take of the listed species that may occur and recommends conservation measures to further conserve the species.

This document represents NMFS's Opinion based on our review of impacts associated with the creation or restoration and operation of 3 public parks with fishing piers along the Gulf coast in Mobile and Baldwin Counties, Alabama. This Opinion analyzes project effects on sea turtles and Gulf sturgeon in accordance with Section 7 of the ESA. This Opinion is based on project information provided by the NOAA Restoration Center (RC), the applicant Alabama Department of Conservation and Natural Resources (ADCNR), and other sources of information including published literature cited herein.

BIOLOGICAL OPINION

1 CONSULTATION HISTORY

- NMFS received early draft project descriptions for the proposed projects on 11/16/16.
- NMFS provided technical assistance comments on the draft project descriptions to NOAA RC on 11/18/16.
- NMFS participated in a call with NOAA RC, ADCNR, USFWS, and project proponents to discuss project plans and potential effects on listed species on 11/30/16.
- NMFS received revised draft project descriptions on 2/13/17, and provided minor comments back to NOAA RC that same day.
- NMFS received a draft Biological Assessment (BA) for the Dauphin Island Eco-Tourism and Environment Education Area Project on 3/22/17, and provided comments back to NOAA RC that same day.
- On 3/30/17, NOAA RC submitted final BAs for the 3 proposed projects and requested initiation of formal consultation at that time.
- On 6/9/17, NMFS requested clarification on several elements of the project descriptions for the proposed projects.
- On 7/12/17, the project proponents submitted additional information in response to NMFS' 6/9/17 inquiry.
- On 7/31/17, NMFS hosted a teleconference with NOAA RC and ADCNR to discuss project related monitoring and reporting of sea turtle interactions at the project piers. At the conclusion of that call, ACDNR was tasked with providing additional information on monitoring and reporting capabilities.
- On 10/25/17 and 11/7/17, NOAA RC sent reminders via email requesting the outstanding information from ADCNR.
- On 11/8/17, ADCNR responded via email, providing all outstanding information necessary for completion of formal consultation on the proposed project. Formal consultation was initiated on that date (11/8/17).

2 DESCRIPTION OF THE PROPOSED ACTIONS AND ACTION AREAS

The following section describes NOAA RC's (on behalf of *Deepwater Horizon* Trustees) proposed action to develop or restore and operate 3 public parks/fishing piers (identified as Laguna Cove Little Lagoon Natural Resource Protection Project, Fort Morgan Pier Rehabilitation Project, and Dauphin Island Eco-Tourism and Environmental Education Area) along the Gulf coast in Mobile and Baldwin Counties, Alabama as shown in Figure 1.

Figure 1: Location of all 3 proposed parks and the surrounding areas (©2017 TerraMetrics; NOAA)

2.1 Laguna Cove Little Lagoon Natural Resource Protection

The proposed *Laguna Cove Little Lagoon Natural Resource Protection* project includes the acquisition and development of recreational amenities on 2 undeveloped tracts of land, totaling approximately 53 acres on Little Lagoon in Gulf Shores, southwest Baldwin County, Alabama (see Figure 2). The two tracts are bordered by Little Lagoon to the north and West Beach Boulevard (SR 182) to the south. The parcels contain low elevation dune habitat, coastal wetlands, and approximately 6,100 linear feet of shoreline on Little Lagoon.

The proposed infrastructure and access improvements that may affect ESA-listed species under NMFS' jurisdiction include the following:

- A proposed fishing pier on the eastern side of the property would be approximately 8 feet by 600 feet and include a 15-foot by 250-foot 'T 'at the end of the pier. The pier would include a ramp for ADA-compliant accessibility. This ramp would be 10 feet wide with a hand rail on each side. There would be a 20-foot by 30-foot deck base at the end of the ramp.

- A pile supported boardwalk would be constructed on the west side of the property, approximately 8 feet wide by 600 feet long that would provide a platform for viewing or fishing.

- A 10-foot by 20-foot kayak launch is proposed at the waterward edge of the boardwalk.

- This project would also incorporate sea turtle friendly lighting that would be reviewed and approved by the appropriate regulatory agencies.

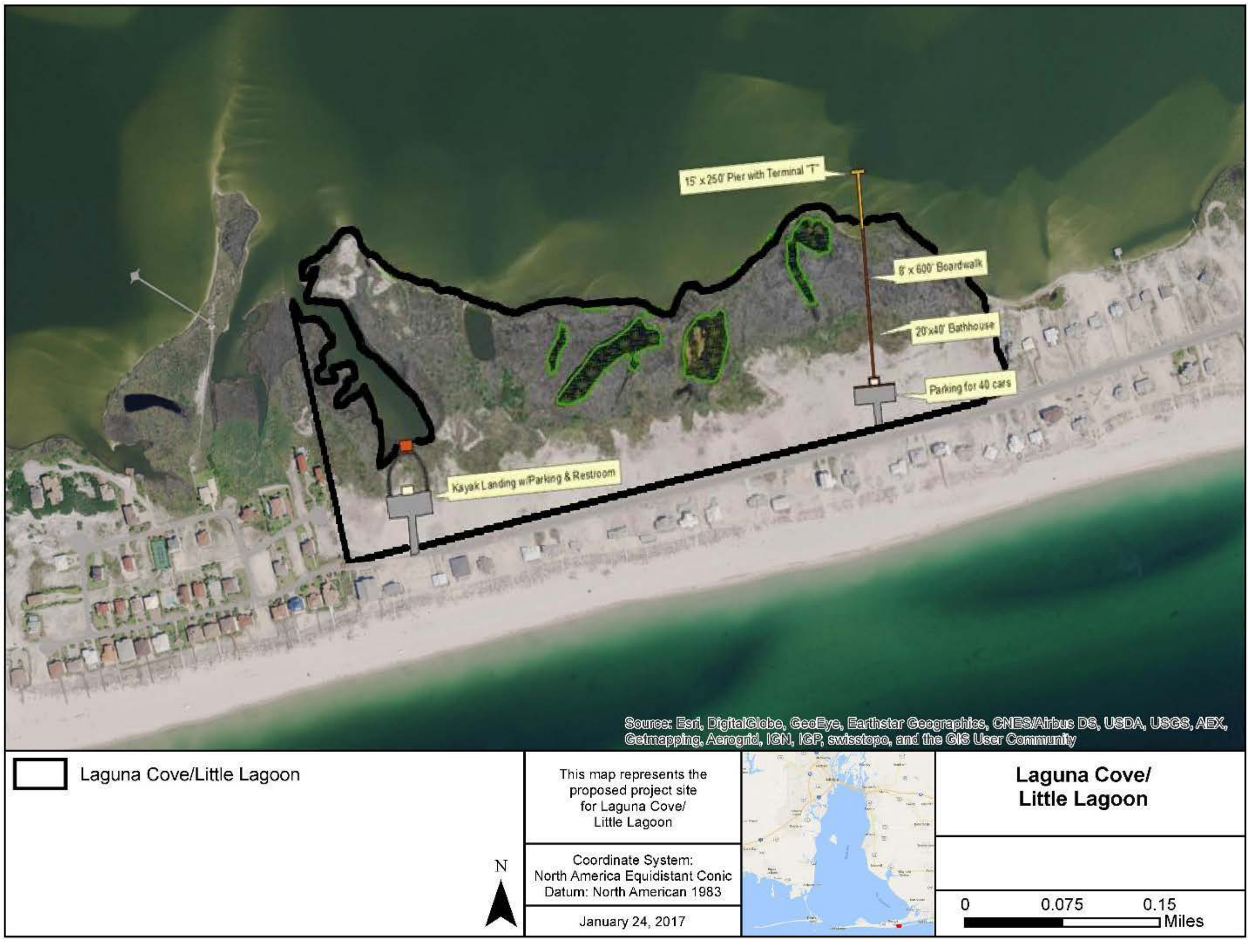

Figure 1: Laguna Cove Little Lagoon Proposed Project Location

Construction and Implementation
All new infrastructure, including the kayak launch would avoid known areas of sea grass. Boardwalks and piers would be appropriately designed and elevated to avoid permanent impacts to wetlands and aquatic vegetation.

Installation of Piles. The fishing pier and elevated boardwalk would be constructed using 10, 12, and/or 14-in diameter wooden piles spaced at 5-foot intervals. The fishing pier would require an estimated total of 342 piles, while the boardwalk would require an estimated total of 242 piles. Piles may be installed using impact hammer, vibratory hammer, or jetting methods, at the discretion of the hired contractor. Pile driving is expected to take approximately 5 days to complete. Equipment would include a long-reach track hoe, which may be used from land or from a barge.

Vehicle and Barge Operation. A single barge is expected to be used during installation of pilings for the pier. A long-reach track hoe would be placed on top of the barge, which would be used to drive the pilings. The barge and track-hoe would be operated for approximately 5 days.

Land-based construction equipment would include light bulldozers, track hoes, small cranes and bucket loaders as well as paving machines and/or concrete trucks.

Duration and Timing of Construction. Construction activities are expected to require 6 months, 5 days of which will include in-water work.

Operations and Maintenance

The City of Gulf Shores would provide short- and long-term maintenance for all project infrastructure including trash removal, monofilament line recycling, and maintaining educational signs on the fishing pier.

Project Monitoring. No park employees or other officials would be stationed on site.

Conservation Measures

The following measures would be implemented to avoid or minimize potential impacts to ESA-listed species and their habitats that may occur as a result of the proposed project:

- All in-water work would comply with the NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions,* dated March 23, 2006[1].

- The project would implement the NMFS *Measures for Reducing Entrapment Risk to Protected Species*, dated May 22, 2012[2].

- Educational signs and outreach materials including NMFS' "Dolphin Friendly Fishing and Viewing Tips" signs and "Save the Sea Turtles and Dolphins" would be placed at the beginning/entrance of the pier and any flat surfaces at regular intervals along the pier.

- NMFS' marine mammal and sea turtle pier surface placards would be installed at regular intervals along the pier.

- Monofilament fishing line recycling bins would be placed at regular intervals along the pier to help avoid fishing line entanglements to marine wildlife. Bins would be emptied routinely.

- All new lighting would be "sea turtle friendly" lighting that complies with the City of Gulf Shores Ordinance #1461 (lighting standards for the protection of sea turtles)[3] .

- Establishment of infrastructure, including the kayak launch would avoid known areas of sea grass.

- Turbidity curtains would be installed around the in-water construction areas to prevent increasing turbidity in Little Lagoon.

- No wetlands would be filled or otherwise impacted during the construction process.

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[1]http://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/sea_turtle_and_smalltooth_sawfish_construction_conditions_3-23-06.pdf

[2]http://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/entrapment_bmps_final.pdf.

[3] http://www.gulfshoresal.gov/DocumentCenter/View/61/Lighting-Ordinance?bidId=

- All construction activities would occur during daylight hours.

2.2 Fort Morgan Pier Rehabilitation project

The proposed *Fort Morgan Pier Rehabilitation* project includes the rehabilitation of a public fishing pier located on Fort Morgan Peninsula on the southwestern tip of Baldwin County, Alabama. The existing pier is approximately 500 feet long and is located at the Fort Morgan State Historic Site (Figure 2). Until recently, the Fort Morgan fishing pier was heavily used by recreational fisherman. However, the pier, which is more than 40 years old, fell into disrepair, and in 2014 the Alabama Historical Commission closed it for safety reasons. The proposed project would rehabilitate the pier on its existing foundations, increasing publicly available opportunities for pier-based fishing in Baldwin County.

The pier would be open from 8:00 a.m. to 5:00 p.m. daily. The admission fees already in place for other amenities at the Fort Morgan State Historic Site, which cover the costs of operations, would be applied.

Proposed improvements would include the following:

- Install anchored vinyl sheet piling as support and protection.
- Back fill the area between the sheet piles and pier for support.
- Remove and dispose of the current wooden decking.
- Replace the current pier decking with new concrete decking.
- Construct a concrete walkway connecting the pier and the shore.

Figure 2: Fort Morgan Pier Proposed Project Location

Construction and Implementation

Construction is expected to take up to six months. In-water work is expected to take 60-90 days. Details of the proposed construction methods are discussed below.

Sheet Pile Installation. Currently an aluminum sheet pile wall exists along the "inside" or boat basin side of the pier. This structure, which has been in place for more than 10 years, would be left intact, and a vinyl sheet pile wall would be installed on the outside of the existing aluminum structure for added support. Additional vinyl sheet piling would be installed along the outside or waterward side of the pier. Approximately 1,080 linear feet of vinyl sheet pile wall would be installed around the pier. The sheet piles would be approximately 30 feet long and would be placed to a depth of approximately 20 to 22 feet, thereby creating a pier elevation of approximately 8 feet above the water line. A pile cap would be placed along the top of the sheet pile walls. Installation would be conducted with a long-reach track hoe with a vibratory head that would be used to drive the sheet piles. The track hoe would be mounted on a barge and the sheet pile installation process is estimated to take one to two months.

Dredging and Backfilling. After successful installation of the sheet piling, the area between the sheet piles and the pier would be backfilled with sand to provide additional structural strength and stability. The area to be filled is approximately 24,451 square feet and would require approximately 5,000 to 6,000 cubic yards of fill. The sand used as fill material would be acquired from dredging of the adjacent boat basin and from an onsite spoil area of sand previously dredged from the same boat basin. Fill material would be dredged using mechanical methods, likely a track hoe, and would be placed into the pier structure using a long reach track hoe, dump truck, and bulldozer. This construction would occur from the existing pier. Dredging of the boat basin is an ongoing, independent maintenance activity and would not represent a change from existing baseline conditions. Turbidity curtains would be installed around the in-water construction areas to avoid excessive increase in turbidity outside of the work area.

Deck Replacement. The support structure underneath the current pier consists of decommissioned barges and wooden pilings. This support structure would be left in place, undisturbed. The current wooden deck area of the existing pier (approximately 17,000 square feet) would be removed. Decking would be removed by track hoe from a barge and would take approximately 2 weeks. Decking would be replaced with concrete 4 to 6 in thick installed by pump truck from land. Construction of concrete decking could take up to a month. ADA-compliant wooden railing would be installed.

Vehicle and Barge Operation. A single barge is expected to be used during installation of sheet piles. A work day would range from between 8 and 14 hours, at the discretion of the contractor, and depending on other factors and conditions.

Operations and Maintenance

The Alabama Historical Commission would provide short- and long-term maintenance for all project infrastructure including trash removal, monofilament line recycling, and maintaining educational signs on the fishing pier. These activities would be funded with site entrance fees. Over time, the entrance fees may be adjusted to reflect changes in the ongoing operating and maintenance costs.

Project Monitoring

There would be no attendant stationed on the pier, but public use would be indirectly monitored using changes in site revenue over time to gauge changes in visitation.

Conservation Measures

The following measures would be implemented to avoid or minimize potential impacts to the ESA-listed species and their habitats that may occur as a result of the proposed project:

- All in-water work would comply with the NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions,* dated March 23, 2006.

- The project would implement the NMFS *Measures for Reducing Entrapment Risk to Protected Species*, dated May 22, 2012.

- Educational signs and outreach materials including NMFS' "Dolphin Friendly Fishing and Viewing Tip" signs and "Save the Sea Turtles and Dolphins" would be placed at the beginning/entrance of the pier and any flat surfaces at regular intervals along the pier.

- NMFS' marine mammal and sea turtle pier surface placards would be installed at regular intervals along the pier.

- Monofilament fishing line recycling bins would be placed at regular intervals along the pier to encourage anglers to properly dispose of used fishing line to reduce the potential for fishing line entanglements of marine wildlife. Bins would be emptied routinely.

- All new lighting would be "sea turtle friendly" lighting that complies with the City of Gulf Shores Ordinance #1461 (lighting standards for the protection of sea turtles)[4].

- Any fish cleaning stations would be built away from the water. Currently, there are no plans for construction of fish cleaning stations.

2.3 Dauphin Island Eco-Tourism and Environmental Education Area

The proposed Dauphin Island Eco-Tourism and Environmental Education Area would be located on Dauphin Island in south Mobile County, Alabama. Dauphin Island is a barrier island that sits at the mouth of Mobile Bay where it joins the Gulf of Mexico. The proposed project is in the geographic middle of the island. Under the proposed project, the Town of Dauphin Island would acquire approximately 100 acres of privately held land and water bottom that are currently for sale. Approximately 90 acres of the property are coastal salt marsh and water bottom and 10 acres are upland. The dominant macrophytes in the marsh are black needlerush (*Juncus roemerianus*) with a waterward fringe of smooth cordgrass (*Spartina alterniflora*). In addition to protecting the land from development, the project would enhance recreational use of the coastal habitat by providing amenities that offer recreational opportunities to the public. These proposed visitor amenities include a fishing pier, bicycle path, parking area, boardwalks, gazebos, and public restrooms.

The fishing pier and boardwalks would allow visitors access to the marsh and water. The proposed project site is shown in Figure 3. By constructing a parking area and boardwalks, this project would provide public access to wetland habitats adjacent to Aloe Bay, where no public access currently exists.

The proposed infrastructure and access improvements that may affect ESA-listed species under NMFS' jurisdiction include the following:

- The fishing pier would be 530 feet long by 10 feet wide and include four finger piers off of the main pier. Each finger pier would be 100 feet by 10 feet and would include handrails. The pier would include a ramp for accessibility. This ramp would be 10 feet wide with hand rails on each side. There would be a 20 foot by 30-foot deck base at the landward end of the ramp.

- An elevated boardwalk above the wetlands would connect with the parking area and fishing pier. The boardwalk would be approximately 1,520 linear feet and 8 feet wide.

[4] http://www.gulfshoresal.gov/DocumentCenter/View/61/Lighting-Ordinance?bidId=

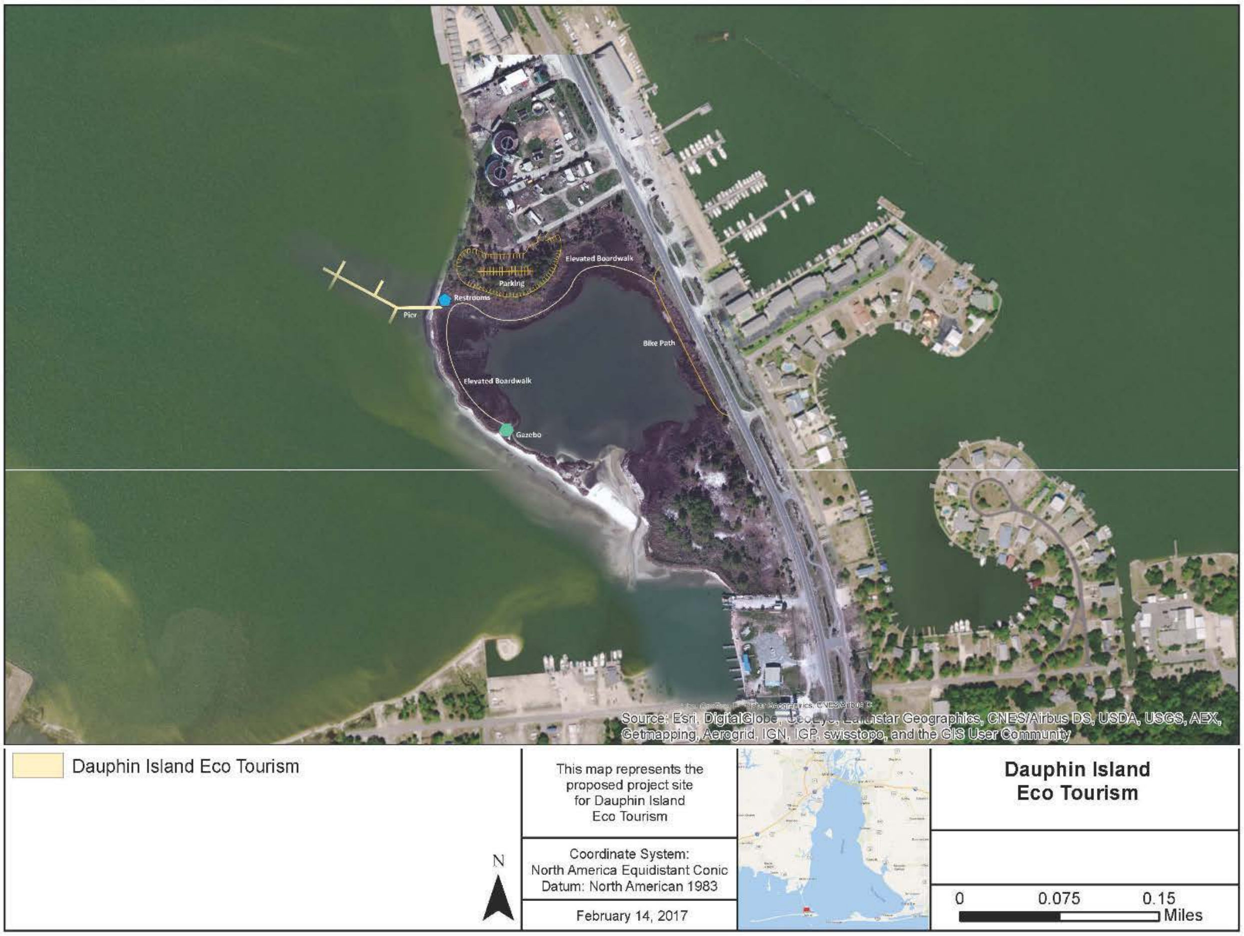

Figure 3: Dauphin Island Proposed Project Location

Construction and Implementation

The proposed fishing pier and boardwalk would be elevated and supported on piles driven into the ground; however, a minimum of approximately 5 feet would be left between the base of the boardwalk and the wetland surfaces so that emergent plants receive adequate sunlight. Surveying would be completed to quantify the amount of affected wetlands and a minimum of 0.75 in would be left between boardwalk slats to allow sufficient sunlight to reach wetland plants beneath the boardwalk. Certain design features such as boardwalk and pier height, may be modified to further avoid impacts to wetlands.

Installation of Piles. The fishing pier would be constructed using 10, 12, and/or 14-in diameter wooden piles spaced at 5-foot intervals. The pier would require an estimated total of 382 piles. Piles may be installed using impact hammer, vibratory hammer, or jetting methods, at the discretion of the hired contractor. Pile driving is expected to take approximately 10 days to complete. Equipment would include a long-reach track hoe, which may be used from land or from a barge.

Vehicle and Barge Operation. A single barge is expected to be used during installation of pilings for the pier. A long-reach track hoe would be placed on top of the barge, which would be used to drive the pilings. The barge and track-hoe would be operated for approximately 10 days.

A work day would range from between 8 and 14 hours, at the discretion of the contractor, and depending on other factors and conditions.

Operations and Maintenance
The Town of Dauphin Island (as the property owner) would provide short- and long-term maintenance for all project infrastructure including trash removal, monofilament line recycling, and maintaining educational signs on the fishing pier. A nominal fee ($2 to $5) would be charged for use of the fishing pier. The fees would be used to fund maintenance of the project. Over time, the fees may be adjusted to reflect changes in ongoing operating and maintenance costs.

Project Monitoring
There would be no attendant stationed on the pier, but public use would be indirectly monitored using fee revenue over time to gauge visitation.

Conservation Measures
The following measures would be implemented to avoid or minimize potential impacts to the ESA-listed species and their habitats that may occur as a result of the proposed project:

- All in-water work would comply with the NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions,* dated March 23, 2006.

- The project would incorporate the NMFS *Measures for Reducing Entrapment Risk to Protected Species,* dated May 22, 2012.

- Educational signs and outreach materials including NMFS' "Dolphin Friendly Fishing and Viewing Tip" signs and "Save the Sea Turtles and Dolphins" would be placed at the beginning/entrance of the pier and any flat surfaces at regular intervals along the pier.

- NMFS' marine mammal and sea turtle pier surface placards would be installed at regular intervals along the pier.

- Monofilament fishing line recycling bins would be placed at regular intervals along the pier to encourage anglers to properly dispose of used fishing line to reduce the potential for fishing line entanglements of marine wildlife. Bins would be emptied routinely.

- All new lighting would be "sea turtle friendly" lighting that complies with the City of Gulf Shores Ordinance #1461 (lighting standards for the protection of sea turtles)[5].

2.4 Action Area

The action area is defined by regulation as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The proposed action is not expected to produce any direct or indirect effects on aquatic species or habitats outside of the nearshore areas immediately adjacent to the parks themselves. Therefore,

[5] http://www.gulfshoresal.gov/DocumentCenter/View/61/Lighting-Ordinance?bidId=

the action area at each site includes the nearshore areas in which construction will take place and the areas within a 705 ft (215 m) radius surrounding the proposed piers (Figure 4) where behavioral effects may occur (see noise analyses in Section 3.1).

Figure 4. Action areas for each of the 3 construction sites shown within red lines (©2018 Google)

Laguna Cove Little Lagoon Natural Resource Protection Area

The proposed Laguna Cove Little Lagoon Natural Resource Protection Area is located near the southwest portion of Little Lagoon, next to the Bon Secour National Wildlife Refuge in Baldwin County, AL (30.23521°N; 87.78909°W, World Geodetic System 1984 [WGS84]). The site is bordered by Little Lagoon to the north and West Beach Boulevard (SR 182) to the south. The parcel contains low elevation dune habitat, large areas of coastal wetlands, and includes approximately 6,100 linear feet of shoreline on Little Lagoon. Little Lagoon was removed from the Alabama 303(d) list in 2012 and currently has no known water quality impairments. The habitat types that exist within the project boundaries are classified as wetlands (27.11 acres) and Maritime forests/uplands (26.25 acres).

Fort Morgan Pier Rehabilitation Project

The proposed Fort Morgan Pier Rehabilitation project is located in Baldwin County, AL, on the far west end of the Fort Morgan Peninsula (30.22811°N; 88.02293°W, WGS84). The pier extends north into Bon Secour Bay; a sub-embayment of Mobile Bay. Bon Secour Bay is listed on the Alabama 303(d) list for pathogens (Enterococcus) resulting in restrictions on shellfish harvesting and swimming. The action area is heavily disturbed and is currently accessible to the public. Much of the action area consists of a gravel parking area and open water, which includes the adjacent boat basin where dredging would occur to obtain backfill material.

Dauphin Island Eco-Tourism and Environment Education Area
The proposed Dauphin Island Eco-Tourism and Environment Education Area is located at Dauphin Island, Alabama, west of Lemoyne Drive, on a parcel zoned for working waterfront (30.26236°N; 88.11581°W WGS84). The site is bordered to the west by Aloe Bay and to the east by Alabama State Highway 193, which connects Dauphin Island to the mainland of Mobile County. The proposed project site encompasses a small body of water that connects to Aloe Bay, which is a sub-bay of the larger Mobile Bay, in the Mississippi Sound. No public access currently exists at this site.

The area contains approximately 90 acres of wetlands including the enclosed waterbody which is classified as an intertidal estuarine wetland. The northern and southern ends of the parcel are classified as forested, palustrine freshwater wetlands dominated by long-leaf pine. Aloe Bay is not listed as impaired on Alabama's 303(d) list and has not been listed in the recent past. Thus, there are no known water quality issues.

3 STATUS OF LISTED SPECIES

The following endangered (E) and threatened (T) species under the jurisdiction of NMFS may occur in or near the action area.

Table 1. Effects Determinations for Species NOAA RC or NMFS Believes May be Affected by the Proposed Action

Species	ESA Listing Status	NOAA RC Effect Determination	NMFS Effect Determination
Sea Turtles			
Leatherback	E	NLAA	NE
Hawksbill	E	NLAA	NE
Green (North Atlantic Distinct Population Segment [DPS])	T	NLAA	LAA
Green (South Atlantic DPS)	T	NLAA	LAA
Kemp's ridley	E	NLAA	LAA
Loggerhead (Northwest Atlantic Ocean [NWA] DPS)	T	NLAA	LAA
Fish			
Gulf sturgeon (Atlantic sturgeon, Gulf subspecies)	T	NLAA	NLAA
E = endangered; T = threatened; LAA = likely to adversely affect; NLAA = may affect, not likely to adversely affect; NE = No Effect			

None of the proposed activities are located within designated or proposed critical habitat for any listed species and there are no foreseeable routes of effects to critical habitats.

We believe the project will have no effect on hawksbill and leatherback sea turtles, due to the species' very specific life history strategies, which are not supported at the project sites. Leatherback sea turtles have a pelagic, deepwater life history, where they forage primarily on jellyfish. Hawksbill sea turtles typically inhabit inshore reef and hard bottom areas (not present at these sites) where they forage primarily on encrusting sponges. We found no documented incidences of either species being hooked or entangled at any fishing piers in the State of Alabama where the proposed actions will take place.

3.1 Project Elements Not Likely to Adversely Affect Listed Species

Laguna Cove Little Lagoon Natural Resource Protection Area
We have determined that the proposed activities associated with the construction and operation of the Laguna Cove Little Lagoon Natural Resource Protection Area are not likely to adversely affect any of the species listed in Table 1 above. This action area is inside of Little Lagoon, an enclosed bay with one small, shallow outlet to the Gulf which frequently becomes blocked by sediment. There have been no documented occurrences of Gulf sturgeon, and only a single documented occurrence of a sea turtle inside of Little Lagoon. The sea turtle was an adult female loggerhead that is thought to have become disoriented during nesting, and walked into the lagoon from the adjacent beach (pers. com. Brittany Petersen, USFWS, 5/19/2017). Due to the extremely low likelihood of Gulf Sturgeon or sea turtles occurring inside of Little Lagoon, the potential for this element of the proposed action to adversely affect any of these listed species is discountable.

Fort Morgan Pier and Dauphine Island Eco-Tourism and Environmental Education Area
Gulf sturgeon and 4 species of sea turtles (loggerhead, green (North Atlantic DPS & South Atlantic DPS), and Kemp's ridley) may be found in or near the other 2 action areas, and may be affected by the proposed actions. Potential effects to these sea turtles and Gulf sturgeon include the risk of injury from being struck by construction vessels, machinery and materials (e.g., barge movement, anchoring, and construction/mechanical dredging equipment operation) during in-water construction activities. NMFS has previously determined (NMFS 2007) that, while ocean-going hopper-type dredges may lethally entrain protected species including sea turtles and sturgeon, non-hopper type dredging methods (e.g., mechanical such as clamshell, and bucket dredging; hydraulic [suction] cutterhead, and pipeline) are slower and extremely unlikely to adversely affect sea turtles and sturgeon. Due to the species' mobility and natural avoidance behaviors, and the applicant's compliance with NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions* (dated March 2006), injury through direct impact from construction vessels, materials, or machinery is extremely unlikely to occur, and therefore, discountable.

Sea turtles and Gulf sturgeon may be temporarily unable to use the project sites for forage and shelter habitat due to avoidance of construction activities including dredging and the placement of pier piles, and exclusion from the project areas due to the use of turbidity curtains. However, we believe any potential effects will be insignificant considering the projects are located in open-water, unconfined areas surrounded by large expanses of similar habitats (see images above) which would allow individuals avoiding the construction sites to forage and shelter throughout the surrounding areas.

The dredging proposed at the Fort Morgan Pier site will remove the top layer of material from a small area inside the adjacent boat basin and/or from an onsite spoil area of sand previously dredged from the same boat basin. This will disrupt or remove any vegetation and sessile or slow moving benthic organisms from the dredged areas, which in turn could impact the foraging success of any sea turtles or Gulf sturgeon which may attempt to forage in these areas. Due to the small area to be dredged (the entire boat basin is less than 1 acre), and the poor habitat conditions in the dredge area (high traffic boat launch with frequent disturbance due to maintenance dredging), any potential effects on sea turtle or Gulf sturgeon foraging would be insignificant.

Sea turtles and Gulf sturgeon may be affected by noise associated with the impact driving of piles for dock construction. Injurious effects can occur in 2 ways. First, effects can result from a single noise event's exceeding the threshold for direct physical injury to animals, and these constitute an immediate adverse effect on these animals. Second, effects can result from prolonged exposure to noise levels that exceed the daily cumulative exposure threshold for the animals, and these can constitute adverse effects if animals are exposed to the noise levels for sufficient periods. Behavioral effects can be adverse if, for example, such effects interfere with animals' migrating, feeding, resting, or reproducing. Our evaluation of effects to listed species as a result of noise created by proposed construction activities is based on the analysis prepared in support of the Biological Opinion for SAJ-82.[6] The noise analysis in this consultation evaluates effects to ESA-listed Gulf Sturgeon and sea turtles identified by NMFS as potentially affected in Table 1, above.

Since the installation method of the wood piles proposed for the Dauphine Island pier has not been determined, we considered the effects from all 3 scenarios for the installation of these piles. The Fort Morgan Pier project proposes the installation of vinyl sheet piles by vibratory hammer:

Jetting wood piles: With regard to the proposed use of water jetting to create pilot holes and install the pier piles, based on our noise calculations, the use of water jetting will not result in injurious noise effects or behavioral noise effects.

Vibratory installation of wood piles or vinyl sheet piles: Similarly, the proposed installation of piles by vibratory hammer (either wooden pier piles or vinyl sheet piles) will not result in any form of injurious noise effects. Our noise analysis used the source level measured for the vibratory installation of a 13-in steel pipe pile as a surrogate for the vibratory installation of wood or vinyl piles. This is a very conservative approach since the installation of a 13-in steel pipe pile would be considerably louder than a similarly-sized wood pile or vinyl sheet pile. The proposed vibratory installation method could result in behavioral effects at radii of up to 16 ft (5 meters [m]) for sea turtles and up to 72 ft (22 m) for Gulf sturgeon. Given the mobility of sea turtles and Gulf sturgeon, we expect them to move away from noise disturbances. Because the radius of potential effects is so small, and there is abundant similar habitat surrounding the construction zones, we anticipate that any impacts to the species feeding, resting, migration or reproductive behavior would be insignificant. Therefore, installation of piles by vibratory

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

hammer will not result in any injurious noise effect, and any behavioral effects will be insignificant.

Impact hammer installation of wood piles: With regards to potential use of an impact hammer to install wooden pier piles, based on our noise calculations, the installation of wood piles by impact hammer will not cause single-strike or peak-pressure injury to sea turtles or gulf sturgeon. The cumulative sound exposure level (cSEL) of multiple pile strikes over the course of a day may cause injury to these species at a radius of up to 30 ft (9 m). Due to the mobility of these species, we expect them to move away from any noise disturbances and avoid significant exposure to the harmful sound energy. Because we anticipate the animals will move away, we believe that an animal's suffering physical injury from noise is extremely unlikely to occur. Even in the unlikely event an animal chooses not to vacate the cumulative injurious impact zone over the course of an entire day, the radius of that area is smaller than the 50-ft radius that will be visually monitored for listed species per NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions* (dated March 23, 2006). Per these conditions, construction personnel are required to cease construction activities if a listed animal is sighted within a 50-ft radius of in-water construction activities. Thus, we believe the likelihood of any injurious cSEL effects is discountable. An animal's movement away from the injurious impact zone is a behavioral response, with the same types of effects discussed below.

Impact hammer pile installation could also cause behavioral effects at radii of 151 ft (46 m) for sea turtles and 705 ft (215 m) for Gulf sturgeon. Due to the mobility of these species, we expect them to move away from noise disturbances. Because the radius of potential effects is relatively small, and there is abundant similar habitat surrounding the construction zones, we anticipate that any impacts to the species feeding, resting, migration, or reproductive behavior would be insignificant. Therefore, installation of wooden piles up to 14 in diameter by impact hammer will not result in any injurious noise effect, and any behavioral effects will be insignificant.

Fishing piers can adversely affect sea turtles through incidental hooking and entanglement either by actively fished lines, discarded, remnant, or broken-off fishing lines, and/or other debris. The potential effects of angling activities on sea turtles will be discussed in Section 5.

There have been no documented hook-and-line takes of Gulf sturgeon associated with fishing piers in Alabama (or any other state). The feeding anatomy and ecology of Gulf sturgeon makes the hooking of this species by standard hook-and-line anglers highly unlikely. Therefore, NMFS concludes that Gulf sturgeon are not likely to be adversely affected by angling activities associated with the proposed fishing piers as the likelihood of any incidental hooking is considered discountable.

3.2 General Threats Faced by All Sea Turtle Species

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

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

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

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

Coastal Development and Erosion Control
Coastal development can deter or interfere with nesting, affect nesting success, and degrade nesting habitats for sea turtles. Structural impacts to nesting habitat include the construction of buildings and pilings, beach armoring and renourishment, and sand extraction (Bouchard et al. 1998; Lutcavage et al. 1997). These factors may decrease the amount and/or quality of nesting habitat 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, polychlorobiphenyls, and perfluorinated chemicals), and others that may cause adverse health effects to sea turtles (Garrett 2004; Grant and Ross 2002; Hartwell 2004; Iwata et al. 1993). Acute exposure to hydrocarbons from petroleum products released into the environment via oil spills and other discharges may directly injure individuals through skin contact with oils (Geraci 1990), inhalation at the water's surface, and ingesting compounds while feeding (Matkin and Saulitis 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability in the action area.

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

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

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

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

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

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

Other Threats

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

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

3.3 Loggerhead Sea Turtle – Northwest Atlantic DPS

The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. NMFS and USFWS published a Final Rule which designated 9 DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011, and effective October 24, 2011). This rule listed the following DPSs: (1) Northwest Atlantic Ocean (threatened), (2) Northeast Atlantic Ocean (endangered), (3) South Atlantic Ocean (threatened), (4) Mediterranean Sea (endangered), (5) North Pacific Ocean (endangered), (6) South Pacific Ocean (endangered), (7) North Indian

Ocean (endangered), (8) Southeast Indo-Pacific Ocean (endangered), and (9) Southwest Indian Ocean (threatened). The Northwest Atlantic (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 (Moncada Gavilan 2001), and along the coasts of Central America, Colombia, Venezuela, and the eastern Caribbean Islands.

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

Within the 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[7]), (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 in long and weigh about 0.7 oz (20 g).

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

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

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 the Indian River Lagoon, Florida, are regularly used by juveniles but not by adult loggerheads. Adult loggerheads do tend to use estuarine areas with more open ocean access, such as the Chesapeake Bay in the U.S. mid-Atlantic. Shallow-water habitats with large expanses of open ocean access, such as Florida Bay, provide year-round resident foraging areas for significant numbers of male and female adult loggerheads (Conant et al. 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, unpublished data; South Carolina Department of Natural Resources, unpublished data). Satellite telemetry has identified the shelf waters along the west Florida coast, The Bahamas, Cuba, and the Yucatán Peninsula as important resident areas for adult female loggerheads that nest in Florida (Foley et al. 2008; Girard et al. 2009; Hart et al. 2012). The southern edge of the Grand Bahama Bank is important habitat for loggerheads nesting on the Cay Sal Bank in The Bahamas, but nesting females are also resident in the bights of Eleuthera, Long Island, and Ragged Islands. They also reside in Florida Bay in the United States, and along the north coast of Cuba (A. Bolten and K. Bjorndal, University of Florida, unpublished data). Moncada et al. (2010) report the recapture of 5 adult female loggerheads in Cuban waters originally flipper-tagged in Quintana Roo, Mexico, which indicates that Cuban shelf waters likely also provide foraging habitat for adult females that nest in Mexico.

Status and Population Dynamics
A number of stock assessments and similar reviews (Conant et al. 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 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 2015 was 89,295 nests (Florida Fish and Wildlife Research Institute (FWRI) nesting database).

In addition to the total nest count estimates, the FWRI uses an index nesting beach survey method. The index survey uses standardized data-collection criteria to measure seasonal nesting and allow accurate comparisons between beaches and between years (Figure 5). This provides a better tool for understanding the nesting trends. FWRI performed a detailed analysis of the long-term loggerhead index nesting data (1989-2016; http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trend/). Over that time period, 3 distinct trends were identified. From 1989-1998, there was a 24% increase that was followed by a sharp decline over the subsequent 9 years. A large increase in loggerhead nesting has occurred since, as indicated by the 71% increase in nesting over the 10-year period from 2007 and 2016. Nesting in 2016 also represents a new record for loggerheads on the core index beaches. FWRI examined the trend from the 1998 nesting high through 2016 and found that the decade-long post-1998 decline was replaced with a slight but nonsignificant increasing trend. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability between 2012-2016 resulting in widening confidence intervals (http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trend/).

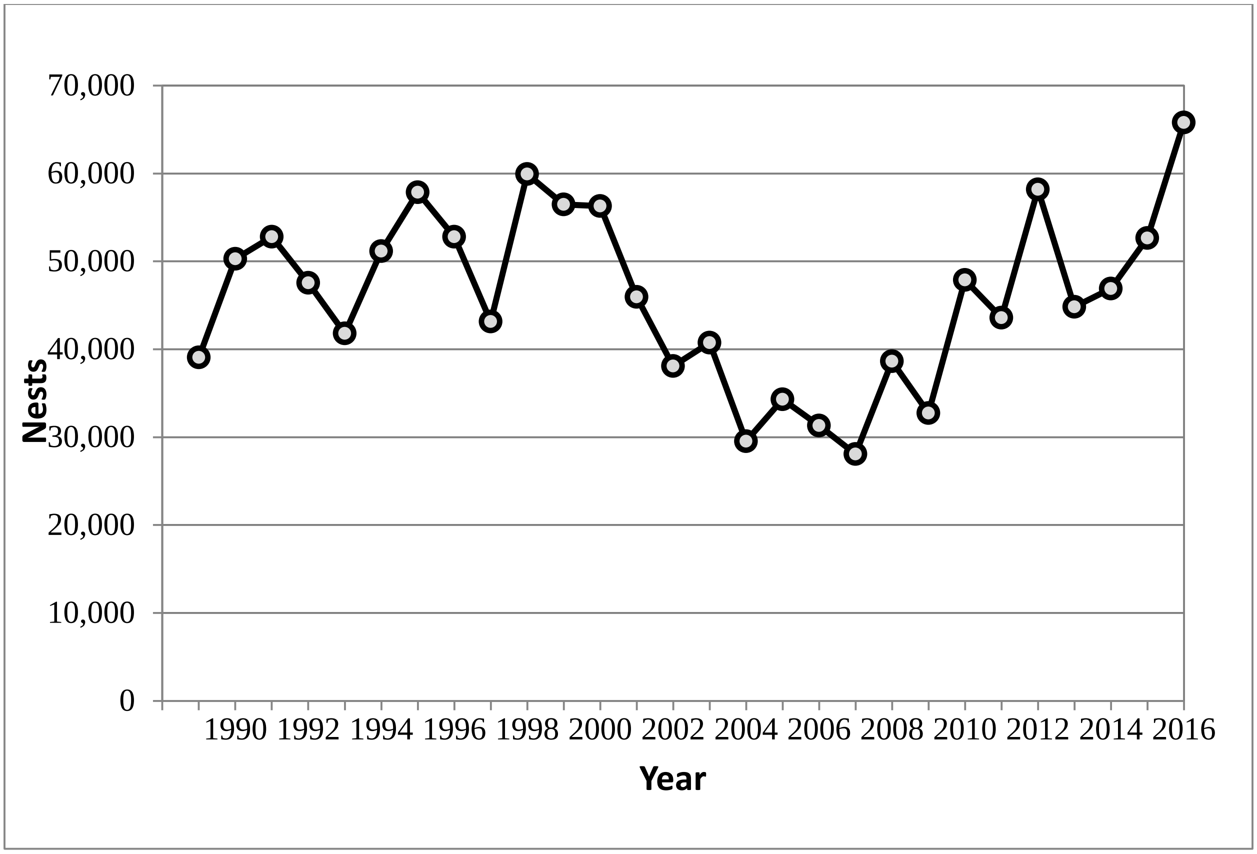

Figure 4. Loggerhead sea turtle nesting at Florida index beaches since 1989

Northern Recovery Unit

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

Data collected since that analysis (Table 2) are showing improved nesting numbers and a departure from the declining trend. Georgia nesting has rebounded to show the first statistically significant increasing trend since comprehensive nesting surveys began in 1989 (Mark Dodd, GADNR press release, http://www.georgiawildlife.com/node/3139). South Carolina and North Carolina nesting have also begun to shift away from the past declining trend. Loggerhead nesting in Georgia, South Carolina, and North Carolina all broke records in 2015 and then topped those records again in 2016.

Table 2. Total Number of NRU Loggerhead Nests (GADNR, SCDNR, and NCWRC nesting datasets compiled at Seaturtle.org)

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

South Carolina also conducts an index beach nesting survey similar to the one described for Florida. Although the survey only includes a subset of nesting, the standardized effort and locations allow for a better representation of the nesting trend over time. Increases in nesting were seen for the period from 2009-2012, and 2012 shows the highest index nesting total since the start of the program (Figure 6).

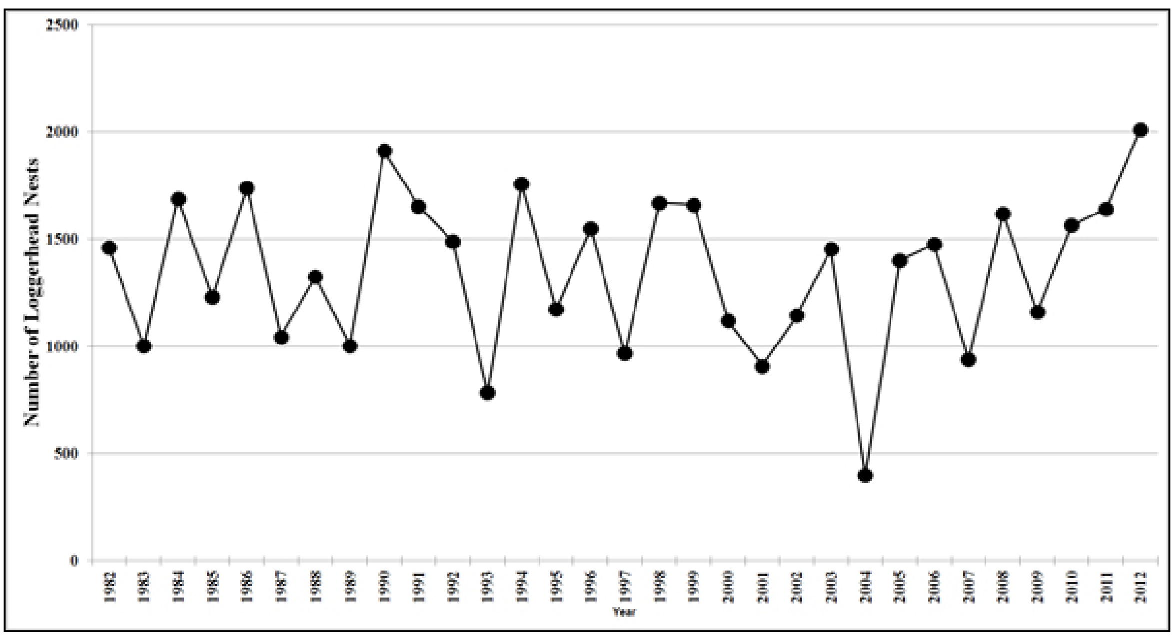

Figure 5. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website: http://www.dnr.sc.gov/seaturtle/nest.htm)

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

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

In-water Trends

Nesting data are the best current indicator of sea turtle population trends, but in-water data also provide some insight. In-water research suggests the abundance of neritic juvenile loggerheads is steady or increasing. Although Ehrhart et al. (2007) found no significant regression-line trend in a long-term dataset, researchers have observed notable increases in catch per unit effort (CPUE) (Arendt et al. 2009; Ehrhart et al. 2007; Epperly et al. 2007). Researchers believe that this increase in CPUE is likely linked to an increase in juvenile abundance, although it is unclear whether this increase in abundance represents a true population increase among juveniles or merely a shift in spatial occurrence. Bjorndal et al. (2005), cited in NMFS and USFWS (2008), caution about extrapolating localized in-water trends to the broader population and relating localized trends in neritic sites to population trends at nesting beaches. The apparent overall increase in the abundance of neritic loggerheads in the southeastern United States may be due to increased abundance of the largest oceanic/neritic juveniles (historically referred to as small benthic juveniles), which could indicate a relatively large number of individuals around the same age may mature in the near future (TEWG 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 3.3. 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 3.3, specific impacts of the DWH oil spill event on loggerhead sea turtles are considered here. Impacts to loggerhead sea turtles occurred to offshore small juveniles as well as large juveniles and adults. A total of 30,800 small juvenile loggerheads (7.3% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. Of those exposed, 10,700 small juveniles are estimated to have died as a result of the exposure. In contrast to small juveniles, loggerheads represented a large proportion of the adults and large juveniles exposed to and killed by the oil. There were 30,000 exposures (almost 52% of all exposures for those age/size classes) and 3,600 estimated mortalities. A total of 265 nests (27,618 eggs) were also translocated during response efforts, with 14,216 hatchlings released, the fate of which is unknown (DWH Trustees 2015). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

Unlike Kemp's ridleys, the majority of nesting for the Northwest Atlantic Ocean loggerhead DPS occurs on the Atlantic coast, and thus loggerheads were impacted to a relatively lesser degree. However, it is likely that impacts to the NGMRU of the NWA loggerhead DPS would be proportionally much greater than the impacts occurring to other recovery units. Impacts to nesting and oiling effects on a large proportion of the NGMRU recovery unit, especially mating and nesting adults likely had an impact on the NGMRU. Based on the response injury evaluations for Florida Panhandle and Alabama nesting beaches (which fall under the NFMRU), the Trustees estimated that approximately 20,000 loggerhead hatchlings were lost due to DWH oil spill response activities on nesting beaches. Although the long-term effects remain unknown, the DWH oil spill event impacts to the 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).

3.4 Green Sea Turtle (Information Relevant to All DPSs)

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

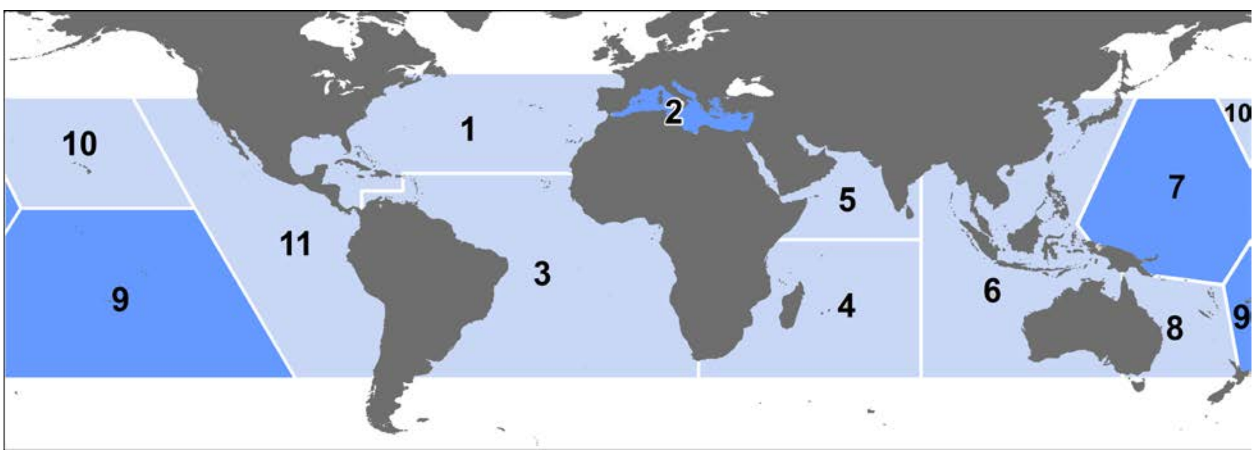

Figure 6. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11.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

Life History Information

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

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

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

Species Description and Distribution

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

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

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

North Atlantic DPS Distribution

The NA DPS boundary is illustrated in Figure 7. 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 7, 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).

Status and Population Dynamics

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

North Atlantic DPS

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

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

In the continental United States, green sea turtle nesting occurs along the Atlantic coast, primarily along the central and southeast coast of Florida where an estimated 200-1,100 females nest each year (Meylan et al. 1994; Weishampel et al. 2003). Occasional nesting has also been documented along the Gulf Coast of Florida (Meylan et al. 1995). Green sea turtle nesting is documented annually on beaches of North Carolina, South Carolina, and Georgia, though nesting is found in low quantities (nesting databases maintained on www.seaturtle.org).

In Florida, index beaches were established to standardize data collection methods and effort on key nesting beaches. Since establishment of the index beaches in 1989, the pattern of green sea turtle nesting has generally shown biennial peaks in abundance with a positive trend during the 10 years of regular monitoring (Figure 8). According to data collected from Florida's index nesting beach survey from 1989-2015, green sea turtle nest counts across Florida have increased approximately ten-fold from a low of 267 in the early 1990s to a high of 27,975 in 2015. Two consecutive years of nesting declines in 2008 and 2009 caused some concern, but this was followed by increases in 2010 and 2011, and a return to the trend of biennial peaks in abundance thereafter (Figure 8). Modeling by Chaloupka et al. (2008) using data sets of 25 years or more has resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9%.

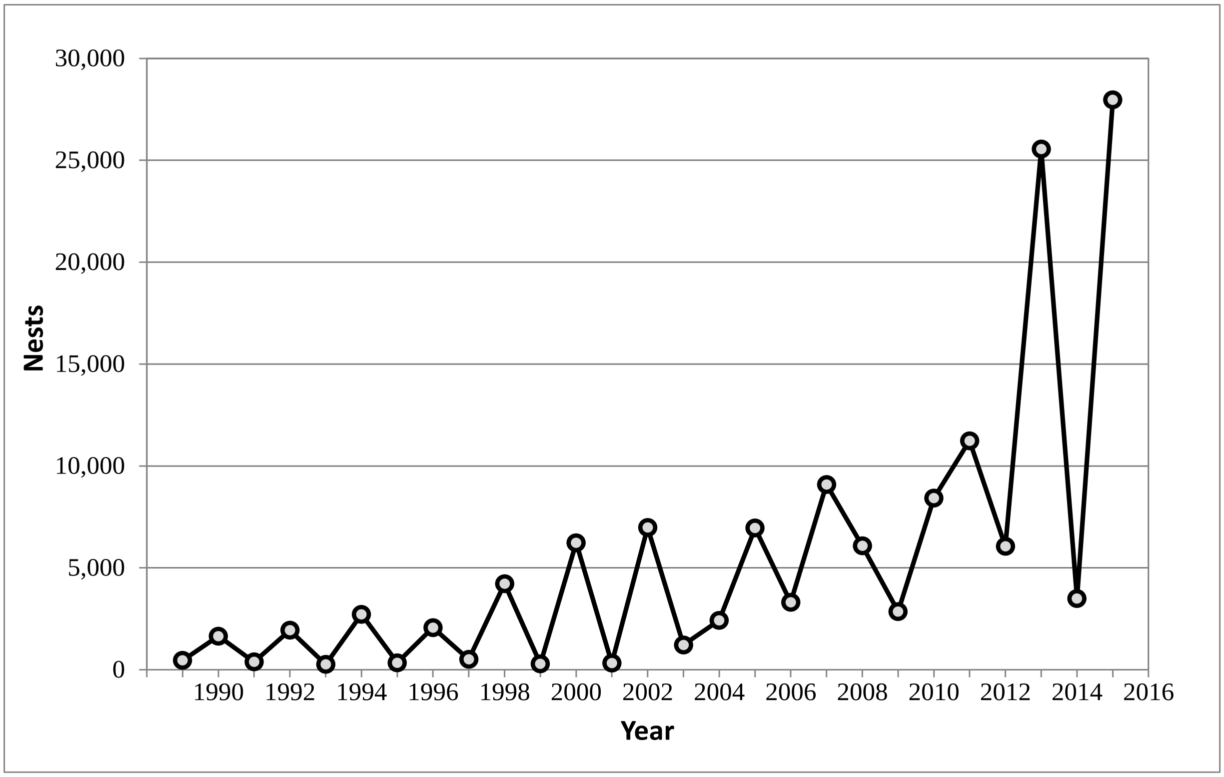

Figure 7. Green sea turtle nesting at Florida index beaches since 1989

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, Aves Island (Venezuela), and Galibi (Suriname) appear to be increasing. Others such as Trindade (Brazil), Atol das Rocas (Brazil), and Poilão and the rest of Guinea-Bissau seem to be stable or do not have sufficient data to make a determination. Bioko (Equatorial Guinea) appears to be in decline but has less nesting than the other primary sites (Seminoff et al. 2015).

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

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of the species for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern United States, green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U.S. jurisdiction, where exploitation is still a threat. Green sea turtles also face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (e.g., plastics, petroleum products, petrochemicals), ecosystem alterations (e.g., nesting beach development, beach nourishment and shoreline stabilization, vegetation changes), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 3.3.

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

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

Whereas oil spill impacts are discussed generally for all species in Section 3.3, specific impacts of the DWH spill on green sea turtles are considered here. Impacts to green sea turtles occurred to offshore small juveniles only. A total of 154,000 small juvenile greens (36.6% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. A large number of small juveniles were removed from the population, as 57,300 small juveniles greens are estimated to have died as a result of the exposure. A total of 4 nests (580 eggs) were also translocated during response efforts, with 455 hatchlings released (the fate of which is unknown) (DWH Trustees 2015). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

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

3.5 Kemp's Ridley Sea Turtle

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

Species Description and Distribution

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

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

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

Life History Information

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

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

Population Dynamics

Of the 7 species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nest on the beaches of Rancho Nuevo, Mexico (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the mid-1980s, however, nesting numbers from Rancho Nuevo and adjacent Mexican beaches were below 1,000, with a low of 702 nests in 1985. Yet, nesting steadily increased through the 1990s, and then accelerated during the first decade of the twenty-first century (Figure 9), which indicates the species is recovering.

It is worth noting that when the Bi-National Kemp's Ridley Sea Turtle Population Restoration Project was initiated in 1978, only Rancho Nuevo nests were recorded. In 1988, nesting data from southern beaches at Playa Dos and Barra del Tordo were added. In 1989, data from the northern beaches of Barra Ostionales and Tepehuajes were added, and most recently in 1996, data from La Pesca and Altamira beaches were recorded. Currently, nesting at Rancho Nuevo accounts for just over 81% of all recorded Kemp's ridley nests in Mexico. Following a significant, unexplained 1-year decline in 2010, Kemp's ridley nests in Mexico reached a record high of 21,797 in 2012 (Gladys Porter Zoo 2013). From 2013 through 2014, there was a second significant decline, as only 16,385 and 11,279 nests were recorded, respectively. Recent data, however, indicates an increase in nesting. In 2015 there were 14,006 recorded nests, and in 2016 overall numbers increased to 18,354 recorded nests (Gladys Porter Zoo 2016). The latest information indicates a record high nesting season in 2017, with 24,570 nests recorded (J. Pena, pers. comm., August 31, 2017). At this time, it is unclear if future nesting will steadily and continuously increase, similar to what occurred from 1990-2009, or if nesting will continue to exhibit sporadic declines and increases as recorded in the past 8 years.

A small nesting population is also emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 42 in 2004, to a record high of 353 nests in 2017 (National Park Service data, http://www.nps.gov/pais/naturescience/strp.htm, http://www.nps.gov/pais/naturescience/current-season.htm). It is worth noting that nesting in Texas has paralleled the trends observed in Mexico, characterized by a significant decline in 2010, followed by a second decline in 2013-2014, but with a rebound since 2015.

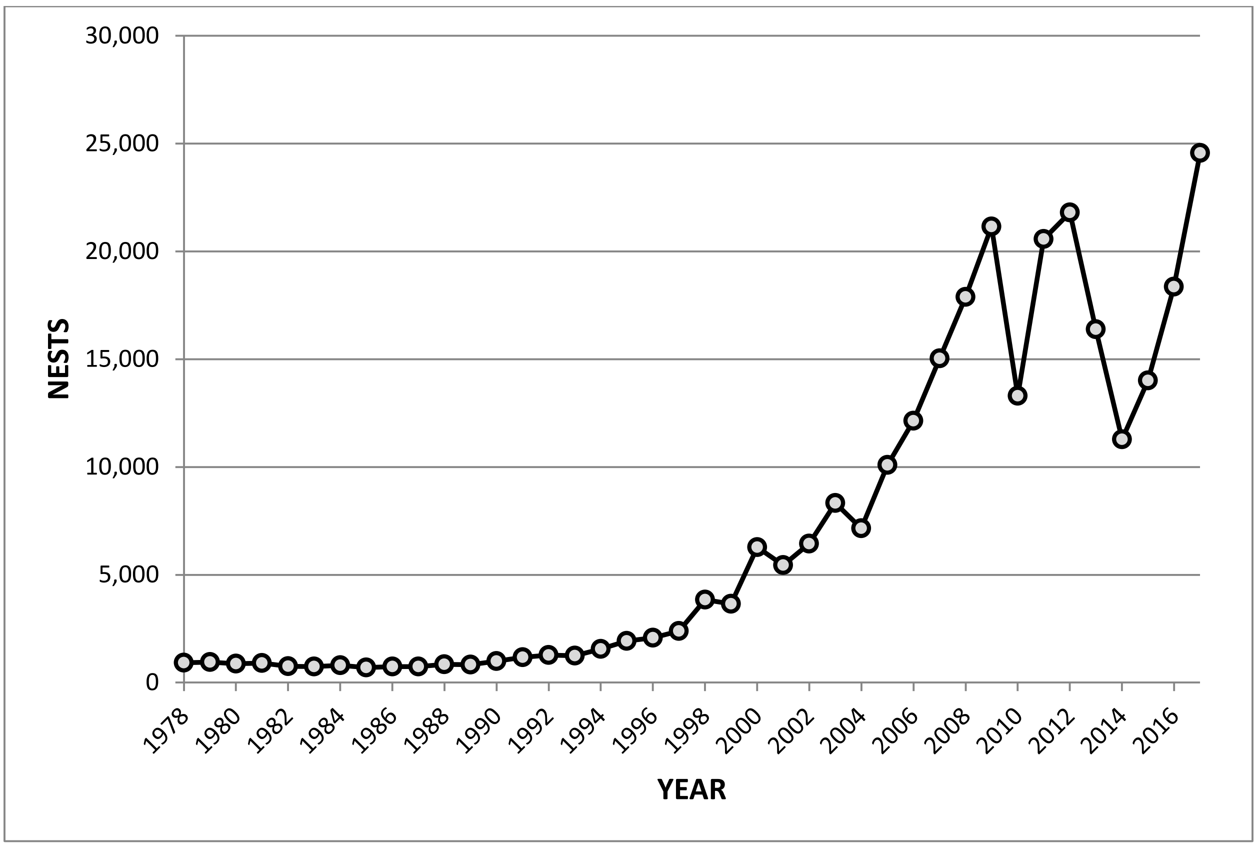

Figure 8. Kemp's ridley nest totals from Mexican beaches (Gladys Porter Zoo nesting database 2017)

Through modelling, Heppell et al. (2005) predicted the population is expected to increase at least 12-16% per year and could reach at least 10,000 females nesting on Mexico beaches by 2015. NMFS et al. (2011) produced an updated model that predicted the population to increase 19% per year and to attain at least 10,000 females nesting on Mexico beaches by 2011. Approximately 25,000 nests would be needed for an estimate of 10,000 nesters on the beach, based on an average 2.5 nests/nesting female. While counts did not reach 25,000 nests by 2015, they came very close to this level in 2017, and it is clear that the population has increased over the long term. The increases in Kemp's ridley sea turtle nesting over the last 2 decades is likely due to a combination of management measures including elimination of direct harvest, nest protection, the use of turtle exclusion devices (TEDs), reduced trawling effort in Mexico and the United States, and possibly other changes in vital rates (TEWG 1998; TEWG 2000). While these results are encouraging, the species' limited range as well as low global abundance makes it particularly vulnerable to new sources of mortality as well as demographic and environmental randomness, all factors which are often difficult to predict with any certainty. Additionally, the significant unexplained nesting declines observed in 2010 and 2013-2014 potentially indicate serious population-level impacts, and despite the recent upward trend, there remains cause for concern regarding the long-term recovery of the species.

Threats

Kemp's ridley sea turtles face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (plastics, petroleum products, petrochemicals, etc.), ecosystem alterations (nesting beach development, beach nourishment and shoreline stabilization, vegetation changes, etc.), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 3.3; the remainder of this section will expand on a few of the aforementioned threats and how they may specifically impact Kemp's ridley sea turtles.

As Kemp's ridley sea turtles continue to recover and nesting arribadas[8] are increasingly established, bacterial and fungal pathogens in nests are also likely to increase. Bacterial and fungal pathogen impacts have been well documented in the large arribadas of the olive ridley at Nancite in Costa Rica (Mo 1988). In some years, and on some sections of the beach, the hatching success can be as low as 5% (Mo 1988). As the Kemp's ridley nest density at Rancho Nuevo and adjacent beaches continues to increase, appropriate monitoring of emergence success will be necessary to determine if there are any density-dependent effects.

Over the past 6 years, NMFS has documented (via the Sea Turtle Stranding and Salvage Network data, http://www.sefsc.noaa.gov/species/turtles/strandings.htm) elevated sea turtle strandings in the Northern Gulf of Mexico, particularly throughout the Mississippi Sound area. In the first 3 weeks of June 2010, over 120 sea turtle strandings were reported from Mississippi and Alabama waters, none of which exhibited any signs of external oiling to indicate effects associated with the DWH oil spill event. A total of 644 sea turtle strandings were reported in 2010 from Louisiana, Mississippi, and Alabama waters, 561 (87%) of which were Kemp's ridley sea turtles. During March through May of 2011, 267 sea turtle strandings were reported from

8 Arribada is the Spanish word for "arrival" and is the term used for massive synchronized nesting within the genus *Lepidochelys.*

Mississippi and Alabama waters alone. A total of 525 sea turtle strandings were reported in 2011 from Louisiana, Mississippi, and Alabama waters, with the majority (455) having occurred from March through July, 390 (86%) of which were Kemp's ridley sea turtles. During 2012, a total of 384 sea turtles were reported from Louisiana, Mississippi, and Alabama waters. Of these reported strandings, 343 (89%) were Kemp's ridley sea turtles. During 2014, a total of 285 sea turtles were reported from Louisiana, Mississippi, and Alabama waters, though the data is incomplete. Of these reported strandings, 229 (80%) were Kemp's ridley sea turtles. These stranding numbers are significantly greater than reported in past years; Louisiana, Mississippi, and Alabama waters reported 42 and 73 sea turtle strandings for 2008 and 2009, respectively. It should be noted that stranding coverage has increased considerably due to the DWH oil spill event.

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

In response to these strandings, and due to speculation that fishery interactions may be the cause, fishery observer effort was shifted to evaluate the inshore skimmer trawl fishery during the summer of 2012. During May-July of that year, observers reported 24 sea turtle interactions in the skimmer trawl fishery. All but a single sea turtle were identified as Kemp's ridleys (1 sea turtle was an unidentified hardshell turtle). Encountered sea turtles were all very small juvenile specimens, ranging from 7.6-19.0 in (19.4-48.3 cm) curved carapace length (CCL). All sea turtles were released alive. The small average size of encountered Kemp's ridleys introduces a potential conservation issue, as over 50% of these reported sea turtles could potentially pass through the maximum 4-in bar spacing of TEDs currently required in the shrimp fishery. Due to this issue, a proposed 2012 rule to require TEDs in the skimmer trawl fishery (77 FR 27411) was not implemented. Based on anecdotal information, these interactions were a relatively new issue for the inshore skimmer trawl fishery. Given the nesting trends and habitat utilization of Kemp's ridley sea turtles, it is likely that fishery interactions in the Northern Gulf of Mexico may continue to be an issue of concern for the species, and one that may potentially slow the rate of recovery for Kemp's ridley sea turtles.

While oil spill impacts are discussed generally for all species in Section 3.3, specific impacts of the DWH oil spill event on Kemp's ridley sea turtles are considered here. Kemp's ridleys experienced the greatest negative impact stemming from the DWH oil spill event of any sea turtle species. Impacts to Kemp's ridley sea turtles occurred to offshore small juveniles, as well as large juveniles and adults. Loss of hatchling production resulting from injury to adult turtles was also estimated for this species. Injuries to adult turtles of other species, such as loggerheads, certainly would have resulted in unrealized nests and hatchlings to those species as well. Yet, the calculation of unrealized nests and hatchlings was limited to Kemp's ridleys for several reasons. All Kemp's ridleys in the Gulf belong to the same population (NMFS et al. 2011), so total population abundance could be calculated based on numbers of hatchlings because all individuals that enter the population could reasonably be expected to inhabit the northern Gulf of Mexico throughout their lives (DWH Trustees 2015).

A total of 217,000 small juvenile Kemp's ridleys (51.5% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. That means approximately half of all small juvenile Kemp's ridleys from the total population estimate of 430,000 oceanic small juveniles were exposed to oil. Furthermore, a large number of small juveniles were removed from the population, as up to 90,300 small juveniles Kemp's ridleys are estimated to have died as a direct result of the exposure. Therefore, as much as 20% of the small oceanic juveniles of this species were killed during that year. Impacts to large juveniles (>3 years old) and adults were also high. An estimated 21,990 such individuals were exposed to oil (about 22% of the total estimated population for those age classes); of those, 3,110 mortalities were estimated (or 3% of the population for those age classes). The loss of near-reproductive and reproductive-stage females would have contributed to some extent to the decline in total nesting abundance observed between 2011 and 2014. The estimated number of unrealized Kemp's ridley nests is between 1,300 and 2,000, which translates to between approximately 65,000 and 95,000 unrealized hatchlings (DWH Trustees 2015). This is a minimum estimate, however, because the sublethal effects of the DWH oil spill event on turtles, their prey, and their habitats might have delayed or reduced reproduction in subsequent years, which may have contributed substantially to additional nesting deficits observed following the DWH oil spill event. These sublethal effects could have slowed growth and maturation rates, increased remigration intervals, and decreased clutch frequency (number of nests per female per nesting season). The nature of the DWH oil spill event effects on reduced Kemp's ridley nesting abundance and associated hatchling production after 2010 requires further evaluation. It is clear that the DWH oil spill event resulted in large losses to the Kemp's ridley population across various age classes, and likely had an important population-level effect on the species. Still, we do not have a clear understanding of those impacts on the population trajectory for the species into the future.

4 ENVIRONMENTAL BASELINE

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

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

Focusing on the impacts of the activities in the action areas specifically allows us to assess the prior experience and state (or condition) of the endangered and threatened individuals. In addition, we can focus on areas of designated critical habitat that occur in an action area that may be exposed to effects from the actions under consultation. This consideration is important because in some states or life history stages, or areas of their ranges, listed individuals or critical habitat features will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be in other states, stages, or areas within their distributions. These localized stress responses or stressed baseline conditions may increase the severity of the adverse effects expected from the proposed actions.

4.1 Status of Sea Turtles within the Action Areas

Based on the information discussed above, and their habitat and eating preferences, loggerhead, green, and Kemp's ridley sea turtles may be located in the action areas and be affected by the proposed recreational fishing activities. All of these species are migratory, traveling for foraging or reproduction purposes. The inshore waters of Mobile and Baldwin Counties may be used by these sea turtles as post-hatchling developmental habitat or foraging habitat. NMFS believes that no individual sea turtles are likely to be permanent residents of the inshore waters in these areas, although some individuals may be present at any given time. These same individuals will migrate into offshore waters, as well as other areas of the Gulf of Mexico, Caribbean Sea, and North Atlantic Ocean at certain times of the year, and thus may be impacted by activities occurring in these areas; therefore, threats to turtles in the action area are considered to include those discussed above in Section 3. All 3 species are known to nest on the Gulf-facing beaches of Mobile and Baldwin Counties although green sea turtle nesting in this area is extremely rare, with just a single confirmed nest documented in 2012. Loggerheads are by far the most abundant nesters in these counties, creating dozens of nests along these beaches each year. Kemp's ridley sea turtles are only occasional nesters in these counties, generally producing only a few nests per year (http://www.alabamaseaturtles.com/nesting-season-statistics/).

4.2 Factors Affecting the Species and Environment within the Action Area

Federal Actions

A search of NMFS records, found no projects directly in the action areas that have undergone Section 7 consultation. However, periodic dredging of the boating channels around the project sites may occur and could affect sea turtles through increased turbidity, temporary avoidance of active dredging zones, and potential direct impacts from dredging equipment (depending on the type of equipment used).

State or Private Actions

Recreational boating and fishing as regulated by the state of Alabama can affect sea turtles or their habitats within the action areas. Recreational boating in the shallow waters of the action areas can damage sea grass beds, increase turbidity, and directly impact sea turtles through vessel strikes. Recreational fishing can threaten sea turtles via incidental hooking and entanglement either by actively fished lines, discarded, remnant, or broken-off fishing lines, and/or other debris. Pressure from recreational boating and fishing around the action area is likely to continue at levels that are difficult to quantify.

Other Potential Sources of Impacts in the Environmental Baseline

Stochastic events

Stochastic (i.e., random) events, such as hurricanes and cold snaps, occur in Alabama and can affect the action areas. These events are by nature unpredictable, and their effect on the recovery of the species is unquantifiable. Stochastic events have the potential to impede recovery if animals are injured or killed as a direct result of the event, or if important habitats are damaged.

Marine Pollution and Environmental Contamination

Coastal runoff, dredging, and contaminant spills can degrade nearshore habitats used by sea turtles (Colburn et al. 1996). Public and private facilities such as marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. While concentrations of these types of contaminants may vary within the action area, only one of the 3 water bodies that make up the action areas (the Fort Morgan site on Bon Secour Bay) is listed as a 303d impaired waterbody for contaminants (pathogens such as Enterococcus).

The Gulf of Mexico is an area of high-density offshore oil extraction with chronic, low-level spills and occasional massive spills (such as the DWH oil spill in 2010, the Ixtoc I oil well blowout and fire in the Bay of Campeche in 1979, and the explosion and destruction of the loaded supertanker, the Mega Borg, near Galveston in 1990). When large quantities of oil enter a body of water, chronic effects such as cancer, and direct mortality of wildlife becomes more likely (Lutcavage et al. 1997).

The accumulation of organic contaminants and trace metals has been studied in loggerhead, green, and leatherback sea turtles (Aguirre et al. 1994; Caurant et al. 1999; Corsolini et al. 2000) (McKenzie et al. 1999). Omnivorous loggerhead sea turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles (Storelli et al. 2008). It is thought that dietary preferences were likely to be the main differentiating factor among species. Sakai et al. (1995) found the presence of metal residues occurring in loggerhead sea turtle organs and eggs. Storelli et al. (1998) analyzed tissues from 12 loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that characteristically, mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals, and porpoises (Law et al. 1991b). No information on detrimental threshold concentrations is available, and little is known about the consequences of exposure of organochlorine compounds to sea turtles. Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles.

Conservation and Recovery Actions Shaping the Environmental Baseline

As discussed in Section 3, NMFS and cooperating states have established an extensive network of STSSN participants along the Atlantic and Gulf of Mexico coasts that not only collect data on dead sea turtles, but also rescue and rehabilitate stranded and injured sea turtles. A recent initiative funded under the DWH Early Restoration Program is designed to increase the survival of sea turtles throughout the Gulf of Mexico. This program includes several elements such as the enhancement of the STSSN through the development of a Sea Turtle Emergency Response

Program, and the reduction of shrimp trawl bycatch of sea turtles through the expansion of NOAA's shrimp trawler observer program and the turtle excluder device monitoring program.

5. EFFECTS OF THE ACTION ON SEA TURTLES

5.1 Effects on Sea Turtles from Recreational Fishing at the Proposed Fishing Piers

Sea turtles may be adversely affected by recreational fishing activity through incidental hooking or entanglement in actively fished or discarded fishing line. Sea turtles have historically been captured in both recreational and commercial fisheries and are known to become entangled in fishing debris. Most sea turtle captures on rod-and-reel, as reported to the STSSN, have occurred during pier fishing. Fishing piers are suspected to attract sea turtles that learn to forage there for discarded bait and fish carcasses. Sea turtles are particularly prone to entanglement as a result of their body morphologies and behaviors. Records of stranded or entangled sea turtles reveal that fishing line can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. If an individual sea turtle is entangled when young, the fishing line can become tighter and more constricting as the individual grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage.

In this section, we will estimate the number and species of sea turtles anticipated to be captured at the proposed Fort Morgan and Dauphin Island Eco-Tourism (the proposed Laguna Cove Little Lagoon Natural Resource Protection Project was determined to be not likely to adversely affect ESA-listed species) fishing piers and the ultimate fate of those individuals based on available data from research and angler surveys conducted on recreational fishing piers in Mississippi.

5.1.1 Estimated Reporting of Hook-and-Line Captures at Fishing Piers

In 2013, NMFS conducted a fishing pier survey in Mississippi that interviewed 382 anglers. This survey indicated that approximately 60% of anglers that had captured a sea turtle actually reported it. Many anglers indicated they were unaware of the requirements to report a captured sea turtle (Cook et al. 2014). Interestingly, Cook et al. (2014) report that, following the survey, an increase in the number of sea turtle incidental captures reported was noted. Regardless, the study indicates that 40% of incidental captures are likely going unreported. It is important to note that in 2012 educational signs, similar to those that will be posted on the proposed new piers, were installed at all fishing piers in Mississippi alerting anglers to report accidental hook-and-line captures of sea turtles. After the signs were installed, there was a dramatic increase in the number of reported sea turtle captures. While there were only 24 reported hook-and-line captures in 2011, the number of reported captures at fishing piers in Mississippi in 2012 rose to 198. This number continued to rise with a total of 299 reported captures in 2014 and 250 reported captures in 2015. Though this increase in reported captures may not solely be related to outreach efforts, it does highlight the importance of educational signs on fishing piers.

5.1.2 Estimating Sea Turtle Take

There have been no large-scale angler surveys or other published research analyzing sea turtle interactions with pier anglers in Alabama. We therefore believe that the best available information for estimating the level of interactions and the likely reporting rate for the proposed new piers is the Mississippi fishing pier research discussed above. Both the Mississippi piers and the proposed 2 piers are located along the northern Gulf Coast and similar signage will be posted on the piers, instructing anglers on the importance of reporting sea turtle interactions. For the proposed actions, we will use the data set from the Mississippi fishing piers to estimate potential future takes and the likely level of reporting of those takes.

The number of interactions in any given year can be influenced by sea temperatures, species abundances, fluctuating salinity levels in estuarine habitats where piers may be located, and other factors that cannot be predicted. Thus, we believe basing our future incidental take limits on a 1-year estimated take level is largely impractical. Based on our experience monitoring protected species interactions with other fishing activities, we believe a 3-year time period is appropriate for meaningful monitoring. The triennial takes are set as 3-year running sums (total for any consecutive 3-year period) and not for static 3-year periods (i.e., 2017-2019, 2018-2020, 2019-2021 and so on, as opposed to 2017-2019, 2020-2022). This approach reduces the likelihood reinitiation of ESA consultation will be required unnecessarily because of inherent variability in take levels, while still allowing for an accurate assessment of how the proposed action is performing versus our expectations.

Now we incorporate the data from the Mississippi research to estimate future captures at the proposed fishing piers. Cook et al (2016) reported a total of 1,041 sea turtles were reported taken by hook-and-line across 48 public fishing piers throughout coastal Mississippi over a 6-year period from 2010-2015. This equates to an average of 21.7 reported turtle captures per pier (1,041 ÷ 48 = 21.7), and 3.6 reported turtle captures per pier, per year (21.7 ÷ 6 = 3.6).

Based on the angler survey data, we will assume that 40% of sea turtle captures were not reported, as per the findings in Cook et al (2014). To determine the number of unreported sea turtle captures (X) we use the equation:

Reported captures ÷ 60% = unreported captures ÷ 40%
$3.6 \div 0.60 = X \div 0.40$
$1.44 = 0.60X$
$X = 2.4$

Therefore, the average annual sea turtle captures estimated to occur from the 2 proposed new public fishing piers is 6 turtles per pier (3.6 reported plus 2.4 unreported). Expanding this estimate over a 3-year running average, we would expect 18 (6 x 3 = 18) sea turtles to be taken at each pier over any consecutive 3-year period.

5.1.3 Effects of Hook-and-Line Captures of Sea Turtles

Hook-and-line gear commonly used by recreational anglers fishing from piers can adversely affect sea turtles via entanglement, hooking, and trailing line. Sea turtles released alive may later succumb to injuries sustained at the time of capture or from exacerbated trauma from fishing hooks or lines that were ingested, entangled, or otherwise still attached when they were released. Of the sea turtles hooked or entangled that do not die from their wounds, some may suffer impaired swimming or foraging abilities, altered migratory behavior, and altered breeding or reproductive patterns.

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

Entanglement

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

Hooking

In addition to being entangled in hook-and-line gear, sea turtles are also injured and killed by being hooked. Hooking can occur as a result of a variety of scenarios, some depend on the foraging strategies and diving and swimming behavior of the various species of sea turtles. Sea turtles are either hooked externally in the flippers, head, shoulders, armpits, or beak, or internally inside the mouth or further down the digestive track when the animal has swallowed the hook (Balazs et al. 1995). Observer data (specific to commercial fishing) indicate that internal hooking is the most common form of angling impact in hardshell sea turtles, especially loggerheads (NMFS unpublished data). Almost all interactions with loggerheads result from the turtle taking the bait and hook; only a very small percentage of loggerheads are foul-hooked externally or entangled.

Swallowed hooks are of the greatest concern. A sea turtle's esophagus (throat) is lined with strong conical papillae directed towards the stomach (White 1994). The presence of these papillae in combination with an S-shaped bend in the esophagus make it difficult to see hooks when looking through a sea turtle's mouth, especially if the hooks have been deeply ingested. Because of a sea turtle's digestive structure, deeply ingested hooks are also very difficult to remove without seriously injuring the turtle. A sea turtle's esophagus is also firmly attached to underlying tissue; thus, if a sea turtle swallows a hook and tries to free itself or is hauled on board a vessel, the hook can pierce the sea turtle's esophagus or stomach and can pull organs from its connective tissue. These injuries can cause the sea turtle to bleed internally or can result in infections, both of which can kill the sea turtle.

If a hook does not lodge into, or pierce, a sea turtle's digestive organs, it can pass through the digestive system entirely (Aguilar et al. 1995; Balazs et al. 1995) with little damage (Work 2000). For example, a study of loggerheads deeply hooked by the Spanish Mediterranean pelagic longline fleet found ingested hooks could be expelled after 53 to 285 days (average 118 days) (Aguilar et al. 1995). If a hook passes through a sea turtle's digestive tract without getting lodged, the hook probably has not harmed the turtle.

Trailing Line

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

5.1.4 Estimating Injury and Post-Release Mortality Rates for Anticipated Future Takes

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

The preferred method to release a hooked sea turtle safely is to lead it into the beach/shore and de-hooked/disentangle it there and release it immediately. If that cannot be accomplished, the next preferred technique is to cut the line as close as possible to the sea turtle's mouth or hooking site, rather than attempt to pull the sea turtle up onto the pier. Some incidentally captured sea turtles are likely to break free on their own and escape with embedded/ingested hooks and/or trailing line. Because of considerations such as current, pier height, and the weight and size of the hooked/entangled sea turtle, some will not be able to be de-hooked, and will be broken off or cut free by anglers. These sea turtles will likely have embedded or swallowed hooks, and/or trailing varying amounts of fishing line which may cause post-release injury or death.

In January 2004, NMFS convened a workshop of experts to develop criteria for estimating PRM of sea turtles caught in the pelagic longline fishery. In 2006, those criteria were revised and finalized (Ryder et al. 2006). In February 2012, the SEFSC updated the 2006 criteria by adding 3 additional hooking scenarios (Table 3). Overall mortality ratios are dependent upon the type of interaction (i.e., hooking, entanglement), the location of hooking if applicable (i.e., hooked externally, hooked in the mouth), and the amount/type of gear remaining on the animal at the time of release (i.e., hook remaining, amount of line remaining, entangled or not). Therefore, the experience, ability, and willingness of anglers to remove the gear, and the availability of gear-removal equipment, are very important factors that influence PRM. The new criteria also take into account differences in PRM between hardshell sea turtles and leatherback sea turtles, with slightly higher rates of PRM assigned to leatherbacks. While no specific analysis of PRM related to recreational hook-and-line gear are currently available, we believe that the commercial fishery information is a reasonable surrogate for recreational fishing as both techniques use similar gear (baited hooks attached to monofilament lines).

Table 3. Criteria for Assessing PRM, With Mortality Rates Shown as Percentages for Hardshell Sea Turtles (NMFS and SEFSC 2012)

Injury Category		Release Condition			
		(A) Released entangled (line is trailing or not trailing, turtle is entangled[9])	(B) Released with hook and with trailing line greater than or equal to half the length of the carapace (line is trailing, turtle is not entangled)	(C) Released with hook and with trailing line less than half the length of the carapace (line is trailing, turtle is not entangled)	(D) Released with all gear removed
I	Hooked externally with or without entanglement	55%	20%	10%	5%
II	Hooked in upper or lower jaw with or without entanglement—includes ramphotheca, but not any other jaw/mouth tissue parts (see Category III)	65%	30%	20%	10%
III	Hooked in cervical esophagus, glottis, jaw joint, soft palate, tongue, and/or other jaw/mouth tissue parts not categorized elsewhere, with or without entanglement—includes all events where the insertion point of the hook is visible when viewed through the mouth.	75%	45%	35%	25%
IV	Hooked in esophagus at or below level of the heart with or without entanglement—includes all events where the insertion point of the hook is not visible when viewed through the mouth	85%	60%	50%	75%[10]
V	Entangled only, no hook involved	Released Entangled 50%	n/a		Fully Disentangled 1%
VI	Comatose/resuscitated	n/a[11]		70%	60%

To estimate the expected release conditions of turtles captured at the proposed fishing piers, we consider the size and elevation of the piers. Given the relatively large size and high elevation off the water of the proposed piers (approximately 8 ft above the mean high water line), it is reasonable to conclude that anglers will not be able to remove the hook from turtles or even cut

9 Length of line, as well as the presence or absence of the hook, is not relevant as turtle remains entangled at release.
10 Although per veterinary recommendations, hooks would not be removed if the insertion point of the hook is not visible when viewed through the open mouth, this has occurred and must be accounted for. We have interpolated the table's value to insert a value for this cell base on veterinary and expert opinion. Also, there are times when the hook location is unknown, but the hook-and-line are retrieved. Because these are coded in this row, we must also allow for the removal of all gear.
11 Assumes that the resuscitated turtle will always have the line cut to a length less than half the length of the carapace, even if the hook remains. Assumes that the turtle is not released entangled in the remaining line.

the line close to the hook. Therefore, turtles are assumed to be released with trailing line longer than half the length of the carapace (Release Condition B in Table 3). We believe that Release Condition A will be rare as pier anglers will be using single lines with single baited hooks which are much less likely to result in entanglement of sea turtles than the multi-hook long-line rigs used by commercial fishermen which were analyzed in Ryder et al. (2006). It is also possible that some anglers will be able to maneuver hooked turtles into shore and remove the hook or get the turtle to a professional rehabilitation center (signs will be posted on the piers describing the preferred method of release and contact information for rescue centers); however, it is impossible to estimate what percentage of captured turtles might be de-hooked and/or rehabilitated, so to ensure a conservative estimate of post release mortality we will assume that all turtles will be released with trailing line longer than half the length of the carapace (Release Condition B in Table 3).

To estimate the likely "Injury Category" of turtles captured at the proposed fishing piers we believe the best available information that we have for the NMFS Southeast Region is reported by the Mississippi STSSN. In cooperation with the Institute of Marine Mammal Studies, the Mississippi STSSN have compiled extensive data on the hook-and-line captures of 924 sea turtles at fishing piers in Mississippi from 2010 to mid-2015 (Table 4). This data includes the location on the sea turtle's body where it was hooked. We looked at this data to determine the types of hooking injuries for sea turtles captured at fishing piers. The data provided includes 24.24% of turtle interactions that did not report the specific sea turtle hooking location. We believe that it is more accurate to estimate the future injury and PRM by only analyzing the reported hook-and-line captures that also reported the hooking location because mortality rates differ depending on the hooking location, so no mortality rate can reliably be estimated from sea turtles that do not have the hooking location reported. Using this data, we estimate that 7% of turtles hooked at fishing piers will suffer a Category I injury defined in Table 3 above, followed by 4% of turtles that will suffer a Category II injury, 85% of turtles that will suffer a Category III injury, and 4% of turtles that will suffer a Category IV injury (Table 4).

Table 4. Category of Injury from Hook-and-Line Captures at Fishing Piers in Mississippi (January 1, 2010- June 10, 2013)

All Reporting Hook-and-Line Captures	**Injury Category I**	**Injury Category II**	**Injury Category III**	**Injury Category IV**	**Unknown/ Blank/NA**	**Total - All**
Records	52	26	596	26	224	924
Percent of Total	5.63%	2.81%	64.50%	2.81%	24.24%	100.00%
Hook-and-Line Captures with hooking location reported	**Injury Category I**	**Injury Category II**	**Injury Category III**	**Injury Category IV**	**Total - Known**	
Records	52	26	596	26	700	
Percent of Total	7.43%	3.71%	85.14%	3.71%	100.00%	

Estimating Post-Release Mortality Rates for Sea Turtles Captured at the Proposed Piers

To estimate the PRM of turtles taken at the proposed piers we use the Injury Categories calculated in Table 3 along with the PRMs for Category B Release Condition shown in Table 4 to calculate the weighted mortality rate expected for each injury category. We then sum the weighted mortality rates across all injury categories to determine the overall PRM Rate for these turtles (Table 5). For example, we anticipate 7% of captures are likely to result in Category I injuries, and 20% of those animals are likely to die as a result of that injury. Therefore, we expect 1.4% of captured turtles (7% x 20%) would suffer PRM as a result of a Category I injury. By following this same approach for each injury category and its corresponding mortality rate, we establish the weighted mortality rates. By summing the weighted mortality rates we can estimate the overall mortality rate for all future turtles captured from the piers (Table 5). This overall rate helps us account for the varying severity of future injuries and varying PRM rates associated with these injuries.

Table 5. Estimated Overall PRM Rate for Turtles Taken at the Piers

Injury Category	**Percentage of Total Captures in Each Injury Category from Table 4**	**PRM Rate per Category B from Table 3**	**Weighted Mortality Rate**
I	7%	20%	1.4%
II	4%	30%	1.2%
III	85%	45%	38.3%
IV	4%	60%	2.4%
Overall Post-Release Mortality Rate			**43.3%***
*Overall mortality rate = Percent of Total Captures in Each Injury Category x PRM Rate per Category = Weighted Mortality; Weighted Mortality Rate for Injury Category I + Weighted Mortality Rate for Injury Category II + Weighted Mortality Rate for Injury Category III + Weighted Mortality Rate for Injury Category IV = Overall mortality rate.			

When this mortality rate (43.3% from Table 5) is applied to the estimated number of captures across both piers over a 3-year period (18 turtles per pier per 3 year period x 2 piers = 36 turtles), we can predict that approximately 15.6 turtles are expected to die as a result of the proposed action (36 * 43.3% = 15.6) every 3 years (on average; Table 6).

Again, this is a conservative estimate because we are assuming that none of the turtles that are hooked or entangled at the new piers will be landed and de-hooked or sent to a rehabilitation facility (assumed release condition B in Table 3). The hope is that the educational signage on the piers will encourage anglers to maneuver hooked turtles in to shore (especially smaller turtles that can be controlled with average angling gear) where they can be dehooked and released or brought to rehab centers. However, because we have no way of estimating the number or species of turtles that might be de-hooked/rehabilitated, we will use the conservative assumption that all turtles will be broken off, and have the hook and line attached upon release (release condition B in Table 3) as a worst case scenario for estimating potential effects.

Estimated Captures and Mortality by Species
Data from the STSSN for 2007-2016 show that all reported incidental takes of sea turtles by hook-and-line fishing in Alabama were for Kemp's ridley, loggerhead and green sea turtles. During this 10 year period, 20 turtles (16 Kemp's ridley, 3 loggerhead, and 1 green sea turtle) were reported taken by hook-and-line fishing in the state. Therefore, we will assume the same species composition for future captures at the 2 new fishing piers; 80% Kemp's ridley sea turtles, 15% loggerhead sea turtles, and 5% green sea turtles.

Table 6. Estimated Take (Lethal and Non-Lethal) by Species for a 3-Year Period

Turtle Species	Estimated Percent of all Turtles Captured	Estimated Total Captures Over any 3-Year Period by Species (36 total turtles x percent capture)	Estimated Captures Leading to Mortality (estimated capture x 43.3% estimated mortality)	Estimated Total Captures Leading to Mortality (Rounded up to be conservative)	Estimated Total Non-Lethal Captures (Total from Column 3 – Total from Column 5; rounded up to be conservative)
Kemp's ridley	80%	36 x 0.8 = 28.8	28.8 x 0.433 = 12.47	13	16
Loggerhead	15%	36 x 0.15 = 5.4	5.4 x 0.433 = 2.34	3	3
Green*	5%	36 x 0.05 = 1.8	1.8 x 0.433 = 0.78	1	1
Total	100%	36	15.6	17	20

*Representation of the 2 DPSs in the expected take is discussed in the jeopardy analysis

6. CUMULATIVE EFFECTS

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

Cumulative effects from unrelated, non-federal actions occurring in the action areas may affect sea turtles and their habitats. Stranding data indicate sea turtles that may utilize the action areas die of various natural causes, including cold stunning and hurricanes, as well as human activities, such as incidental capture in fisheries, ingestion of and/or entanglement in debris, vessel strikes, oil spills, and degradation of nesting habitat. The cause of death of most sea turtles recovered by the stranding network is unknown.

Within the action areas, major future changes are not anticipated in the ongoing human activities described in the environmental baseline. Recreational boating, maintenance dredging and other human-caused effects on the action area are expected to continue at the present levels of intensity in the foreseeable future, and we did not identify any new state, tribal, local or private actions that are reasonably certain to occur in the action area that could contribute to cumulative effects.

7. JEOPARDY ANALYSIS

The analyses conducted in the previous sections of this Opinion provide a basis to determine whether the proposed action is likely to jeopardize the continued existence of Kemp's ridley, NA or SA DPS of green, or NWA DPS of loggerhead sea turtles, by identifying the nature and extent of adverse effects expected to impact each species. Next we consider how these species will be impacted by the proposed action in terms of overall population effects and whether those effects of the proposed action will jeopardize the continued existence of the species when considered in the context of the status of the species and their habitat (Section 3), the environmental baseline (Section 4), and cumulative effects (Section 6).

To jeopardize the continued existence of a species 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 these species. The analysis next considers whether any such reduction would in turn result in an appreciable reduction in the likelihood of survival of these species in the wild, and the likelihood of recovery of these species in the wild.

The NMFS and USFWS's ESA Section 7 Handbook (USFWS and NMFS 1998) defines survival and recovery, as they apply to the ESA's jeopardy standard. Survival means "the species' persistence… beyond the conditions leading to its endangerment, with sufficient resilience to allow recovery from endangerment." Survival is the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a sufficiently large population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter. Recovery means "improvement in the status of a listed species to the point at which listing is no longer appropriate under the criteria set out in Section 4(a)(1) of the Act." Recovery is the process by which species' ecosystems are restored and/or threats to the species are removed so self-sustaining and self-regulating populations of listed species can be supported as persistent members of native biotic communities. To determine the impacts of the action on the affected species' likelihood of recovery, we evaluate whether the action will appreciably interfere with achieving recovery objectives in the wild.

All life stages are important to the survival and recovery of a species; however, it is important to note that individuals of one life stage are not equivalent to those of other life stages. For example, the take of male juveniles may affect survivorship and recruitment rates into the reproductive population in any given year, and yet not significantly reduce the reproductive potential of the population. Yet, the death of mature, breeding females can have an immediate effect on the reproductive potential of a species. Sublethal effects on adult females may also reduce reproduction if, for example, foraging success is impacted, thus reducing energy reserves to the point that the female is unable to produce multiple clutches of eggs in a breeding year. Different age classes may be subject to relative rates of mortality, resilience, and overall effects of population dynamics. Ontogenetic shifts, or changes in location and habitat, have a major impact on where sea turtles occur and what human hazards they may encounter. Young juvenile sea turtles are generally not subject to hook-and-line capture because of their pelagic oceanic stage of life. Still, a shift in diet for all sea turtles occurs when juvenile sea turtles shift to a neritic habitat and benthic feeding, at which time they would become more susceptible to fishing impacts. For the proposed actions, we would not expect early juvenile stage sea turtles of any of these species to be subject to take from any aspect of pier construction or continued use of the piers. However, later stage juveniles and adults of these species are more likely to be subject to incidental take as a result of foraging in the areas of increased fishing activity which would occur as a result of the proposed action.

7.1 NWA DPS of Loggerhead Sea Turtles

The proposed actions are anticipated to result in the capture of approximately 6 loggerhead sea turtles every 3 years (on average) due to fishing activities or entanglement in fishing gear associated with the proposed piers, of which 3 captures are expected to result in mortality (with the other 3 expected to survive the interaction; Table 6). With regard to those turtles expected to survive the interactions, injuries resulting from nonlethal takes have the potential to cause impacts to the reproductive potential, fitness, or growth of the captured sea turtles, depending on the nature and severity of the injury. We expect these impacts to be temporary, as turtles with non-fatal injuries will eventually recover and resume normal feeding and reproductive activities. For example, a mature female that is severely, but not fatally injured may be forced to forego nesting activities that year, but eventually an ingested hook would decompose or pass, wounds would heal, and the turtle would be able to resume normal feeding and reproductive activities. This example would represent a potential reduction in reproduction for a single female for 1 year.

The potential lethal take of 3 turtles every 3 years (on average) represents a reduction in numbers, and may also result in an additional reduction in reproduction as a result of lost reproductive potential, if any of the individuals are females who would have survived other threats and reproduced in the future. For example, an adult female loggerhead sea turtle can lay 3 or 4 clutches of eggs every 2-4 years, with 100-130 eggs per clutch. The loss of an adult female sea turtle could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity.

With regard to the potential for the effects of the proposed action to cause a reduction in the distribution of loggerhead sea turtles, this is an extremely wide ranging DPS with numerous, well established nesting beaches, each of which generally sees dozens if not hundreds of females nesting each year. Therefore, the small mortality rate expected to result from the proposed action is not expected to reduce the distribution of this DPS.

Whether the mortality of 3 loggerhead sea turtles every 3 years (on average) would appreciably reduce the likelihood of survival for the DPS depends on what effect this reduction in numbers and potentially reproduction would have on overall population sizes and trends, i.e., whether the estimated reduction, when viewed within the context of the current status of the species, environmental baseline and cumulative effects, is of such magnitude that adverse effects on population dynamics are appreciable. In Section 3.4, we reviewed the status of the species in terms of nesting and female population trends and several recent assessments based on population modeling (e.g., (Conant et al. 2009b; NMFS-SEFSC 2009b). Below, we synthesize what that information means in general terms and also in the more specific context of the proposed action.

Loggerhead sea turtles are a slow growing, late-maturing species. Because of these traits, 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. (2009b) concluded because loggerhead natural growth rates are low, natural survival needs to be high, and even low to moderate mortality can drive the population into decline. Because recruitment to the adult population is slow, population modeling studies suggest even small increases in mortality rates in adults and subadults could substantially impact population numbers and viability over the long term (Chaloupka and Musick 1997b; Crouse et al. 1987; Crowder et al. 1994; Heppell et al. 1995).

NOAA's SEFSC (2009) estimates the adult female population size for the NWA DPS is likely between 20,000 and 40,000 individuals, with a low likelihood of being up to 70,000 individuals. A more recent conservative 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 nearly 1 million. Further insight into the numbers of loggerhead sea turtles along the U.S. coast is available in NMFS-NEFSC (2011), which reported a conservative estimate of 588,000 juvenile and adult loggerhead sea turtles present on the continental shelf from the mouth of the Gulf of St. Lawrence to Cape Canaveral, Florida, when using only positively identified loggerhead sightings from an aerial survey. A less conservative analysis from the same study resulted in an estimate of 801,000 loggerheads in the same geographic area when a proportion of the unidentified hardshell turtles were categorized as loggerheads. This study did not include Florida's east coast south of Cape Canaveral or the Gulf of Mexico, which are areas where large numbers of loggerheads occur.

A detailed analysis of Florida's long-term loggerhead nesting data (1989-2016) revealed 3 distinct annual trends (Figure 5). From 1989-1998 there was a 30% increase that was then followed by a sharp decline over the subsequent decade. Large increases in loggerhead nesting have occurred since then. FWRI examined the trend from the 1998 nesting high through 2013 and found the decade-long post-1998 decline had reversed and there was no longer a demonstrable trend. Looking at the data from 1989 through 2016 (an increase of nearly 60%), FWRI concluded that there was an overall positive change in the nest counts (http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/).

We believe that the incidental take and resulting mortality of loggerhead sea turtles associated with the proposed action are not reasonably expected to cause an appreciable reduction in the likelihood of survival of the NWA DPS of loggerhead sea turtles. Surveys show the current population is comparatively large (i.e., several hundred thousand individuals) and is showing encouraging signs of stabilizing and possibly increasing. Nesting surveys, in-water surveys and hatchling survival rates indicate that the DPS is represented by a broad range of age classes, supports genetic heterogeneity, and a large number of sexually mature individuals producing viable offspring (NMFS-NEFSC 2011; Ehrhart et al. 2007). The expected take of 2 loggerhead sea turtles per year, resulting in one mortality per year (on average) is not a large enough effect to cause this robust and wide spread DPS of hundreds of thousands of individuals to lose genetic heterogeneity, broad demographic representation, or long-term successful reproduction.

The Services' recovery plan for the NWA population of the loggerhead sea turtle (NMFS and USFWS 2008) which is the same population of sea turtles as the NWA DPS, anticipates that, with implementation of the plan, the western North Atlantic population will recover within 50-150 years, but notes that reaching recovery in only 50 years would require a rapid reversal of the then declining trends of the Northern, Peninsular Florida, and Northern Gulf of Mexico Recovery Units. The recovery plan provides additional explanation of the goals and vision for recovery for this population. The recovery objectives most pertinent to the threats posed by the proposed action are Numbers 1 and 2 (listed below):

1. Ensure that the number of nests in each recovery unit are increasing and that this increase corresponds to an increase in the number of nesting females.

2. 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 Objective 1, "Ensure that the number of nests in each recovery unit is increasing…," is the plan's overarching objective and has associated demographic criteria. Currently, none of the plan's criteria are being met, but the plan acknowledges that it will take 50-150 years to do so. Further reduction of multiple threats throughout the North Atlantic, Gulf of Mexico, and Greater Caribbean will be needed for strong, positive population growth, following implementation of more of the plan's actions. While impacts that result in significant ongoing mortality can affect the potential for population growth, we believe the predicted ongoing loss of just 3 loggerhead sea turtles every 3 years (on average) as a result of the proposed action will not impede or prevent achieving this recovery objective. The NWA DPS of loggerhead sea turtles is thought to be recovering with a modest increasing population trend and the relatively minor impacts expected to result from the proposed action will not impede this recovery. The loss of 3 loggerhead sea turtles every 3 years would not have an appreciable adverse effect on population dynamics of the NWA DPS because the potential reproductive loss would be so small in comparison to the overall DPS reproductive capacity. Further, as discussed in Section 3.4, there has been a 74% increase in nesting between 2008 and 2015 in Florida that suggests an overall increase of thousands of nesting females during that time. Even if all the mortalities resulting from the proposed action were nesting females (highly unlikely), the potential loss of 3 nesting females every 3 years would not cause an appreciable effect on the number of nesting females for the NWA DPS of loggerheads. This potential loss of nesting females would not have a discernable impact when compared to the recent upward trend in nesting females with greater than 50,000 nesting females in Florida alone for 2015, for example.

Recovery Objective 2, "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." Currently, there are not enough data on the population trends of juvenile loggerhead sea turtles to determine if this objective is being met. Because of scant and spatially deficient data on in-ocean population trends of loggerhead sea turtles, the most reliable information on population trends is derived from loggerhead nesting since nests are easier to accurately identify, count, and track annually. The NWA DPS nesting trend has modestly increased since 1998 (see Section 3.4). In addition, gulf-wide efforts to monitor sea turtle nests and protect them from natural predators and human impacts are likely to be improving the numbers and survival of hatchlings reaching the ocean. These efforts, along with the documented increasing trends in nesting indicate a commensurate increase in in-water abundance of juveniles. In other words, we assume a modest increase in juvenile abundance given the increasing trend in nesting females and protection of nests and hatchlings over the past several years, discussed above. Given the conservative abundance estimate for loggerhead sea turtles along the east coast (excluding FL and the Gulf of Mexico) of 588,000 individuals (described above), and the current upward trend in these numbers, we do not believe that the loss of just 3 loggerhead sea turtles every 3 years (on average) would result in an appreciable reduction in in-water juvenile abundance.

Recovery is the process of removing threats so self-sustaining populations persist in the wild. The effects of the proposed action would not appreciably impede progress on achieving the identified relevant recovery objectives or achieving the overall recovery strategy. The nonlethal takes of loggerhead sea turtles as discussed in this opinion would not affect population numbers or long-term reproductive success. Thus, the proposed actions are not expected to impede the recovery objectives above and will not result in an appreciable reduction in the likelihood of the NWA DPS of loggerhead sea turtles' recovery in the wild.

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

Mixed-stock analyses of foraging grounds show that green sea turtles from multiple nesting beaches commonly mix at feeding areas across the Caribbean and Gulf of Mexico, with higher contributions from nearby large nesting sites and some contribution estimated from nesting populations outside the DPS (Bass et al. 1998; Bass and Witzell 2000; Bjorndal and Bolten 2008; Bolker et al. 2007). In other words, the proportion of animals on the foraging grounds from a given nesting beach is proportional to the overall importance of that nesting beach to the entire DPS. For example, Tortuguero, Costa Rica, is by far the largest nesting beach in the NA DPS and the number of animals from that nesting beach on foraging grounds in the same area was much higher than from any other nesting beach within the NA DPS. However, in some foraging locations within the NA DPS closer to the border of the SA DPS, there may be significant mixing between the DPSs. More specifically, Lahanas et al. (1998) showed through genetic sampling that juvenile green sea turtles in The Bahamas originate mainly from the western Caribbean (Tortuguero, Costa Rica) (79.5%) (NA DPS) but that a significant proportion may be coming from the eastern Caribbean (Aves Island/Suriname; 12.9%) (SA DPS). In general, the proportion of individuals on a given foraging ground is roughly proportional to the numbers of individuals on nearby nesting beaches.

Flipper tagging studies provide additional information on the co-mingling of turtles from the NA DPS and SA DPS. Flipper tagging studies on foraging grounds and/or nesting beaches have been conducted in Bermuda (Meylan et al. 2011), Costa Rica (Troeng et al. 2005), Cuba (Moncada et al. 2006), Florida (Johnson and Ehrhart 1996; Kubis et al. 2009), Mexico (Zurita et al. 2003; Zurita et al. 1994), Panama (Meylan et al. 2011), Puerto Rico (Collazo et al. 1992; Patricio et al. 2011), and Texas (Shaver 1994; Shaver 2002). Nesters have been satellite tracked from Florida, Cuba, Cayman Islands, Mexico, and Costa Rica. Troeng et al. (2005) report that while there is some crossover of adult female nesters from the NA DPS into the SA DPS foraging grounds, particularly in the equatorial region where the DPS boundaries are in closer proximity to each other, NA DPS nesters primarily use the foraging grounds within the NA DPS.

While there are currently no in-depth studies available to determine the percent of NA and SA DPS individuals in any given location, an analysis of cold-stunned green turtles in St. Joseph Bay, Florida (northern Gulf of Mexico) found approximately 4% of individuals came from nesting stocks in the SA DPS and that the remainder were from the NA DPS (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 SA DPS (Bass and Witzell 2000). All of the individuals in both studies were benthic juveniles.

Taken together, this information suggests that the vast majority of the anticipated captures in the Gulf of Mexico are likely to come from the NA DPS. However, it is possible that animals from the SA DPS could be captured as a result of the proposed action. Since the cold-stun study of the northern Gulf of Mexico (Foley et al. 2007) represents the best available data teasing out the NA and SA DPS distribution for greens in the action area, we will assume that 96% of animals captured as a result of the proposed action will be from the NA DPS, and the remaining 4% will be from the SA DPS, per the breakdown in the study. For these reasons, we will act conservatively and conduct jeopardy analyses on the assumption that both the NA DPS and the SA DPS will be captured as a result of the proposed action but that the vast majority (96%) will be from the NA DPS.

We estimate up to 2 green sea turtles may be taken at the proposed piers over any 3-year period, 1 lethal and 1 nonlethal (Table 6). In order to represent the SA DPS in the take estimate, we will assume that 1 of those takes will be a turtle from the SA DPS. However, because of the much lower probability that green sea turtles captured will be from the SA DPS, we will assume that the take from the SA DPS will be non-lethal (discussed further below).

NA DPS

The potential lethal take of 1 green sea turtle from the NA DPS every 3 years (on average) would reduce the number of green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. If any of those turtles were to be females that would otherwise have survived to reproduce, this could result in a reduction in future reproduction. For example, a healthy green sea turtle can live for 80-100 years or more, and an adult female can lay 1-7 clutches (usually 2-3) of eggs every 2-4 years, with 110-115 eggs/nest, of which a small percentage is expected to survive to sexual maturity.

Injuries resulting from nonlethal takes have the potential to cause temporary impacts to the reproductive potential, fitness, or growth of the captured sea turtles, depending on the nature and severity of the injury. We expect these impacts to be temporary, as turtles with non-fatal injuries are likely to eventually recover and resume normal feeding and reproductive activities. For example, a mature female that is severely, but not fatally injured may be forced to forego nesting activities that year, but eventually an ingested hook would decompose or pass, wounds would heal, and the turtle would be able to resume normal feeding and reproductive activities. This example would represent a potential reduction in reproduction for a single female for 1 year.

With regard to the potential for the effects of the proposed action to cause a reduction in the distribution of NA DPS green sea turtles, this is an extremely wide ranging DPS with numerous, well established nesting beaches, each of which generally see dozens if not hundreds or even thousands of females nesting each year. Therefore, the small mortality rate expected to result from the proposed action is not expected to reduce the distribution of the NA DPS.

Whether the reduction in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. Seminoff et al. (2015) estimate there are greater than 167,000 nesting females in the NA DPS. The nesting at Tortuguero, Costa Rica, accounts for approximately 79% of that estimate (approximately 131,000 nesters), with Quintana Roo, Mexico (approximately 18,250 nesters; 11%), and Florida, USA (approximately 8,400 nesters; 5%) also accounting for a large portion of the overall nesting (Seminoff et al. 2015).

At Tortuguero, Costa Rica, the number of nests laid per year from 1999 to 2003, was approximately 104,411 nests/year, which corresponds to approximately 17,402-37,290 nesting females each year (Troëng and Rankin 2005). The number of nests laid per year increased to an estimated 180,310 nests during 2010, corresponding to 30,052-64,396 nesters. This increase occurred despite substantial human impacts to the population at the nesting beach and at foraging areas (Campell and Lagueux 2005; Troëng 1998; Troëng and Rankin 2005).

Nesting locations in Mexico along the Yucatan Peninsula also indicate the number of nests laid each year has increased (Seminoff et al. 2015). In the early 1980s, approximately 875 nests/year were deposited, but by the year 2000 this increased to over 1,500 nests/year (NMFS and USFWS 2007a). By 2012, more than 26,000 nests were counted in the Mexican state of Quintana Roo on the Yucatan Peninsula (J. Zurita, CIQROO, unpubl. data, 2013, in Seminoff et al. 2015)

In Florida, most nesting occurs along the Atlantic coast of eastern central Florida, where a mean of 5,055 nests were deposited each year from 2001 to 2005 (Meylan et al. 2006) and 10,377 each year from 2008 to 2012 (B. Witherington, Florida Fish and Wildlife Conservation Commission, pers. comm., 2013). As described in the Section 3.5, nesting has increased substantially over the last 20 years and peaked in 2015 with 27,975 nests statewide. In-water studies conducted over 24 years in the Indian River Lagoon, Florida, suggest similar increasing trends, with green sea turtle captures up 661% (Ehrhart et al. 2007). Similar in-water work at the St. Lucie Power Plant site revealed a significant increase in the annual rate of capture of immature green sea turtles over 26 years (Witherington et al. 2006).

Seminoff et al. (2015) also conducted a population viability analysis for the Tortuguero, Costa Rica, and Florida, USA nesting sites (as well as 2 others: Isla Aguada, Mexico and Guanahacabibes, Cuba).[12] The population viability analysis evaluated the probabilities of nesting populations declining to 2 separate biological thresholds after 100 years: (1) a trend-based reference point where nesting populations decline by 50% and (2) the number of total adult females falls to 300 or fewer at these sites (Seminoff et al. 2015).[13] Seminoff et al. (2015) point out that population viability analyses do not fully incorporate spatial structure or threats. They also assume all environmental and man-made pressures will remain constant in the forecast period, while also relying solely on nesting data.

The Tortuguero, Costa Rica, population viability analysis indicated a 0.7% probability that this population will fall below the 50% decline threshold at the end of 100 years, and a 0% probability that this population will fall below the absolute abundance reference point of 100 nesting females per year at the end of 100 years (Seminoff et al. 2015). For the Florida, USA, population, the population viability analysis indicated there is a 0.3% probability that this population will fall below the 50% decline threshold at the end of 100 years, and a 0% probability this population falls below the absolute abundance threshold of 100 nesting females per year at the end of 100 years (Seminoff et al. 2015).

Nesting surveys, in-water surveys and hatchling survival rates indicate that the DPS is represented by a broad range of age classes, supports genetic heterogeneity, and a large number of sexually mature individuals producing viable offspring (Musick and Limpus 1997; Seminoff et al. 2015; Ehrhart et al. 2007; Witherington et al. 2006). The potential lethal take of a single green sea turtle from the NA DPS every 3 years (on average) as a result of the proposed action will not have any measurable effect on these survival parameters. Therefore, we believe the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the NA DPS of green sea turtle in the wild.

The NA DPS of green sea turtles did not have a recovery plan in place at the time of listing. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991) does exist. Since the animals within the NA DPS all occur in the Atlantic Ocean and are 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.*

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12 Not enough information was available to conduct a population viability analysis on the Quintana Roo, Mexico, nesting population.

13 Since green sea turtles are believed to nest every 3 years, the analysis evaluated the likelihood that the population would fall to 100 or fewer nesters annually (300 adult females ÷ nesting every 3 years = 100 adult female nesters annually).

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

Given the estimated nesting abundance of over 167,000 adult females from 73 nesting sites, and the fact that all major nesting populations are experiencing long-term increases in abundance (Seminoff et al. 2015), the effects of 1 lethal take of a green sea turtle from the NA DPS every 3 years (on average) is not expected to have any detectable influence on the average annual nesting levels or the overall numbers of individuals on foraging grounds in Florida. Therefore, the proposed actions will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of the NA DPS of green sea turtles' recovery in the wild.

SA DPS

The potential nonlethal take of 1 green sea turtle from the SA DPS every 3 years (on average) is not expected to have any measurable impact on the reproduction, numbers, or distribution of this DPS. The individual suffering nonlethal injury is expected to eventually recover. If that individual happens to be a mature female, and the injury is severe enough to prevent that individual from nesting that year, this would constitute a reduction in reproduction. However, the loss of a single nesting season by a single turtle once every 3 years would not be expected to have an appreciable effect on the overall reproduction or numbers of a DPS estimated to include over 63,000 nesters across 51 identified nesting sites. The take will occur anywhere in a small, discrete action area which in turn encompasses a tiny portion of the SA DPS of green sea turtles' overall range/distribution. Since any incidentally caught animal is likely to be released within the general area where caught, and the animal is expected to survive post-release, no reduction in the distribution of SA DPS green sea turtles is expected. Therefore, the proposed actions are not expected to appreciably reduce the SA DPS of green sea turtle's likelihood of survival or recovery in the wild.

7.3 Kemp's Ridley Sea Turtles

The proposed actions are anticipated to result in the take of up to 29 Kemp's ridley sea turtles every 3 years (on average) due to fishing activities associated with the proposed piers (Table 6). Of these takes, up to 13 are expected to result in mortality. Injuries resulting from the 16 nonlethal takes have the potential to cause impacts to the reproductive potential, fitness, or growth of the captured sea turtles, depending on the nature and severity of the injury. We expect these impacts to be temporary, as turtles with non-fatal injuries are likely to eventually recover and resume normal feeding and reproductive activities. For example, a mature female that is severely, but not fatally injured may be forced to forego nesting activities that year, but eventually an ingested hook would decompose or pass, wounds would heal, and the turtle would be able to resume normal feeding and reproductive activities. This example would represent a potential reduction in reproduction for a single female for 1 year.

The potential lethal take of 13 Kemp's ridley sea turtles every 3 years (on average) would reduce the species' numbers compared to what would have been present in the absence of the proposed action, assuming all other variables remained the same. The Turtle Expert Working Group (TEWG 1998b) estimates age at maturity for Kemp's ridley sea turtles to be anywhere from 7-15 years. Females return to their nesting beach about every 2 years (TEWG 1998b). The mean clutch size for Kemp's ridleys is 100 eggs/nest, with an average of 2.5 nests/female/season. Lethal take could also result in a potential reduction in future reproduction, assuming at least 1 of these individuals would be female and would have survived to reproduce in the future. The loss of up to 13 adult female Kemp's ridley sea turtles could preclude the production of thousands of eggs and hatchlings, of which a fractional percentage would be expected to survive to sexual maturity. Thus, the death of any females would eliminate their contribution to future generations, and result in a proportionate reduction in Kemp's ridley sea turtle reproduction.

With regard to the potential for the effects of the proposed action to cause a reduction in the distribution of Kemp's ridley sea turtles, this is wide ranging species with numerous, well established nesting beaches, each of which generally see dozens if not hundreds of females nesting each year. Therefore the small mortality rate expected to result from the proposed action is not expected to reduce the distribution of Kemp's ridley sea turtles.

In the absence of any total population estimates for Kemp's ridley sea turtles, nesting trends are the best proxy we have for estimating population changes (Figure 9). Heppell et al. (2005a) predicted in a population model that the Kemp's ridley sea turtle population was expected to increase at least 12-16% per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2015. Research by NMFS et al. (2011b) included an updated model, which predicted that the population was expected to increase 19% per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2011. Approximately 25,000 nests would be needed for an estimate of 10,000 nesting females on a beach, based on an average 2.5 nests/nesting female. While counts did not reach 25,000 nests by 2012, it is clear that the population is steadily increasing over the long term. Following a significant, unexplained 1-year decline in 2010, Kemp's ridley nests in Mexico reached a record high of 21,797 in 2012 (Gladys Porter Zoo nesting database 2013). In 2013 through 2014, there was a second significant decline, with only 16,385 and 11,279 nests recorded, respectively.   In 2015 nesting again began to increase with 14,006 recorded nests, and in 2016 overall numbers reached 18,354 recorded nests (Gladys Porter Zoo 2016). Recent information indicates a record high nesting season in 2017, with 24,570 nests recorded (J. Pena, pers. comm., August 31, 2017), indicating that the number of nesting females on Mexican beaches has reached close to 10,000. A small nesting population is also emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 209 nests in 2012, and a record high of 353 nests in 2017 (National Park Service data, http://www.nps.gov/pais/naturescience/strp.htm, http://www.nps.gov/pais/naturescience/current-season.htm). It is worth noting that nesting in Texas has paralleled the trends observed in Mexico, characterized by a significant decline in 2010, followed by a second decline in 2013-2014, and a corresponding rebound from 2015 to 2017.

We believe this increasing trend in nesting numbers and locations is evidence of an increasing population, as well as a population that is maintaining (and potentially increasing) its genetic diversity. We also believe these nesting trends are indicative of a species with a significant number of sexually mature individuals. However, it is unknown whether the significant fluctuations in nesting numbers observed from 2010 through 2017 indicate a serious, reoccurring problem, or temporary setbacks in the generally increasing population trend. It is important to remember that with sea turtle species that exhibit normal inter-annual variation in nesting levels, population trends necessarily are measured over decades and the long-term trend line better reflects the population trajectory in Kemp's ridleys. The recent fluctuations may also be an indication that the trend line is changing from an asymptotic upward curve to a more leveled increase. Either way, long-term data from 1990 to present support that Kemp's ridleys are increasing in population size. Therefore, we do not believe the limited impacts anticipated from the proposed action will have a measurable effect on the overall nesting trends for Kemp's ridley sea turtles. Nor do we believe the anticipated takes will affect the future production of viable offspring to an extent that could change current population trends or genetic diversity. We therefore conclude that the proposed action will not cause an appreciable reduction in the likelihood of survival of Kemp's ridley sea turtles.

The recovery plan for the Kemp's ridley sea turtle (NMFS et al. 2011b) lists the following relevant recovery objective:

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

The recovery plan states the average number of nests per female is 2.5; it sets a recovery goal of 10,000 nesting females associated with 25,000 nests. The 2012 nesting season recorded approximately 22,000 nests and preliminary numbers from 2017 are very close to 25,000, indicating that the goal of 10,000 nesting females may have been reached. However, the steep declines experienced in 2010, 2013 and 2014, indicate that the current population levels may not be completely stable and it will take several years of additional nesting data to determine whether this goal has been fully achieved.

The lethal take of up to 13 Kemp's ridley sea turtles every 3 years (on average) as a result of the proposed actions will result in a reduction in numbers and reproduction, but it is unlikely to have any detectable influence on the nesting population trends noted above. The nonlethal takes of Kemp's ridley sea turtles as discussed in this opinion would not affect the adult female nesting population or long-term nesting levels. Thus, we believe the proposed actions will not have an appreciable effect on the recovery objective above, and will not result in an appreciable reduction in the likelihood of Kemp's ridley sea turtles' recovery in the wild.

8. CONCLUSION

We have analyzed the best available data on the current status of the species, environmental baseline, effects of the proposed action, and cumulative effects to the species and determined that the proposed action is not likely to jeopardize the continued existence of the NA DPS or the SA DPS of green sea turtles, the NWA DPS of loggerhead sea turtles, or Kemp's ridley sea turtles.

9. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 7(b)(4) and Section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, if that action is performed in compliance with the terms and conditions of this incidental take statement.

9.1 Anticipated Amount or Extent of Incidental Take

The take estimates (lethal and non-lethal captures) shown in Table 6 are our best estimates of the total amount of take expected over any consecutive 3-year period. However, as described in Section 5 above, many captures are expected to go unreported/undocumented. The take limits prescribed in this Opinion that will trigger the requirement to reinitiate consultation must be based on the amount of take that we expect to be *reported* as it will be impossible to count the incidents that go unreported. While many of the measures described below in Section 9.3 are intended to improve the reporting rate of turtle takes at the proposed new piers, the actual level of improvement that may result from these measures is unknown. Therefore, in order to ensure conservative take reinitiation triggers for the proposed project, we will base our estimate of future reported takes on the best available information, which is the research described by Cook et al. (2014). These are the estimates we will use to determine if take limits have been exceeded and reinitiation of ESA Section 7 consultation is necessary.

As described above in Section 5.1.1, Cook et al. (2014) found that approximately 60% of anglers that had captured a sea turtle actually reported the incident. We will assume that a similar reporting rate of captured sea turtles will occur at the proposed piers, and therefore 60% of captures will be reported to the local authorities at the piers and/or to the STSSN. Given this assumption, the numbers of each species expected to be reported over any consecutive 3-year period are displayed in Table 7 below. As some of these numbers come out as fractions of individual animals, we have rounded down to the nearest whole number to define a conservative level of incidental take and clearly define reinitiation triggers.

Table 7. Estimated Incidental Take Limits Based on Reported Captures by Species for Each of the 2 Piers Over Running 3-Year Periods

Species (DPS)	Total Estimated Captures Reported to the STSSN	Incidental Take Limits/Reinitiation Triggers
Kemp’s ridley	28.8 * 0.6 = 17.3	No more than 17 reported captures over any 3 consecutive years.
Loggerhead (NWA DPS)	5.4 * 0.6 = 3.2	No more than 3 reported captures over any 3 consecutive years.
Green (NA and SA DPS’)	1.8 * 0.6 = 1.1	No more than 1 reported capture over any 3 consecutive years.

9.2 Effect of the Take

NMFS has determined the anticipated incidental take specified in Section 5.1.4 is not likely to jeopardize the continued existence of sea turtles (NA DPS of green, SA DPS of green, NWA DPS of loggerhead, and Kemp's ridley).

9.3 Reasonable and Prudent Measures (RPMs)

Section 7(b)(4) of the ESA requires NMFS to issue a statement specifying the impact of any incidental take on listed species, which results from an agency action otherwise found to comply with Section 7(a)(2) of the ESA. It also states that the RPMs necessary to minimize the impacts of take and the terms and conditions to implement those measures must be provided and must be followed to minimize those impacts. Only incidental taking by the federal agency or applicant that complies with the specified terms and conditions is authorized.

The RPMs and terms and conditions are specified as required by 50 CFR 402.14 (i)(1)(ii) and (iv) to document the incidental take by the proposed action and to minimize the impact of that take on sea turtles. These measures and terms and conditions are nondiscretionary, and must be implemented by the NOAA RC or the applicants (ADCNR) in order for the protection of Section 7(o)(2) to apply. The NOAA RC has a continuing duty to regulate the activity covered by this incidental take statement. If the NOAA RC or the ADCNR fail to adhere to the terms and conditions of this Incidental Take Statement (ITS) through enforceable terms, and/or fail to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse. To monitor the impact of the incidental take, the NOAA RC or the ADCNR must report the progress of the action and its impact on the species to NMFS as specified in this ITS [50 CFR 402.14(i)(3)].

NMFS has determined that the following RPMs are necessary and appropriate to minimize impacts of the incidental take of sea turtles related to 2 of the 3 projects included in the proposed action (Dauphin Island Eco-Tourism & Environmental Education Area and Fort Morgan Pier Rehabilitation). Because the proposed Laguna Cove Little Lagoon Natural Resource Protection Project was determined to be not likely to adversely affect ESA-listed species, the following RPMs (and their implementing Terms and Conditions) are not required for this project. The associated terms and conditions are established to implement these RPMs, and to document incidental takes. Only incidental takes that occur while these measures are in full implementation are authorized. These restrictions remain valid until reinitiation and conclusion of any subsequent Section 7 consultation.

1. The NOAA RC must ensure that monofilament recycling bins and trash receptacles are installed and maintained at all fishing piers included in the proposed action.

2. The NOAA RC shall ensure that educational signs are installed and maintained at all fishing piers included in the proposed action. The signs should be placed at regular intervals along the piers where the view of these signs is unobstructed. These signs should contain information on avoiding sea turtle interactions, what to do in the event of a capture, and how to report interactions with ESA-listed species (including turtles and Gulf sturgeon) to the appropriate authorities.

3. The NOAA RC shall ensure that at least one local official (e.g., Park employees at the Fort Morgan State Historic Site, and employees of the Town of Dauphin Island near the Dauphin Island Eco-Tourism and Environmental Education Area) is "on call" during fishing pier operating hours and available to assist in the landing and handling of any turtles captured at these two piers.

4. The NOAA RC shall keep track of capture data on any sea turtles reported as captured from any of the proposed new fishing piers. The NOAA RC shall submit a report detailing the available data on any such captures at the end of each calendar year in which such a capture is reported.

5. The NOAA RC shall ensure that angler surveys are conducted at the new piers on a quarterly basis, with sea turtle encounter questions included in the surveys and supplemental educational material on sea turtle rescue and reporting distributed during these surveys. The results of these surveys shall be reported to NMFS per the terms and conditions below.

6. The NOAA RC shall ensure that annual underwater debris cleanups are conducted around the new fishing piers.

9.4 Terms and Conditions

In order to be exempt from liability for take prohibited by Section 9 of the ESA, the NOAA RC must comply with the following terms and conditions, which implement the RPMs described above. These terms and conditions are nondiscretionary.

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

1.a. The applicant has agreed to place and maintain monofilament recycling bins and trash receptacles on the fishing piers (see Section 2). To implement RPM No. 1, NOAA RC must ensure that the applicant installs and maintains both monofilament recycling bins and trash receptacles at the piers to reduce the probability of trash and debris entering the water.

2.a. The applicant stated that informational signs will be displayed and maintained on the fishing piers to educate the public on safe fishing practices that can reduce or prevent sea turtle injuries and provide information on how to report dead, injured, or entangled sea turtles (see Section 2). To implement RPM No. 2, NOAA RC must ensure that the applicant installs and maintains NMFS Protected Species Educational Signs describing avoidance and reporting of interactions with ESA-listed species such as sea turtles and Gulf sturgeon at the entrance to all fishing piers. Sign designs and installation methods are provided on our website at: http://sero.nmfs.noaa.gov/protected_resources/section_7/protected_species_educational_signs/index.html.

2.b. Signs must also include instructions for contacting local officials trained in landing, handling and de-hooking sea turtles as described in RPM # 3

3.a. Instructions for contacting trained, local officials will be included on the signage at the piers and each official will complete training on landing, handling and de-hooking sea turtles.

3.b. Trained, local officials will have ready access to turtle landing and de-hooking equipment (long handled nets, pliers, etc.) as well as current contact information for local turtle rescue and rehabilitation facilities.

4.a. Reports detailing available data on captures of sea turtles (or other ESA listed species) from the proposed fishing piers shall be submitted to NMFS at the end of each calendar year in which such a capture is reported. Reports shall be submitted to:
NOAA Fisheries Service – Protected Resources Division
DWH Restoration Program Monitoring Reports
263 13th Avenue South
St. Petersburg, Florida 33701

5.a. NOAA RC must ensure that angler surveys are conducted at the new piers on a quarterly basis. These surveys shall include questions on sea turtle encounters at the piers. Attachment A to this Opinion is an example survey questionnaire designed to provide all necessary information on angler encounters with sea turtles at fishing piers.

5.b. Annual reports describing the results of these surveys shall be submitted to:
NOAA Fisheries Service – Protected Resources Division
DWH Restoration Program Monitoring Reports
263 13th Avenue South
St. Petersburg, Florida 33701

6.a. The NOAA RC shall ensure that annual underwater fishing debris cleanup around the new fishing piers are conducted to remove any fishing line, nets, and other debris and trash from the water. Reports describing the results of each cleaning event should be submitted to:

NOAA Fisheries Service – Protected Resources Division
DWH Restoration Program Monitoring Reports
263 13th Avenue South
St. Petersburg, Florida 33701

10. CONSERVATION RECOMMENDATIONS

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

1. The NOAA RC and/or the ADCNR are encouraged to conduct research to develop deterrents to discourage turtles from using fishing piers as a habitualized food source.

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

11. REINITIATION OF CONSULTATION

This concludes consultation on the creation/restoration of 3 public parks along the Gulf coast in Mobile and Baldwin Counties, Alabama. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of taking specified in the incidental take statement is exceeded, (2) new information reveals effects of the action may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Biological Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

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