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F/SER31:KBD

DEC 04 2012

Mr. William G. Bailey
Chief, Planning Division
Department of the Army
Savannah District, Corps of Engineers
100 W. Oglethorpe Avenue
Savannah, GA 31401-3640

Re: Savannah District Bed Leveler Evaluation, Glynn County/Chatham County, GA

Dear Mr. Bailey:

Enclosed is the National Marine Fisheries Service's (NMFS) biological opinion (opinion) to the Savannah District, Corps of Engineers analyzing the proposed use of a bed leveler and closed-net trawling within the entrance channels of Brunswick Harbor and Savannah Harbor following maintenance dredging of these channels by hopper dredge. The Savannah District proposes to evaluate the effectiveness of bed levelers used in concert with hopper dredges to minimize the take of sea turtles while maintaining entrance channels of deep-draft navigation projects.

The opinion analyzes the project's effects on North Atlantic right whales, Atlantic sturgeon, shortnose sturgeon, and swimming sea turtles in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, and is based on information provided in the USACE's letter dated July 24, 2012; the biological assessment submitted on September 19, 2012; and information from previous NMFS' consultations. It is our opinion that the action, as proposed, is likely to adversely affect loggerhead, Kemp's ridley, and green sea turtles, and Atlantic sturgeon, but is not likely to jeopardize their continued existence. The opinion authorizes a limited amount of incidental take of loggerhead, Kemp's ridley, and green sea turtles, and Atlantic sturgeon by bed leveling and/or closed-net trawling.

We look forward to further cooperation with you on other USACE projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this consultation, please contact Kay Davy, consultation biologist, by e-mail at Kay.Davy@noaa.gov or (954) 356-6791.

Sincerely,

Miles M. Croom

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

Enclosure

cc: Mary E. Richards, USACE

File: 1514-22.F.3
Ref: F/SER/2012/03110

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency:	U.S. Army Corps of Engineers, Savannah District, Planning Division
Activity:	Evaluation of Bed Levelers and Closed-Net Trawling Associated with Maintenance Dredging of Brunswick and Savannah Harbors, Georgia (Consultation Number F/SER/2012/03110)
Consulting Agency:	National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida
Approved by:	Miles M. Croom for Roy E. Crabtree, Ph.D., Regional Administrator NMFS, Southeast Regional Office St. Petersburg, Florida
Date Issued:	DEC 04 2012

Contents

ACRONYMS AND ABBREVIATIONS

AMOVA Analysis of Molecular Variance
ASSRT Atlantic Sturgeon Status Review Team
BA Biological Assessment
°C Degrees Celsius
CAFOs Concentrated Animal Feeding Operations
CDFs Confined Disposal Facilities
CFR Code of Federal Regulations
cfs Cubic Feet per Second
cm Centimeter
cps Centimeters per Second
CPUE Catch per Unit Effort
DO Dissolved Oxygen
DPS Distinct Population Segment
DEIS Draft Environmental Impact Statement
EA Environmental Assessment
EIS Environmental Impact Statement
EPA U.S. Environmental Protection Agency
ESA Endangered Species Act
°F Degrees Fahrenheit
FAA Federal Aviation Administration
FL Fork Length
FST F-statistics
ft Feet
fps Feet per Second
FEMA Federal Emergency Management Agency
FERC Federal Energy Regulatory Commission
FHWA Federal Highway Administration
FEIS Final Environmental Impact Statement
FWC Florida Fish and Wildlife Conservation Commission
GADNR Georgia Department of Natural Resources
GHG Greenhouse Gases
ITS Incidental Take Statement
kg Kilogram
km Kilometer
MSA Magnuson-Stevens Fishery Conservation and Management Act
MMPA Marine Mammal Protection Act
m Meters
mt Metric Tons
mm Millimeter
mgd Million Gallons per Day
mps Meters per Second
mtDNA Mitochondrial Deoxyribonucleic Acid
nDNA Nuclear Deoxyribonucleic Acid
mg/L Milligrams per Liter
NAST National Assessment Synthesis Team
NWA DPS Northwest Atlantic Distinct Population Segment

NED National Economic Development
NEPA National Environmental Policy Act
NGVD National Geodetic Vertical Datum
NMFS National Marine Fisheries Service
NPS National Park Service
NRC Nuclear Regulatory Commission
O&M Operations and Maintenance
ODMDS Ocean Dredged Material Disposal Site
POD Prevention of Degradation
ppt Parts per Thousand
RPAs Reasonable and Prudent Alternatives
RWEWS Right Whale Early Warning System
SARBO South Atlantic Regional Biological Opinion
SCDNR South Carolina Department of Natural Resources
SEFSC Southeast Fisheries Science Center
SLR Sea-level Rise
STSSN Sea Turtle Stranding and Salvage Network
TNC The Nature Conservancy
TL Total Length
USACE U.S. Army Corps of Engineers
USCG United States Coast Guard
USFWS U.S. Fish and Wildlife Service
WRDA Water Resources Development Act
YOY Young-of-the-Year

Introduction

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), requires that each federal agency ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a federal agency may affect a protected species, that agency is required to consult with either the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the protected species that may be affected.

This document represents NMFS' biological opinion (opinion) based on our review of the Biological Assessment prepared by the U.S. Army Corps of Engineers (USACE) Savannah District for the proposed use of bed levelers and closed-net trawling following maintenance dredging of Brunswick and Savannah Harbors in Georgia and its effects on green sea turtles *(Chelonia mydas)*, leatherback sea turtles (*Dermochelys coriacea*), hawksbill sea turtles *(Eretmochelys imbricata)*, the Northwest Atlantic DPS of loggerhead sea turtles (*Caretta caretta*), Kemp's ridley sea turtles *(Lepidochelys kempii)*, North Atlantic right whales (*Eubalaena glacialis*), the South Atlantic DPS of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), and shortnose sturgeon (*Acipenser brevirostrum*), in accordance with Section 7 of the ESA. Information for this opinion was provided by the USACE, or was obtained from a variety of sources including published and unpublished literature cited herein and other sources of information including the USACE Sea Turtle Data Warehouse (http://el.erdc.usace.army.mil/seaturtles/index.cfm; USACE 2012).

Consultations on most listed species and critical habitat in the marine environment are conducted between the action agency and NMFS. Consultation is concluded after NMFS determines that an action is not likely to adversely affect listed species or 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, develops measures (i.e., reasonable and prudent measures - RPMs) to reduce the effect of take, and recommends conservation measures to further conserve the species. Notably, no incidental destruction or adverse modification of critical habitat can be authorized, and thus there are no RPMs, only reasonable and prudent alternatives (RPAs) that must avoid destruction or adverse modification.

BIOLOGICAL OPINION

1 CONSULTATION HISTORY

September 25, 1997: NMFS issues a regional biological opinion for the South Atlantic (SARBO), "The continued hopper dredging of channels and borrow areas in the southeastern United States." This is the current opinion authorizing incidental take of sea turtles and shortnose sturgeon pursuant to USACE dredging activities in the South Atlantic Division (SAD). Dredging of Brunswick Harbor and Savannah Harbor is covered by the SARBO, but the opinion does not mention or analyze bed leveling activities.

May 1, 2003: During consultation associated with the Brunswick Harbor Deepening Project, NMFS discovers that bed leveling is apparently often associated with hopper dredging (and other types of dredging) operations, particularly in the cleanup phase (James Calver, e-mail to Eric Hawk, May 1, 2003), and may be associated with sea turtle strandings.

June 23, 2006: NMFS advises SAD that bed leveler use, apparently widespread in conjunction with hopper dredging projects within the SAD, was not considered in and is not authorized by the September 25, 1997, SARBO. NMFS advises SAD that the correct way to address bed leveling is through reinitiation of consultation on the SARBO, since ongoing and proposed bed leveling fits at least one of the consultation reinitiation triggers of 50 CFR 402.16, and because new species listed since 1997 that could be affected by USACE hopper dredging also trigger the need for reinitiation of consultation on the SARBO.

April 30, 2007: SAD requests reinitiation of the 1997 SARBO.

September 12, 2008: SAD submits the South Atlantic Regional Biological Assessment (SARBA) for reinitiation of the SARBO. SAD included discussion of bed leveling and closed-net trawling in detail in the draft SARBA.

July 26, 2012: NMFS receives a request from USACE Savannah District for ESA Section 7 consultation on the proposed evaluation of bed levelers used after maintenance dredging of the entrance channels of Brunswick Harbor and Savannah Harbor by hopper dredge. USACE proposes to evaluate the effectiveness of bed levelers to minimize the take of sea turtles while maintaining entrance channels of deep-draft navigation projects. USACE determines that closed-net trawling must be included to identify any incidental take during the bed leveler evaluation and requests authorization to include that process.

September 10, 2012: During a conference call on the proposed project with the Savannah District, NMFS requests additional information be provided on the details of the proposed action.

September 19, 2012: The Savannah District provides a Biological Assessment (BA) on the proposed bed leveler evaluation.

September 20, 2012: During review of the project documents, NMFS determines that USACE's proposed use of a hopper dredge for maintenance dredging in the federal channels is authorized by the 1997 SARBO. However, the proposed use of bed levelers and closed-net trawling is not authorized by the existing SARBO; therefore, USACE will need a "stand-alone" biological opinion, and Incidental Take Statement to authorize potential protected species interactions occurring during the evaluation. NMFS initiates formal consultation.

October 12, 2012: NMFS requests additional information on proposed dredging volumes, design of the bed leveler, and sea turtle stranding data.

October 17, 2012: USACE provides additional information on items requested during October 12, 2012, call with NMFS.

October 23, 2012: During a call with NMFS, USACE provides additional information and clarification on details of the proposed bed leveling evaluation.

October 24, 2012: USACE provides acreage of area anticipated to be dredged and leveled by using the bed leveler.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 Proposed Action

The proposed action is to perform an evaluation of bed leveling following hopper dredging of the entrance channels in Brunswick and Savannah Harbors, Georgia. The purpose of the proposed action is to assess the efficacy of a bed leveler to reduce overall sea turtle mortality during Operation and Maintenance (O&M) hopper dredging of deep-draft navigation channels in Georgia. The Savannah District estimates that 114.78 acres will be dredged between stations 26+000B to 36+000B in the Brunswick Harbor entrance channel and 137.74 acres between stations 25+000B to 35+000B in the Savannah Harbor entrance channel. Closed-net trawling would be used behind the bed leveler to capture any turtles that are injured or killed by the bed leveler. The rate of injury would be compared to take rates associated with hopper dredging alone to assess the relative potential for take by bed levelers compared to hopper dredges. The Savannah District has stated that their experience has been that sea turtle take by hopper dredges increases during cleanup activity when using the hopper dredge draghead to level peaks/mounds. According to the Savannah District, the use of bed levelers with hopper dredges would minimize the potential take of sea turtles, since a greater number of sea turtles may be taken during hopper dredging cleanup operations.

Deep-draft navigation projects operating under the 1997 SARBO are currently not authorized to perform bed leveling or use closed-net trawlers. The USACE is currently undergoing reinitiation of consultation with NMFS for hopper dredging activities under the SARBO and bed leveling will be addressed in the new SARBO. The State of Georgia also does not allow the use of a bed leveler for the federal navigation channels. Their 2003 Water Quality Certification for the Brunswick Harbor Navigation Project specifically states that a bed leveler is not authorized for maintenance of the channel. However, the State has indicated its support for a study of the effects of bed levelers.

The bed leveler evaluation would be performed during the regular hopper dredging season, December 15 through April 30. Brunswick Harbor would most likely be dredged first during January 1 to February 28. The evaluation would be conducted following normal entrance channel maintenance dredging operations for 2012-2013. The bed leveler evaluation would be conducted two weeks after the hopper dredging event. The use of a hopper dredge for the maintenance dredging of the entrance channels is covered under the current SARBO. However, the use of a bed leveler and closed-net trawling is not covered under the SARBO; therefore, a new biological opinion is needed to address these activities.

For the bed leveler evaluation, contract specifications will require the Contractor to use a bed leveler that can produce a sand wave, thereby reducing the risk of taking sea turtles. The design of the device used in the evaluation will be documented and will also include photo documentation. No new bed leveler design is to be constructed, as the intent is to employ an existing bed leveler design that is already used by the industry (see Appendix A for existing designs). The contract dredging specifications will also state that no bed leveling can be performed without a bed leveling device that has been approved by the Contracting Officer. The bed leveler will be lowered to the working depth slowly and dragged at no more than two knots relative to the bottom (Figure 1). The bed leveler must include a device that records position (state plane coordinates and elevation relative to mean lower low water) at least every minute. No teeth or other projections will be allowed on the bottom or leading edge of the bed leveler.

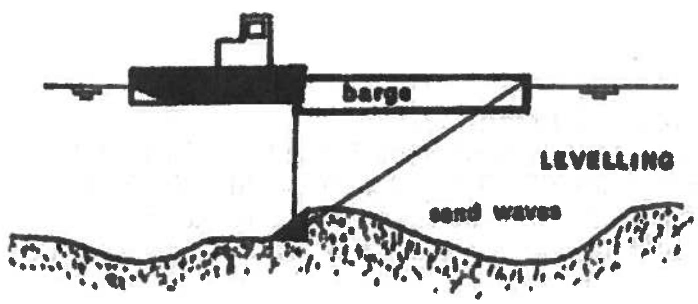

Figure 1. Diagram of typical drag-beam "bed leveler" device used for bed leveling.

Prior to the commencement of the bed leveling evaluation, a closed-net trawler would be used for at least three days to assess the relative abundance of turtles in the entrance channel. Any captured turtles would be tagged and released back into the channel. If the sea turtle abundance data from the test period indicate that turtles are not present in sufficient numbers to draw reliable conclusions about the take rate of the bed leveler when compared to the hopper dredge draghead, USACE would likely request NMFS' approval to extend the study through the following dredging season.

USACE would require the bed leveler to be used no sooner than two weeks after the hopper dredge has left the harbor to ensure that any possible turtles impacted by the dredge cannot be attributed to bed leveling. This would ensure that if an injured or dead turtle is recovered followed the operation of the bed leveler, the take could only be attributed to the bed leveler. Sea turtle take would be assessed by use of a closed-net trawler following the bed leveler at all times. Trawler and nets would be required to meet past specifications for closed-net trawling (including tows no longer than 30 minutes). If the trawler experienced downtime for any reason, the bed leveler would be required to stand down until the trawler is again operating.

The USACE has stated that dredging of Brunswick Harbor normally occurs first, so the first dredging event will likely occur there. The bed leveler will be used following conclusion of the hopper dredging and if the USACE believes that bed leveling was useful towards achieving project depth and there was no evidence of impacts to turtles, it will be used in Savannah Harbor as well. According to the USACE, after surveys have been conducted identifying peaks/mounds above project depth, the bed leveler will likely operate 24 hours per day and seven days per week. It will be used until all of the peaks have been leveled to project depth or is stopped due to turtle take. The approximate operating speed of the vessel deploying the bed leveler is one to two knots.

Specifications for Closed-net Trawling
The trawler will be equipped with two 60-foot flat-style trawling nets fabricated from 8-inch mesh (stretch). The nets will be fitted with mud rollers and floats and will conform to the following:

- Design: 4-seam, 4-legged, 2-bridle trawl net.
- Webbing: 4-inch bar, 8-inch stretch top; 36-gauge twisted nylon dipped side; and 36-gauge twisted nylon dipped bottom.
- Net Length: 60 feet from cork line to cod end.
- 4 Body Taper: 2 to 1.
- Wing End Height: 6 feet.
- Center Height: Dependent on depth of trawl, 14 to 18 feet.
- Cod End: Length 50 meshes x 4 inches (16.7 feet); webbing 2-inch bar, 4-inch stretch, 84-gauge braid nylon dipped, 80 meshes around, 40 rigged meshes with 1/4 x 2-inch choker rings, 1 each x 4-inch at end; cod end cover-none; chaffing gear -none.
- Head Rope: 60-foot combination rope (braided nylon with stainless steel cable center).
- Foot Rope: 65-foot (2-inch) combination rope.
- Leg Line: Top, 6 feet; bottom, 6 feet.
- Floats: 12 tuna floats (football style), 7 inches in diameter, 9 inches long; center on top net, spaced 2 inches apart.
- Mud Rollers: 22 each, 5-inch diameter by 5.5-inch length, 3-foot spacing; attach with 3/8-inch polypropylene rope (replaced with Snap-On rollers when broken).
- Tickler chain: None. (Discontinued - but previously used 1/4 inch x 74-foot galvanized chain).
- Weight: 20 feet of 1/4 inch galvanized chain on each wing, 40 feet per net looped and tied.
- Door Size: 7 feet by 40 inches or 8 feet by 40 inches; 1-inch by 6-inch shoe; 3/8-inch high test chain bridles.
- Cable Length: 7/16-inch cable, 240 to 300 feet (total bridle length), varies with bottom conditions.
- Float Ball: None.
- Lazy Lines: 1 inch nylon.
- Pickup Lines: 3/8-inch polypropylene.
- Whip Lines: 1-inch nylon.

Uninjured turtles captured during trawling would be tagged, tissue removed for genetic testing by NMFS, and released back into the channel. The Georgia Department of Natural Resources - Coastal Resources Division (GADNR-CRD) will report all turtle strandings occurring during the period from two months before the test, during the test, and for two months after the test is concluded. At the end of the field work, the USACE will notify the state representative of the Sea Turtle Stranding and Salvage Network (STSSN) when the work began and ended, and request notification of any sea turtle strandings in the project area that, in the opinion of the STSSN, have signs of potential draghead impingement, entrainment, or interaction with bed leveling type equipment.

The proposed success criteria that would be used to assess the effectiveness of bed levelers in reducing turtle take would include:

1. Conduct the evaluation in waters where sea turtles are present,
2. Demonstrate that sea turtle take is lower with the use of bed levelers than from a hopper dredge in cleanup mode[1] and,
3. Demonstrate that the bed leveler is able to reduce shoaling peaks to achieve target dredging depth.

2.2 Action Area

"Action area" means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action area (50 CFR 402.02). The action area includes the Savannah Harbor entrance channel (Figure 2) located seventy miles north of Brunswick Harbor. The Savannah Harbor consists of 11.4 miles of ocean channel that is 44 feet deep Mean Lower Low Water (MLLW) and 600 feet wide. The action area also includes the Brunswick Harbor entrance channel (Figure 3). The hopper dredged section of Brunswick Harbor consists of approximately 6 miles of channel inland from Station 0+000 and 10 miles of ocean channel. The entrance channel is 38 feet deep and 500 feet wide across the bar, and 36 feet deep and 400 feet wide through St. Simon's Sound.

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[1] Cleanup mode is defined as using the hopper dredge draghead to go back over the dredged area and remove peaks or mounds of sediment that were left behind. During this process, the draghead may move over trenches while still in vacuum mode, which could result in turtle take if turtles are present in the trenches.

Figure 2. Project location map – Savannah Harbor, Georgia

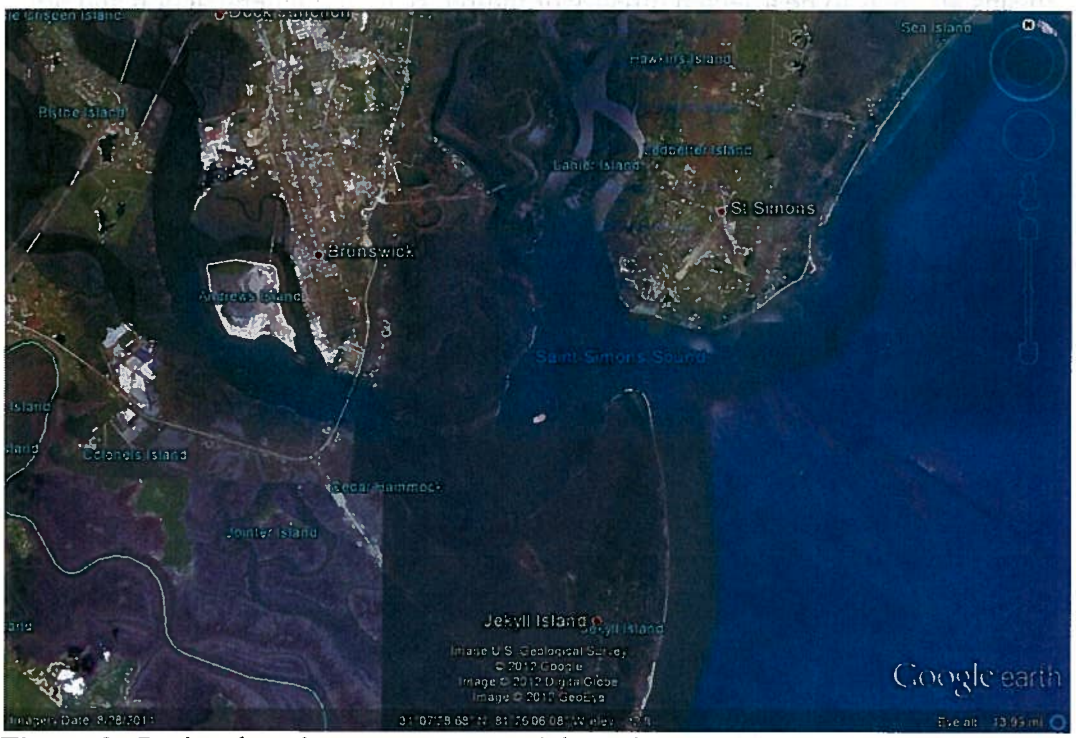


Figure 3. Project location map – Brunswick Harbor, Georgia

3 STATUS OF THE SPECIES

Much of the information for this section, as well as additional detailed information relating to the species biology, habitat requirements, threats, and recovery objectives, can be found in the recovery plan for each species (see "Literature Cited" section). The following listed species under the jurisdiction of NMFS are known to occur near the action area:

Common Name	Scientific Name	Status
Sea Turtles		
Green sea turtle	*Chelonia mydas*[2]	E/T
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Hawksbill sea turtle	*Eretmochelys imbricata*	E
Loggerhead sea turtle	*Caretta caretta*[3]	T
Fish		
Shortnose sturgeon	*Acipenser brevirostrum*	E
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*[4]	E
Marine Mammals		
North Atlantic right whale	*Eubalaena glacialis*	E

3.1 Species Not Likely to be Adversely Affected

3.1.1 North Atlantic right whale

The USACE has stated that the proposed work would have no effect on the North Atlantic right whale. In addition, the USACE has a specific set of specifications for the Savannah District that deal with large whale protection measures. The precautionary collision avoidance measures to be implemented during operations that take place during the time North Atlantic right whales are present in waters offshore of Georgia are:

Pre-project briefing
Before the initiation of the project, at the pre-construction/partnering meeting, the USACE briefs the Contractor on the presence of endangered species, and reviews the requirements for their protection.

Contractor requirements
Each Contractor will be required to instruct all personnel associated with the project about the possible presence of endangered species in the area and the need to avoid collisions. Each Contractor will also be required to brief his personnel concerning the civil and criminal penalties

[2] Green turtles in U.S. waters are listed as threatened except for the Florida and Pacific coast of Mexico breeding populations, which are listed as endangered.
[3] Northwest Atlantic Ocean Distinct Population Segment
[4] South Atlantic Distinct Population Segment

for harming, harassing, or killing species that are protected under the ESA and the MMPA. Vessels are required to stop, alter course, or otherwise maneuver to avoid approaching the known location of a North Atlantic right whale.

Vessel speed
From November 1 through April 30, vessels will use extreme caution and proceed at a safe speed, no greater than 10 knots, such that the vessel can take proper and effective action to avoid a collision with a North Atlantic right whale or other marine mammal, and can be stopped within a distance appropriate to the prevailing circumstances and conditions. During daylight hours, the vessel operator must take necessary precautions to avoid whales. During evening hours or when there is limited visibility due to fog or sea states of greater than Beaufort 3, the vessel must slow down to no greater than 5 knots when transiting between areas if whales have been spotted by observers or the Right Whale Early Warning System (RWEWS) within 15 nm (nautical miles) of the vessel's path within the previous 24 hours. Slower vessel speeds can reduce the potential for a vessel strike with a listed species by providing more time for animals to react to a vessel and move out of the way. Slower vessel speeds also reduce the likelihood of a strike resulting in serious injury or mortality.

Observers
Monitoring is required by NMFS-approved endangered species observers with at-sea large whale identification experience to conduct daytime observations for whales between November 1 and April 30. Observers would monitor for the presence of marine mammals from the bridge during daylight hours.

NMFS has determined that potential effects on North Atlantic right whales from the proposed action are limited to the following: injury from potential interactions with construction equipment (e.g., a project-related vessel striking a whale) and temporary avoidance of the area during construction (i.e., bed leveling/closed-net trawling) operations. It is assumed that migrating right whales may be present in the vicinity of the Brunswick and Savannah Harbor entrance channels from October through April as they move back and forth between their summer feeding/nursery areas and winter calving sites. However, NMFS believes the vessels (i.e., bed leveler and trawler) associated with the proposed project are not likely to adversely affect North Atlantic right whales. The Contractor will be required to abide by the 10-knot speed restriction during North Atlantic right whale calving season and follow NMFS' *Vessel Strike Avoidance and Reporting Guidelines*. With implementation of these mandatory conservation measures, NMFS believes that the likelihood of North Atlantic right whales being affected by the proposed use of bed levelers and trawlers is discountable. As a result, this species will not be discussed further in this opinion.

3.1.2 Shortnose Sturgeon and Atlantic Sturgeon DPSs of the Gulf of Maine, New York Bight, Chesapeake Bay, and Carolina

Shortnose sturgeon inhabit large coastal rivers of eastern North America. In the southern portion of the range, they are currently found in the Altamaha, Ogeechee, Oconee, and Savannah Rivers in Georgia. While shortnose sturgeon may occasionally be found in marine waters, they typically are found in more estuarine waters, and in rivers near the saltwater-freshwater interface.

Although the capture of shortnose sturgeon may potentially occur in the project area, no captures of this species by a closed-net relocation trawler have been documented (C. Slay, pers. comm. to E. Hawk, November 2, 2012). Because the proposed action takes place in marine waters and farther offshore of where shortnose sturgeon typically are found, NMFS believes that the likelihood of shortnose sturgeon being affected by the proposed action is discountable. In addition, since they are mobile, they would be able to avoid contact with the bed leveler and trawl. As a result, shortnose sturgeon will not be discussed further in this opinion.

Five separate distinct population segments (DPS) of the Atlantic sturgeon were listed under the ESA by NMFS on February 6, 2012 (77 FR 5880 and 5914). From north to south, the DPSs are the Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic (Figure 4). The New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs are listed as endangered, and the Gulf of Maine DPS is listed as threatened. Since adult Atlantic sturgeon mix extensively in marine waters, Atlantic sturgeon from any DPS may be encountered in the marine portion of the action area; however, impact-producing aspects of the project will most likely only affect the South Atlantic DPS because despite extensive mixing in coastal waters, Atlantic sturgeon display high site fidelity to their natal waters. Straying between areas within a DPS would sometimes exceed five individuals migrating per generation, but between DPSs has usually been less than one migrant per generation. Because the probability of encountering an Atlantic sturgeon from one of the other DPSs (Gulf of Maine, New York Bight, Chesapeake Bay, or Carolina) is low, NMFS believes that the likelihood of an Atlantic sturgeon from any of these other DPSs being affected by the proposed action is discountable.

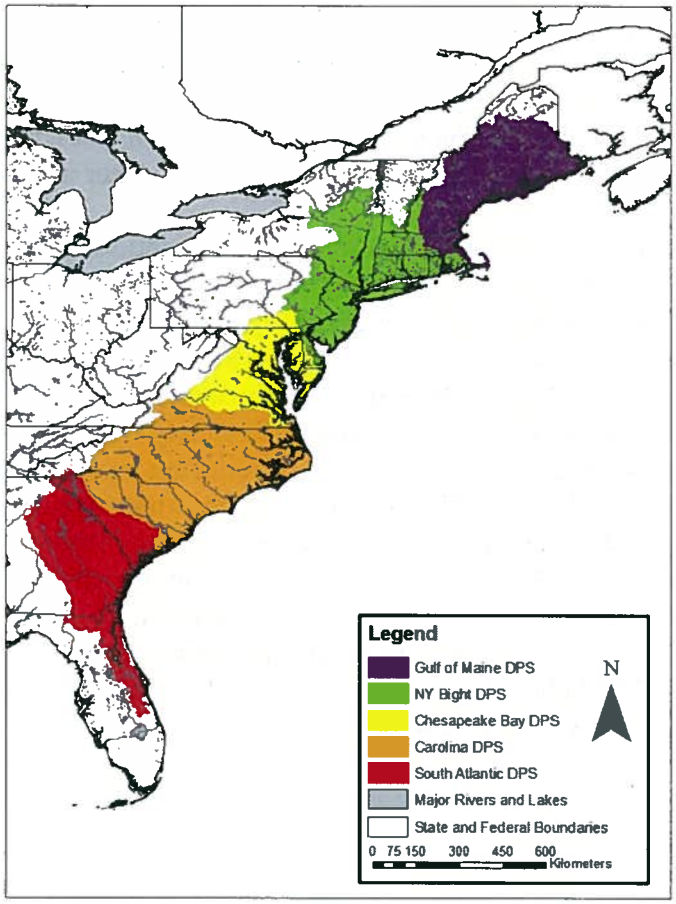


Figure 4. Map depicting the five Distinct Population Segments (DPSs) of Atlantic sturgeon: Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic.

3.1.3 Leatherback and Hawksbill Sea Turtles

NMFS has analyzed the routes of potential effects on five species of sea turtles (loggerhead, Kemp's ridley, leatherback, hawksbill, and green) from the proposed action. We have determined the potential routes of effects to sea turtles in the marine environment include injury or death from potential interactions with and operation of the bed leveler and closed-net trawler, and avoidance of the area caused by vessel lighting and noise. Of these, only interactions with the bed leveler and closed-net trawler have the potential for adverse effects and only for certain turtle species, as discussed below and in the Effects of the Action section.

Leatherback sea turtles tend to be open ocean foragers and are uncommon in shallow nearshore waters, except during nesting season (NMFS and USFWS 2007d). Leatherback sea turtles undertake extensive migrations between northern foraging grounds and tropical and subtropical nesting beaches. Furthermore, in over 30 years of NMFS consultations with the USACE on hopper dredging projects carried out in the Savannah and Brunswick Harbors and elsewhere, there has never been a documented take of a leatherback sea turtle during dredging. Therefore, NMFS believes that the likelihood of leatherback sea turtles being adversely affected by the proposed project is discountable.

Hawksbill sea turtles are also rare in the nearshore waters off of Georgia and rarely enter Georgia's inshore waters (Epperly et al. 1995a). During the past 30 years of NMFS consultations with the USACE on hopper dredging projects carried out in the Savannah and Brunswick Harbors and elsewhere, there has never been a documented take of a hawksbill sea turtle by a hopper dredge. Juveniles and adults are most commonly associated with coral reef habitats. However, additional habitats may include other hardbottom habitats, seagrass beds, algal beds, mangrove bays and creeks, or mud flats. These habitat types are not found in the project area. Therefore, we believe the potential for impacts to hawksbill sea turtles is discountable.

Based on the above information, we believe the proposed project may affect, but is not likely to adversely affect leatherback and hawksbill sea turtles. Therefore, these species will not be discussed further in the document.

We believe the project is likely to adversely affect loggerhead, Kemp's ridley, and green sea turtles, as described below. The proposed action includes the use of bed levelers and closed-net trawling, which increases the potential for injury and/or death to sea turtles that are likely to occur in the action area. Based on the best available dredging event data from the USACE's website, (http://el.erdc.usace.army.mil/seaturtles/info.cfm?Type=District&Code=SAS), which provides information on dredging events along with any occurrence of sea turtles takes, we believe loggerhead, green, and Kemp's ridley sea turtles are likely to be adversely affected by the bed leveler and closed-net trawling.

3.2 Species Likely to be Adversely Affected

NMFS believes the proposed action is likely to adversely affect loggerhead, green, and Kemp's ridley sea turtles and Atlantic sturgeon. The status of these species is discussed in the following sections. Species discussions in this section will provide background information on each species. Discussions of sea turtles will focus primarily on the Atlantic Ocean populations of these species since these are the populations that may be affected by the proposed action. However, because green sea turtles are listed globally, we also discuss their worldwide status. The following subsections are synopses of the best available information on the life history, distribution, population trends, and current status of the three species of sea turtles and the South Atlantic DPS of Atlantic sturgeon that are likely to be adversely affected by one or more components of the proposed action.

3.2.1 South Atlantic DPS of Atlantic Sturgeon

Atlantic sturgeon between the ACE Basin in South Carolina, southward to the St. Johns River in Florida, constitute the South Atlantic DPS that was recently listed as endangered (75 FR 61904). The marine range of the Atlantic sturgeon South Atlantic DPS extends from the Bay of Fundy, Canada, to the St. Johns River, Florida.


Atlantic sturgeon

Species Description
Atlantic sturgeon populations show clinal variation, with a general trend of faster growth and earlier age at maturation in more southern systems. Atlantic sturgeon mature between the ages of 5 and 19 years in South Carolina (Smith et al. 1982). Atlantic sturgeon likely do not spawn every year. Multiple studies have shown that spawning intervals range from 1 to 5 years for males (Caron et al. 2002; Collins et al. 2000b; Smith 1985) and 2 to 5 years for females (Stevenson and Secor 1999; Van Eenennaam et al. 1996; Vladykov and Greely 1963). Fecundity of Atlantic sturgeon has been correlated with age and body size, with egg production ranging from 400,000 to 8 million eggs per year (Dadswell 2006; Smith et al. 1982; Van Eenennaam and Doroshov 1998). The average age at which 50 percent of maximum lifetime egg production is achieved is estimated to be 29 years, approximately 3 to 10 times longer than for other bony fish species examined (Boreman 1997).

Juvenile and adult Atlantic sturgeon reside in upper estuarine habitat where they frequently congregate around the saltwater/freshwater interface. Estuarine habitats are important for juveniles, serving as nursery areas by providing abundant foraging opportunities, as well as thermal and salinity refuges, for facilitating rapid growth. Some juveniles will take up residency in non-natal rivers that lack active spawning sites (Bain 1997). Residency time of young Atlantic sturgeon in estuarine areas varies between one and six years (Schueller and Peterson 2010; Smith 1985), after which Atlantic sturgeon start outmigration to the marine environment. Outmigration of adults from the estuaries to the sea is cued by water temperature and velocity. Adult Atlantic sturgeon will reside in the marine habitat during the non-spawning season and forage extensively. Coastal migrations by adult Atlantic sturgeon are extensive and are known to occur over sand and gravel substrate (Greene et al. 2009). Atlantic sturgeon remain in the marine habitat until the waters begin to warm, at which time ripening adults migrate back to their natal rivers to spawn.

Upstream migration to the spawning grounds is cued primarily by water temperature and velocity. Therefore, fish in the southern portion of the range migrate earlier than those to the north (Kieffer and Kynard 1993; Smith 1985). In Georgia and South Carolina, this begins in February or March (Collins et al. 2000a). Males commence upstream migration to the spawning sites when waters reach around 6 degrees Celsius (Dovel and Berggren 1983b; Smith 1985; Smith et al. 1982) with females following a few weeks later when water temperatures are closer to 12°C or 13°C (Collins et al. 2000a; Dovel and Berggren 1983b; Smith 1985). In some rivers, predominantly in the south, a fall spawning migration may also occur (Moser et al. 1998; Rogers and Weber 1995a), with running ripe males found August through October and post-spawning females captured in late September and October (Collins et al. 2000b).

In general, sturgeon are omnivorous benthic feeders (feeding on the surface of the water bottom) and filter large quantities of substrate when they suction food into their protrusible mouth. Few diet studies have been conducted on the Atlantic sturgeon. Adult sturgeon diets are comprised of mollusks, gastropods, amphipods, isopods, and fish (ASSRT 2007). Juvenile sturgeon feed on aquatic insects and other invertebrates (ASSRT 2007). A recent investigation by Collins et al. (2006) indicated that sub-adult Atlantic sturgeon in both the Edisto and Savannah Rivers foraged mostly on invertebrates, with a high percentage of amphipods and polychaetes. In marine waters, Atlantic sturgeon feed on mollusks, polychaete worms, gastropods, shrimps, amphipods, isopods, and small fish (Scott and Crossman 1973). The presence of food in the stomachs of large (greater than 1.25 meters fork length) Atlantic sturgeon captured in the Edisto and Savannah Rivers demonstrates that these fish do not fast while in freshwater as previously believed (Collins et al. 2006).

Population Status

The South Atlantic DPS is estimated to number less than 6 percent of its historical population size (ASSRT 2007), with all river populations except the Altamaha estimated to be less than 1 percent of historical abundance. Prior to 1890, Secor (2002) estimated there were 8,000 adult spawning females in South Carolina and 11,000 adult spawning females in Georgia. Currently, there are an estimated 343 spawning adults in the Altamaha and less than 300 spawning adults (total of both sexes) in each of the other major river systems occupied by the DPS, whose freshwater range occurs in the watersheds of the Ashepoo, Combahee, and Edisto Rivers (ACE Basin) in South Carolina to the St. Johns River, Florida (Table 1).

Sturgeon are still found within the St. Johns River in Florida, but this river is now believed to only serve as a nursery. The marine range of Atlantic sturgeon from the South Atlantic DPS extends from the Bay of Fundy, Canada, to the St. Johns River, Florida. Collins and Smith (1997) reported that Atlantic sturgeon were captured at depths of 132 feet in marine waters off South Carolina. The offshore range of Atlantic sturgeon is best investigated through fishery bycatch records that record data by depth rather than distance offshore. The vast majority of Atlantic sturgeon bycatch via gillnets is observed in waters shoal of 50 fathoms, but Atlantic sturgeon are recorded as bycatch out to 500 fathoms.

River/Estuary	Reproduction	Source
Ashepoo River, SC	Uncertain,	NMFS 2010
Combahee River, SC	Spawning, YOY	NMFS 2010
Edisto River, SC	Spawning, YOY	NMFS 2010
Savannah River, GA/SC	Spawning, YOY	NMFS 2010
Ogeechee River, GA	Spawning, YOY	NMFS 2010
Altamaha River, GA	Spawning, YOY	NMFS 2010
Satilla River, GA	Spawning, YOY	NMFS 2010
St. Johns River, FL	Uncertain	NMFS 2010

Table 1. List of rivers in the southeast United States known to support Atlantic sturgeon that comprise the South Atlantic Distinct Population Segment.

Threats

Atlantic sturgeon throughout the South Atlantic DPS are exposed to a variety of habitat threats including: restricted access to riverine habitat; large portions of degraded habitat, which may result in high levels of tissue contamination and water quality standards that are below fish health standards; and/or poor quality of some benthic habitat. Without substantial mitigation and management to improve the habitat and water quality of these systems, Atlantic sturgeon subpopulations will likely continue to be depressed until suitable habitat and water quality conditions are achieved. This is evident in southern streams that are suspected to no longer support reproducing Atlantic sturgeon subpopulations, such as the St. Marys and St. Johns rivers. Although these rivers are at the southern range of the species, the degradation of habitat via dredging and water pollution likely prohibit Atlantic sturgeon from recolonizing these systems. The recovery of Atlantic sturgeon along the Atlantic Coast, especially in areas where habitat and water quality is severely degraded, will require improvements in the following areas (1) elimination of barriers to spawning habitat either through dam removal, breaching, or installation of successful fish passage facilities; (2) operation of water control structures to provide flows compatible with Atlantic sturgeon use in the lower portions of rivers (especially during the spawning season); (3) imposition of restrictions on dredging, including seasonal restrictions and avoidance of spawning/nursery habitat; and (4) mitigation of water quality parameters that are restricting sturgeon use of a river (i.e., dissolved oxygen). Additional data regarding sturgeon use of riverine and estuarine environments is needed.

The Atlantic sturgeon recovery team (SRT) evaluated the status of Atlantic sturgeon using the five-factor analysis described in section 4(a)(1) of the ESA. The SRT identified 15 stressors within these five factors and summarized their impacts on Atlantic sturgeon using a semi-quantitative extinction risk analysis (ERA), similar to that used by other status review reports (e.g. *Acropora*). Of the stressors evaluated, bycatch mortality, water quality, lack of adequate state and/or federal regulatory mechanisms, and dredging activities were identified as the most significant threats to the viability of Atlantic sturgeon populations.

Climate change is also predicted to elevate water temperatures and exacerbate nutrient-loading, pollution inputs, and lower dissolved oxygen. Climate change may affect all DPSs of Atlantic sturgeon in the future; however, effects of increased water temperature are most likely to affect the South Atlantic and Carolina DPSs. Rising sea level may result in the salt wedge moving upstream in affected rivers. Atlantic sturgeon spawning occurs in fresh water reaches of rivers because early life stages have little to no tolerance for salinity. Similarly, juvenile Atlantic sturgeon have limited tolerance to salinity and remain in waters with little to no salinity. If the salt wedge moves further upstream, rearing habitat could be restricted. In river systems with dams or natural falls that are impassable by sturgeon, the extent that spawning or rearing may be shifted upstream to compensate for the shift in the movement of the salt wedge would be limited. While there is an indication that an increase in sea level rise would result in a shift in the location of the salt wedge, at this time there are no predictions on the timing or extent of any shifts that may occur; thus, it is not possible to predict any future loss in spawning or rearing habitat. However, in all river systems, spawning occurs miles upstream of the salt wedge. It is unlikely that shifts in the location of the salt wedge would eliminate freshwater spawning or rearing habitat. If habitat was severely restricted, productivity or survivability may decrease. The increased rainfall predicted by some models in some areas may increase runoff and scour spawning areas and flooding events could cause temporary water quality issues. Rising temperatures predicted for all of the United States could exacerbate existing water quality problems with dissolved oxygen and temperature. While this occurs primarily in rivers in the southeast United States and the Chesapeake Bay, it may start to occur more commonly in the northern rivers. Atlantic sturgeon prefer water temperatures up to approximately 28°C (82.4°F); these temperatures are experienced naturally in some areas of rivers during the summer months. If river temperatures rise and temperatures above 28°C are experienced in larger areas, sturgeon may be excluded from some habitats. Increased droughts (and water withdrawal for human use) predicted by some models in some areas may cause loss of habitat including loss of access to spawning habitat. Drought conditions in the spring may also expose eggs and larvae in rearing habitats. If a river becomes too shallow or flows become intermittent, all Atlantic sturgeon life stages, including adults, may become susceptible to strandings or habitat restriction. Low flow and drought conditions are also expected to cause additional water quality issues. Any of the conditions associated with climate change are likely to disrupt river ecology causing shifts in community structure and the type and abundance of prey. Additionally, cues for spawning migration and spawning could occur earlier in the season causing a mismatch in prey that are currently available to developing sturgeon in rearing habitat.

Overutilization of Atlantic sturgeon from directed fishing caused initial severe declines in Atlantic sturgeon populations from which they have never rebounded. Atlantic sturgeon are more sensitive to bycatch mortality in commercial fisheries because they are a long-lived species, have an older age at maturity, have lower maximum fecundity values, and a large percentage of egg production occurs later in life. Based on these life history traits, Boreman (1997) calculated that Atlantic sturgeon can only withstand the annual loss of up to 5 percent of their population to bycatch mortality without suffering population declines. Atlantic sturgeon are particularly vulnerable to being caught in sink gillnets; therefore, fisheries using this type of gear account for a high percentage of Atlantic sturgeon bycatch and bycatch mortality. Little data exists on bycatch in the Southeast and high levels of bycatch underreporting are suspected. Further, a total population abundance for the five Atlantic sturgeon DPSs are not available, and it is therefore not possible to calculate the percentage of each DPS subject to bycatch mortality based on the available bycatch mortality rates for individual fisheries. However, fisheries known to incidentally catch Atlantic sturgeon occur throughout the marine range of the species and in some riverine waters as well. Because Atlantic sturgeon mix extensively in marine waters and may access multiple river systems, they are subject to being caught in multiple fisheries throughout their range. In addition, stress or injury to Atlantic sturgeon taken as bycatch but released alive may result in delayed mortality or increased susceptibility to other threats, such as poor water quality (e.g., exposure to toxins and low dissolved oxygen). Sublethal impacts may result in reduced ability to perform major life functions, such as foraging and spawning, or even post-capture mortality.

Viability of the South Atlantic DPS
The viability of sturgeon population growth is particularly sensitive to mortality, given their long lived, slow growing, and relatively low stock productivity. Because a DPS is a group of populations, the stability, viability, and persistence of individual populations affects the persistence and viability of the larger DPS. The loss of any population within a DPS will result in (1) a long-term gap in the range of the DPS that is unlikely to be recolonized; (2) loss of reproducing individuals; (3) loss of genetic biodiversity; (4) potential loss of unique haplotypes; (5) potential loss of adaptive traits; and (6) reduction in total number. The loss of a population will negatively impact the persistence and viability of the DPS as a whole, as fewer than two individuals per generation spawn outside their natal rivers (Secor and Waldman 1999). The persistence of individual populations, and in turn the DPS, depends on successful spawning and rearing within the freshwater habitat, the immigration into marine habitats to grow, and then the return of adults to natal rivers to spawn.

The riverine spawning habitat of the South Atlantic DPS occurs within the South Atlantic Coastal Plain eco-region. The Nature Conservancy (TNC) describes the South Atlantic Coastal Plain eco-region as fall-line sandhills to rolling longleaf pine uplands to wet pine flatwoods; from small streams to large river systems to rich estuaries; from isolated depression wetlands to Carolina bays to the Okefenokee Swamp. Other ecological systems in the eco-region include maritime forests on barrier islands, pitcher plant seepage bogs and Altamaha grit (sandstone) outcrops. The primary threats to biological diversity in the South Atlantic Coastal Plain listed by TNC are intensive silvicultural practices, including conversion of natural forests to highly managed pine monocultures and the clear-cutting of bottomland hardwood forests. Changes in water quality and quantity, caused by hydrologic alterations (impoundments, groundwater withdrawal, and ditching), and point and nonpoint pollution, are threatening the aquatic systems. Development is a growing threat, especially in coastal areas. Agricultural conversion, fire regime alteration, and the introduction of nonnative species are additional threats to the eco-region's diversity. The South Atlantic DPS' spawning rivers, located in the South Atlantic Coastal Plain, are primarily of two types: brownwater (with headwaters north of the fall line, silt-laden) and blackwater (with headwaters in the coastal plain, stained by tannic acids). Therefore, the eco-region delineations support that the physical and chemical properties of the Atlantic sturgeon spawning rivers utilized by the South Atlantic DPSs are unique to the population segment.

The concept of a viable population able to adapt to changing environmental conditions is critical to Atlantic sturgeon, and the low population numbers of every river population in the South Atlantic DPS puts them in danger of extinction throughout their range; none of the populations are large or stable enough to provide with any level of certainty for continued existence of Atlantic sturgeon in this part of its range. Their late age at maturity provides more opportunities for individual Atlantic sturgeon to be removed from the population before reproducing. While a long life span allows multiple opportunities to contribute to future generations, it also increases the time frame over which exposure to the multitude of threats facing the South Atlantic DPS can occur.

Summary of the Status of Atlantic Sturgeon
The Atlantic sturgeon is an anadromous species inhabiting large coastal rivers along the Eastern seaboard of North America from the Saint John River in New Brunswick, Canada south to the St. Johns River in Florida. Clinal differences in growth and behavior are obvious for Atlantic sturgeon: fish in the north grow slower, but reach larger size; timing of spawning migration is earlier in the south; etc. Genetic analysis has indicated that population structure occurs across the range of Atlantic sturgeon. Threats to Atlantic sturgeon include the loss, reduction, and degradation of habitat resulting from dams, dredging, and changes in water quality parameters (such as depth, temperature, velocity, and dissolved oxygen).

3.2.2 Green Sea Turtle

Green turtles are distributed circumglobally and can be found in the Pacific, Indian, and Atlantic Oceans, as well as the Mediterranean Sea (NMFS and USFWS 1991, Seminoff 2004, NMFS and USFWS 2007a). In 1978, the Atlantic population of the green sea turtle was listed as threatened under the ESA, except for the breeding populations in Florida and on the Pacific coast of Mexico, which were listed as endangered.

Green sea turtle

Life History and Distribution
The estimated age at sexual maturity for green sea turtles is between 20-50 years (Balazs 1982, Frazer and Ehrhart 1985). Green sea turtle mating occurs in the waters off the nesting beaches. Each female deposits 1-7 clutches (usually 2-3) during the breeding season at 12-14 day intervals. Mean clutch size is highly variable among populations, but averages 110-115 eggs/nest. Females usually have 2-4 or more years between breeding seasons, whereas males may mate every year (Balazs 1983). After hatching, green sea turtles go through a post-

hatchling, pelagic stage during which they are associated with drift lines of algae and other debris. At approximately 20- to 25-cm carapace length, juveniles leave pelagic habitats and enter benthic foraging areas (Bjorndal 1997).

Green sea turtles are primarily herbivorous, feeding on algae and sea grasses, but also occasionally consume jellyfish and sponges. The post-hatchling, pelagic-stage individuals are assumed to be omnivorous, but little data are available.

Green sea turtle foraging areas in the southeastern United States include any coastal shallow waters having macroalgae or seagrasses. This includes areas near mainland coastlines, islands, reefs, or shelves, as well as open-ocean surface waters, especially where advection from wind and currents concentrates pelagic organisms (Hirth 1997, NMFS and USFWS 1991). 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, Carr 1984), 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 (Wershoven and Wershoven 1992, Guseman and Ehrhart 1992). Adults of both sexes are presumed to migrate between nesting and foraging habitats along corridors adjacent to coastlines and reefs.

Some of the principal feeding pastures in the western Atlantic Ocean include the upper west coast of Florida and the northwestern coast of the Yucatán Peninsula. Additional important foraging areas in the western Atlantic include the Mosquito Lagoon and Indian River Lagoon systems and nearshore wormrock reefs between Sebastian and Ft. Pierce Inlets in Florida, Florida Bay, the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Caribbean coast of Panama, the Miskito Coast in Nicaragua, and scattered areas along Colombia and Brazil (Hirth 1997). The summer developmental habitat for green turtles also encompasses estuarine and coastal waters from North Carolina to as far north as Long Island Sound (Musick and Limpus 1997).

Population Dynamics and Status

Nest counts can be used to estimate the number of reproductively mature females nesting annually. The 5-year status review for the species identified eight geographic areas considered to be primary sites for green sea turtle nesting in the Atlantic/Caribbean and reviewed the trend in nest count data for each (NMFS and USFWS 2007a). These sites are (1) Yucatán Peninsula, Mexico; (2) Tortuguero, Costa Rica; (3) Aves Island, Venezuela; (4) Galibi Reserve, Suriname; (5) Isla Trindade, Brazil; (6) Ascension Island, United Kingdom; (7) Bioko Island, Equatorial Guinea; and (8) Bijagos Achipelago, Guinea-Bissau (NMFS and USFWS 2007a). Nesting at all of these sites was considered to be stable or increasing with the exception of Bioko Island and the Bijagos Archipelago where the lack of sufficient data precluded a meaningful trend assessment for either site (NMFS and USFWS 2007a). Seminoff (2004) likewise reviewed green sea turtle nesting data for eight sites in the western, eastern, and central Atlantic, including all of the above with the exception that nesting in Florida was reviewed in place of Isla Trindade, Brazil. Seminoff (2004) concluded that all sites in the central and western Atlantic showed increased nesting, with the exception of nesting at Aves Island, Venezuela, while both sites in the eastern Atlantic demonstrated decreased nesting. These sites are not inclusive of all green sea turtle nesting in the Atlantic. However, other sites are not believed to support nesting levels high enough that would change the overall status of the species in the Atlantic (NMFS and USFWS 2007a).

By far, the most important nesting concentration for green turtles in the western Atlantic is in Tortuguero, Costa Rica (NMFS and USFWS 2007a). Nesting in the area has increased considerably since the 1970s, and nest count data from 1999-2003 suggest nesting by 17,402-37,290 females per year (NMFS and USFWS 2007a). The number of females nesting per year on beaches in the Yucatán, Aves Island, Galibi Reserve, and Isla Trindade number in the hundreds to low thousands, depending on the site (NMFS and USFWS 2007a). The vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Meylan et al. 1995, Johnson and Ehrhart 1994). Green sea turtle nesting in Florida has been increasing since 1989 (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute Index Nesting Beach Survey Database). Certain Florida nesting beaches have been designated index beaches. 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 turtle nesting shows biennial peaks in abundance with a generally positive trend during the ten years of regular monitoring. This is perhaps due to increased protective legislation throughout the Caribbean (Meylan et al. 1995). A total statewide average (all beaches, including index beaches) of 5,039 green turtle nests were laid annually in Florida between 2001 and 2006, with a low of 581 in 2001 and a high of 9,644 in 2005 (NMFS and USFWS 2007a). Data from the index nesting beaches program in Florida substantiate the dramatic increase in nesting. In 2007, there were 9,455 green turtle nests found just on index nesting beaches, the highest since index beach monitoring began in 1989. The number fell back to 6,385 in 2008, further dropping under 3,000 in 2009, but that consecutive drop was a temporary deviation from the normal biennial nesting cycle for green turtles, as 2010 saw an increase back to 8,426 nests on the index nesting beaches (FWC Index Nesting Beach Survey Database). Occasional nesting has been documented along the Gulf coast of Florida, at southwest Florida beaches, as well as the beaches on the Florida Panhandle (Meylan et al. 1995). More recently, green turtle nesting occurred on Bald Head Island, North Carolina; just east of the mouth of the Cape Fear River; on Onslow Island; and on Cape Hatteras National Seashore. In 2010, a total of 18 nests were found in North Carolina, 6 nests in South Carolina, and 6 nests in Georgia (nesting databases maintained on www.seaturtle.org). Increased nesting has also been observed along the Atlantic coast of Florida, on beaches where only loggerhead nesting was observed in the past (Pritchard 1997). FWC data indicates that nest counts for green turtles in Florida have increased dramatically over a 23-year period (1989-2012). The average annual increase for this species is approximately 12 percent. Recent modeling by Chaloupka et al. (2008) using data sets of 25 years or more resulted in an estimate of the Tortuguero, Costa Rica, population, the largest Atlantic rookery, growing at 4.9 percent annually.

There are no reliable estimates of the number of immature green sea turtles that inhabit coastal areas of the southeastern United States, where they come to forage. However, information on incidental captures of immature green sea turtles at the St. Lucie Power Plant in St. Lucie County, Florida, shows that the annual number of immature green sea turtles captured by their offshore cooling water intake structures has increased significantly over the years. Green sea turtle annual captures averaged 19 for 1977-1986, 178 for 1987-1996, and 262 for 1997-2001 (FPL 2002). In the five years from 2002-2006, green sea turtle captures averaged 333 per year, with a high of 427 and a low of 267 (FPL and Quantum Resources 2007). More recent unpublished data shows 101 captures in 2007, 299 in 2008, 38 in 2009 (power output was cut—and cooling water intake concomitantly reduced—for part of that year) and 413 in 2010. Ehrhart et al. (2007) has also documented a significant increase in in-water abundance of green turtles in the Indian River Lagoon area. It is likely that immature green sea turtles foraging in the southeastern United States come from multiple genetic stocks; therefore, the status of immature green sea turtles in the southeastern United States might also be assessed from trends at all of the main regional nesting beaches, principally Florida, Yucatán, and Tortuguero.

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of green sea turtles 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. However, there are still significant and ongoing threats to green sea turtles from human-related causes in the United States. These threats include beach armoring, erosion control, artificial lighting, beach disturbance (e.g., driving on the beach), pollution, foraging habitat loss as a result of direct destruction by dredging, siltation, boat damage, other human activities, and interactions with fishing gear, and oil spills. In 2010, there was a massive release of oil in the Gulf of Mexico at British Petroleum's Deepwater Horizon well. At this time the assessment of total direct impact to sea turtles has not been determined. Additionally, the long-term impacts to sea turtles as a result of habitat impacts, prey loss, and subsurface oil particles and oil components broken down through physical, chemical, and biological processes are not known. Sea sampling coverage in the pelagic driftnet, pelagic longline, Southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green turtles. The diversity of sea turtles' life history leaves them susceptible to many natural impacts, including impacts while they are on land, in the benthic environment, and in the pelagic environment. Hurricanes are particularly destructive to sea turtle nests. Sand accretion and rainfall that result from these storms, as well as wave action, can appreciably reduce hatchling success.

There is also the increasing threat from green sea turtle fibropapillomatosis disease. Presently, this disease is cosmopolitan and has been found to affect large numbers of animals in some areas, including Hawaii and Florida (Herbst 1994, Jacobson 1990, Jacobson et al. 1991). Other sources of natural mortality include cold-stunning and biotoxin exposure. Cold-stunning is not considered a major source of mortality in most cases. As temperatures fall below 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 1989). 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, with hundreds found dead, or dying after they were gathered. Another cold-stunning event occurred in the western Gulf of Mexico in February 2011, resulting in approximately 1,500 green turtles found cold-stunned off Texas, and another 300 or so off Mexico, with an as yet undetermined number found dead or dying after they were found.

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).

Impacts on sea turtles currently cannot, for the most part, be predicted with any degree of certainty; however, significant impacts to the hatchling sex ratios of green turtles may result (NMFS and USFWS 2007). In marine turtles, sex is determined by temperature in 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). Green sea turtle hatchling size also appears to be influenced by incubation temperatures, with smaller hatchlings produced at higher temperatures (Glen et al. 2003).

The effects from increased temperatures may be exacerbated on developed nesting beaches where shoreline armoring and construction has denuded vegetation. 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 (Daniels, White et al. 1993), (Fish, Cote et al. 2005), (Baker, Littnan et al. 2006). 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 increased frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis, Baker et al. 2006), (Baker, Littnan et al. 2006).

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

Summary of Status for Atlantic Green Sea Turtles

Green turtles range in the western Atlantic from Massachusetts to Argentina, including the Gulf of Mexico and the Caribbean Sea, but are considered rare in benthic areas north of Cape Hatteras (Wynne and Schwartz 1999). Green turtles face many of the anthropogenic threats for other sea turtles described herein. In addition, green turtles are also susceptible to fibropapillomatosis, which can result in death. In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Recent population estimates for the western Atlantic area are not available. The pattern of green turtle nesting shows biennial peaks in abundance, with a strong positive trend since establishment of index beaches in Florida in 1989.

3.2.3 Kemp's Ridley Sea Turtle

The Kemp's ridley was listed as endangered on December 2, 1970. Internationally, the Kemp's ridley is considered the most endangered sea turtle (Zwinenberg 1977, Groombridge 1982, TEWG 2000). Kemp's ridleys nest primarily at Rancho Nuevo, a stretch of beach in Mexico's Tamaulipas State. This species occurs mainly in coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean. Occasional individuals reach European waters (Brongersma 1972). Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the United States.

Kemp's ridley sea turtle

Life History and Distribution

The TEWG (1998) estimates age at maturity from 7-15 years. Females return to their nesting beach about every 2 years (TEWG 1998). Nesting occurs from April into July and is essentially limited to the beaches of the western Gulf of Mexico, near Rancho Nuevo in southern Tamaulipas, Mexico. The mean clutch size for Kemp's ridleys is 100 eggs/nest, with an average of 2.5 nests/female/season.

Little is known of the movements of the post-hatchling stage (pelagic stage) within the Gulf of Mexico. Studies have shown the post-hatchling pelagic stage varies from 1-4 or more years, and the benthic immature stage lasts 7-9 years (Schmid and Witzell 1997). Benthic immature Kemp's ridleys have been found along the eastern seaboard of the United States and in the Gulf of Mexico. Atlantic benthic immature sea turtles travel northward as the water warms to feed in the productive, coastal waters off Georgia through New England, returning southward with the onset of winter (Lutcavage and Musick 1985, Henwood and Ogren 1987, Ogren 1989). Studies suggest that benthic immature Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud 1995).

Stomach contents of Kemp's ridleys along the lower Texas coast consisted of nearshore crabs and mollusks, as well as fish, shrimp, and other foods considered to be shrimp fishery discards (Shaver 1991). A 2005 dietary study of immature Kemp's ridleys off southwest Florida documented predation on benthic tunicates, a previously undocumented food source for this species (Witzell and Schmid 2005). These pelagic stage Kemp's ridleys presumably feed on the available *Sargassum* and associated infauna or other epipelagic species found in the Gulf of Mexico.

Population Dynamics and Status

Of the seven extant 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 Rancho Nuevo beaches (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, nesting numbers were below 1,000 (with a low of 702 nests in 1985). However, observations of increased nesting (with 6,277 nests recorded in 2000) suggest that the decline in the ridley population has stopped and the population is now increasing (USFWS 2000). Poaching was once a problem, but the Mexican government closely monitors the beaches at Rancho Nuevo, so poaching is no longer a threat to nesting Kemp's ridleys (R.Hoffman, NMFS, pers. comm., 2012). The number of nests observed at Rancho Nuevo and nearby beaches increased at a mean rate of 11.3 percent per year from 1985 to 1999 (TEWG 2000). These trends are further supported by 2004-2007 nesting data from Mexico. The number of nests over that period has increased from 7,147 in 2004, to 10,099 in 2005, to 12,143 in 2006, and 15,032 during the 2007 nesting season (Gladys Porter Zoo nesting database 2007). In 2008, there were 17,882 nests in Mexico (Gladys Porter Zoo 2008), and nesting in 2009 reached 21,144 (Gladys Porter Zoo 2010). In 2010, nesting declined significantly, to 13,302 (Gladys Porter Zoo 2010). Nesting numbers rebounded from 2010's reduced nesting to 20,576 (Gladys Porter Zoo 2011). A small nesting population is also emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 128 in 2007, 195 in 2008, and 197 in 2009. Texas nesting then experienced a decline similar to that seen in Mexico for 2010, with 140 nests (National Park Service data, http://www.nps.gov/pais/naturescience/strp.htm), but nesting rebounded in 2011 with a record 199 nests (National Park Service data, http://www.nps.gov/pais/naturescience/current-season.htm).

Heppell et al. (2005) predicted in a population model that the population is expected to increase at least 12-16 percent per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2015. 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. In 2009 the population was on track with 21,144 nests, but an unexpected and as yet unexplained drop in nesting occurred in 2010 (13,302). A subsequent increase to 20,576 nests in 2011 occurred, then in 2012, nesting numbers in Mexico were the highest recorded at 21,797 (Gladys Porter Zoo 2012). The increases in Kemp's ridley sea turtle nesting seen in the last two decades is likely due to a combination of management measures including elimination of direct harvest, nest protection, the use of Turtle Excluder Devices (TEDs), reduced trawling effort in Mexico and the U.S., 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 stochasticity all of which are often difficult to predict with any certainty.

Threats

Kemp's ridleys face many of the same threats as other sea turtle species, including impacts while they are on land, in the benthic environment, and in the pelagic environment. Hurricanes are particularly destructive to sea turtle nests. Sand accretion and rainfall that result from these storms, as well as wave action, can appreciably reduce hatchling success. Oceanic events such as cold-stunning can occur throughout the range of the species, but it may be a greater risk for sea turtles that utilize the more northern habitats of Cape Cod Bay and Long Island Sound. For example, in the winter of 1999-2000, there was a major cold-stunning event where 218 Kemp's ridleys, 54 loggerheads, and 5 green sea turtles were found on Cape Cod beaches (R. Prescott, NMFS, pers. comm. 2001). Annual cold-stunning events do not always occur at this magnitude; the extent of episodic major cold-stun events may be associated with numbers of sea turtles utilizing Northeast waters in a given year, oceanographic conditions, and the occurrence of storm events in the late fall. Many cold-stunned sea turtles can survive if found early enough, but cold-stunning events can still represent a significant cause of natural mortality. A complete list of other indirect factors can be found in a report published by the NMFS Southeast Fisheries Science Center (SEFSC) in 2001.

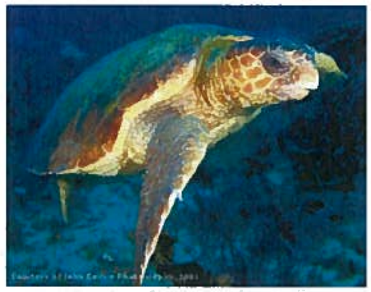
Although changes in the use of shrimp trawls and other trawl gear have helped to reduce mortality of Kemp's ridleys, this species is also affected by other sources of anthropogenic impacts. For example, in the spring of 2000, a total of 5 Kemp's ridley carcasses were recovered from the same North Carolina beaches where 275 loggerhead carcasses were found. Cause of death for most of the sea turtles recovered was unknown, but the mass mortality event was suspected to have been from a large-mesh gillnet fishery operating offshore in the preceding weeks. The 5 Kemp's ridley carcasses that were found are likely to have been only a minimum count of the number of Kemp's ridleys that were killed or seriously injured as a result of the fishery interaction because it is unlikely that all of the carcasses washed ashore.

Summary of Status for Kemp's Ridley Sea Turtles
The only major nesting site for Kemp's ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). The number of nests observed at Rancho Nuevo and nearby beaches increased from 1985 to 2009. Nesting has also exceeded 12,000 nests per year from 2004-2009 (Gladys Porter Zoo database). In 2010, nesting declined significantly to 13,302, but in 2011 Kemp's ridley nesting in Mexico rebounded to 20,576 nests, which is still fewer nests than in 2009. Then in 2012, nesting numbers in Mexico were the highest ever recorded at 21,797. Kemp's ridleys mature at an earlier age (7-15 years) than other chelonids, thus "lag effects" as a result of unknown impacts to the non-breeding life stages would likely have been seen in the increasing nest trend beginning in 1985 (USFWS and NMFS 1992).

The largest contributors to the decline of Kemp's ridleys in the past were commercial and local exploitation, especially poaching of nests at the Rancho Nuevo site, as well as the Gulf of Mexico trawl fisheries. The advent of TED regulations for trawlers and protections for the nesting beaches has allowed the species to begin to recover. Many threats to the future of the species remain, including interactions with fishery gear, marine pollution, foraging habitat destruction, illegal poaching of nests and potential threats to the nesting beaches from such sources as global climate change, development, and tourism pressures.

3.2.4 Northwest Atlantic Ocean DPS of the Loggerhead Sea Turtle

NMFS and USFWS published a final rule listing nine DPSs of loggerhead sea turtles as threatened or endangered (76 FR 58,868, September 22, 2011; effective October 24, 2011). The DPSs established by this rule are (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 is the only one considered in this opinion.


Loggerhead sea turtle

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 five Western Atlantic subpopulations, divided geographically as (1) a northern nesting subpopulation, occurring from North Carolina to Northeast Florida at about 29°N; (2) a South Florida nesting subpopulation, occurring from 29°N on the east coast 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 and SEFSC 2001). The recovery plan for the NWA population of loggerhead sea turtles concluded, based on recent advances in genetic analyses, that there is no genetic distinction between loggerheads nesting on adjacent beaches along the Florida Peninsula and that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the 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 (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 and Distribution
Past literature gave an estimated age at maturity of 21-35 years (Frazer and Ehrhart 1985; Frazer, Limpus et al. 1994) with the benthic immature stage lasting at least 10-25 years. However, based on new data from tag returns, strandings, and nesting surveys, NMFS and SEFSC (2001) estimated ages of maturity ranging from 20-38 years and benthic immature stage lasting from 14-32 years.

Mating takes place in late March-early June, and eggs are laid throughout the summer, with a mean clutch size of 100-126 eggs in the southeastern United States. Individual females nest multiple times during a nesting season, with a mean of 4.1 nests per individual (Murphy and Hopkins 1984). Nesting migrations for an individual female loggerhead are usually on an interval of 2-3 years, but can vary from 1-7 years (Dodd and U.S. Fish and Wildlife Service. 1988). Generally, loggerhead sea turtles originating from the Western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for as long as 7-12 years or more. Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length, they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico, although some loggerheads may move back and forth between the pelagic and benthic environment (Witzell 2002). Benthic immature loggerheads (sea turtles that have come back to inshore and nearshore waters)—the life stage following the pelagic immature stage—have been found from Cape Cod, Massachusetts, to southern Texas, and occasionally strand on beaches in northeastern Mexico.

Tagging studies have shown loggerheads that have entered the benthic environment undertake routine migrations along the coast that are limited by seasonal water temperatures. Loggerhead sea turtles occur year-round in offshore waters off North Carolina where water temperature is influenced by the Gulf Stream. As coastal water temperatures warm in the spring, loggerheads begin to immigrate to North Carolina inshore waters (e.g., Pamlico and Core Sounds) and also move up the coast (Epperly 1995; Epperly, Braun et al. 1995; Epperly, Braun et al. 1995), occurring in Virginia foraging areas as early as April and on the most northern foraging grounds in the Gulf of Maine in June. The trend is reversed in the fall as water temperatures cool. The large majority of loggerheads leave the Gulf of Maine by mid-September but some may remain in mid-Atlantic and Northeast areas until late fall. By December, loggerheads have emigrated from inshore North Carolina waters and coastal waters to the north to waters offshore of North Carolina, particularly off Cape Hatteras, and waters further south where the influence of the Gulf Stream provides temperatures favorable to sea turtles (≥ 11°C) (Epperly 1995; Epperly, Braun et al. 1995; Epperly, Braun et al. 1995). Loggerhead sea turtles are year-round residents of central and south Florida.

Pelagic and benthic juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd and U.S. Fish and Wildlife Service. 1988). Sub-adult and adult loggerheads are primarily coastal dwelling and typically prey on benthic invertebrates such as mollusks and decapod crustaceans in a variety of habitats.

More recent studies are revealing that the loggerhead's life history is more complex than previously believed. Rather than making discrete developmental shifts from oceanic to neritic environments, research is showing that both adults and (presumed) neritic stage juveniles continue to use the oceanic environment and will move back and forth between the two habitats (Witzell 2002), (Blumenthal, Solomon et al. 2006), (Hawkes, Broderick et al. 2006), (McClellan and Read 2007). One of the studies tracked the movements of adult females post-nesting and found a difference in habitat use was related to body size, with larger turtles staying in coastal waters and smaller turtles traveling to oceanic waters (Hawkes, Broderick et al. 2006). A tracking study of large juveniles found that the habitat preferences of this life stage were also diverse, with some remaining in neritic waters while others moved off into oceanic waters

(McClellan and Read 2007). However, unlike the Hawkes et al. study (Hawkes, Broderick et al. 2006),there was no significant difference in the body size of turtles that remained in neritic waters versus oceanic waters (McClellan and Read 2007). In either case, the research not only supports the need to revise the life history model for loggerheads but also demonstrates that threats to loggerheads in both the neritic and oceanic environments are likely impacting multiple life stages of this species.

Population Dynamics and Status

A number of stock assessments and similar reviews (TEWG 1998; TEWG 2000; TEWG 2009) (NMFS and SEFSC 2001), (Heppell, Crowder et al. 2003), (NMFS and USFWS 2008), (Conant, Dutton et al. 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. However, nesting beach surveys can provide a reliable assessment of trends in the adult female population, due to the strong nest site fidelity of females turtles, as long as such studies are sufficiently long and effort and methods are standardized (see, e.g., (NMFS and USFWS 2008), (Meylan 1982). NMFS and USFWS (2008) concluded that the lack of change in two 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. Analysis of available data for the Peninsular Florida Recovery Unit up through 2008 led to the conclusion that the observed decline in nesting for that unit could best be explained by an actual decline in the number of adult female loggerheads in the recovery unit (Witherington et al. 2009).

Annual nest totals from beaches within what NMFS and USFWS have defined as the Northern Recovery Unit (NRU) averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (GDNR unpublished data, NCWRC unpublished data, SCDNR unpublished data), and represent approximately 1,272 nesting females per year (4.1 nests per female, (Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3 percent annually. Nest totals from aerial surveys conducted by SCDNR showed a 1.9 percent annual decline in nesting in South Carolina since 1980. Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline. Data in 2008 has shown improved nesting numbers, but future nesting years will need to be analyzed to determine if a change in trend is occurring. In 2008, 841 loggerhead nests were observed compared to the 10-year average of 715 nests in North Carolina. The number dropped to 276 in 2009, but rose again to 846 in 2010. In South Carolina, 2008 was the seventh highest nesting year on record since 1980, with 4,500 nests, but this did not change the long-term trend line indicating a decline on South Carolina beaches. Then in 2009 nesting dropped to 2,183, with an increase to 3,141 in 2010. Georgia beach surveys located a total of 1,648 nests in 2008. This number surpassed the previous statewide record of 1,504 nests in 2003. In 2009, the number of nests declined to 998, and in 2010, a new statewide record was established with 1,760 loggerhead nests. According to analyses by the Georgia Department of Natural Resources (GADNR), the 40-year time-series trend data show an overall decline in nesting, but the shorter comprehensive survey data (20 years) indicate a stable population (SCDNR 2008; GDNR, NCWRC, and SCDNR nesting data located at www.seaturtle.org).Another consideration that may add to the importance and vulnerability of the NRU is the sex ratio of this subpopulation.

NMFS scientists have estimated that the Northern subpopulation produces 65 percent males (NMFS and SEFSC 2001). However, research conducted over a limited time frame has found opposing sex ratios (Wyneken, Blair et al. 2004), so further information is needed to clarify the issue. Since nesting female loggerhead sea turtles exhibit nest fidelity, the continued existence of the Northern subpopulation is related to the number of female hatchlings that are produced. Producing fewer females will limit the number of subsequent offspring produced by the subpopulation.

The Peninsular Florida Recovery Unit (PFRU) is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census (all beaches including index nesting beaches) undertaken from 1989 to 2007 showed a mean of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008). The statewide estimated total for 2010 was 73,702 (FWRI nesting database). A detailed analysis of Florida's long-term loggerhead nesting data (1989-2012) revealed three distinct annual trends. Following a 23 percent increase between 1989 and 1998, nest counts declined sharply over nearly a decade. However, annual nest counts show a strong increase over the last five years. Examining only the period between the high-count nesting season in 1998 and the most recent (2012) nesting season, researchers found no demonstrable trend, indicating a reversal of the post-1998 decline. The overall change in counts from 1989 to 2012 is positive. Nest counts in 2012, corrected for subtle variation in survey effort, were slightly below the high nest count recorded in 1998. Florida accounts for more than 90 percent of U.S. loggerhead nesting (Florida Fish and Wildlife Conservation Commission (FWC) data, http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/).

The remaining three recovery units—Dry Tortugas (DTRU), Northern Gulf of Mexico (NGMRU), and Greater Caribbean (GCRU)—are much smaller nesting assemblages but 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 has been 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 with no detectable trend during this period (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, Statewide Nesting Beach Survey Data, NMFS and USFWS 2008). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. The 12-year dataset (1997-2008) of index nesting beaches in the area shows a significant declining trend of 4.7 percent annually (NMFS and USFWS 2008). Similarly, nesting survey effort has been inconsistent among the GCRU nesting beaches and no trend can be determined for this subpopulation. Zurita et al. (2003) found a statistically significant increase in the number of nests on seven of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. However, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008).

Determining the meaning of the nesting decline data is confounded by various in-water research that suggests the abundance of neritic juvenile loggerheads is steady or increasing (Ehrhart, Redfoot et al. 2007), (M. Bresette, pers. comm. regarding captures at the St. Lucie Power Plant, SCDNR unpublished SEAMAP-SA data), (Epperly, Braun-McNeill et al. 2007). Ehrhart, Redfoot et al. (2007) found no significant regression-line trend in the long-term dataset.

However, notable increases in recent years and a statistically significant increase in CPUE of 102.4 percent from the 4-year period of 1982-1985 to the 2002-2005 periods were found. Epperly, Braun-McNeill et al. (2007) determined the trends of increasing loggerhead catch rates from all the aforementioned studies in combination provide evidence there has been an increase in neritic juvenile loggerhead abundance in the southeastern United States in the recent past. A study led by the South Carolina Department of Natural Resources found that standardized trawl survey CPUEs for loggerheads from South Carolina to North Florida was 1.5 times higher in summer 2008 than summer 2000. However, even though there were persistent inter-annual increases from 2000-2008, the difference was not statistically significant, likely due to the relatively short time series. Comparison to other datasets from the 1950s through 1990s showed much higher CPUEs in recent years regionally and in the South Atlantic Bight, leading SCDNR to conclude that it is highly improbable that CPUE increases of such magnitude could occur without a real and substantial increase in actual abundance (Arendt, Byrd et al. 2009). Whether this increase in abundance represents a true population increase among juveniles or merely a shift in spatial occurrence is not clear. NMFS and USFWS (2008), citing Bjorndal, Bolten et al. (2005), 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 Stage III individuals (oceanic/neritic juveniles, historically referred to as small benthic juveniles), which could indicate a relatively large cohort that will recruit to maturity in the near future. However, such an increase in adults may be temporary, as in-water studies throughout the eastern United States also indicate a substantial decrease in the abundance of the smallest Stage III loggerheads, a pattern also corroborated by stranding data (TEWG 2009).

The NMFS Southeast Fishery Science Center has developed a preliminary stage/age demographic model to help determine the estimated impacts of mortality reductions on loggerhead sea turtle population dynamics (TEWG 2009). This model does not incorporate existing trends in the data (such as nesting trends) but instead relies on utilizing the available information on the relevant life-history parameters for sea turtles and then predicts future population trajectories based upon model runs using those parameters. Therefore, the model results do not build upon, but instead are complementary to, the trend data obtained through nest counts and other observations. 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. Model runs were done for each individual recovery unit as well as the western North Atlantic population as a whole, and the resulting trajectories were found to be very similar. One of the most robust results from the model was an estimate of the adult female population size for the western North Atlantic in the 2004-2008 time frame. The distribution resulting from the model runs suggest the adult female population size to be likely between approximately 20,000 to 40,000 individuals, with a low likelihood of being up to 70,000. A much less robust estimate for total benthic females in the western North Atlantic was also obtained, with a likely range of approximately 30,000-300,000 individuals, up to less than 1 million.

The results of one set of model runs suggest that the western North Atlantic population (using data up through 2008) is most likely declining, but this result was very sensitive to the choice of the position of the parameters within their range and hypothesized distributions. This example was run to predict the distribution of projected population trajectories for benthic females using a range of starting population numbers from the 30,000 estimated minimum to the greater than the 300,000 likely upper end of the range and declining trajectories were estimated for all of the population estimates. After 10,000 simulation runs of the models using the parameter ranges, 14 percent of the runs resulted in growing populations, while 86 percent resulted in declining populations. While this does not translate to an equivalent statement that there is an 86 percent chance of a declining population, it does illustrate that, given the life history parameter information currently thought to comprise the likely range of possibilities, it appears most likely that with no changes to those parameters the population is projected to decline. Additional model runs using the range of values for each life history parameter, the assumption of non-uniform distribution for those parameters, and a 5 percent natural (non-anthropogenic) mortality for the benthic stages resulted in a determination that a 60-70 percent reduction in anthropogenic mortality in the benthic stages would be needed to bring 50 percent of the model runs to a static (zero growth or decline) or increasing trajectory.

As a result of the large uncertainty in our knowledge of loggerhead life history, at this point predicting the future populations or population trajectories of loggerhead sea turtles with precision is very uncertain. The model results, however, are useful in guiding future research needs to better understand the life history parameters that have the most significant impact in the model. Additionally, the model results provide valuable insights into the likely overall declining status of the species and in the impacts of large-scale changes to various life history parameters (such as mortality rates for given stages) and how they may change the trajectories. The results of the model, in conjunction with analyses conducted on nest count trends, such as Witherington, Kubilis et al. (2009), which have suggested that the population decline is real, provides a strong basis for the conclusion that the western North Atlantic loggerhead population is in decline. NMFS also recently convened a new Turtle Expert Working Group (TEWG) for loggerhead sea turtles that gathered available data and examined the potential causes of the nesting decline and what the decline means in terms of population status. The TEWG ultimately could not determine whether or not decreasing annual numbers of nests among the Western North Atlantic loggerhead subpopulations were due to stochastic processes resulting in fewer nests, a decreasing average reproductive output of the adult females, decreasing numbers of adult females, or a combination of those factors. Past and present mortality factors that could impact current loggerhead nest numbers are many, and it is likely that several factors compound to create the current decline. Regardless of the source of the decline, it is clear that the reduced nesting will result in depressed recruitment to subsequent life stages over the coming decades (TEWG 2009).

Threats

The 5-year status review of loggerhead sea turtles recently completed by NMFS and the USFWS provides a summary of natural as well as anthropogenic threats to loggerhead sea turtles (NMFS and USFWS 2007). The Loggerhead Recovery Team also undertook a comprehensive evaluation of threats to the species, and described them separately for the terrestrial, neritic, and oceanic zones (NMFS and USFWS 2008). The diversity of sea turtles' life history leaves them susceptible to many natural and human impacts, including impacts while they are on land, in the benthic environment, and in the pelagic environment. Hurricanes are particularly destructive to sea turtle nests. Sand accretion and rainfall that result from these storms, as well as wave action, can appreciably reduce hatchling success. For example, in 1992 all of the eggs over a 90-mile length of coastal Florida were destroyed by storm surges on beaches that were closest to the eye of Hurricane Andrew (Milton, Leone-Kabler et al. 1994). Also, many nests were destroyed during the 2004 and 2005 hurricane seasons. In August 2011, Hurricane Irene side-swiped the U.S. Atlantic sea turtle nesting beaches prior to making landfall farther up north. Impacts to sea turtle nests and nesting beaches varied from minor to hundreds of nests and the loss of extensive nesting habitat on the various beaches. The damage to turtle nesting was somewhat mitigated by the storm's occurrence late in the nesting season, as many nests had already hatched and the hatchlings had already left the beach. Although no specific information is available to determine the long-term population impacts of Hurricane Irene, the impact is not expected to be significant.

Other sources of natural mortality include cold-stunning and biotoxin exposure. Cold-stunning is not considered a major source of mortality, but cold-stunning of loggerhead turtles has been reported at several locations in the northeast and southeast United States, including the Indian River Lagoon in Florida (Mendonça and Ehrhart 1982), (Ehrhart 1989) and Texas inshore waters (Hildebrand 1982, Shaver 1990).

Anthropogenic factors that impact hatchlings and adult female sea turtles on land or the success of nesting and hatching include: beach erosion, beach armoring and nourishment, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, beach driving, coastal construction and fishing piers, exotic dune and beach vegetation, and poaching. An increase in human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased presence of native species (e.g., raccoons, armadillos, and opossums), which raid and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the Northwest Atlantic coast (in areas like Merritt Island, Archie Carr, and Hobe Sound National Wildlife Refuges), other areas along these coasts have limited or no protection. Sea turtle nesting and hatching success on unprotected East Florida nesting beaches from Indian River to Broward County, including some high density beaches, are affected by all of the above threats.

Loggerhead sea turtles are affected by a completely different set of anthropogenic threats in the marine environment. These threats include oil and gas exploration, coastal development, marine transportation, marine pollution (which may have a direct impact, or an indirect impact by causing harmful algal blooms), underwater explosions, hopper dredging, offshore artificial lighting, power plant entrainment and/or impingement, entanglement in debris, ingestion of marine debris, marina and dock construction and operation, boat collisions, poaching, and fishery interactions. At this time an assessment of total direct impact to sea turtles from the Deepwater Horizon spill has not been determined and the long-term impacts to sea turtles as a result of habitat impacts, prey loss, and subsurface oil particles and oil components broken down through physical, chemical, and biological processes are also not known. Loggerheads in the pelagic environment are exposed to a series of longline fisheries, which include the highly migratory species' Atlantic pelagic longline fisheries, an Azorean longline fleet, a Spanish longline fleet, and various longline fleets in the Mediterranean Sea (Aguilar, Mas et al. 1995), (Bolten, Bjorndal et al. 1994). Loggerheads in the benthic environment in waters off the coastal United States are exposed to a suite of fisheries in federal and state waters including trawl, purse seine, hook-and-line, gillnet, pound net, longline, and trap fisheries. The sizes and reproductive values of sea turtles taken by fisheries vary significantly, depending on the location and season of the fishery, and size-selectivity resulting from gear characteristics. Therefore, it is possible for fisheries that interact with fewer, more reproductively valuable turtles to have a greater detrimental effect on the population than one that takes greater numbers of less reproductively valuable turtles if the fishery removes a higher overall reproductive value from the population (Wallace, Heppell et al. 2008). The Loggerhead Biological Review Team determined that the greatest threats to the Northwest Atlantic DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant, Dutton et al. 2009). Attaining a more thorough understanding of the characteristics, as well as the quantity, of sea turtle bycatch across all fisheries is of great importance.

Increasing information is becoming available on the future impacts of global climate change. Some of the likely effects being discussed include 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).

Impacts on sea turtles currently cannot, for the most part, be predicted with any degree of certainty; however, significant impacts to the hatchling sex ratios of loggerhead turtles may result (NMFS and USFWS 2007). In marine turtles, sex is determined by temperature in 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 2007). Modeling suggests an increase of 2°C in air temperature would result in a sex ratio of over 80 percent 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 percent female offspring. More ominously, an air temperature increase of 3°C is likely to exceed the thermal threshold of most clutches, leading to death (Hawkes, Broderick et al. 2007).

Warmer sea surface temperatures have been correlated with an earlier onset of loggerhead nesting in the spring (Weishampel, Bagley et al. 2004; Hawkes, Broderick et al. 2007), as well as short inter-nesting intervals (Hays, Broderick et al. 2002) and shorter nesting season (Pike, Antworth et al. 2006).

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

Actions have been taken to reduce anthropogenic impacts to loggerhead sea turtles from various sources, particularly since the early 1990s. These include lighting ordinances, predation control, and nest relocations to help increase hatchling survival, as well as measures to reduce the mortality of pelagic immatures, benthic immatures, and sexually mature age classes in various fisheries and other marine activities. Recent actions have taken significant steps towards reducing the recurring sources of mortality of sea turtles in the environmental baseline and improving the status of all loggerhead subpopulations. For example, the Turtle Excluder Device (TED) regulation published on February 21, 2003 (68 FR 8456), represents a significant improvement in the baseline effects of trawl fisheries on loggerhead sea turtles, though shrimp trawling is still considered to be one of the largest sources of anthropogenic mortality on loggerheads.

Summary of Status for Loggerhead Sea Turtles
NMFS recognizes five recovery units of loggerhead sea turtles in the western North Atlantic based on genetic studies and management regimes. Cohorts from all of these are known to occur within the action area of this consultation, and together comprise the NWA DPS. Using data up through 2007-2008, no long-term data suggest any of the loggerhead subpopulations throughout the entire North Atlantic were increasing in annual numbers of nests (TEWG 2009). Additionally, using both computation of susceptibility to quasi-extinction and stage-based deterministic modeling to determine the effects of known threats to Northwest Atlantic loggerheads, the Loggerhead Biological Review Team determined that this population is likely to decline in the foreseeable future, driven primarily by the mortality of juvenile and adult loggerheads from fishery bycatch throughout the North Atlantic Ocean. These computations were done for each of the recovery units, and all of them resulted in an expected decline (Conant, Dutton et al. 2009). However, with the recent increase in nesting, data through 2010 changes the trend for the PFRU from negative to no trend (slightly negative but not statistically significant) (NMFS and USFWS 2010). Nesting at the index nesting beaches for the PFRU in 2011 declined from 2010, but was still the second highest since 2001, at 43,595 nests (FWRI nesting database). Because of its size, the PFRU may be critical to the survival of the species in the Atlantic Ocean.

All loggerhead subpopulations are faced with a multitude of natural and anthropogenic effects that negatively influence the status of the species. Many anthropogenic effects occur as a result of activities outside of U.S. jurisdiction (i.e., fisheries in international waters).

4 ENVIRONMENTAL BASELINE

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the action area. The environmental baseline is a "snapshot" of a species' health at a specified point in time. It does not include the effects of the action under review in the consultation.

By regulation, environmental baselines for biological opinions include the past and present impacts of all state, federal, or private actions and other human activities in the action area. We identify the anticipated impacts of all proposed federal projects in the specific action area of the consultation at issue, that have already undergone formal or early Section 7 consultation as well as the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02, emphasis added).

Focusing on the impacts of the activities in the action area specifically, allows us to assess the prior experience and state (or condition) of the endangered and threatened individuals that will be exposed to effects from the action under consultation. This is important because, in some phenotypic states or life history stages, listed individuals will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be in other states, stages, or areas within their distributions. The same is true for localized populations of endangered and threatened species: the consequences of changes in the fitness or performance of individuals on a population's status depends on the prior state of the population.

4.1 Status of Sea Turtles within the Action Area

Loggerhead, Kemp's ridley, and green sea turtles are located in the nearshore Atlantic Ocean and may be affected by the proposed action. These species are migratory, traveling for forage grounds or reproduction purposes. The nearshore and inshore waters of the Atlantic Ocean 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 action area, although some individuals may be present at any given time. These same individuals will migrate into other areas of the Atlantic Ocean, as well as the Gulf of Mexico and Caribbean Sea at certain times of the year, and thus may be impacted by activities occurring there; therefore, the status of the species in the action area is the same as the species' range-wide status discussed in Section 3 above. Because they travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea, individuals in the action area are impacted by activities that occur in other areas within their geographic range.

4.1.1 Factors Affecting Sea Turtles within the Action Area

As stated in Section 2 ("Action Area"), the action area is the entrance channels of the harbors in Brunswick and Savannah, Georgia. Numerous activities have been identified as threats and may affect sea turtles in their respective ranges, and thus the action area. The following analysis examines actions that may affect these species' environment within the action area.

4.1.2 Federal Actions

In recent years, NMFS has undertaken several ESA Section 7 consultations to address the effects of federally-permitted fisheries and other federal actions on sea turtles, including green, Kemp's ridley, and loggerhead sea turtles. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on sea turtles. Similarly, recovery actions NMFS has undertaken under the ESA are addressing the problem of interactions with sea turtles by the fishing and oil and gas industries, vessel operations, and other activities such as USACE dredging operations. The summary below of sources of incidental take of sea turtles includes only those federal actions in the South Atlantic which have already concluded or are currently undergoing formal Section 7 consultation.

Vessel and Military Operations
Potential sources of adverse effects from federal vessel operations in the action area include operations of the U.S. Department of Defense (DOD), Navy (USN), Air Force and Coast Guard

(USCG), the Environmental Protection Agency, the National Oceanic and Atmospheric Administration (NOAA), and the USACE. NMFS has conducted formal consultations with the USCG, the USN, and NOAA on some of their vessel operations. Through the Section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. At the present time, however, they present the potential for some level of interaction. Refer to the biological opinions for the USCG (NMFS 1995; NMFS 1996; NMFS 1998) and the USN (NMFS 1997a; 2009) for details on the scope of vessel operations for these agencies and conservation measures being implemented as standard operating procedures. The current USN biological opinion for Mayport (NMFS 2009) authorizes the (lethal) take of up to 17 loggerhead, 3 green, and 2 Kemp's ridley sea turtles during their proposed project.

Since the 2009 USN consultation only covered operations out of Mayport, Florida, and the USN also operates out of Kings Bay, Georgia, which is located just south of the Brunswick Harbor, the potential still remains for USN vessels to adversely affect sea turtles within the action area. Similarly, operations of vessels by other federal agencies within the action area (NOAA, EPA, USACE) may adversely affect sea turtles. However, the in-water activities of those agencies are limited in scope, as they operate either a limited number of vessels or are engaged in research or operational activities that are unlikely to contribute a large amount of risk.

Fisheries

Adverse effects on threatened and endangered species from several types of fishing gear occur in the Atlantic Ocean. Efforts to reduce the adverse effects of commercial fisheries are addressed through the ESA Section 7 process. Trawl, hook-and-line, gillnet, and cast net gear fisheries have all been documented as interacting with sea turtles. For each of these fisheries for which there is a federal fishery management plan (FMP) or for which any federal action is taken to manage that fishery, impacts have been evaluated under Section 7. Several formal consultations have been conducted on the following fisheries that NMFS has determined are likely to adversely affect threatened and endangered species (including sea turtles): the South Atlantic and Gulf of Mexico coastal migratory pelagic fishery, Southeast shrimp fishery, and Atlantic Highly Migratory Species shark fishery. An Incidental Take Statement (ITS) has been issued for interactions with sea turtles in each of these fisheries.

NMFS completed a Section 7 consultation on the continued authorization of the coastal migratory pelagic fishery in the South Atlantic (NMFS 2007c) where hook-and-line, gillnet, and cast net gears are used. The recreational sector uses hook-and- line gear. The hook-and-line effort is primarily trolling. The biological opinion concluded that green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles may be adversely affected by operation of the fishery.

The Southeast shrimp fishery affects sea turtles as they rest, forage, or swim on or near the bottom where they are captured by shrimp trawls pulled along the bottom. In 1990, the National Research Council (NRC) concluded the Southeast shrimp trawl fishery affected more sea turtles than all other activities combined and was the most significant anthropogenic source of sea turtle mortality in U.S. waters, in part due to the high reproductive value of turtles interacted with in this fishery (NRC 1990). The level of annual mortality described in NRC (1990) is believed to have continued until 1992-1994, when U.S. law required all shrimp trawlers in the Atlantic to use turtle excluder devices (TEDs), which allowed some turtles to escape nets before drowning (NMFS 2002). TEDs approved for use have had to demonstrate 97 percent effectiveness in excluding sea turtles from trawls in controlled testing. Despite the apparent success of TEDs for some species of sea turtles (e.g., Kemp's ridleys), it was later discovered that TEDs were not adequately protecting all species and size classes of sea turtles. Analyses by Epperly and Teas (2002) indicated that the minimum requirements for the escape opening dimension in TEDs in use at that time were too small for some sea turtles and that many of the loggerheads stranding annually along the Atlantic were too large to fit the existing openings. In February 2003, NMFS implemented revisions to the TED regulations addressing that problem (68 FR 8456, February 21, 2003). The revised TED regulations were expected to reduce shrimp trawl related mortality by 94 percent for loggerheads and 97 percent for leatherbacks.

In addition to improvements in TED designs, interactions between sea turtles and otter trawls in the years leading up to this consultation were also thought to be declining because of reductions of fishing effort unrelated to fisheries management actions. Over the past ten years, low shrimp prices, rising fuel costs, competition with imported products, and the impacts of hurricanes in the Gulf of Mexico have all impacted shrimp fleets; in some cases reducing fishing effort by as much as 50 percent in offshore waters of the Gulf of Mexico (GMFMC 2007). For example, the estimated annual number of interactions and mortalities between sea turtles and shrimp trawls in the Gulf shrimp fisheries (state and federal) under the new regulation (68 FR 8456, February 21, 2003) based on Epperly et al. (2002) estimated catch per unit effort and updated 2007 effort data in Nance et al. (2008) were significantly less than predicted in the 2002 opinion. However, given elevated strandings in the northern Gulf of Mexico during the springs of 2010 and 2011, necropsy information indicating that drowning may have contributed to many of the mortalities, and evidence of TED compliance issues in the fisheries, these estimates likely underrepresented actual past effects from shrimp fisheries in the Gulf of Mexico. A new biological opinion for the Southeastern shrimp fishery was issued in May 2012.

In 2008, NMFS issued a biological opinion on the continued authorization of Highly Migratory Species Atlantic shark fisheries (NMFS 2008). This commercial fishery uses bottom longline and gillnet gear. The recreational sector of the fishery uses only hook-and-line gear. To protect declining shark stocks, the proposed action seeks to greatly reduce the fishing effort in the commercial component of the fishery. These reductions are likely to greatly reduce the interactions between the commercial component of the fishery and sea turtles. The biological opinion concluded that green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles may be adversely affected by operation of the fishery but that the proposed action was not expected to jeopardize the continued existence of any of these species.

Dredging

The construction and maintenance of federal navigation channels, and nearshore and offshore sand mining activities, have been identified as sources of sea turtle mortality because these activities are often performed by hopper dredges. Hopper dredges are large, ocean-going vessels that move relatively rapidly (compared to sea turtle swimming speeds) and can entrain and kill sea turtles as the trailing, suction dragheads of the forward-moving dredge overtake the slower moving sea turtle. The USACE has the 1997 SARBO from NMFS addressing hopper dredging in the Atlantic. In the SARBO, NMFS concluded that sea turtles can be adversely affected by hopper dredges and included ITS, pursuant to Section 7 of the ESA. The ITS contains reasonable and prudent measures with implementing terms and conditions to help minimize these interactions. The USACE is currently undergoing reinitiation of consultation with NMFS for hopper dredging activities under the SARBO and has an agreement with NMFS that the hopper dredging activities will continue under the 1997 SARBO until the new SARBO is finalized.

Nearshore, and offshore areas of Georgia are regularly dredged for maintenance of navigation channels. The figures below (Figures 5 and 6) show turtle takes from past hopper dredging events in the action area. These dredging events were covered by the SARBO. Only the months (i.e., December through April) for the proposed bed leveler evaluation addressed in this opinion are included in this graph for comparison purposes. During these months, Brunswick Harbor had a total of 52 turtle takes and Savannah Harbor had 21 turtle takes since 1988. For both harbors, the highest number of takes during this time frame (December – April) have occurred during March.

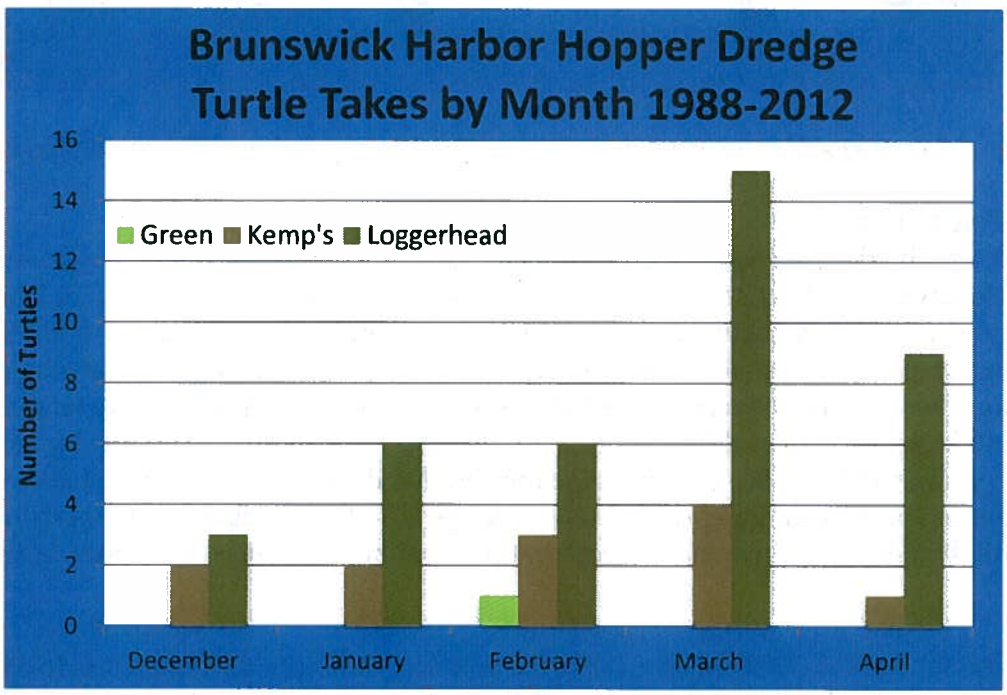


Figure 5. Turtle takes that occurred during hopper dredging season in Brunswick Harbor.

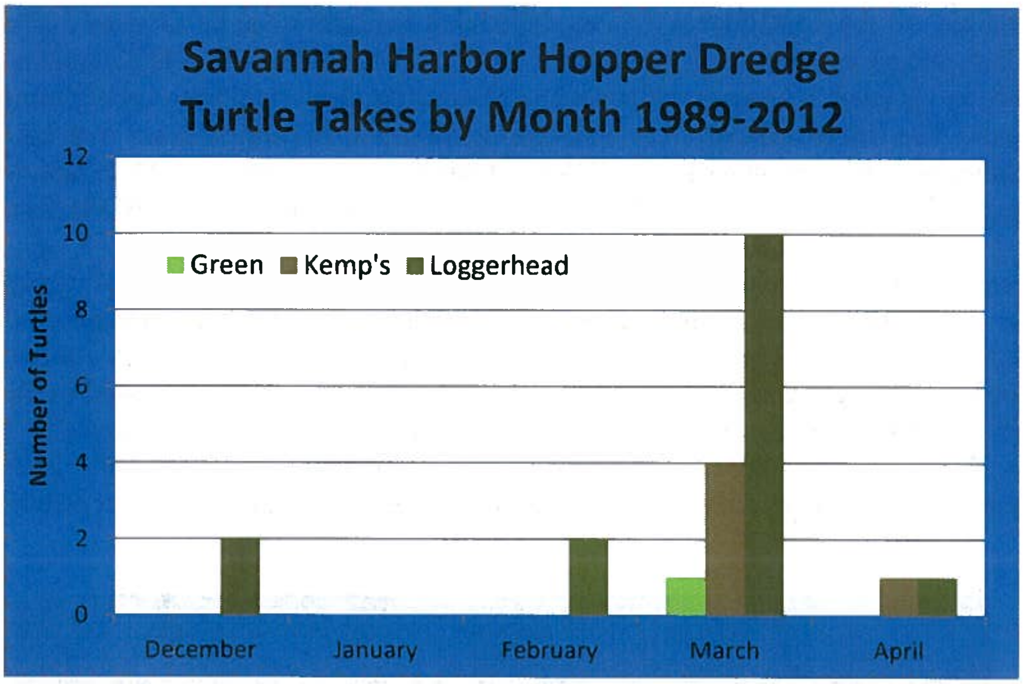


Figure 6. Turtle takes that occurred during hopper dredging season in Savannah Harbor.

Bed Leveling Operations

Evidence submitted by the Savannah District has indicated that bed levelers may have the potential to adversely affect sea turtles. The GADNR sea turtle coordinator, Mark Dodd, reported to the Savannah District that six sea turtle strandings with odd injuries were found along the Georgia coast in 2003 at about the time the dredging contractor for the deepening project was employing a bed leveling type device (a written summary of this report is at Appendix B). All were found in the vicinity of the Brunswick bar channel. The injuries exhibited by the strandings were, according to Mr. Dodd, crushing type injuries that did not appear to be consistent with those produced by hopper dredges. These strandings raise the possibility that operation of a bed leveler following hopper dredging of deep-draft navigational channels may result in takes of sea turtles.

The bed leveler used in 2003 consisted of a flat wooden platform on which a bulldozer blade was mounted with the blade approximately straight up with supports on the back side running from the top edge of the blade in a diagonal line to the back edge of the wooden platform. The leading edge of the platform contained an approximately 9-inch blade that met the surface at a low angle. The apparatus was suspended from a barge pulled by a tug usually at about 1.5 to 2 knots. A closed-net trawler was not used behind the bed leveler.

ESA Section 10 Permits

The ESA allows the issuance of permits to capture/interact with ESA-listed species for the purposes of scientific research, under ESA Section 10(a)(1)(A). Authorized activities range from photographing, weighing, and tagging protected species incidentally taken in fisheries, to blood sampling, tissue sampling (biopsy), and performing laparoscopy on intentionally-captured organisms. The number of authorized takes varies widely depending on the research and species involved, but may involve the taking of hundreds of individuals annually. Most captures or interactions authorized under these permits are expected to be (and are) non-lethal. Before any research permit is issued, the proposal must be reviewed under the permit regulations (i.e., must show a benefit to the species). In addition, since issuance of the permit is a federal activity, issuance of the permit by NMFS must also be reviewed for compliance with Section 7(a)(2) of the ESA to ensure that issuance of the permit does not result in jeopardy to the species or adverse modification of its critical habitat.

4.1.3 State or Private Actions

Vessel Traffic
Commercial vessel traffic and recreational boating pursuits can have adverse effects on sea turtles through propeller and boat strike damage. The extent of the impact on sea turtles in the action area is not known at this time.

State Fisheries
Recreational fishing from private vessels occurs in the action area near jetties associated with the entrance channels. Observations of recreational fisheries in other states have shown that green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are known to bite baited hooks, and loggerheads may ingest the hooks. Hooked turtles have been reported by the public fishing from boats, beaches, and jetties and from commercial fishermen (NMFS 2001b). Additionally, lost fishing gear such as line cut after snagging on rocks, or discarded hooks and line, can also pose an entanglement threat to sea turtles in the area. A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the TEWG reports (1998; 2000).

4.1.4 Other Potential Sources of Impacts in the Environmental Baseline

Marine Debris
A number of activities that may indirectly affect sea turtles in the action area of this consultation include anthropogenic marine debris. Discarded or lost fishing lines or gear, intentional dumping or accidental loss of garbage by vessels, and debris associated with areas flooded by storms can be introduced into the marine environment. This debris may be ingested by turtles or turtles may become entangled in the debris. The impacts from marine debris are difficult to measure. Where possible, conservation actions are being implemented to monitor or study impacts from these sources.

Environmental Contamination
Coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise and boat traffic can degrade marine habitats used by sea turtles (Colbum et al. 1996). The development of marinas and docks in inshore waters can negatively impact nearshore habitats. An increase in the number of docks built increases boat and vessel traffic. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. Although these contaminant concentrations do not

likely affect the more pelagic waters, sea turtles analyzed in this biological opinion travel between nearshore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

Poaching
During the 2012 nesting season, a resident of Sapelo Island, Georgia, was arrested for poaching loggerhead eggs. Four nests have been lost on Sapelo this year due to poaching (Savannah Morning News, Mary Landers, June 19, 2012).

4.1.5 Conservation and Recovery Actions Shaping the Environmental Baseline

NMFS has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles from commercial fisheries in the action area. These include sea turtle release gear requirements for Atlantic HMS fisheries and TED requirements for the southeastern shrimp fisheries. These regulations have relieved some of the pressure on sea turtle populations.

Outreach and Education, Sea Turtle Entanglements, and Rehabilitation
NMFS and cooperating states have established an extensive network of Sea Turtle Stranding and Salvage Network (STSSN) participants along the Atlantic coast that collects data on dead sea turtles, and also rescues and rehabilitates any live stranded sea turtles.

Sea Turtle Handling and Resuscitation Techniques
NMFS published a final rule (66 FR 67495, December 31, 2001) detailing handling and resuscitation techniques for sea turtles that are incidentally caught during scientific research or fishing activities. Persons participating in fishing activities or scientific research are required to handle and resuscitate (as necessary) sea turtles as prescribed in the final rule. These measures help to prevent mortality of hard-shelled turtles caught in fishing or scientific research gear.

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

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

Other Actions
A revised recovery plan for the loggerhead sea turtle was completed December 8, 2008 (NMFS and USFWS 2008). Recovery teams comprised of sea turtle experts have been convened and are currently working towards revising other plans based upon the latest and best available information. Five-year status reviews have recently been completed for green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles. These reviews were conducted to comply with the ESA mandate for periodic evaluation of listed species to ensure that their threatened or endangered listing status remains accurate. Each review determined that no delisting or reclassification of a species status (i.e., threatened or endangered) was warranted at the time. However, further review of species data for the green, hawksbill, leatherback, and loggerhead sea turtles was recommended, to evaluate whether distinct population segments (DPS) should be established for these species (NMFS and USFWS 2007a; NMFS and USFWS 2007b; NMFS and USFWS 2007c; NMFS and USFWS 2007d; NMFS and USFWS 2007e). The Services published a final rule on September 22, 2011, listing loggerhead sea turtles as separate DPSs.

4.1.6 Summary and Synthesis of Environmental Baseline for Sea Turtles

In summary, several factors adversely affect sea turtles in the action area. These factors are ongoing and are expected to occur contemporaneously with the proposed action. The shrimp fisheries in the action area likely had the greatest adverse impacts on sea turtles in the mid to late 1980s, when effort in most fisheries was near or at peak levels. With the decline of the health of managed fishery species, fishing effort since that time has generally been declining. However, interactions with fisheries gear are still ongoing and are expected to occur contemporaneously with the proposed action. Other environmental impacts including effects of vessel operations, dredging, permits allowing take under the ESA, and marine pollution, continue to have adverse effects on sea turtles in the action area.

4.2 Status of Atlantic Sturgeon within the Action Area

The Savannah River supports a reproducing subpopulation of Atlantic sturgeon (Collins and Smith 1997). According to NOAA's National Ocean Service, 70 Atlantic sturgeon have been captured since 1999 (J. Carter, NOS, supplemental data 2006). Twenty-two of these fish have been YOY (< 410 mm TL). A running ripe male was captured at the base of the New Savannah Bluff Lock and Dam during the late summer of 1997, which supports the hypothesis that spawning occurs there in the fall. While spawning has been confirmed in the Savannah River, no spawning sites have been verified (Collins and Smith 1997). The fresh–brackish water interface area serves as the summer nursery habitat for Atlantic sturgeon (Smith et al. 1993, McCord 1998).

It is thought that overharvesting of sturgeon in the 1890s led to the dramatic decline in the population, and poor water quality since then has not been conducive to recovery. Secor and Gunderson (1998) showed that juvenile Atlantic sturgeon are less tolerant of summer-time hypoxia than juveniles of other estuarine species. The recent extirpations and severe population depressions of these species in the South is probably not coincidental. Mortalities related to the synergistic effects of low dissolved oxygen levels and high summer temperatures would tend to affect southern populations to a greater extent than those further north.

Prior to the collapse of the fishery in the late 1800s, the sturgeon fishery was the third largest fishery in Georgia. Secor (2002) estimated from U.S. Fish Commission landing reports that approximately 11,000 spawning females were likely present prior to 1890. While fishing occurred in the Savannah River, the sturgeon fishery was mainly centered on the Altamaha River, and in more recent years, peak landings were recorded in 1982 (13,000 lbs). Based on juvenile presence and abundance, the Altamaha seems to currently support one of the healthiest Atlantic sturgeon subpopulations in the Southeast (D. Petersen, UGA, pers. comm. to S. Bolden, 2006). Atlantic sturgeon are also present in the Ogeechee River, which is interconnected to the Savannah River at its lowest reaches; however, the absence of age-1 fish during some years and the unbalanced age structure suggests that the subpopulation is highly stressed (Rogers and Weber 1995). Spawning adults have been collected in recent years from the Satilla River (Waldman et al. 1996). Recent sampling of the St. Marys River located sturgeon (D. Petersen, UGA, pers. comm. to S. Bolden, 2011), which changes previous reports by Rogers et al. (1994) that the subpopulation may be extirpated. In Georgia, Atlantic sturgeon are believed to spawn in the Savannah, Ogeechee, Altamaha, and Satilla rivers.

Previous studies in the nearby Ogeechee River have shown the continued persistence of Atlantic sturgeon in this river, as indicated by the capture of age +1 fish. Sampling efforts (including 1991-1994, 1997, and 1998) to collect age-1 sturgeon as part of the Savannah River genetics study suggest that juvenile abundance is rare, with high inter-annual variability, indicating spawning or recruitment failure. However, the Army's Environmental and Natural Resources Division (AENRD) at Fort Stewart, Georgia, which borders the Ogeechee River, collected 17 sturgeon in 2003 considered to be YOY (less than 30 cm TL) and an additional 137 fish in 2004, using a 30 m x 2 m experimental gillnet (3.8, 7.7, 12.7, 15.2, 17.8 cm stretched mesh). Most of these fish were juveniles; however, nine of these fish measured less than 41 cm TL and were considered YOY. In 2003, 17 sturgeon captured in this survey were also considered YOY (reported as less than 30 cm TL). The AENRD survey provides the most recent captures of YOY in the Ogeechee.

4.2.1 Factors Affecting Atlantic Sturgeon within the Action Area

As stated in Section 2.2 ("Action Area"), the proposed project is located off Georgia, the action areas include the entrance channels of Savannah Harbor and Brunswick Harbor. The following analysis examines actions that may affect this species' environment specifically within the defined action area.

Dams

Several Georgia rivers are segmented by dams that adversely impact fish populations through (1) the blockage and/or impairment of required migration patterns of anadromous and diadromous species; (2) river ecosystem fragmentation; and (3) instream flow modifications that alter natural, seasonal hydrological conditions and river morphology. Habitat accessibility and location of dams throughout the Southeast river basins are inseparably linked; fish passage at one facility determines the passage potential at other dams. Access to traditional spawning grounds is now blocked by a series of six dams on the Savannah River. The construction of these dams and reservoirs has converted or blocked access to approximately half of 384 miles of historical anadromous fish spawning and nursery habitat. A major portion of high quality anadromous fish spawning habitat (rapids complex: boulder, bedrock, cobble and gravel substrate) that was once available has been blocked or inundated by large reservoirs above the Augusta Diversion Dam, which is located approximately 20 miles above the New Savannah Bluff Lock and Dam. The majority of the habitat that is no longer accessible was the most heavily used. It is estimated that 90 to 95 percent of the quality spawning habitat for rapids-dependent anadromous species has been lost. The New Savannah Bluff Lock and Dam currently impedes sturgeon from accessing important habitat areas. It is the first impediment encountered by all anadromous fish species migrating between estuarine/marine coastal waters into freshwater habitats of the Savannah River. The New Savannah Bluff Lock and Dam is an inactive navigation dam that precludes sturgeon access to valuable spawning habitat upstream at the Augusta Shoals, which is located just below the Augusta Diversion Dam.

The USACE has proposed construction of a fish passage bypass facility at the New Savannah Bluff Lock and Dam as mitigation for the effects of the deepening in the lower Savannah River. Establishing successful fish passage at the lock and dam would enhance spawning potential at sites located upstream of this structure. Establishing fish passage at the New Savannah Bluff Lock and Dam should also trigger the construction of fish passage at dams located upriver. In 1994, the USFWS, NMFS, SCDNR, and the GADNR completed development of a plan to restore access to a portion of historical anadromous fish spawning habitat in the Savannah River. The plan was filed by the FWS on behalf of the resource agencies in 1994, and was adopted by the Federal Energy Regulatory Commission (FERC) as a Comprehensive Plan pursuant to Section 10(a)(2) of the Federal Power Act. The plan is a guide for resource agency efforts and would restore access to approximately 35 miles of spawning and maturation habitat. The plan includes (1) reliable passage of anadromous fish at the New Savannah Bluff Lock and Dam; (2) the design and implementation of an upstream fish passage mechanism and safe downstream (out-migrant) passage at the Augusta Diversion Dam; (3) the design and implementation of an upstream fish passage mechanism and safe downstream (out-migrant) passage at the Stevens Creek Dam; and (4) improvement of poor dissolved oxygen releases from the J. Strom Thurmond Dam during the summer months. Three of the four elements of the plan to restore access to the 35 miles of the Savannah River between the New Savannah Bluff Lock and Dam and the J. Strom Thurmond Dam are in place.

In 2004, the NMFS and USFWS sent the FERC a joint prescription for fish passage at the Augusta Diversion Dam, as well as minimum flow requirements necessary over the Augusta Shoals in regards to the proposed re-licensing of the Diversion Dam. When FERC issued the license for the Stevens Creek Hydropower Project in 1995, it reserved authority for the USFWS to prescribe a fishway at that project once upstream passage was achieved at the Augusta Diversion Dam. Plans are in place to provide fish passage at the Augusta Diversion Dam and the Stevens Creek Hydroelectric Project once fish passage is achieved at the New Savannah Bluff Lock and Dam.

Dredging

Dredging of navigation channels can adversely affect Atlantic sturgeon due to their benthic nature. The Savannah River is home to one of the busiest ports on the Atlantic Coast and is maintenance dredged regularly up to the Garden City Terminal. A seasonal restriction on dredging operations has been imposed from March 16–May 31 to protect striped bass in the Savannah River. This spring closure likely benefits sturgeon as well (M. Collins, SCDNR, pers. comm. 1998).

Seasonal restrictions (hopper dredging "windows") are also placed on hopper dredging conducted offshore of Savannah Harbor and Brunswick Harbor in the shipping channel to protect sea turtles. Hopper dredges can also lethally harm sturgeon directly by entraining sturgeon in dredge drag arms and impeller pumps. Mechanical dredges have also been documented to kill Atlantic sturgeon. Environmental impacts of dredging include the direct removal/ burial of organisms; turbidity/siltation effects; contaminant resuspension; noise/disturbance; alterations to hydrodynamic regime and physical habitat; and actual loss of riparian habitat (Chytalo 1996; Winger et al. 2000). According to Smith and Clugston (1997), dredging and filling impact important habitat features of Atlantic sturgeon as they disturb benthic fauna, eliminate deep holes, and alter rock substrates. To reduce the impacts of dredging on anadromous fish species, most of the Atlantic states impose work restrictions during sensitive time periods (spawning, migration, feeding) when anadromous fish are present. Reduced dissolved oxygen levels and upriver movement of the salt wedge may result from channel deepening. Potential impacts from hydraulic dredge operations may be avoided by imposing work restrictions during sensitive time periods (i.e., spawning, migration, feeding) when sturgeon are most vulnerable to mortalities from dredging activity.

Dredging operations may impact sturgeon by destroying benthic feeding areas, disrupting spawning migrations, and re-suspending fine sediments in spawning habitat sediments that cover required substrate. Because sturgeon are benthic omnivores, the modification of the benthos could affect the quality, quantity, and availability of sturgeon prey species.

Hopper dredges are used within known sturgeon habitat throughout the proposed project area, including the ocean bar channels. In the area overseen by the Savannah District, nine incidental takes have occurred during hopper dredging operations, all of which were Atlantic sturgeon. Six occurred during hopper dredging in Brunswick Harbor and three have occurred during hopper dredging activities in Savannah Harbor. Of these nine incidental takes, one occurred in December, four occurred during February, and four occurred in March.

Since Atlantic sturgeon primarily lead a marine existence, with the exception of their spawning migration, and hopper dredges are often operated in ocean bar channels or offshore borrow areas, there is an increased risk of entrainment by hopper dredges for Atlantic sturgeon. The use of the "turtle deflecting draghead" on hopper dredges reduces the potential for take of benthic oriented species (i.e., sea turtles and sturgeon) by creating a sand wave in front of the draghead that pushes animals out of the way that are at risk of entrainment. Though the use of the "turtle deflecting draghead" likely reduces potential risk of sturgeon entrainment based on the understanding of its operating conditions, takes can still occur due to dragtender operator error, uneven bottom contours, or difficult dredging conditions. Few studies exist that evaluate entrainment risk relative to sturgeon behavior, size class, life cycle, etc., though effects of entrainment on adult fish are presumed low (Dickerson et al. 2004).

Although the potential for significant numbers of adult and juvenile sturgeon being hit by a hydraulic cutterhead dredge is fairly low; takes of shortnose sturgeon have been documented. Adult and juvenile sturgeon are believed to be very mobile, even when occupying resting areas during the summer months (deep holes and other deep areas). However, the eggs and larvae of sturgeon are not as mobile, but most of those life stages occur over 100 river miles upstream from where hydraulic dredges are proposed for use in the project area. Therefore, no impacts to sturgeon eggs or larvae are expected with the project work in the harbor entrance channels.

Though rare, documented incidental take of Atlantic sturgeon by mechanical dredges has also been reported. Clamshell dredges operate by dropping an open bucket into the water column which plunges to the bottom where the bucket closes, ascends, and discards the dredged material into a scow or barge. Since 1990, dredging operations throughout the North Atlantic, South Atlantic, and Gulf waters have resulted in a total of three sturgeon (one shortnose and two Atlantic) being reported as captured by clamshell dredge operations. Of the three documented captures by a clamshell, one occurred in the South Atlantic region on December 3, 2000, while performing work for the Wilmington Harbor deepening project in the Cape Fear River, North Carolina. Though this sturgeon was cited in various reports as a lethal incidental take, the endangered species incident report prepared by Coastwise Consulting indicated that the "bucket brought up an Atlantic Sturgeon entangled in a net. The specimen was decomposing." Assuming that the specimen was killed by entanglement in a net prior to being captured by the bucket, this documented "take" can be discounted. Detailed information is not available for the other two mechanical dredge takes. Given the mobility of sturgeon, the lack of a suction field from mechanical dredging, and the small area of active dredging by a bucket during each load, the likelihood of mechanical dredging to incidentally take sturgeon species is small. Furthermore, compared to other hydraulic dredging techniques, mechanical dredging is often recommended by NMFS as the preferred dredging technique for minimizing incidental take of sea turtles and sturgeon. Though clamshell dredge operations have reported capture of larger sturgeon (adult/juvenile), it is unlikely that clamshell dredging operation would impact small juvenile and larval sturgeon since there is no suction field generated by mechanical dredges.

Relocation trawling associated with hopper dredging has also resulted in the capture of Atlantic sturgeon. The Savannah District documented the capture of Atlantic sturgeon by relocation trawling in Savannah. Two were captured April 3, 2006, and eight captures occurred from January 14-31, 2007. The Savannah District also documented eleven captures of Atlantic sturgeon by relocation trawling in Brunswick: one on November 29, 2004 and ten from January 14-24, 2008.

ESA Consultations and Permits

Since the recent listing of the South Atlantic DPS of Atlantic sturgeon, NMFS has participated in five ESA Section 7 consultations to address the effects of federal actions on Atlantic sturgeon in

Georgia., and when appropriate, has authorized the incidental taking of this species. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on Atlantic sturgeon (Table 2).

Date	Project
11/04/2011	Savannah Harbor Expansion Project
01/17/2012	GDOT Bridge Rehabilitation, Glynn County
05/10/2012	Kings Bay Naval Submarine Base
05/31/2012	Augusta Canal
08/01/2012	GDOT Back River Bridge, Chatham County

Table 2. Summary of ESA Section 7 consultations for Atlantic sturgeon conducted in Georgia

Through ESA Section 6 cooperative agreements with Georgia and South Carolina, NMFS has supported numerous research projects within the project area to investigate the Atlantic sturgeon. A number of Section 10(a)(1)(A) scientific research permits, which approve sampling methodology and authorize incidental take, have been issued to study sturgeon in Georgia rivers.

Ship Strike

Commercial traffic can have an adverse effect on sturgeon through propeller and ship strike damage. Ship strikes pose a particular threat to sturgeon within shipping channels. Sturgeon are benthic feeders and spend most of their time on the bottom. Large vessels that transit shipping channels typically draft close to the bottom of the channel, thereby posing a threat to sturgeon. Multiple suspected ship strikes have been reported in rivers in the Mid-Atlantic States. A large number of the mortalities observed in these rivers from potential ship strikes have been of large adult Atlantic sturgeon. Between 2005 and 2008, a total of 28 Atlantic sturgeon mortalities were reported in the Delaware Estuary. Sixty-one percent of the mortalities reported were of adult size and 50 percent of the mortalities resulted from apparent vessel strikes (Brown and Murphy 2010). Analysis of the location and type of injury indicated that the encounters were most likely due to propeller strikes and not bow strikes. Vessels transit the Delaware Estuary through a shipping channel that extends 121 river miles from the mouth of Delaware Bay to near Bordentown, New Jersey. The relatively long distance vessels need to travel from the sea through the estuary to reach the ports is unusual as most of the other major Atlantic Coast ports, including Savannah Harbor, are located much closer to the sea. It is thought that the long distance that vessels transit through the Delaware Estuary allow for a greater chance of vessel interaction with sturgeon (Brown and Murphy 2010).

The James River, Virginia, is similar to the Delaware River in that commercial vessels transit long distances (over 80 river miles) through a narrow channel to reach the ports. During 2005, five sturgeon were reported to have been struck by commercial vessels within the James River. Additionally, an average of one strike per five years has been reported in the Cape Fear River, North Carolina. No vessel strikes to sturgeon have ever been reported occurring in the Savannah River, which has a shipping channel that is shorter and wider than the aforementioned channels. The chance of a ship strike within the Savannah River is lower because the populations of sturgeon are small, the distance from the mouth of the harbor to the port is short (less than 19 miles), and the channel is also wide, ranging from 500 to 2400 feet. In addition, according to the USACE, there will be fewer (but larger) vessels entering the Savannah Harbor, which should decrease the chance of encounters with sturgeon.

Drought

Large-scale factors impacting riverine water quality and quantity that likely exacerbate habitat threats to Atlantic sturgeon include drought, and intra- and inter-state water allocation. Since 2007, the southeastern United States has experienced several years of drought. During this time, Georgia and South Carolina experienced drought conditions that ranged from moderate to extreme. From 2006 until mid-2009, Georgia experienced the worst drought in its history. Between November 2007 and November 2008, 50 to 100 percent of the state of Georgia experienced some level of drought ranging in intensity from "abnormally dry" to "exceptional," based on the drought intensity categories used by the U.S. Drought Monitor (NIDIS 2008). Meanwhile water allocation issues are increasing with population growth; a precedent may also be set by a United States Supreme Court decision in a case between Georgia, Alabama, and Florida and between North Carolina and South Carolina over water transfers out of the river basins found in these states (Chapman 2008, McMaster 2007).

Abnormally low stream flow can restrict access to habitat areas, reduce thermal refugia, and exacerbate water quality issues such as high temperature, low dissolved oxygen, and elevated nutrient and contaminant levels. Further reduction in flow would likely disrupt spawning cues, and upstream migration may occur earlier; a disparity between prey availability and demand by larvae could ensue. NMFS believes that reduced flow down the rivers coupled with rising sea level will push the salt wedge further upriver and likely result in constricting available sturgeon foraging habitat. Data from gauging stations indicate that periods when river flows are inadequate to protect the riverine environment from salt water intrusion are becoming more frequent. Human-induced modifications to free-flowing rivers also influence coastal and marine systems, often reducing the ability of the system to adapt to natural variability and change.

Drought and water allocation issues and their associated impacts on water quality will likely work synergistically with climate change impacts. While debated, researchers anticipate (1) the frequency and intensity of droughts and floods will change across the Nation; (2) a warming of about 0.2°C per decade; and (3) a rise in sea level (NAST 2000). A warmer and drier climate will reduce stream flows and increase water temperature, resulting in a decrease of dissolved oxygen and an increase in the concentration of nutrients and toxic chemicals due to reduced flushing. Sea level is expected to continue rising. During the 20th century global sea level has increased 15 to 20 cm, and between 1985 and 1995 more than 32,000 acres of coastal salt marsh was lost in the southeastern United States due to a combination of human development activities, sea level rise, natural subsidence and erosion. Rising sea level will likely drive the salt wedge further upstream, possibly affecting the survival of drifting larvae and constricting available foraging habitat.

Maintenance of adequate flow in spawning areas is especially crucial to the survival of sturgeon. Studies on larval dispersal patterns compared behavior of larvae collected from Connecticut River to those spawned from Savannah River stock. All post-yolk-sac larvae made some downstream movement as yolk-sac larvae (observed more often in the Savannah River stock), dispersal downstream was more closely associated with the post yolk-sac larval stage. Dispersal rates differed as fish from the Connecticut River peaked on days 7–12 after hatching while Savannah River individuals had a longer dispersal with multiple, prolonged peaks, and a low level of downstream movement that continued for the entire larval and early juvenile period.

Impingement and Entrainment
Rates of impingement and entrainment are not known, but the death of one telemetered adult in the intake structure of a factory in the Port of Savannah has been documented. Larvae of Atlantic and shortnose sturgeon have also been recorded from the intake canals at the Savannah River Site, a federal nuclear facility.

Commercial and Recreational Fisheries
Directed harvest of sturgeon is currently prohibited. However, sturgeon are taken incidentally in anadromous fisheries occurring within Georgia and South Carolina that deploy nets, and are likely targeted by poachers throughout their range (Dadswell 1979, Dovel et al. 1992, Collins et al. 1996). Impacts from poaching are unknown. During 1989-1991, the commercial shad gillnet fishery's bycatch included more shortnose sturgeon than juvenile Atlantic sturgeon, which is considered unusual. The incidental capture of sturgeons in the Georgia and South Carolina gillnet fishery for American shad (*Alosa sapidissima*) and the trawl fishery for penaeid shrimp (*Penaeus* spp.) was summarized by Collins et al. (1996): the commercial shad fishery was active from approximately mid-January through mid-April along the South Atlantic coast; sturgeon captured in the shad gillnet fishery were primarily adults and accounted for 52 percent of Atlantic sturgeon bycatch and the shrimp trawl fisheries accounted for 39 percent. Collins et al. (1996) reported that two commercial fishermen collected 14 fish over the period of 1990-1992, averaging seven Atlantic sturgeon/fisher/year.

Sturgeons (especially juvenile and subadult Atlantics) occur in the by-catch of trawl fisheries in South Carolina and Georgia, especially the inshore/nearshore segment of the penaeid shrimp trawl fishery during cool months. During the period from 1973 to 1975, commercial shrimp trawlers caught a total of 1,111 sturgeon off North Carolina, South Carolina, and Georgia (Keiser 1976). The report did not identify whether they were shortnose or Atlantic sturgeon. Trawling in the shrimp fishery produced 39 percent of 97 reported recaptures of Atlantic sturgeon tagged in a Georgia study conducted before use of turtle excluder devices became mandatory (Collins et al. 1996). Use of turtle excluder devices is thought, but not proven, to reduce bycatch of sturgeons.

Entanglement of sturgeon in gillnets can result in injury and mortality, reduced fecundity, and delayed or aborted spawning migrations of sturgeon (Moser and Ross 1993 and 1995, Weber 1996, Collins et al. 2000a, Moser et al. 2000). In the Savannah River, adults were common in the bycatch from the lowest point in the river at which gillnet fishing was allowed (about river kilometer 43) up to river kilometer 278 (the uppermost of several sturgeon spawning areas), as reported by Collins and Smith (1993). Bycatch of sturgeon in the river was as high as 102 fish/fisher/yr, and immediate bycatch mortality of sturgeon for this gear type was 16 percent, with another 20 percent of fish being injured (Collins et al. 1996). In addition to such accidental mortality, intentional mortality of shortnose sturgeon captured in the shad fishery has been known to occur (McCord 1998).

Mandatory reporting of sturgeon bycatch was initiated in 2000 by the Atlantic States Marine Fisheries Commission; a summary of self-reported Atlantic sturgeon bycatch in the Savannah River via the South Carolina shad gillnet fishery is presented in Table 3. The possession of a commercial shad license permits the fishing of 10 nets; however, on average a licensee usually has 4-5 nets (B. Post, SCDNR, pers. comm. to S. Bolden, 2009). Nets are usually 5 ½-inch stretch mesh and may not exceed 600 feet in length. No net may be set within 600 feet of any gillnet previously set.

Year	Atlantic Sturgeon
2009	15
2008	2
2007	6
2006	3
2005	0
2004	0
2003	3
2002	4
2001	N/A
2000	5

Table 3. Summary of self-reported effort and incidental bycatch of Atlantic sturgeon by the commercial shad gillnet fishery in the Savannah River as reported to the Atlantic States Marine Fisheries Commission by South Carolina.

4.2.2 Conservation and Recovery Actions Benefiting Atlantic Sturgeon

Many measures have been implemented to protect the sturgeon in the Savannah River estuary. Overfishing related to targeted fishing of sturgeon has been eliminated as a causative factor in the decline of the Savannah River sturgeon population. In 1998, the Atlantic States Marine Fisheries Commission (ASMFC) instituted a coast-wide moratorium on the harvest of Atlantic sturgeon, which is to remain in effect until there are at least 20 protected age classes in each spawning stock (anticipated to take up to 40 or more years). NMFS followed the ASMFC moratorium with a similar moratorium for federal waters. Sturgeon that are caught incidentally as bycatch in shrimp trawls are to be released alive. The phasing out of the traditional method of catching American shad (gillnets in a coastal intercept fishery) has greatly reduced the number of sturgeon inadvertently caught by shad fisherman. In turn, this has greatly reduced the interruption of sturgeon migrations in the late winter and early fall.

Point source discharges in the Savannah River are regulated under the NPDES program by the Georgia DNR-EPD in coordination with the EPA. Since the NPDES is a federally-mandated program, all permits issued under the program are subject to review per the provisions of the ESA. The EPA established a total maximum daily load (TMDL) for the Savannah River to improve dissolved oxygen conditions in the Savannah Harbor. The TMDL requires a reduction in oxygen demanding substances (over time, as the various NPDES permits come up for renewal) in point source discharges. This impacts NPDES permit holders in the Augusta, Georgia, area as well, since their waste loads contribute to the dissolved oxygen deficiencies in Savannah Harbor.

4.2.3 Summary and Synthesis of Environmental Baseline for Atlantic Sturgeon

In summary, Atlantic sturgeon occupy habitats that are likely to be impacted by the proposed project. The demersal nature of these fish makes them vulnerable to dredging operations and they may be subject to direct mortality from these operations or from strikes associated with ships and other vessels. The degradation of habitat due to dredging has also been indicated as being detrimental to sturgeon in the Savannah River (Collins et al. 2001).

5 EFFECTS OF THE ACTION

This section examines the likely effects (direct and indirect) of the proposed action on sea turtles and Atlantic sturgeon from bed leveling, and closed-net trawling in the action area within the context of the species status now and projected over the course of the action, the environmental baseline, and cumulative effects.

Below, the discussion will consider the effects of the bed leveling evaluation and the use of closed-net trawling on loggerhead, Kemp's ridley, and green sea turtles, and Atlantic sturgeon that will be conducted following the completion of hopper dredging in the entrance channels of Brunswick Harbor and Savannah Harbor.

Bed leveling Activities
Bed leveling is often associated with hopper dredging (and other types of dredging) operations, and may be utilized in this project. Bed leveling "dredges" do not use suction; they redistribute sediments, rather than removing them. Plows, I-beams, or other seabed leveling mechanical dredging devices are often used for cleanup operations, i.e., to lower high spots left in channel bottoms and dredged material deposition areas by hopper dredges or other type dredges. Leveling devices typically weigh about 30 to 50 tons and are fixed with cables to a derrick mounted on a barge pushed or pulled by a tugboat at about one to two knots. Some evidence provided by GADNR indicates that bed leveling devices may be responsible for occasional sea turtle mortalities (NMFS 2003e). Sea turtles may be crushed as the leveling device passes over a turtle which fails to move or is not pushed out of the way by the sediment "wave" generated by and pushed ahead of the device.

According to a report by the GADNR (Appendix B), sea turtles in Georgia waters may have been crushed and killed in 2003 by bed leveling which commenced after the hopper dredge finished its work associated with the Brunswick Harbor Entrance Channel dredging. The local sea turtle stranding network reported documented six stranded crushed sea turtles (four loggerheads and two Kemp's ridleys) in the area where the bed leveler dredge was working, within days after the dredge was in the area. All of the turtles were found in the vicinity of the Brunswick Entrance Channel. The injuries exhibited by the stranded turtles were, according to the GADNR, crushing type injuries that did not appear to be consistent with those produced by hopper dredges (Appendix C). Although the strandings were not proven to be a result of the use of the bed leveler (a closed-net trawler was not used), and other mortality sources for these strandings are possible, NMFS believes that bed leveling activities are the most likely explanation.

Brunswick Harbor is also one of the sites where sea turtles captured by relocation trawlers sometimes show evidence of brumating (over-wintering) in the muddy channel bottom, which could explain why, if sea turtles were in fact crushed by bed leveler type dredges, they failed to react quickly enough to avoid the bed leveler. Bed leveler use at other dredging operations has not resulted in observed or documented sea turtle mortalities; therefore, the best available evidence points to occasional potential interactions to brumating sea turtles at Brunswick. All things considered, the use of bed levelers is probably preferable (less likely to result in sea turtle interactions) to the use of hopper dredges for cleanup operations, since turtles foraging, resting, or brumating on irregular bottoms are probably more likely to be entrained by suction dragheads than crushed by bed levelers, because (1) sea turtle deflector dragheads are less effective on uneven bottoms; (2) hopper dredges move considerably faster than bed leveler "dredges;" and (3) bed levelers do not use suction.

The project proposes to use bed levelers following hopper dredging of the entrance channels to evaluate their effectiveness in leveling the bottom while not causing harm to sea turtles or sturgeon. Their use would be restricted to the leveling of high spots in the channel where the use of a hopper dredge for such work would be expected to result in equal or greater take of endangered species. No new design modifications (i.e., integrated deflector configurations) to traditional bed levelers are proposed as the purpose of this evaluation is to determine whether existing bed levelers being used during hopper dredging are responsible for causing injury to sea turtles.

NMFS believes it is possible that sea turtles and Atlantic sturgeon resting in the troughs created by hopper dredging may be adversely affected by potential bed leveling activities during "high-spot cleanup" associated with the proposed action. After a hopper dredge completes its major production cuts, the channel is often left with ridges and trenches. It is believed that when a hopper dredge returns to these areas to ensure the entire channel bottom is at the required depth, sea turtles that may rest in those trenches are in danger of being sucked into the dragarm and killed. Bed levelers may be used as an alternative to additional cleanup passes by the hopper dredge to level the remaining sediment near the end of a dredging project. If a bed leveler is able to level the sediment below the required dredging depth, then the project would be complete. It is proposed that use of a bed leveler in a channel with numerous trenches would reduce potential turtle take because the bed leveler employs no suction. A bed leveler is suspended at a set elevation, so in situations with a deep trench, the bed leveler may pass over a resting turtle. In other situations, the sand wave produced by a bed leveler may disturb a resting turtle and cause it to rise into the water column above the leveler.

Closed-net Trawling
The function and purpose of closed-net trawling in this evaluation is to capture sea turtles that may have been in the bed leveler's path. According to the USACE, the effects of closed-net trawling on sea turtles would be identical to the effects of relocation trawling, except that turtles would be released immediately from the trawler instead of being relocating to another location,

so past discussion on the effects of trawling during previous relocation trawling events will be included for this evaluation. However, a major difference between closed-net trawling and regular relocation trawling is that the closed-net trawler would be traveling immediately behind the bed leveler to capture any sea turtles that may have been injured or killed by the bed leveler. Therefore, since the bed leveler will be preceding the closed-net trawler its presence may function to "disturb" sea turtles and cause them to relocate, possibly moving out of the path of the closed-net trawler, thus we would expect fewer live turtles to be caught by the closed-net trawler. In effect, the only turtles that should be caught in the closed-net trawler would be those that were injured or killed by the bed leveler.

The capture and handling of sea turtles can result in raised levels of stressor hormones, and can cause some discomfort during tagging procedures; based on past observations obtained during similar research trawls for turtles, these physiological effects are expected to dissipate within a day (Stabenau and Vietti 1999). During the course of 1,600 days of relocation trawling (at Wilmington, North Carolina; Kings Bay and Savannah, Georgia; Pensacola, Florida; and Sabine Pass, Galveston, Freeport, Matagorda Pass, and Corpus Christi, Texas), Coastwise Consulting, successfully captured, tagged, and released over 770 loggerhead, Kemp's ridley, green, and hawksbill, and leatherback sea turtles (C. Slay, Coastwise Consulting, pers. comm. via e-mail to E. Hawk, NMFS, January 25, 2007). On the Georgia coast, recent data show that a maximum of 35 turtles have been captured during a relocation trawling event occurring over 23 days. The Savannah District has stated that while the number of turtle takes is highly dependent on the month, they would not expect to see more than 35 per project. The Savannah District has documented no lethal turtle takes during relocation trawling and believes that such a take would be highly unlikely.

Atlantic sturgeon that might be caught in the closed-net trawl are expected to show no effects from the short trawl duration (15-30 minutes) and would be released unharmed. The Savannah District has previously documented the capture of Atlantic sturgeon during trawling events in the entrance channels of Savannah and Brunswick. Two Atlantic sturgeon were caught in the Savannah Harbor on April 3, 2006, and eight during trawling occurring from January 14 to 31, 2007. In Brunswick, one was caught on November 29, 2004, and ten were caught from January 14 to 24, 2008. These data indicate that up to 10 Atlantic sturgeon could be captured per project but none are expected to be lethal.

Estimates of Lethal and Non-Injurious Effects of Bed Leveling and Closed-net Trawling, Respectively, on Sea Turtles

We must determine the number of turtles that may be killed (by bed leveling and/or closed-net trawling) and the number of turtles that may be taken, non-lethally, by the act of capturing and releasing them during the closed-net trawling. We will begin our analysis with an estimate of the number of turtles that may be killed by the bed leveling operation. The use of a closed-net trawler with the bed leveler may help to determine the number of turtle takes. Being conservative, NMFS is assuming that the six stranded turtles mentioned above that were killed following the 2003 hopper dredging event in which a bed leveler was used were indeed killed as a result of the use of the bed leveler.

The Savannah District estimated that during the time frame that the stranded turtles were found, the bed leveler was used on 280 acres, which would equate to about 0.02 turtles killed per acre (6/280). In the proposed action, the Savannah District estimates that the bed leveler will be used on approximately 115 acres in the Brunswick Harbor entrance channel and approximately 138 acres in the Savannah Harbor entrance channel. Therefore, NMFS estimates that three turtles will be killed or injured (0.02 x 115 rounded to the next higher whole number to be conservative) during the bed leveler evaluation in Brunswick Harbor. NMFS also estimates that three turtles will be killed or injured (0.02 x 138) in the Savannah Harbor as a result of the use of the bed leveler. Based on strandings data, loggerhead turtles are the most abundant in the action area, followed by Kemp's ridley turtles, by a 3:1 ratio. Green turtle strandings are low compared to those of loggerhead and Kemp's ridley turtles. Therefore, NMFS expects that the six turtles taken will be a combination of loggerhead and Kemp's ridley turtles and may include one green turtle. We cannot be more precise than this because no data currently exists that evaluates take by bed levelers. In the absence of this data, our jeopardy analysis will evaluate the worst case take scenario for loggerheads and Kemp's; i.e., 5 loggerhead and 1 green or 5 Kemp's ridleys and 1 green sea turtle.

In addition to lethal interactions with the bed leveler, sea turtles may be captured by the closed-net trawler. As discussed above, we believe that the majority of sea turtles affected by closed-net trawling will not be injured or killed. However, approximately up to 0.5 percent of closed-net trawl captured turtles may drown as a result of trawl-capture forced submergence or injury (NMFS, unpublished data; pers. comm., E. Hawk, NMFS, 2012). NMFS believes that properly conducted and supervised closed-net trawling (i.e., observing NMFS-recommended trawl speed, low tow-time limits, and taking adequate precautions to release captured animals) and tagging is unlikely to result in the injury or death of sea turtles. Nevertheless, the effects of capture and handling on sea turtles during closed-net trawling can result in elevated levels of stressor hormones and tagging procedures can cause some discomfort. Based on past observations obtained during similar research-trawling for turtles, these effects are expected to dissipate within a day (Stabenau and Vietti 1999). In order to estimate the potential take of sea turtles associated with closed-net trawling for the current project, we used the past results of relocation trawling events as the basis for our estimate.

During ten years of relocation trawling off Georgia, 102 sea turtles have been captured resulting in an average of ten turtles per year. Because the bed leveler will precede the closed-net trawler and may cause turtles to flee the area, NMFS believes that fewer live turtles will be captured by the closed-net trawler when compared to regular relocation trawling, and that any dead or injured turtles that are caught will have resulted from being struck by the bed leveler. However, based on previous relocation trawling events, NMFS will conservatively estimate that up to a total of ten turtles (seven/eight loggerhead, one/two Kemp's ridley, and one green sea turtle) will be captured and released alive by closed-net trawling in Brunswick and Savannah Harbors. In addition, as stated earlier, NMFS estimates that six sea turtles will be injured or killed by the bed leveler and these six turtles will mostly likely be captured by the closed-net trawler. NMFS does not predict any lethal interactions of sea turtles to occur with the closed-net trawler itself.

Estimates of Lethal and Non-Injurious Effects of Bed Leveling and Closed-net Trawling, Respectively, on Atlantic Sturgeon

NMFS believes that Atlantic sturgeon will avoid the slow-moving bed leveler. Unlike a hopper dredge, the bed leveler will be pushing a sand wave in front of it that should cause sturgeon to relocate out of the path of the bed leveler. In addition, the bed leveler will be moving very slowly at approximately one to two knots. While sturgeon may be found resting in the troughs, they would not be brumating as sea turtles often do, so they should respond with a quicker reaction to the bed leveler that would result in avoidance of impact. Therefore, NMFS believes the effects of the bed leveler on Atlantic sturgeon will be discountable.

During 2006-2007, ten Atlantic sturgeon were taken and released alive in relocation trawling off Savannah. There were eleven Atlantic sturgeon taken and released alive during relocation trawling from 2004 to 2008 (ten occurred in 2008) off Brunswick. The majority of the sturgeon taken during relocation trawling occurred during the month of January off Savannah and Brunswick. Based on this information and the anticipated amount of closed-net trawling that will occur during the bed leveler evaluation, NMFS believes that it is likely that Atlantic sturgeon will be taken and released alive during the closed-net trawling. The Savannah District also expects no lethal take of Atlantic sturgeon. Based on these results, NMFS believes that up to ten Atlantic sturgeon could be captured per location (Brunswick and Savannah Harbors). Sturgeon that might be caught in the closed-net trawl are expected to show no effects from the short trawl duration (15 – 30 minutes) and would be released unharmed. Therefore, there would be no lethal take of Atlantic sturgeon by closed-net trawling.

NMFS estimates that mortality associated with bed leveling for this project is six turtles (five loggerhead and one green or five Kemp's ridleys and one green sea turtle) and no Atlantic sturgeon will be injured or killed. Worst-case scenario would involve the loss of adult female turtles.

In addition, we believe the proposed action may non-injuriously capture (by closed-net trawling) up to ten sea turtles (seven/eight loggerhead, one/two Kemp's ridley, and one green sea turtle). NMFS also believes that the proposed action may non-injuriously capture (by closed-net trawling) up to ten Atlantic sturgeon per location (Brunswick and Savannah Harbors), for a total of twenty Atlantic sturgeon.

6 CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions reasonably certain to occur with the action area considered in this opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

Cumulative effects from unrelated, non-federal actions occurring in the area may affect sea turtles and Atlantic sturgeon. Stranding data indicate sea turtles in southeast Atlantic waters die of various natural causes, including cold stunning and hurricanes, as well as human activities, such as incidental capture in state fisheries, ingestion of and/or entanglement in debris, ship strikes, and degradation of nesting habitat. The cause of death of most sea turtles recovered by the stranding network is unknown. Likewise, Atlantic sturgeon are also susceptible to human activities such as incidental capture in state fisheries and ship strikes.

The fisheries occurring within the action area are expected to continue into the foreseeable future. Numerous fisheries in state waters along the Georgia coast have also been known to adversely affect threatened and endangered species. NMFS is not aware of any proposed or anticipated changes in these fisheries that would substantially change the impacts each fishery has on the species covered by this opinion.

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

7 JEOPARDY ANALYSIS

This section evaluates the likelihood that the proposed action will jeopardize the continued existence of loggerhead, Kemp's ridley, and green sea turtles, and Atlantic sturgeon in the wild. To *jeopardize the continued existence of* is defined as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Section 5 ("Effects of the Action") describes the effects of the proposed action on sea turtles and Atlantic sturgeon, and the extent of those effects in terms of an estimate of the number of sea turtles or Atlantic sturgeon that would be killed or otherwise "taken." In ESA parlance, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. As explained above, the effects and jeopardy analyses of this opinion consider the effects of the USACE's proposed action.

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 (including reductions that may not necessarily be observed as discussed in Section 5.0). 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. In sum, we evaluated whether or not any anticipated take of that species will result in any reduction in reproduction, numbers, or distribution of that species that may appreciably increase a species' risk of extinction, or appreciably interfere with achieving recovery objectives, in the wild.

In the following analyses, we find that although some reduction in numbers and reproduction is expected for these species, the anticipated take will not appreciably increase the risk of extinction of these species in the wild, or appreciably interfere with achieving recovery objectives for the species.

All life stages are important to the survival and recovery of the 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.

For turtles, a very low percent of hatchlings is typically expected to survive to reproductive age. The death of mature, breeding females can have an immediate effect on the reproductive rate of the species. Sub-lethal effects on adult females may also reduce reproduction by hindering foraging success, as sufficient energy reserves are probably necessary for producing multiple clutches of eggs in a breeding year. Different age classes may experience varying rates of mortality and resilience.

Loggerhead Sea Turtles

The potential non-lethal capture of up to eight loggerheads may result from the use of a closed-net trawler as a part of the proposed action. The non-lethal take is not expected to have any measurable impact on the reproduction, numbers, or distribution of these species because closed-net trawling is not expected to result in mortality. The individuals are expected to fully recover such that no reductions in reproduction or numbers of loggerhead sea turtles are anticipated. Since the displacement of individuals from the closed-net trawling is temporary and very small in relation to the individual and species ranges, no change in the distribution of loggerhead sea turtles is anticipated from the temporary displacement.

The proposed action may result in the lethal take of up to five loggerhead sea turtles by bed leveling. The take would result in a reduction in the number of loggerhead sea turtles. Because the potential lethal takes are expected to occur throughout the proposed action area and sea turtles generally have large ranges in which they disperse, the distribution of loggerhead sea turtles in the western North Atlantic is not expected to be reduced. Lethal takes could also result in a potential reduction in future reproduction, assuming the individuals were females and would have survived to reproduce. For example, an adult female loggerhead sea turtle can lay 3-4 clutches of eggs every 2 to 4 years, with 100 to 130 eggs per clutch. The loss of up to five adult female sea turtles could preclude the production of thousands of eggs and hatchlings, of which a small percentage is expected to, survive to sexual maturity. Thus, the death of an adult female eliminates an individual's contribution to future generations, and the action will result in a reduction in sea turtle reproduction.

Considering their population sizes in the western North Atlantic, we believe loggerhead sea turtle populations are sufficiently large enough to persist and recruit new individuals to replace those expected to be lethally taken. We use the following estimates for loggerhead sea turtle populations to support our determination.

Because nesting activity by loggerheads is highly monitored it produces reliable data from which to evaluate numbers of adult female sea turtles. NMFS SEFSC (2009a) estimated the likely minimum adult female population size for the western North Atlantic subpopulation in the 2004-2008 time frame to be between 20,000 to 40,000 (median 30,000) female individuals, with a low likelihood of there being as many as 70,000 individuals. The estimate of western North Atlantic adult loggerhead females was considered conservative for several reasons. The number of nests used for the western North Atlantic was based primarily on U.S. nesting beaches; as such, the results are a slight underestimate of total nests because of the inability to collect complete nest counts for many non-U.S. nesting beaches. In estimating the current population size for adult nesting female loggerhead sea turtles, NMFS SEFSC (2009a) simplified the number of assumptions and reduced uncertainty by using the minimum total annual nest count over the last five years (i.e., 48,252 nests). This was a particularly conservative assumption considering how the number of nests and nesting females can vary widely from year to year, (cf., 2008's nest count of 69,668 nests, which would have increased proportionately the adult female estimate to between 30,000 and 60,000). Further, minimal assumptions were made about the distribution of remigration intervals and nests per female parameters, which are fairly robust and well-known parameters. Florida's long-term loggerhead nesting data (1989-2012) has shown three distinct trends. Following a 23 percent increase between 1989 and 1998, nest counts declined sharply for over a decade. During the period between the high-count nesting season in 1998 and the most recent (2012) nesting season, researchers found no demonstrable trend, indicating a reversal of the post-1998 decline. The overall change in counts from 1989 to 2012 is positive. Nest counts in 2012, corrected for subtle variation in survey effort, were slightly below the high nest count recorded in 1998

Although not included in the NMFS SEFSC (2009) report, in conducting its loggerhead assessment NMFS SEFSC also produced a much less robust estimate for total benthic females in the western North Atlantic, with a likely range of approximately 60,000 to 700,000, up to less than one million. The estimate of overall benthic females is considered less robust because it is model-derived, assumes a stable age/stage distribution, and is highly dependent upon the life history input parameters. Relative to the more robust estimate of adult females, this estimate of total benthic female population is consistent with our knowledge of loggerhead life history and the relative abundance of adults and benthic juveniles: the benthic juvenile population is an order of magnitude larger than adults. Therefore, we believe female benthic loggerheads number in the hundreds of thousands, and therefore smaller pelagic stage individuals would occur in even greater numbers.

Based on the total numbers of adult females and benthic females estimated by NMFS SEFSC for the western North Atlantic population of loggerhead sea turtles, the anticipated lethal take of five loggerheads – in the extremely unlikely worst case that all five are female and all five are adult – resulting from the proposed action would represent the removal of approximately 0.0167 percent ([5/30,000] x 100) of the estimated adult loggerhead female population. Even though we believe the number of benthic females to number in the hundreds of thousands, using the most conservative approach, the level of lethal take of sea turtles by this project would represent the removal of only 0.008 percent ([5/60,000] x 100) to a minimum of 0.0007 percent ([5/700,000] x 100) of the estimated female benthic loggerhead population, if all lethal takes are benthic females. These removals are very small and contribute only minimally to the overall mortality on the population. For benthic juvenile females, the contribution to overall mortality is less. Further, these percentages are likely an overestimation of the impact of the anticipated lethal take resulting from the proposed project on loggerhead sea turtles for the following reason. These percentages represent impacts to adult and benthic juvenile female loggerhead sea turtles only, and not to the population as a whole. Because this estimated contribution to mortality is a tiny part of our range of uncertainty across what total mortality might be for loggerhead sea turtles, we believe that the small effect posed by the lethal take resulting from the proposed project will not result in a detectable or appreciable reduction in the species' likelihood of survival in the wild.

The Services' recovery plan for the Northwest Atlantic population of the loggerhead turtle (NMFS and USFWS 2009), which is in essence the same population of turtles as comprise the NWA DPS, provides additional explanation of the goals and vision for recovery for this population. The objectives of the recovery plan most pertinent to the threats posed by bed leveling associated activities are numbers 1, 11, and 13:

1. Ensure that the number of nests in each recovery unit is increasing and that this increase corresponds to an increase in the number of nesting females...
11. Minimize trophic changes from ... habitat alteration...
13. Minimize vessel strike mortality.

The recovery plan anticipates that, with implementation of the plan, the western North Atlantic population will recover within 50 to 150 years, but notes that reaching recovery in only 50 years would require a rapid reversal of the declining trends of the Northern, Peninsular Florida, and Northern Gulf of Mexico Recovery Units.

Loggerhead nest counts on Florida's index beaches have declined from a peak of nearly 60,000 in 1998. However, 2011 counts were close to the average of the previous five years. Although this may be the beginning of a stabilizing trend, additional good nesting years will be required to reverse the preceding decline (FWRI Web site: http://myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals/).

The potential lethal take of five loggerheads over the duration of the project will result in reduction in numbers when take occurs and possibly by lost future reproduction, but, given the magnitude of these trends and likely large absolute population size, it is unlikely to have any detectable influence on the population objectives and trends noted above. Thus, the proposed action will not interfere with achieving the recovery objectives and will not result in an appreciable reduction in the likelihood of loggerhead sea turtles' recovery in the wild.

Green Sea Turtles
The non-lethal capture of one green sea turtle due to closed-net trawling is not expected to have any measurable impact on the reproduction, number, or distribution of this species because the trawling efforts are not expected to result in mortality. The individual is expected to fully recover such that no reduction in reproduction or number of green sea turtles is expected. Since the displacement of the individual from closed-net trawling is temporary and very small in relation to the individual and species ranges, no change in the distribution of loggerhead sea turtles is anticipated from the temporary displacement.

The lethal take of one green sea turtle by the bed leveler would result in an instantaneous, but temporary reduction in total population numbers. Since sea turtles have large ranges in which they disperse, no reduction in the distribution of green sea turtles is expected from the loss of a single individual within the action area The lethal take could also result in a potential reduction in future reproduction, assuming the individual was female and would have survived to reproduce. For example, an adult green sea turtle can lay 1-7 clutches (usually 2-3) of eggs every 2 to 4 years, with 110-115 eggs per nest. The loss of an adult female sea turtle, on average, could preclude the production of thousands of eggs and hatchlings, of which a fractional percentage is expected to survive to sexual maturity. Potential reductions to species numbers or reproduction from a single lethal take would not be significant in terms of local, regional, or global population numbers or trends.

This species is currently showing a very large increasing nesting trend in Florida, with nesting numbers already approaching or exceeding those required by the recovery plan for the species. Therefore, we believe that the reduction in numbers and reproduction as a result of the lethal take is not expected to appreciably reduce the likelihood of survival of green sea turtles in the wild.

We also considered the recovery objectives in the recovery plan prepared for the U.S. populations of green sea turtles that may be affected by the predicted reduction in numbers and reproduction. The recovery plan for green sea turtles (NMFS and USFWS 1991) lists the following relevant recovery objectives:

The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years. Nesting data must be based on standardized surveys.

> Status: An average of 5,039 green turtle nests were laid annually in Florida between 2001 and 2006, with a low of 581 in 2001 and a high of 9,644 in 2005 (NMFS and USFWS 2007a). That average increased to 7,436 nests per year for the 6-year period of 2004-2009. Data from the index nesting beach program in Florida support the dramatic increase in nesting. In 2007, there were 9,455 green turtle nests found just on index nesting beaches, the highest since index beach monitoring began in 1989. The number fell back to 6,385 in 2008, but that is thought to be part of the normal biennial nesting cycle for green turtles (FWC Index Nesting Beach Survey Database). An additional drop to just below 3,000 nests was seen on the index nesting beaches in 2009, but the occasional break from the normal biennial pattern is not without precedent, as there were two consecutive years of increase from 2003-2005 (FWC Index Nesting Beach Survey Database). State nesting data for 2011 show an increase in green turtle nests to 10,701, the highest number of nests since 1988 (FWRI Web site: http://myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals/).

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

> Status: There are no reliable estimates of the number of immature green sea turtles that inhabit coastal areas (where they come to forage) of the southeastern United States. However, information on incidental captures of immature green sea turtles at the St. Lucie

Power Plant (they have averaged 215 green sea turtle captures per year since 1977) in St. Lucie County, Florida, show that the annual number of immature green sea turtles captured has increased significantly in the past 26 years (FPL 2002). Ehrhart et al. (2007) has also documented a significant increase in in-water abundance of green turtles in the Indian River Lagoon area.

The lethal take of one individual will result in a reduction in numbers and reproduction, but will not have any detectable influence on the population and nesting trends noted above. The loss of one individual will not have an appreciable impact on total recruitment of new sea turtles to the population given the extent of the impact versus the very rapid population increases occurring over the past decade. Thus, the proposed action will not interfere with achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of green sea turtles' recovery in the wild.

Kemp's Ridley Sea Turtles
The non-lethal take of up to two Kemp's ridley sea turtles due to closed-net trawling is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. The individuals are expected to fully recover such that no reductions in reproduction or numbers of this species are anticipated. Since the displacement of the individual from closed-net trawling is temporary and very small in relation to the individual and species ranges, no change in the distribution of loggerhead sea turtles is anticipated from the temporary displacement.

The lethal take of up to five Kemp's ridley sea turtles by the bed leveler would result in an instantaneous, but temporary reduction in total population numbers. Because all potential take is expected to occur in the action area and sea turtles generally have large ranges in which they disperse, no reduction in the distribution of Kemp's ridley sea turtles is expected from the take of these individuals. The lethal takes could also result in a potential reduction in future reproduction, assuming at least some of the individuals would be female and would have survived to reproduce in the future. The loss of these adult female sea turtles could preclude the production of thousands of eggs and hatchlings, of which a fractional percentage is expected to survive to sexual maturity. Thus, the death of any females would eliminate their contribution to future generations, and result in a reduction in sea turtle reproduction.

Whether the reductions in numbers and reproduction of this species would appreciably reduce their likelihood of survival depends on the effect the changes in numbers and reproduction would have relative to current population sizes and trends. As demonstrated by nesting increases at the main nesting sites in Mexico, adult ridley numbers have increased over the last decade. The population model used by TEWG (2000) projected that Kemp's ridleys could reach the recovery plan's intermediate recovery goal of 10,000 nesters by the year 2015. 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. Recent calculations of nesting females determined from nest counts show that the population trend is increasing towards that recovery goal, with an estimate of 4,047 nesters in 2006 and 5,500 in 2007 (NMFS 2007, Gladys Porter Zoo 2007). Recent nesting data indicated a population of an estimated 8,460 females in 2009 with 21, 144 nests, and 5,320 females in 2010 with 13,302 nests. An increase to 20,576 nests occurred in 2011, then in 2012, nesting numbers were the highest recorded at 21,797 (Gladys Porter Zoo 2012). Based on this information, the anticipated lethal take of up to five Kemp's ridley sea turtles would not be expected to have a detectable effect on the increasing trends in the Kemp's ridley sea turtle population.

Based on the above analysis, we believe that the reduction in numbers and potential reduction in reproduction from the lethal take of up to five Kemp's ridley sea turtles associated with the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of these species in the wild.

The following analysis considers the effects of the take on the likelihood of recovery in the wild. We considered the recovery objectives in the recovery plans prepared for each species that relate to population numbers or reproduction that may be affected by the predicted reductions in the numbers or reproduction of sea turtles resulting from the proposed action. The recovery plan for Kemp's ridley sea turtles (USFWS and NMFS 1992) lists the following relevant recovery objective:

> Attain a population of at least 10,000 females nesting in a season.

The lethal take of up to five Kemp's ridleys will affect population numbers and potentially reproduction. We already have determined this take is not likely to reduce population numbers over time due to current population sizes and expected recruitment. We therefore do not believe that this level of take will affect the recovery objective of attaining a population of at least 10,000 females nesting in a season. Thus, we believe the proposed action is not likely to result in an appreciable reduction in the likelihood of Kemp's ridley sea turtles' recovery in the wild.

Atlantic Sturgeon

No lethal take of Atlantic sturgeon is expected from this action. The expected non-lethal take of up to twenty Atlantic sturgeon by closed-net trawling would not result in a reduction in numbers or reproduction. Since the displacement of individual sturgeon from closed-net trawling is temporary and very small in relation to the individual and species ranges, no change in the distribution of Atlantic sturgeon is anticipated from the temporary displacement. Therefore, the proposed action is not expected to appreciably reduce the likelihood of the Atlantic sturgeon's survival or recovery in the wild.

8 CONCLUSION

Sea Turtles and Atlantic Sturgeon

Based on the analyses of the proposed action on loggerhead, Kemp's ridley, and green sea turtles, and Atlantic sturgeon, it is our opinion that the proposed action is not likely to jeopardize the continued existence of these species in the wild. Our analyses focused on the impacts to, and population responses of these species in the Atlantic basin. However, the impact of the effects of the proposed action on the Atlantic populations must be directly linked to the global populations of the species (except for the loggerhead NWA DPS and Atlantic sturgeon in the South Atlantic DPS), and the final jeopardy analysis is for the global populations as listed in the ESA. Because the proposed action will not reduce the likelihood of survival and recovery of any Atlantic populations of sturgeon or sea turtles it is our opinion that the proposed project is also not likely to jeopardize the continued existence of Atlantic sturgeon in the South Atlantic DPS or loggerhead turtles in the NWA DPS, or Kemp's ridley, or green sea turtles in the wild.

9 INCIDENTAL TAKE STATEMENT

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

9.1 Anticipated Amount or Extent of Incidental Take

Section 9 of the ESA and federal regulations pursuant to Section 4(d) of the ESA prohibit take of endangered and threatened species, respectively, without 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. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of ESA Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement. This incidental take statement applies only to those actions occurring under USACE's authority.

Sea Turtles and Atlantic Sturgeon
Based on historical distribution data, hopper dredge observer reports, relocation trawling information, and observations of past strandings, Kemp's ridley, green, and loggerhead sea turtles may occur in the action area and may be taken by the bed leveler or closed-net trawling operations for this project. NMFS anticipates that documented incidental take, by injury or mortality, will consist of six sea turtle mortalities (up to five loggerhead and one green sea turtle or up to five Kemp's ridley and one green sea turtle), and the incidental take, by non-injurious closed-net trawling, will consist of up to ten sea turtles (seven/eight loggerhead, one/two Kemp's ridley, and one green sea turtle) during the time frame of the project in Brunswick and Savannah Harbors. In addition, NMFS anticipates that closed-net trawling will result in twenty non-lethal takes of Atlantic sturgeon.

9.2 Effect of the Take

Sea Turtles
NMFS has determined the anticipated level of incidental take specified in Section 9.1 will not reduce the likelihood of survival and recovery of Kemp's ridley, green, and NWA DPS of loggerhead sea turtles and is therefore not likely to jeopardize the continued existence of these sea turtles. NMFS has also determined that the anticipated level of incidental take will not reduce the likelihood of survival and recovery of the South Atlantic DPS of Atlantic sturgeon and is therefore not likely to jeopardize the continued existence of this species.

9.3 Reasonable and Prudent Measures

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 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 that complies with the specified terms and conditions is authorized.

The RPMs and terms and conditions are specified as required, by 50 CFR 402.01(i)(1)(ii) and (iv), to document the incidental take by the proposed action and to minimize the impact of that take on ESA-listed species. These measures and terms and conditions are non-discretionary, and must be implemented by USACE in order for the protection of Section 7(o)(2) to apply. USACE has a continuing duty to regulate the activity covered by this incidental take statement. If USACE fails to adhere to the terms and conditions through enforceable terms, and/or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse.

NMFS has determined that the following reasonable and prudent measures must be implemented by USACE:

1. USACE shall have measures in place to monitor and report all interactions with any protected species (ESA or MMPA) resulting from the proposed action. Reports shall be sent to the Assistant Regional Administrator (Mr. David Bernhart) for NMFS' Protected Resources Division, Southeast Regional Office, 263 13th Avenue South, St. Petersburg, Florida 33701-5505.

2. USACE shall monitor strandings in conjunction with the Georgia STSSN and the GADNR during all bed leveling activities. The determination of take of a stranded turtle by bed leveling activities will be made by the GADNR in consultation with the USACE.

3. USACE shall ensure that all contracted personnel involved in operating the bed leveler and closed-net trawler receive thorough training on measures of operation that will minimize sea turtle and sturgeon takes.

4. The USACE shall follow all of the turtle protection and monitoring actions included in this Opinion. If for some reason these actions cannot be followed, ESA Section 7 consultation shall be reinitiated.

9.4 Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the ESA, USACE is required to comply with the terms and conditions which implement the RPMs. The following terms and conditions are nondiscretionary. USACE shall require the following terms and conditions to minimize the effects of take on sea turtles and Atlantic sturgeon:

1. A project report summarizing the results of the bed leveling and the sea turtle and/or sturgeon take (if any) must be submitted to NMFS within 30 working days of completion. Reports shall contain information on project location, start-up and completion dates, problems encountered, incidental takings (include photographs, if available) and sightings of protected species, daily water temperatures, type of bed leveler, and any other information the USACE and/or contractor deems relevant. This report must be provided to NMFS' Protected Resources Division at the address provided in RPM 1 above and notification of take shall be provided to NMFS at the following e-mail address within 24 hours, referencing the present opinion by NMFS identifier number (F/SER/2012/03110), title, and date: **takereport.nmfsser@noaa.gov**.

2. The USACE project manager shall notify the Sea Turtle Stranding and Salvage Network (STSSN) state representative (contact information available at http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of bed leveling operations and ask to be notified of any sea turtle strandings in the project area that, in the estimation of the STSSN personnel, bear signs of potential draghead impingement or entrainment. Information on any such strandings shall be reported in writing within 30 days of project end to NMFS' Southeast Regional Office (address provided in RPM 1 above), or included in the project report (Term and Condition # 1). Because of different possible explanations for, and subjectivity in the interpretation of potential causes of strandings, these strandings will not normally be counted against USACE's take limit (in this biological opinion); however, if GADNR confirms it, and compelling STSSN observer reports and evidence convinces NMFS that a turtle was killed by a bed leveler, that take will be deducted from the Incidental Take Statement's anticipated take level for the project (RPM 2).

3. If sea turtles are captured during closed-net trawling, the following conditions must be observed (RPM 3):

   a. *Handling During Trawling*: Sea turtles captured pursuant to closed-net trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating).

b. *Captured Turtle Holding Conditions*: Captured turtles shall be kept moist, and shaded whenever possible, until they are released. They may be held for up to 24 hours if opportunistic, ancillary, "piggy-back" research (e.g., opportunistic satellite tagging) is proposed.

c. *Weight and Size Measurements and PIT Tagging*: All turtles shall be measured (standard carapace measurements including body depth), tagged (PIT or Inconel), and weighed prior to release when safely possible. Any external tags shall be noted and data recorded into the observer's log. Only NMFS-approved observers or observer candidates in training under the direct supervision of a NMFS-approved observer shall conduct the tagging/measuring/weighing/tissue sampling operations. PIT tagging may only be conducted by observers with PIT-tagging training or experience. This opinion provides the authority to NMFS-approved observers to PIT tag captured sea turtles without the need for an ESA Section 10 permit. Contact Lisa Belskis (Lisa.Belskis@noaa.gov) for recent updates on PIT tagging and tissue sampling protocols.

d. *Take and Release Time During Trawling*: Turtles shall be kept no longer than 12 hours prior to release (except as noted in b. above) and shall be released not less than 3 nautical miles (nm) from the trawl site.

e. *Injuries and Incidental Take Quota*: Any protected species injured or killed during or as a consequence of closed-net trawling shall count toward the incidental take quota. Minor skin abrasions resulting from trawl capture are considered non-injurious. Injured sea turtles shall be immediately transported by USACE at its own expense to the nearest sea turtle rehabilitation facility; all rehabilitation costs and sea turtle transportation costs shall be borne by USACE.

f. *Flipper Tagging*: All sea turtles captured by closed-net trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida's Archie Carr Center for Sea Turtle Research. This opinion serves as the permitting authority for any NMFS-approved endangered species observer a relocation trawler to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this authority.

g. *PIT-Tag Scanning*: All sea turtles captured by closed-net trawling shall be thoroughly scanned for the presence of PIT tags prior to release using a scanner powerful enough to read dual frequencies (125 and 134 kHz) and read tags deeply embedded deep in muscle tissue (e.g., manufactured by Biomark or Avid). Turtles which have been previously PIT tagged shall never-the-less be externally flipper tagged. The data collected (PIT-tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov.

h. *CMTTP:* External flipper tag and PIT-tag data generated and collected by closed-net trawling shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

i. *Tissue Sampling*: All live or dead sea turtles captured by closed-net trawling shall be tissue-sampled prior to release, according to the protocols described in Appendix II or Appendix III of the November 19, 2003, Gulf of Mexico Regional Biological Opinion on Hopper Dredging, as revised through Revision No. 2. Tissue samples shall be sent within 60 days of capture to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov. The present opinion to USACE serves as the permitting authority for any NMFS-approved endangered species observers aboard closed-net trawlers to tissue-sample live- or dead-captured sea turtles, without the need for an ESA Section 10 permit.

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 or critical habitat to help implement recovery plans or to develop information.

The USACE should work to evaluate the use of bed levelers to determine if and how they may affect sea turtles. This can be done in similar fashion to the testing done to develop the turtle deflectors for hopper dredges. Also, the USACE should evaluate different configurations of bed levelers (e.g., a flat surface vs. angled surface) to find the most turtle-friendly configuration.

11 REINITIATION OF CONSULTATION

This concludes formal consultation on USACE's proposed evaluation of bed leveling and closed-net trawling activities following hopper dredging of the Brunswick Harbor Entrance Channel and the Savannah Harbor Entrance Channel. 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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Appendix A. Existing designs of bed levelers

Great Lakes bed leveler design

Bean bed leveler design

Appendix B.

Georgia Department of Natural Resources

Nongame/Endangered Wildlife Program Coastal Office
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MEMORANDUM

DATE: July 28, 2003

TO: Bob Hoffman, NMFS

FROM: Mark Dodd

SUBJECT: Summary of strandings during I-beam operation in Brunswick Ship Channel, Brunswick, GA during winter/spring 2003.

The purpose of this memo is to provide a summary of sea turtle strandings during the operation of the I-beam leveler in the Brunswick Ship Channel during the spring of 2003.The I-beam leveler is a 50 ft. long steel beam approx. 5 feet wide and 4 feet tall weighing approximately 50 tons with a bulldozer-type blade welded to the front. The I-beam is lowered from a moving barge to smooth out ruts in the channel bottom. On 3/6/03 I rode briefly on the I-beam barge/tug to examine the operation. The beam was being pushed at 2.7-2.8 knots (from my GPS unit). According to the personnel from the dredging company, the I-beam moves approximately ½ foot of material at a time. The winter/spring of 2003 is the first time this equipment has been used in Georgia's territorial waters. The Georgia Department of Natural Resources (GADNR) was not contacted by the USACE or the project contractor prior to the use of the I-beam in Georgia.

It is our understanding that the I-beam was used intermittently in the Brunswick Ship Channel during February including 2/2, 2/8, 2/9, and 2/12. The I-beam was used daily from 5 March through 26 March. The equipment was brought back to Georgia on 22 April, to help reduce the elevation of spoil piles adjacent to the ship channel. Work continued through 24 April. A final day of work was completed on 30 April.

The GADNR monitors sea turtle strandings as part of the National Marine Fisheries Service's Sea Turtle Stranding and Salvage Network. Strandings are evaluated and a cause of death is determined when possible. Some common sources of mortality include: 1) incidental capture by commercial fisheries (good physical condition, no sign of disease or injury), 2) boat strikes (propeller wounds with slashing cuts), and 3) diseased or injured animals (poor body condition). During channel maintenance dredging operations (hopper dredge), we have documented sea turtles with massive damage to the carapace and sand imbedded in the skin and muscle tissue. These carcasses are consistent with turtles found by dredge observers monitoring turtle mortality.

During the spring of 2003, we documented six unusual strandings on islands adjacent to the Brunswick Ship Channel. These injuries including crushed or smashed skulls and carapaces and did not appear to be consistent with strandings associated with hopper dredging activity. After making a few inquires, we learned that a new piece of equipment was being used in the Brunswick Ship Channel deepening project. We believe the operation of the I-beam may have been responsible for the mortality of these turtles.

The following is a list of unusual strandings that occurred during the late winter and spring of 2003. The first 2 strandings are particularly unusual (see photos).

Date	Island	Species	Size	Injury
29-Mar	Brunswick Ship Chanl	Kemp's Ridley	38.2 x 39.1	Crushed skull
2-Apr	Jekyll Island	Loggerhead	69.1 x 64.4	Crushed/scraped skull
25-Apr	St. Simons Island	Loggerhead	no measurements	Head, right front flipper and piece of plastron
28-Apr	Jekyll Island	Loggerhead	no measurements	Front half of carapace only
6-May	Jekyll Island	Kemp's Ridley	no measurements	Front half of carapace only
9-May	St. Simons Island	Loggerhead	no measurements	Crushed but badly decomposed

The corresponding stranding forms and photos are attached. A photo was not obtained for the stranding on 4/25/03.

Several factors, including the size, weight and configuration of the I-beam, make it dangerous to sea turtles. In a USACE study, researchers found that a flat surface (front of hopper dredge drag head) configured perpendicular to the direction of movement along the bottom rode over turtle decoys resulting in their capture. By comparison, an angled surface (draghead plow) moved/pushed the turtle decoys to the side away from the draghead. The plow design is now required on hopper dredges to reduce impacts of dredging on sea turtles. The I-beam leveler is large, heavy and configured perpendicular to the direction of travel. The combination of these factors may result in the take of sea turtles. We believe additional research is necessary to determine the impacts of the I-beam prior to its use in dredging operations in Georgia.

Please feel free to contact me if you have questions regarding this information.

Appendix C. Photos of 3 of the 6 injured sea turtles that stranded following the I-beam operation in Brunswick Ship Channel, Brunswick, Georgia during winter/spring 2003 (Referenced in Appendix B).