Environmental Assessment
Issuance of a Protected Species Conservation Grant to the South Carolina Department of Natural Resources (Award No. NA10NMF4720036) to Conduct Research on Atlantic Sturgeon and Shortnose Sturgeon

I. Proposed Action

The National Marine Fisheries Service, Office of Protected Resources (NMFS PR) proposes to provide financial assistance in the form of a grant to the South Carolina Department of Natural Resources (SCDNR). This award would be issued through the Protected Species Cooperative Conservation Grant Program (CFDA no. 11.472, Unallied Science Programs) authorized under section 6 of the Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. 1535). The award would be for three years (1 July 2010 – 30 June 2013). South Carolina DNR would be partnering with the North Carolina Division of Marine Fisheries (NCDMF), North Carolina State University, and the University of Georgia (UGA) to complete the proposed work. Because the partnership includes another state government (NC), and in accordance with section 6(d)(2) of the ESA, the Federal Government would provide 90 percent of the cost of the project, and the states would provide the remaining 10 percent. This financial assistance award is planned to extend for three years (three annual payments) and is subject to semi-annual review by NMFS. The grant would support monitoring activities for Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), a candidate for listing under the ESA, and conservation actions for the endangered shortnose sturgeon (*Acipenser brevirostrum*) in South Carolina, North Carolina, and Georgia.

II. Purpose and Need

Under section 6 the ESA, NMFS is authorized to cooperate with states to the maximum extent practicable in carrying out programs for the conservation of threatened and endangered species and monitoring of candidate species. Scientific research is an important means of gathering valuable information about protected species to inform conservation and management measures to recovery listed species, and avoid the listing of candidate species. The purpose of this proposed action is to provide financial assistance to support research that would fill identified data gaps in shortnose and Atlantic sturgeon status, habitat requirements, riverine and coastal movements, and life history characteristics. Specifically, the funded work would involve: (1) development, installation, and maintenance of an acoustic receiver array to track the movement of shortnose and Atlantic sturgeon in North Carolina (Roanoke, Chowan, Meherrin, and Cape Fear rivers), South Carolina (Savannah, Combahee, Edisto, Cooper, Santee, and Winyah Bay system), and Georgia (Altamaha, Ogeechee and Satilla rivers) rivers, coastal waters, and the Intracoastal Waterway; (2) collecting, acoustic and satellite tagging and monitoring the movements of 20 to 30 (of each species) Atlantic sturgeon and shortnose sturgeon each year (i.e., 60 to 90 total per species over the life of the project) to identify and assess the use of spawning and other habitat and interbasin and coastal movements; (3) development and testing of a less invasive procedure for aging of these two species based on relative DNA telomere length from

small tissue samples; and (4) participation in multiple types of stakeholder outreach efforts. Such data and information sharing is critical for recovery planning, and in particular, for identifying appropriate management units and actions and critical habitats.

Section 6(d) of the ESA allows NMFS to provide financial assistance to any State, through its respective State agency that has entered into a section 6 agreement with NMFS, to support conservation activities for threatened and endangered species, or to monitor the status of candidate species and recently de-listed species. Specific activities that would be funded through the proposed action addressing endangered shortnose sturgeon have been authorized under ESA section 10(a)(1)(A) permits (permit nos. 1505, 10037, 10115, 14394, and 14759); thus, these activities have also been previously analyzed under NEPA. Atlantic sturgeon are candidate species and are not yet listed under the ESA; therefore, issuance of a scientific research permit under section 10(a)(1)(A) of the ESA for these activities is not required, however this project does require NEPA analysis.

III. Description of the Proposed Action

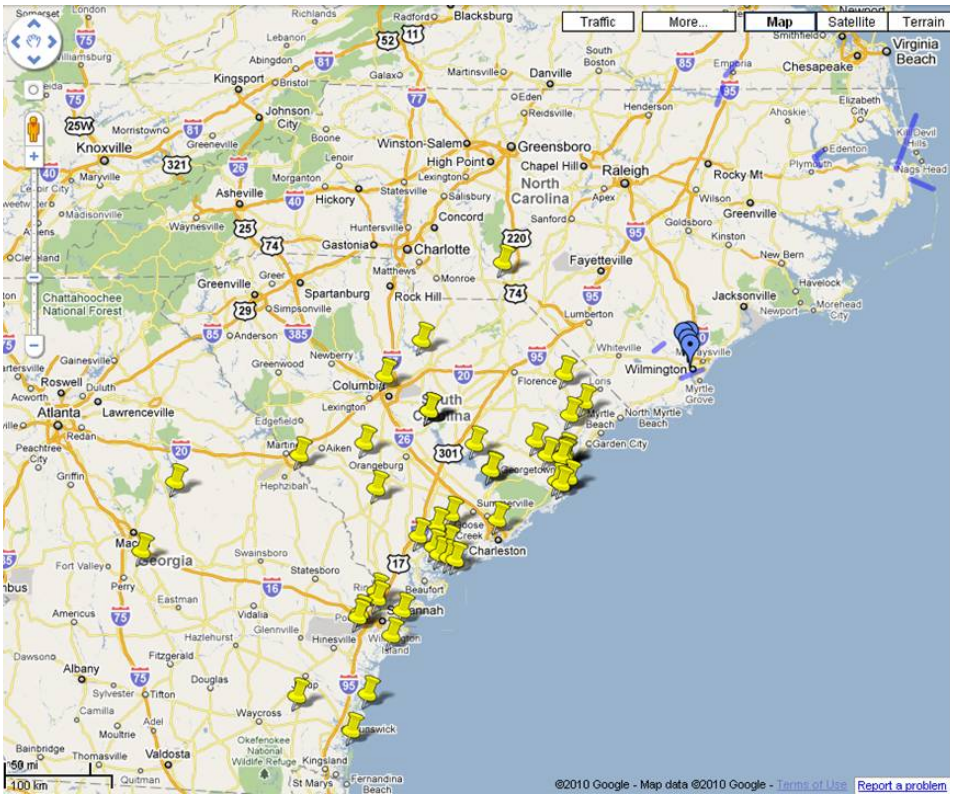
Action Area

The proposed research under Award No. NA10NMF4720036 to SCDNR would take place in rivers in North Carolina (Roanoke, Chowan, Meherrin, and Cape Fear rivers), South Carolina (Savannah, Combahee, Edisto, Cooper, Santee, and Winyah Bay system rivers), and Georgia (Altamaha and Ogeechee rivers), neighboring sounds, and in the Intracoastal Waterway (Figure 1). Appendix 1 provides geographic limits for the upper and lower limits of work in each river system. Further descriptions of the action area are provided in the Environmental Assessments for shortnose sturgeon from permit nos. 1505 (*Environmental Assessment of the Issuance of Scientific Research Permit to Dr. James P. Kirk, U.S. Army Engineer Research and Development Center (File No. 1489), Mr. Douglas W. Cooke, South Carolina Department of Natural Resources (File No. 1505), and Mr. Thomas F. Savoy, Connecticut Department of Environmental Protection (File No. 1516)*), 10037 (*Environmental Assessment of Issuance of a Scientific Research Permit to Dr. Douglas Peterson, University of Georgia, (File No.10037) to Conduct Research on Endangered Shortnose Sturgeon*), 10115 (*Environmental Assessment on the Effects of the Issuance of a Scientific Research Permit to Conduct Research on Shortnose Sturgeon in the Saint Marys River and Satilla Rivers, Georgia and Florida),* 14394 (*Environmental Assessment on the Effects of the Issuance of a Scientific Research Permit (File No. 14394) to Conduct Research on Shortnose Sturgeon in the Altamaha River, Georgia*), and 14759 (*Draft Environmental Assessment on the Effects of the Issuance of a Scientific Research Permit (File No. 14759) to Conduct Scientific Research on Shortnose Sturgeon in North Carolina Rivers*) and are hereby incorporated by reference. These EAs will be made available by NMFS Office of Protected Resources permitting division upon request. Field activities would occur during all months of the year.

Proposed Action

The proposed action is issuance of a grant to SCDNR (William Post, Principal Investigator and Program Manager) through the fiscal year 2010 Protected Species Cooperative Grant Program (CFDA no. 11.472, Unallied Science Programs) authorized under section 6 of the ESA (16 U.S.C. 1535). The proposed action includes three different project components, encompassing field research, genetic test development and analysis, and outreach activities. Field work activities would include deployment and maintenance of data-logging hydrophones; gillnetting (using multi-mesh gillnets) and trammel netting to capture shortnose and Atlantic sturgeon; surgical implantation of acoustic tags (VEMCO V-16), PIT tagging, dart tagging and/or satellite tagging; and tissue sampling. Development and testing of a telomere length aging technique would use previously collected tissue samples and would take place within a laboratory or office setting. This project would provide information on the status, habitat requirements, riverine and coastal movements, and life history characteristics of shortnose and Atlantic sturgeon. Results would advance current understanding of shortnose and Atlantic sturgeon populations within this region and data would be used by both state and federal agencies to define appropriate management units, recovery actions, and key habitats. The applicant proposes to complete this research within a three-year period.

Figure 1. Study area and sample sites. Thumbtacks represent the proposed location of sample sites including the upper and lower limits of sample areas by river (see Appendix 1).



Because the work proposed for shortnose sturgeon has already been analyzed under NEPA for permit numbers 1505, 10037, 10115, 14394, and 14759, the focus of this analysis is the work proposed for Atlantic sturgeon. All capture, handling, tagging, tissue sampling, anesthesia, manatee interaction, and aquatic nuisance species protocols for shortnose sturgeon would be followed as described in permit conditions and previous NEPA analyses (permit nos. 1505, 10037, 14394, and 14759); methods described in prior NEPA analyses associated with issuance of these scientific research permits are hereby incorporated by reference. Specific activities targeting Atlantic sturgeon are described further in this document.

Receiver Array Deployment and Maintenance

An array of 540 data-logging hydrophones would be strategically deployed throughout all rivers in SC, the Roanoke, Chowan, Meherrin, and Cape Fear Rivers in NC, and the Altamaha, Ogeechee and Satilla rivers in GA (Figure 1, Appendix 2). Receiver locations within these systems would be designed to track migration patterns including spawning runs and transfer between river basins. Each receiver would be tethered in the mid water column with either cable ties or hose clamps and attached to a stainless steel cable which would be anchored to the bottom with weights (e.g., cinder blocks) (Figure 2). Each receiver would be supported by an orange bullet float buoy and attached again to shoreline structure (pilling, tree, etc.), which has proven effective in past studies (Gibbons and Post 2009) to collect migration data. During the last 10+ years, this attachment technique has been used: the applicants have seen no evidence of entanglement of any animals (Post, personal communication). Monthly to bi-monthly field trips to download and clean receivers would be performed.

Figure 2. Diagram of sonic receiver tethering design.

Capture Methods

Since incidental take or directed take of endangered shortnose sturgeon may occur during sampling for Atlantic sturgeon, capture and handling protocols would follow the same conditions as prescribed for shortnose sturgeon in ESA scientific research permit nos. 1505, 10037, 10115, 14394, and 14759 as summarized below. The researchers propose to capture up to 100 adult/juvenile Atlantic sturgeon annually using standardized netting protocols (multifilament or monofilament mesh gill net and small trammel nets; trammel nets would only be used in Georgia). It is anticipated only 10 to15 sub-adult (80cm-170cm) or adult Atlantic sturgeon (175cm and up) would receive transmitters in most river systems. However, in systems where no shortnose sturgeon are thought to occur (NC rivers), all transmitters would be used in Atlantic sturgeon, unless a shortnose sturgeon is captured. Sampling for sturgeon would take place approximately 3 to 5 days per week, typically during spring months, but may occur throughout the year. Gill nets would be used in NC and SC rivers, and trammel nets would be used in Georgia. These nets would be fished on slack tides and soak times and conditions would follow the terms stipulated in associated ESA permits. In some cases (mainly GA), drift gill nets would be used. Researchers would remain with nets at all times to extract animals. The sampling effort would be conducted primarily during 2011 through 2013 in spring months (January through May), but may occur year round. In some cases, permitted commercial fishermen would assist in netting for adult Atlantic sturgeon.

All sampling and handling of Atlantic sturgeon would be conducted following the guidelines established in "*A Protocol for the Use of Shortnose and Atlantic Sturgeon*" (Moser *et al*. 2000). Net mesh sizes used during this project would consist of mesh sizes between 12.7 and 40.6 cm stretched measure. Netting material would consist of heavy multifilament nylon (size 208-233mm) or monofilament mesh and would measure 100 m long by 3.65 -6.0 m deep.

The following net-setting protocol summarized in Table 1 below would be adhered to by all researchers. All nets would be attended to avoid marine mammal and sea turtle interactions. In waters having minimum dissolved oxygen (D.O.) concentrations of 4 to 5 mg/L, one exception is required (i.e., soak times would be reduced to the next lower duration when D.O. measures between 4 and 5 mg/L).

Table 1: Summary of Netting Conditions

Water Temperature (^{O}C)	Minimum D.O. Level (Mg/L)*	Maximum Net Set Duration (Hours)
<15	5	10
15 – 20	5	4
20 – 25	5	2
25 – 28	5	1
> 28	Any	Cease netting until consulting with NMFS

* If DO concentration is between 4 and 5 mg/L at any temperature range, netting may occur, but only at the next lower net set duration indicated.

100-meter trammel nets would be used at slack tide during the same time periods as above and fished in GA rivers. As with gill nets, the soak time would be less than one hour at temperatures over 27°C. The mesh dimensions would consist of 3 cm interior panel and 15 cm exterior panels.

General Handling

Once removed from nets, captured Atlantic sturgeon would be recovered in a floating net pen (4 x 8 ft) for 10-15 minutes and then individually moved from the net pen into a water filled measuring box in the boat for examination and tagging. Additional net pens would be onboard to accommodate excess holding of sturgeon and/or bycatch. To minimize handling stress, each fish would be moved and handled by researchers using latex gloves. When in the onboard measuring box, sturgeon would be immersed in a continuous stream of water supplied by a pump-hose assembly mounted over the side of the research vessel, and dissolved oxygen would

be supplemented with compressed oxygen to ensure that the dissolved oxygen concentration does not fall below saturation. Sturgeon would be weighed on a platform scale fitted with a small waterproof cushion attached to the surface of the weighing platform. Total length of each sturgeon would also be measured.

The time required to complete routine, non-invasive methods (i.e., measuring, weighing) would be less than one minute per fish. The time required for procedures such as anesthetizing and telemetry tagging, would vary, but would average less than 15 minutes per fish. Following processing, all fish would be treated with slime coat restorative and placed in a separate net pen to ensure full recovery prior to release.

T-Bar Tagging
All Atlantic sturgeon captured in the Albemarle Sound area of North Carolina would be marked with a yellow t-bar tag placed in the dorsal musculature. Tags would uniquely identify each fish captured by project personnel and would be reported to the FWS for updating their tagging database. Past studies have shown, through recaptured fish, this position demonstrates adequate retention and in no way harms the animal (Moser *et al*. 2000).

PIT Tagging
All Atlantic sturgeon (>300 mm TL) captured would be marked with PIT tags to uniquely identify each fish captured and to formulate mark-recapture models. Prior to tagging, the entire dorsal surface of each fish would be scanned using a PIT tag reader to verify untagged fish and detect tags of previously captured fish. Sturgeon greater than 300 mm TL would be marked with 12.45mm x 2.22mm, 125 KHz PIT tags.

Dart Tagging
All Atlantic sturgeon captured in SC rivers (>300 mm TL) would be marked with international orange dart tags to uniquely identify each fish captured by project personnel or commercial fishers. The tags would be inserted into the dorsal musculature slightly below the dorsal fin. Past studies have shown, through recaptured fish, this position demonstrates adequate retention and in no way harms the animal.

Tissue Sampling
Immediately prior to release, a (1.0 cm^2) pectoral fin clip tissue sample of the leading pectoral ray would be collected from each Atlantic sturgeon as follows. A small (1.0 cm^2) soft tissue sample would be collected from the trailing margin of soft tissue of one of the pectoral fins or caudal fin using sharp sterilized scissors. Tissue samples would be preserved in individually labeled vials containing 95% ethanol. Genetic tissue samples would be collected from sturgeon for archival purposes and sent to the NOAA/NOS Tissue Archive located in Charleston, South Carolina, or to Co-investigators identified in relevant permits. Proper certification, identity, and chain of custody of samples would be maintained during transfer of tissue samples.

Anesthesia and Surgical Implantation of Acoustic Tags
Annually during the study, approximately 30 sub-adult Atlantic sturgeon (> 300 mm TL) would be collected for surgical implantation of Vemco V-16 sonic transmitters devices limited in size

to no more than 2 percent of a fish's body weight.

Specifications of these transmitters are as follows:

Model	Length	Diameter	Weight (H_20)	Weight (O_2)
Vemco V-16	68mm	16 mm	11g	25g

The following 3-5 minute transmitter implantation surgery under anesthesia protocol (Coyle *et al.* 2004) would be used. Atlantic sturgeon selected for transmitter implantation would be netted at temperatures of 27°C or below. Each sturgeon would be anaesthetized using a solution of 100 mg/L of tricaine methane sulfonate (MS-222) buffered to neutral pH with sodium bicarbonate. A low volume pump would deliver the anesthetic over the gills through a tube placed within the sturgeon's mouth until a state of anesthesia is reached (i.e., loss of equilibrium, little reaction to touch stimuli, cessation of movement, except for opercula movement). The anesthetic's induction and recovery time would vary but would be appropriate for shortnose and Atlantic sturgeon under the specific water temperature and oxygen conditions present (Fox *et al.* 2000).

Just prior to the surgical procedure, the tube supplying the anesthetic would be removed and the sturgeon placed on a moist surgery rack. Respiration would be maintained by directing fresh ambient water pumped across the gills with a tube inserted in the animals' mouth. The incision site (40 to 60 mm anterior to the pelvic fins, although the specific location would vary with fish size) would be disinfected with Betadyne. A single sterile surgical packet, containing all surgical instruments and supplies, would be used to make a 10 mm incision in individual fish selected for surgery. Sterilized sonic transmitters, coated with an inert polymer compound, would be inserted into the surgical openings of sturgeon and the incision closed with resorbable sutures, sealed with a layer of surgical glue. A thin layer of petroleum jelly mixed with Betadyne would then be spread over the incision areas to protect against infection (Fox *et al*. 2000). Following processing, all fish would be treated with a slime coat restorative and placed in a separate net pen to ensure full recovery prior to release. Any fish not responding readily would be recovered further in the net pen by holding the fish upright and immersed it in river water and gently moving the fish front to back to aid freshwater passage over the gills to stimulate the fish. When the fish shows signs of being able to swim away strongly, it would be released and a spotter would watch to make sure the fish stays down and fully recovered.

Water Quality Sampling

Water quality at the time of capture (including water temperature, dissolved oxygen concentration, conductivity and salinity) would be recorded using YSI Model 85 dissolved oxygen meter.

Telomere Aging

Approximately 200 shortnose and 200 Atlantic sturgeon tissue samples of known age individuals for both sturgeon species are already compiled from past SCDNR sturgeon studies (Collins *et al.* 2009) and available for the development of the aging tools. Past cooperative research projects along the southeastern U.S. have archived genetic samples for both sturgeon species and would

be the source of additional samples for this project, including larval through adult senescent stages for each species. No additional field sampling is required for this part of the study. One hundred animals would be used to test whether telomere length can be used to age these species. Initial analysis of telomere length would be performed using TeloTAGGG Telomere Length Assay kits (Roche Applied Science; Mannheim, Germany) following the manufacturers specifications. Following the development of the TRF standard age curve for a species, an additional twenty known-age samples would be used to test the reliability of the curve in age prediction.

IV. Alternatives Under Consideration

Two alternatives have been considered:

(1) Under the No Action alternative, Award File 4720036 would not be approved. This alternative would not fund research that would fill identified data gaps in shortnose and Atlantic sturgeon status, habitat requirements, riverine and coastal movements, and life history characteristics in South Carolina, North Carolina, and Georgia.

(2) Under the Proposed Action alternative, Award File 4720036 would be approved. The proposed action is issuance of a grant to SCDNR (William Post, Principal Investigator and Program Manager) through the fiscal year 2010 Protected Species Cooperative Grant Program (CFDA no. 11.472, Unallied Science Programs) authorized under section 6 of the ESA (16 U.S.C. 1535). The proposed action includes three different project components, encompassing field research, genetic test development and analysis, and outreach activities. Field work activities would include deployment and maintenance of data-logging hydrophones; gillnetting (using multi-mesh gillnets) and trammel netting to capture shortnose and Atlantic sturgeon; surgical implantation of acoustic tags (VEMCO V-16), PIT tagging, dart tagging and/or satellite tagging; and tissue sampling. Development and testing of a telomere length aging technique would use previously collected tissue samples and would take place within a laboratory or office setting. This project would provide information on the status, habitat requirements, riverine and coastal movements, and life history characteristics of shortnose and Atlantic sturgeon. Results would advance current understanding of shortnose and Atlantic sturgeon populations within this region and data would be used by both state and federal agencies to define appropriate management units, recovery actions, and key habitats. The applicant proposes to complete this research within a three-year period

V. Description of the Affected Environment

This EA evaluates the potential impacts to the human environment from issuance of the proposed funding award and the potential impacts on the social, economic, physical, and biological environment, specifically those that may result from the proposed research activities.

Social and Economic Environment

Although economic and social factors are listed in the definition of effects in the CEQ

regulations and NAO 216-6, the definition of human environment states that "economic and social effects are not intended by themselves to require preparation of an EIS." However, an EIS or EA must include a discussion of a proposed action's economic and social effects when these effects are interrelated with effects on the natural or physical environment. The social and economic environment is not described in detail because there is no potential for social and economic effects. There are no significant social or economic impacts of the proposed action interrelated with significant natural or physical environmental effects.

Physical Environment

The following section provides a summary description of the critical resources within the action area. More detailed descriptions of the action area can be found within the EAs prepared for the associated shortnose sturgeon research permits (permit nos. 1505, 10037, 10115, 14394, and 14759) and those are thus incorporated by reference. Descriptions are by state and river system below.

North Carolina River Systems

There are three main study rivers in North Carolina: the Chowan/Meherrin, Roanoke, and Cape Fear.

Chowan and Meherrin Rivers

The Chowan River Basin is located in the northeastern Coastal Plain of North Carolina and southeastern Virginia and occupies approximately 5,415 square miles: approximately 75 percent of the basin (4,061 square miles) is located in the Virginia portion of the watershed (Basinwide Planning Section 2007), with the remaining 1,378 square miles in North Carolina (NCSU 2008). The river is formed at the border of North Carolina and Virginia by the confluence of the Nottoway and Blackwater Rivers. A third major tributary, the Meherrin River, joins the Chowan River south of the Virginia border. The basin is part of the Albemarle-Pamlico National Estuary Program of the US Environmental Protection Agency and thus it has a Comprehensive Conservation and Management Plan.

The major dams in the Chowan River and tributaries were summarized by Street *et al.* (2005). The lowermost dam, the Emporia Dam (in VA) is a hydropower facility located on the Meherrin River that has blocked diadromous fish movement for over 90 years. In 1990, a fish lift was constructed at the dam to facilitate migration of American shad and river herring. The effectiveness of the lift is unknown and it is likely that this would still be the upstream limit for sturgeon if they were present on the Chowan River. There is also a dam on the Nottoway River, the Baskerville Mill Dam that restricts the historical migration of striped bass and would likely restrict passage of sturgeon if they were present. Additional dams located in the Virginia portion of the watershed are present in the system on the Blackwater and Nottoway tributaries of the Chowan, and may also block access to historic sturgeon spawning habitat.

There are three authorized Army Corps of Engineers (ACOE) navigation channels in the Chowan Basin. These include: 1) a 10-foot deep channel along the Meherrin River, from the mouth to Murfreesboro, NC for a distance of approximately 10.5 miles; 2) a 12-foot deep channel along the Chowan River, between the Meherrin River and the confluence of the

Blackwater and Nottoway rivers - a distance of 11.4 miles; and 3) a 12-foot deep channel on the Blackwater River from the mouth to Franklin, VA, a distance of about 13 miles. All of these projects are considered inactive and are not maintained.

All of the waters in the Chowan River Basin are presently designated as Nutrient Sensitive Waters (NSW): water quality in the basin is presently considered generally good (Basinwide Planning Section 2007). However, the Chowan River has historically experienced severe problems attributed to declining water quality as a result of excessive nutrient inputs from 1973-1983 (NC DEM 1979, 1982; Sauer and Kuenzler 1981, Paerl 1982) with nuisance blue-green algal blooms being the most noticeable manifestation of the water quality problem (Witherspoon *et al.* 1979, Paerl 1982). Nonpoint sources have been identified as the major sources of nutrients that were affecting the ecosystem (Sauer and Kuenzler 1981; Paerl 1982); the loadings varied as a function of water discharge. Blue-green algal blooms were greatest between 1972 and 1978, when high spring tributary discharges were coupled with relatively long water residency times during summer months. Other indications of degraded water quality in the Chowan have included fish kills (Johnson 1982), declining commercial fisheries (Street 1982), and decreases in recreational activities (NC DEM 1982).

Roanoke River

The Roanoke River Basin begins in the Blue Ridge Mountains of northwestern Virginia and flows for more than 400 miles in a generally southeastern direction, emptying into Albemarle Sound in northeastern North Carolina (Basinwide Planning Section 2006). Most of its upper course in Virginia between the City of Roanoke and Clarksville is known as the Staunton River. About 36% of the watershed is within North Carolina with the remainder in Virginia; much of the North Carolina portion is comprised by the Dan River and its tributaries. At the fall line near Roanoke Rapids, the drainage area is nearly 8,000 square miles; from Roanoke Rapids to the coast the river drains another 2,000 square miles. Discharge from Roanoke River is greater than any other North Carolina river (Basinwide Planning Section 2006).

The upper Dan River is classified as trout waters and part of the area is also designated as a State Water Trail by the North Carolina Division of Parks and Recreation. The lower portion of the basin below Roanoke Rapids Dam contains the largest intact and least-disturbed remaining bottomland hardwood floodplain ecosystem in the mid-Atlantic region (TNC and the Southeast Aquatic Resources Partnership 2005). The Nature Conservancy's Board of Governors has designated the lower river as one of "The Last Great Places," making it one of only 200 such sites in America, Asia and the Pacific designated. Large tracts of floodplain on the lower river are owned and managed by the North Carolina Wildlife Resources Commission (NCWRC), The Nature Conservancy, or US Fish and Wildlife Service (USFWS 2005). NCWRC has designated a portion of the river as an Inland Primary Nursery Area due to its importance as spawning habitat for anadromous fish. The river supports world-class recreational fisheries for migratory striped bass and hickory shad (Basinwide Planning Section 2006).

The hydrologic regime is significantly and negatively influenced by three dams constructed around the 1950s and located near the fall line between the Piedmont and the Coastal Plain. In addition to hydrologic alteration from dams, a large silt deposit exists, presumably developed

between the mid-1800s and the 1950s: this deposit may have contributed to significant entrenchment of the river and impacts are unclear. Habitat presently accessible to sturgeon includes the lower Roanoke River from the base of Roanoke Rapids Dam (variously reported as between 135- 137.5 miles upstream of Albemarle Sound).

Cape Fear River

The Cape Fear River basin and estuary is the most industrialized river basin in North Carolina (Mallin *et al.* 2003) and perhaps the most highly altered hydrodynamically as a consequence of dams in the estuary and on the main stem, water diversions and withdrawals, and navigational channel construction (Snow's Cut) and deepening to facilitate the upstream excursion and intrusion of saline waters into areas that were historically fresh. The estuary is a drowned river valley, characterized by tidally driven currents, high turbidity and vertical salinity stratification (Moser and Ross 1995). The over 200 mile long watershed originates in interior North Carolina around Greensboro with the two main tributary streams being the Haw and Deep rivers.

The Cape Fear River Estuary is unique in North Carolina in that it is the only estuary which opens directly into the Atlantic Ocean (Street *et al.* 2005), and it has the highest tidal range (± 6 ft) of any North Carolina estuary. Tidal range attenuates up the estuary and decreases from 4 ft at river mile (RM) 30 to 1 ft at RM 60 (Moser and Ross 1995). The estuarine portion of the Cape Fear River Basin occupies 340 square miles of the entire system (approximately 6 percent). A side channel of the Cape Fear River which parallels the main channel runs from RM 23 to 29 and is named the Brunswick River (Moser and Ross 1995).

The river channel is regularly dredged: initially in 1822 by the State of North Carolina and recently by the ACOE in collaboration with the state (Sprunt 1916, NCCMP 2006, NCDWR 2006). Multiple low-head dams on the main stem Cape Fear River presently block access to what were the likely historic spawning habitats for both Atlantic and shortnose sturgeon. The lowest dam on the river occurs in Riegelwood, North Carolina (rkm 90).

South Carolina River Systems

Combahee and Edisto rivers

This is a pristine, undammed, minimally developed system. The Combahee is a short blackwater river that is one of the three rivers that forms the ACE basin (with the Ashepoo and Edisto rivers).

The Edisto River is the longest completely undammed/unleveed blackwater river in North America, flowing 206 miles from its sources in Saluda and Edgefield counties. It has 2 main tributaries, the North and South forks) that originate just south of the fall line.

Santee and Cooper Rivers

The Santee River Basin encompasses 11 watersheds and 1,279 square miles. The Santee River Basin originates in the upper coastal plain region of the state. The Santee River is formed from the confluence of the Congaree (a focus of this study) and Wateree Rivers and flows through

Lake Marion. The river is diverted in lower Lake Marion, and either flows out of the Santee dam to eventually drain into the Atlantic Ocean via the South Santee River and the North Santee River, or is channeled along a 7.5 mile diversion canal to fill Lake Moultrie. After flowing through the Santee dam, the Santee River is joined by the rediversion canal connecting Lake Moultrie and the (lower) Santee River and flows to the Atlantic Ocean. The Congaree River is only 47 miles long, originating near Columbia, South Carolina by the confluence of the Saluda and Broad rivers near the fall line. The river is navigable by barges and is not dammed.

The Cooper River is mainly a tidal river that flows from Lake Moultrie to Charleston Harbor estuary. It has long been used as a commercial waterway.

The Santee-Cooper System is a complex system that includes three dams that form two reservoirs. There is no dredging or blasting in either the reservoirs or Santee River. The lower Cooper River and Charleston Harbor are dredged to maintain the shipping channel.

Winyah Bay River System

The Winyah Bay watershed is approximately 18,000 square miles comprised of the drainage of several major rivers, including the Waccamaw, the Little Pee Dee, the Great Pee Dee (a focus of the study), and the Black River. More than 16,000 square miles of this drainage area is associated with the Pee Dee-Yadkin River system, which originates in the Blue Ridge Mountains area of North Carolina. Water from this area flows across the Piedmont region of both North and South Carolina and into Winyah Bay through the Pee Dee River. The lower part of the river has been designated a scenic river by South Carolina. The only dams in the watershed occur above the fall line in North Carolina, so movement of sturgeon is likely not restricted though discharge has been greatly altered. The river is not extensively used for navigation.

Savannah River

The Savannah River basin is 350 mile long, 10,000-square mile area watershed in portions of North Carolina, South Carolina, and Georgia. The Savannah River, which is the boundary between South Carolina and Georgia, is formed at Hartwell Reservoir by the confluence of the Seneca and Tugaloo rivers and flows southeast to the Atlantic Ocean at the port city of Savannah, Georgia. The New Savannah Bluff Lock and Dam 13 miles below Augusta Georgia (rkm 299) limits sturgeon movement.

Georgia River Systems

There are three main study rivers in Georgia: the Satilla, Ogeechee and Altamaha rivers.

Satilla River

The Satilla River lies entirely within the Coastal Plain and flows approximately 200-miles in an easterly direction to the Atlantic. The Satilla River basin is composed primarily of the Satilla River, Little Satilla River, and Turtle River. It is a typical 'black water' river that has a dark (although clear) color to the water due to inputs of humic material from the extensive flood plain swamps of cypress and black gum bordering the river. The Satilla River drainage area is almost 4,000 square miles of land. Development and industrial-residential pollution is very low, and

there is relatively little agricultural runoff into the river. Dredging only occurs on a relatively small scale in this system in order to maintain the Intracoastal Waterway.

Ogeechee River

The Ogeechee River basin is located entirely within the State of Georgia, draining about 5,400 square miles of land. The River is formed by the confluence of the North and South Forks of Ogeechee River and runs for about 245 miles from the Piedmont Province to the Atlantic Ocean. During low-flow conditions, saltwater wedges in the lower portion of the river extend between 30 and 35 miles upstream (GA DNR 2001). The Ogeechee River is one of Georgia's few remaining free flowing rivers and it contains excellent habitat for many freshwater species. It is a typical black water coastal stream resulting from tannins of decaying tree roots and other organic materials. The pH value of Ogeechee River, however, is about 7, which is higher than compared to other black water rivers. This pH is due to a large input of carbonate-rich water from Magnolia Springs (GA DNR 2001).

There are no large storage reservoirs or hydroelectric plants on the river; however, many surface waters are impaired by non-point sources of pollution from agricultural operations, urban, industrial, and residential lands, and forestry. Although there are no data on whether or how these sources of pollution pose a risk to sturgeon, as benthic predators, sturgeon would be exposed to sediments and benthic biota that are potential sources of contaminants.

Altamaha River

Located entirely within Georgia, the Altamaha River and its main tributaries, the Oconee and Ocmulgee Rivers, flow over 500 miles from the headwaters near Atlanta, Georgia to the Atlantic Ocean near Darien, draining nearly one-third of the state. The Altamaha watershed encompasses roughly 13,900 square miles and is one of the largest watersheds on the east coast of the United States. The Altamaha River is also second only to the Pascagoula River in Mississippi in length of unimpounded river from the ocean for rivers east of the Mississippi River (Dynesius and Nilsson 1994). The Oconee and Ocmulgee Rivers contain the only impoundments within the watershed; however, none are found farther downstream than RM 224, which is well upstream of the known habitat of sturgeon in this system (Rogers and Weber 1994).

Essential Fish Habitat (EFH), Critical Habitat, and Other Protected Areas

There is no ESA designated critical habitat located within the area for the proposed activities. The only protected areas where the study species occur are the North Inlet Winyah and ACE basin National Estuarine Research Reserves.

There are no eligible historic resources in the project location.

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) requires NMFS to complete an EFH consultation for any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by the agency that may adversely affect EFH. Designated EFH exists in the action area for panaeid shrimp and red drum in estuarine tidal areas and inlets and for coastal migratory pelagic species (king and Spanish

mackerel) in coastal inlets, and the sandy shoals of capes and offshore bars. NMFS therefore considered the potential for adverse impacts on EFH in the study area. This proposed action area largely overlaps with the action areas of currently permitted research on shortnose sturgeon, and the impact of boating activities, and gill and trammel netting have previously been considered. The Southeast Region's Habitat Conservation Division was contacted via email that the proposed action as it would be conditioned would have minimal impacts on EFH. While considering the experimental design, nature of the surveys, and limited scope of subject activities the HCD had no EFH conservation recommendations to provide pursuant to Section 305(b)(2) of the Magnuson-Stevens Act.

Biological Environment

The target of the proposed research is the endangered shortnose sturgeon and ESA candidate[1] Atlantic sturgeon. The following is a brief summary of the status and occurrence of Atlantic sturgeon range-wide, including within the proposed study area. Since the proposed field work would take place only in North Carolina, South Carolina, and Georgia, the status of Atlantic sturgeon in those systems is also discussed in further detail in this section. Full descriptions of the status of this species can be found in the NMFS Status Review Report at http://www.nmfs.noaa.gov/pr/species/fish/atlanticsturgeon.htm.

Background on Atlantic Sturgeon

The Atlantic sturgeon was first designated as a candidate[1] species in 1991, meaning that this species was being considered for listing as endangered or threatened but was not yet the subject of a proposed rule. On June 2, 1997, NMFS and the USFWS received a petition from the Biodiversity Legal Foundation requesting that Atlantic sturgeon in the United States be listed as threatened or endangered and that critical habitat be designated. A notice was published in the *Federal Register* on October 17, 1997, stating that the NMFS had determined substantial information existed indicating the petitioned action may be warranted (62 FR 54018). In 1998, after completing a comprehensive status review, a 12-month determination was published in the *Federal Register* announcing that ESA listing was not warranted at that time (63 FR 50187; September 21, 1998). Atlantic sturgeon was however retained on the candidate species list. Concurrently, the Atlantic States Marine Fisheries Commission (ASMFC) completed Amendment 1 to the 1990 Atlantic Sturgeon Fishery Management Plan (FMP) that imposed a 20 to 40 year moratorium on all Atlantic sturgeon fisheries until the Atlantic Coast spawning stocks could be restored to a level where 20 subsequent year classes of adult females were protected (ASMFC, 1998). In 1999, pursuant to section 804(b) of the Atlantic Coastal Fisheries Cooperative Management Act (16 U.S.C. 5101 *et seq.*), NMFS followed this action by closing the Exclusive Economic Zone (EEZ) to Atlantic sturgeon retention.

In 2003, NMFS sponsored a workshop along with the USFWS and the ASMFC to discuss the status of Atlantic sturgeon along the Atlantic Coast and determine what obstacles, if any, were impeding their recovery. The results of the workshop (Kahnle *et al.* 2005) indicated some river

1 A candidate species is a) one that is actively being considered for listing as either threatened or endangered under the ESA and is the subject of a positive 90-day finding but not yet the subject of a proposed rule, or b) is a species for which NMFS has initiated an ESA status review and has announced the review in the *Federal Register* (see 71 FR 61022; October 17, 2006). This status does not carry any procedural or substantive protections under the ESA.

populations seemed to be recovering while others were declining. Bycatch and habitat degradation were noted as possible causes for continued declines. Based on the information gathered from the 2003 workshop, NMFS decided that a second review of Atlantic sturgeon status was needed to determine if listing as endangered or threatened under the ESA was warranted. A comprehensive, peer-reviewed status review report was completed in 2007 and indicated that some populations warranted protections under the ESA (this report is available at http://www.nmfs.noaa.gov/pr/species/fish/atlanticsturgeon.htm and is cited within this document as ASSRT 2007). The agency then began the process to list the species under the ESA.

On October 6, 2009, NMFS received a petition from the Natural Resources Defense Council to list Atlantic sturgeon as endangered under the ESA and designate critical habitat. NMFS accepted this petition on January 6, 2010 (75 FR 838) and must make a 12-month finding by October 6, 2010.

Range-wide status of Atlantic sturgeon

Historically, Atlantic sturgeon were present in approximately 38 rivers in the United States from St. Croix, Maine to the Saint Johns River, Florida, of which 35 rivers have been confirmed to have supported spawning for Atlantic sturgeon (ASSRT 2007). It is unknown how many Canadian rivers were historically used by Atlantic sturgeon. However, it is likely that Atlantic sturgeon spawned in the Miramichi, Shubenacadie, Avon, Annapolis rivers, and in other systems of similar size in addition to the presently known subpopulations that spawn in the Saint Lawrence and Saint John rivers (reviewed in Dadswell 2006, ASSRT 2007). Overall, historical sightings of Atlantic sturgeon were generally reported from Hamilton Inlet, Labrador, south to the Saint Johns River, Florida (Murawski and Pacheko 1977, Smith and Clugston 1997, ASSRT 2007). Occurrences south of the Saint Johns River, Florida and north of Hamilton Inlet, Labrador may have always been rare.

It is clear that Atlantic sturgeon underwent significant range-wide declines from historical abundance levels due to overfishing (reviewed in Smith and Clugston 1997). Although Atlantic sturgeon had been previously exploited in commercial fisheries (Scott and Crossman 1973, Dadswell 2006, ASSRT 2007), records from the 1700's and 1800's document large numbers of sturgeon in many rivers along the Atlantic coast (Kennebec River Resource Management Plan 1993, Armstrong and Hightower 2002). However, in 1870, a significant fishery for the species developed when a caviar market was established. Record landings were reported in 1890, when over 3350 metric tons (mt) of Atlantic sturgeon were landed from coastal rivers along the Atlantic Coast (reviewed in Smith and Clugston 1997 Secor and Waldman 1999). The fishery collapsed in 1901, ten years after peak landings, when less than 10% (295 mt) of its 1890 peak landings were reported. During the 1950s, the remaining fishery switched to targeting sturgeon for flesh, rather than caviar. Commercial fisheries were active in many rivers during all or some of the period from 1962 to 1997, albeit at much lower levels than in the late 1800's to early 1900's (Smith and Clugston 1997). Nevertheless, many of these contemporary fisheries also resulted in overfishing, which prompted the ASMFC to impose the 1998 coastwide moratorium for fisheries targeting Atlantic sturgeon and NMFS to close the EEZ to Atlantic sturgeon retention in 1999.

Currently, Atlantic sturgeon presence is documented in 36 rivers in the United States and Canada, combined (ASSRT 2007; J. Sulikowski, UNE, *pers. comm.*). At least 20 rivers are believed to support spawning based on available evidence (i.e., presence of young-of-year or gravid Atlantic sturgeon documented within the past 15 years) (ASSRT 2007). These rivers are the: Saint Lawrence, Quebec; Annapolis, Nova Scotia; Saint John, NB; Kennebec, ME; Hudson, NY; Delaware, NJ/DE/PA; James, VA; Roanoke, NC; Tar-Pamlico, NC; Cape Fear, NC; Waccamaw, SC; Great PeeDee, SC; Santee, SC; Cooper, SC; Combahee, SC; Edisto, SC; Savannah, SC/GA; Ogeechee, GA; Altamaha, GA; and, the Satilla, GA (ASSRT 2007). Rivers with possible, but unconfirmed, spawning include: St Croix, NB/ME; Penobscot, Androscoggin, and Sheepscot, ME, York, VA; and, Neuse, NC (ASSRT 2007).

Comprehensive information on current abundance of Atlantic sturgeon is lacking for any of the spawning rivers (ASSRT 2007). In the United States, an estimate of 870 spawning adults/year is available for the Hudson River (Kahnle *et al*. 2007). However, this estimate is based on data collected from 1985 to 1995 and may underestimate current conditions (Kahnle *et al*. 2007). An estimate of 343 spawning adults/year is available for the Altamaha River, Georgia, based on data collected in 2004-2005 (Schuller and Peterson 2006). Data collected from the Hudson River and Altamaha River studies cannot be used to estimate the total number of adults in either population since mature Atlantic sturgeon may not spawn every year (Vladykov and Greeley 1963, Smith, 1985, Van Eenennaam *et al.* 1996, Stevenson and Secor, 1999, Collins *et al*. 2000, Caron *et al*. 2002), and it is unclear to what extent mature fish in a non-spawning condition occur on the spawning grounds. Nevertheless, since the Hudson and Altamaha rivers are presumed to have the healthiest Atlantic sturgeon populations within the U.S., other U.S. populations are predicted to have fewer spawning adults than either the Hudson or the Altamaha (ASSRT 2007). In Canada, an estimate of spawning population size is available for the Saint Lawrence River for which tagging work suggests a total spawning population of over 500 adults (Caron *et al*. 2002, Dadswell 2006).

Status of Atlantic sturgeon in North Carolina Rivers

Historically, Atlantic sturgeon were abundant in most North Carolina coastal rivers and estuaries; the largest fisheries occurred in the Roanoke River/Albemarle Sound system and in the Cape Fear River (Kahnle *et al.* 1998). Historic landing records from the late 1800s indicated that Atlantic sturgeon were very abundant within the Albemarle Sound (~ 61.5 mt/yr); however, these landings are relatively small compared to the Delaware fishery (~2,700 mt/yr) (Secor 2002). Abundance estimates derived from these historical landings records indicated that between 7,200 and 10,500 adult females were present within North Carolina prior to 1890 (Armstrong and Hightower 2002, Secor 2002).

<u>Albemarle Sound (Roanoke and Chowan/Meherrin/Nottoway Rivers)</u>

Historic and current survey data indicate that spawning occurs in the Roanoke River/Albemarle Sound system, where both adults and small juveniles have been captured. Since 1990, NCDMF has conducted the Albemarle Sound Independent Gill Net Survey (IGNS), initially designed to target striped bass. The survey is conducted from November through May, using a randomized block sampling design and employing 439 meters of gill net, both sinking and floating, with stretched mesh sizes ranges from 2.5 in to 10 in. Since 1990, 842 sturgeon have been captured

ranging from 15.3 to 100 cm FL, averaging 47.2 cm FL. One hundred and thirty-three (16%) of the 842 sturgeon captured could be classified as young-of-the-year (YOY) (≤41 cm TL, ≤35 cm FL); the others were subadults. Incidental take of Atlantic sturgeon in the IGNS indicate that the subpopulation has been increasing in recent years (1990-2000), but since then recruitment has dramatically declined. Similarly, the NCDMF Observer Program documented the capture of 30 Atlantic sturgeon in large and small mesh gill nets; two of these individuals being YOY (< 41 cm TL) (Blake Price, NCDMF, *pers. comm.* 2006).

In 1997 and 1998, NC State University (NCSU) researchers characterized the habitat use, growth, and movement of juvenile Atlantic sturgeon (Armstrong and Hightower 2002). Their survey collected 107 Atlantic sturgeon, of which 15 (14%) could be considered YOY. Young juveniles were observed more often over organic rich mud bottoms and at depths of 3.6 to 5.4 meters. Adult running ripe sturgeon have not been collected in the Roanoke River even though the NC Wildlife Resources Commission has sampled the spawning grounds since the 1990s during their annual striped bass electrofishing survey. However, in 2005, an angler captured a YOY (39 cm TL) Atlantic sturgeon in the Roanoke River, near the city of Jamesville. These multiple observations of YOY from the Albemarle Sound and the Roanoke River provide evidence that spawning continues, and catch records indicate that this population seemed to be increasing until 2000, when recruitment began to decline.

The construction of Roanoke Rapids Dam in 1955 on the Roanoke River blocked access to diadromous fish above rkm 207. It is uncertain how spawning has been affected by this dam as age-0 and 1 juveniles still occur in the Albemarle Sound portion of the system, and therefore, spawning must be continuing on the Roanoke River below the dams or in other Albemarle Sound tributaries. Flow, water temperature and oxygen levels in the Roanoke River are also affected by dams. The ACOE conducts extensive annual dredging operations to maintain navigational access through Oregon Inlet, which is the main corridor into Albemarle Sound. However, dredging in the Sound itself and its major tributaries is relatively minor with the exception of the Atlantic Intercoastal Waterway. Water quality in the Albemarle Sound ecosystem and in its major tributaries is relatively good, due in large part to the fact that most of the watershed is rural and/or forested.

Cape Fear River

A gill net survey for adult shortnose and juvenile Atlantic sturgeon was conducted in the Cape Fear River drainage from 1990-1992, and replicated between 1997and 2005. Each sampling period included two overnight sets (checked every 24 hrs). The 1990 to 1992 survey captured 100 Atlantic sturgeon below Lock and Dam #1 (rkm 95) for a catch per unit effort (CPUE) of 0.11 fish/net-day. No sturgeon were collected during intensive sampling above Lock and Dam #1. In 1997, 16 Atlantic sturgeon were captured below Lock and Dam #1, an additional 60 Atlantic sturgeon were caught in the Brunswick (a tributary of the Cape Fear River), and 12 were caught in the Northeast Cape River (Moser *et al.* 1998). Relative abundance of Atlantic sturgeon below Lock and Dam #1 seemed to have increased dramatically since the survey was conducted in 1990-1992 (Moser *et al.* 1998) as the CPUE of Atlantic sturgeon was two to eight times greater during 1997 than in the earlier survey. Since 1997, Atlantic sturgeon CPUE has been gradually increasing: a regression analysis revealed that CPUE doubled between the years of

1997 (~0.25 CPUE) and 2003 (0.50 CPUE) (Williams and Lankford 2003). This increase may reflect the effects of North Carolina's ban on Atlantic sturgeon fishing that began in 1991; however, the increase in CPUE may also be artificial as these estimates are similar among years except in 2002 (large increase) that likely skewed the regression analysis. In 2003, the NCDMF continued the sampling program (Cape Fear River Survey) and collected 91 Atlantic sturgeon (43 – 147 cm FL).

Adult Atlantic sturgeon have been observed migrating upstream in the fall within the Cape Fear River, indicating that there may be two spawning seasons, or some upstream overwintering may be occurring (M. Williams, former University of North Carolina Wilmington (UNCW), *pers. comm.* 2006). One large Atlantic sturgeon was tracked moving upstream in the Black River, which is a tributary of the Cape Fear River, in early October. Moreover, all of the largest sturgeon collected by UNCW personnel were later captured only during September and October in both the Cape Fear and Northeast Cape Fear rivers. Finally, a carcass of an adult female Atlantic sturgeon with fully developed ovaries was discovered in an area well upstream of the saltwater-freshwater interface in mid-September. Studies in other river systems have also demonstrated that some sturgeon will participate in upstream spawning migrations in the fall (Rogers and Weber 1995, Weber and Jennings 1996, Moser *et al.* 1998).

The Cape Fear system is reported to have lost 36% of accessible habitat (ASSRT 2007). The Cape Fear River has three locks and dams between Wilmington and Fayetteville that are located below the fall line; two additional dams, Buckhorn and B. Everette Jordan, are located above the fall line. Atlantic sturgeon movement is blocked at the first lock and dam located in Riegelwood, NC (rkm 90). Dredging operations (including the blasting of rock) on the lower Cape Fear River, Brunswick River and port facilities at the U.S. Army's Sunny Point Military Ocean Terminal and Port of Wilmington are extensive. To protect diadromous fish, restrictions are placed on dredging to avoid sensitive seasons and locations. Water quality in the Cape Fear River is less than desirable for aquatic life, due largely to industrial development and use, including the Port of Wilmington and numerous industrial point source discharges.

Status of Atlantic sturgeon in South Carolina Rivers

Historically, Atlantic sturgeon were likely present in many South Carolina river/estuary systems, but it is not known where spawning occurred. Secor (2002) estimated that 8,000 spawning females were likely present prior to 1890, based on US Fish Commission landing records. Since the 1800s, however, populations have declined dramatically (Collins and Smith 1997). During the last two decades, Atlantic sturgeon have been observed in most South Carolina coastal rivers, although it is not known if all rivers support a spawning subpopulation (Collins and Smith 1997).

<u>Winyah Bay (Waccamaw, Great Pee Dee, and Sampit Rivers)</u>

Recent shortnose sturgeon sampling (using 5, 5.5, 7, and 9 inch stretched mesh experimental gill Nets or 16' otter trawl) conducted in Winyah Bay captured two sub-adult Atlantic sturgeon during 4.2 hrs of effort in 2004. Captures of age-1 juveniles from the Waccamaw River during the early 1980s suggest that a reproducing population of Atlantic sturgeon may persist in that river, although the fish could have been from the nearby Great Pee Dee River (Collins and Smith 1997). In 2003 and 2004, nine Atlantic sturgeon (48 - 112 cm FL) were captured in the

Waccamaw River during the SCDNR annual American shad gill net survey, although none were considered spawning adults or YOY. However, Collins *et al.* (1996) note that unlike northern populations, in South Carolina, YOY are considered to be less than 50 cm TL or 42.5 cm FL, as growth rates are greater in the warmer southern waters compared to cooler northern waters. Therefore, the capture of a 48 cm FL sturgeon provides some evidence that YOY may be present in the Waccamaw River and thus some evidence of a spawning subpopulation. Lastly, watermen on the lower Waccamaw and Pee Dee rivers have observed jumping sturgeon, which suggest that rivers either serve as a nursery/feeding habitat or support an extant subpopulation(s) (W. Laney, USFWS, *pers. comm.* 2007).

Until recently, there was no evidence that Atlantic sturgeon spawned in the Great Pee Dee River, although subadults were frequently captured and large adults were often observed by fishers. However, a fishery survey conducted by Progress Energy Carolinas, Inc. captured a running ripe male in October of 2003 and observed other large sturgeon, perhaps revealing a fall spawning run.

Only the Great Pee Dee Rive is dammed in this river system; Blewett Falls Dam is located at or near the fall line (305 km upstream). It is unknown how much of the river was used by Atlantic sturgeon prior to dam construction, but a historic fishery for sturgeon near Winston Salem has been noted and suggests that some portion of the historical spawning habitat is impeded. Winyah Bay and its hipping channel, which includes the salinity regime commonly inhabited by age 1-4 juveniles, are dredged with some regularity for navigation into the Port of Georgetown. In the Bay, a seasonal restriction to protect sea turtles restricts dredging during the summer months. Industrialization, including paper and steel mills, in the upper portion (Sampit River arm) of Winyah Bay has impacted water quality. Riverine sediment samples contain high levels of various toxins including dioxins (NMFS and USFWS 1998). The effects of these contaminants are unknown, but there are fish consumption advisories for three fish species in the system due to mercury contamination.

<u>Santee and Cooper Rivers</u>

The capture of 151 subadults, including age-1 juveniles, in the Santee River in 1997 suggests that an Atlantic sturgeon population exists in this river (Collins and Smith 1997). This is supported by three adult Atlantic sturgeon carcasses found above the Wilson and Pinopolis dams in Lakes Moultrie (Santee-Cooper reservoirs) during the 1990s (M. Collins, SCDNR, *pers. comm.* 2006). Although shortnose sturgeon spawning above the dam has been documented, there is scant information to support existence of a land-locked subpopulation of Atlantic sturgeon. In 2004, 15 subadult Atlantic sturgeon were captured in shortnose sturgeon surveys during 156.6 hrs of effort conducted in the Santee estuary. The previous winter, four juvenile (YOY and subadults) Atlantic sturgeon were captured (36 – 66 cm FL) from the Santee (n = 1) and Cooper (n = 3) rivers. These data support previous hypotheses that a fall spawning run occurs within this system, similar to that observed in other southern river systems. However, SCDNR biologists are skeptical as to whether these smaller sturgeon (36 and 38 cm FL) from the Santee-Cooper are resident YOY as flood waters from the Pee Dee or Waccamaw River could have transported them to the Santee-Cooper system via Winyah Bay and the Intercoastal Waterway (McCord 2004).

The Santee-Cooper system is reported to have lost 59% of accessible habitat (ASSRT 2007). The Santee-Cooper Hydroelectric Project is located in the coastal plain of the Santee Basin on the Santee and Cooper rivers. The project was constructed between 1938 and 1942 and includes Lake Marion, which is impounded by the Santee Dam (Wilson Dam) on the Santee River at river mile (rm) 87, and Lake Moultrie, which is impounded by the Pinopolis Dam on the Cooper River at rm 48. The project structures consist of the Wilson Dam, Pinopolis Dam, Diversion Canal, Santee Spillway Hydroelectric Station, and Jefferies Hydroelectric Station. There is no dredging in the Santee River that would have the potential to affect Atlantic sturgeon habitat, however the Cooper River flows into Charleston Harbor, which is one of the busiest ports on the Atlantic Coast and is dredged regularly. The river channel is maintained by dredging all the way to the Pinopolis Dam.

Ashley River

The Ashley River, along with the Cooper River, drains into Charleston Bay; only shortnose sturgeon have been sampled in these rivers. While the Ashley River historically supported an Atlantic sturgeon spawning subpopulation, it is unknown whether the subpopulation still exists.

ACE Basin (Ashepoo, Combahee, and Edisto Rivers)

The Ashepoo, Combahee, and Edisto rivers, and St. Helena Sound into which they flow, are among the least developed in the region with generally very good water quality. The area near their confluence has been designated the ACE Basin National Estuarine Research Reserve. From 1994 to 2001, over 3,000 juveniles have been collected in the ACE Basin including 1,331 YOY sturgeon (Collins and Smith 1997, M. Collins, SCDNR, *pers. comm.* 2005). Sampling for adults began in 1997, with two adult sturgeon captured in the first year of the survey, including one gravid female (234 cm TL) captured in the Edisto River and one running ripe male (193 cm TL) captured in the Combahee River. The running ripe male in the Combahee River was recaptured one week later in the Edisto River, which suggests that the three rivers that make up the ACE basin may support a single subpopulation that spawns in at least two of the rivers. In 1998, an additional 39 spawning adults were captured (M. Collins, SCDNR, *pers. comm.* 2006). These captures show that a current spawning subpopulation exists in the ACE Basin as both YOY and spawning adults are regularly captured.

There are only two dams on the Ashepoo River, the Cocker Pond and Bennetts Pond dams, which are located near the fall zone and impede 5 miles of habitat from the dam to the fall line. All other ACE basin streams are not impeded by dams. Subpopulations in this system have received little impact from dredging, dams, or diminished water quality (NMFS and USFWS 1998).

Savannah River

The Savannah River supports a reproducing subpopulation of Atlantic sturgeon (Collins and Smith 1997). According to the NOAA National Ocean Service, 70 Atlantic sturgeon have been captured since 1999 (J. Carter, NOS, unpublished data 2006). Twenty-two of these fish have been YOY (< 41 cm TL). A running ripe male was captured at the base of the dam at Augusta

during the late summer of 1997, which supports the hypothesis that spawning occurs there in the fall.

The New Savannah Bluff Lock and Dam (NSBL&D) at the city of Augusta (rkm 299), is located just a few kilometers below impassible rapids, denying Atlantic sturgeon access to 7% of its historically available habitat (NMFS and USFWS 1998). Under normal spring flows when the gates are open, the headpond and tailwater elevations are often at the same level, and fish may pass upstream over the submerged weirs at each gate opening, though sturgeon passage has not been confirmed. Maintenance dredging, occurring primarily in nursery habitat, is frequent, and substantial channel deepening took place in 1994. A seasonal restriction on dredging operations has been imposed from March 16th – May 31st to protect striped bass in this river system. This spring closure likely benefits Atlantic sturgeon as well (M. Collins, SCDNR, *pers. comm.* 1998). The lower Savannah River is heavily industrialized and serves as a major shipping port. Nursery habitat in the lower river has been heavily impacted by diminished water quality and channelization, but effects on juveniles have not been determined. Reduced DO levels and upriver movement of the salt wedge may result from channel deepening. Mercury contamination is also prevalent within the system.

Status of Atlantic sturgeon in Georgia Rivers

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. 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*. 2006). Atlantic sturgeon are also present in the Ogeechee River; 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. Mary's River failed to locate any sturgeon, which suggests that the subpopulation may be extirpated (Rogers *et al.* 1994). In Georgia, Atlantic sturgeon are believed to spawn in the Savannah, Ogeechee, Altamaha, and Satilla rivers.

<u>Satilla River</u>

Sampling results indicate that the Atlantic sturgeon subpopulation in the Satilla River is highly stressed (Rogers and Weber 1995). Only four spawning adults or YOY, which were used for genetic analysis (Ong et al. 1996), have been collected from this river since 1995 (Waldman et al. 1996).

<u>Ogeechee River</u>

Previous studies 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, GA, collected 17 sturgeon in 2003 considered to be YOY (less than 30 cm TL) and an additional 137 fish in 2004. 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.

Atlantic sturgeon have access to 97% of their historical spawning habitat as the Jordan Mill Pond Dam is located 6 miles downstream of the fall line. There have been no dredging projects reported in the last 25 years.

Altamaha River

The Altamaha River supports one of the healthiest Atlantic sturgeon subpopulations in the Southeast, with over 2,000 subadults captured in trammel nets, 800 of which were nominally age-1 as indicated by size. Independent monitoring of the American shad fishery also documents the incidental take of Atlantic sturgeon within the river. Using these data, the subpopulation does not seem to be increasing or decreasing, as catch trends are variable. A survey targeting Atlantic sturgeon was initiated in 2003 by the University of Georgia. Trammel nets (91 m x 3 m) and gill nets were set in the lower 27 rkm of the Altamaha River, and were fished for 20 to 40 minutes during slack tides only. Sampling for adults was conducted using large mesh-gill nets set by local commercial fishermen during the months of April through May 2003. During 2005, similar gill nets were drift set during slack tides to supplement catches. As of October 2005, 1,022 Atlantic sturgeon have been captured using these gear types (trammel and large gill nets). Two hundred and sixty seven of these fish were collected during the spring spawning run in 2004 (n = 74 adults) and 2005 (n = 139 Adults). From these captures, 308 (2004) and 378 (2005) adults were estimated to have participated in the spring spawning run, which is 1.5% of Georgia's historical spawning stock (females) that were estimated from U.S. Fish Commission landing records (Schuller and Peterson 2006, Secor 2002).

Although the two major tributaries are impounded, all dams are well upriver, at or above, the fall line and the probable historic extent of Atlantic sturgeon habitat. The drainage basin is dominated by silviculture and agriculture, with two paper mills and over two dozen other industries or municipalities discharging effluent into the river. Nitrogen and phosphorus concentrations are increasing, and eutrophication and loss of thermal refugia are concerns. Dredging operations are restricted to maintenance dredging of the Hatch Nuclear Power Plant water intake structures located on the Altamaha River at RM 112.

Biology and Natural History of Atlantic Sturgeon

Atlantic sturgeon are distinguished by armor-like plates and a long snout with a ventrally located protruding mouth. Four barbels crossing in front of the mouth help the sturgeon to locate prey. Sturgeon are omnivorous benthic feeders (feed off the bottom) and filter quantities of mud along with their food. Adult sturgeon diets include mollusks, gastropods, amphipods, isopods, and fishes. Juvenile sturgeon feed on aquatic insects and other invertebrates (ASSRT 2007).

The general life history pattern of Atlantic sturgeon is that of a long lived (approximately 60

years; Mangin 1964, Stevenson and Secor 1999), late maturing, estuarine dependent, anadromous species (ASSRT 2007). They can reach lengths up to 14 feet (4.26 m), and weigh over 800 pounds (≈364 kg).

Fecundity of female Atlantic sturgeon has been correlated with age and body size, with observed egg production ranging from 400,000 to 4 million eggs per spawning year (Smith *et al.* 1982, Van Eenennaam *et al.* 1996, Van Eenennaam and Doroshov 1998, Dadswell 2006). Female gonad weight varies from 12 to 25% of the total body weight (Dadswell 2006). Therefore, the fecundity of a 770 pound (350 kg) female, like the one captured in the St. John River, Canada, in 1924, could be 7 to 8 million eggs (Dadswell 2006). The average age at which 50% of the maximum lifetime egg production is achieved is estimated to be 29 years (Boreman 1997).

Atlantic sturgeon likely do not spawn every year. Multiple studies have shown that spawning intervals range from 1 to 5 years for males (Smith 1985, Collins *et al.* 2000, Caron *et al.* 2002) and 2 to 5 years for females (Vladykov and Greeley 1963, Van Eenennaam *et al.* 1996, Stevenson and Secor 1999). Spawning behavior also differs between the sexes. While there is a window of time for each river during which spawning occurs, spawning females do not migrate upstream together. Individual females make rapid spawning migrations upstream and quickly depart following spawning (Bain 1997). Spawning males usually arrive on the spawning grounds before any of the females have arrived and leave after the last female has spawned (Bain 1997). Presumably, this provides an opportunity for a single male to fertilize eggs of multiple females.

Spawning is believed to occur in flowing water between the salt front of estuaries and the fall line of large rivers, where optimal flows are 1.5 to 2.5 ft/s and depths are 3 to 27 meters (Borodin 1925, Leland 1968, Scott and Crossman 1973, Crance 1987, Bain *et al.* 2000). Sturgeon eggs are highly adhesive and are deposited on the bottom substrate, usually on hard surfaces such as cobble (Gilbert 1989, Smith and Clugston 1997). Hatching occurs approximately 94 and 140 hours after egg deposition at temperatures of 20° and 18°C, respectively. Once hatched, larvae assume a demersal existence (Smith *et al.* 1980). The yolksac larval stage is completed in about 8 to 12 days, during which time the larvae move downstream to the rearing grounds (Kynard and Horgan 2002). During the first half of this migration, larvae move only at night and use benthic structure (e.g., gravel matrix) as refuge during the day (Kynard and Horgan 2002). During the latter half of migration to the rearing grounds, when larvae are more fully developed, movement occurs during both day and night. Larvae transition into the juvenile phase as they continue to move even further downstream into brackish waters, developing a tolerance to salinity as they go, and eventually become residents in estuarine waters for months or years. Juveniles then transition to the subadult phase while commencing oceanic migrations. Subadults travel widely once they emigrate from rivers (Doevel and Berggen 1983, Dadswell 2006, ASSRT 2007). Likewise, Atlantic sturgeon spend most of their adult life in the marine environment distributed along the eastern coast of North America (ASSRT 2007). However, adult Atlantic sturgeon return to their natal rivers to spawn (Collins *et al.* 2000; K. Hattala, NYSDEC, *pers. comm.* in ASSRT 2007).

Atlantic sturgeon that originate from different rivers demonstrate differences in growth rate,

maturation, and timing of spawning. For example, Atlantic sturgeon mature in South Carolina river systems at 5 to 19 years (Smith *et al.* 1982), in the Hudson River at 11 to 21 years (Young *et al.* 1998), and in the Saint Lawrence River at 22 to 34 years (Scott and Crossman 1973). In general, Atlantic sturgeon subpopulations show clinal variation with faster growth and earlier age at maturation for fish originating from more southern systems, though not all data sets conform to this trend. Timing of spawning migrations also exhibit a latitudinal pattern in which migrations generally occur during February-March in southern systems, April-May in mid-Atlantic systems, and May-July in Canadian systems (Murawski and Pacheco 1977, Smith 1985, Bain 1997, Smith and Clugston 1997, Caron *et al.* 2002). In some rivers, predominantly in the south, a fall spawning migration may also occur (Rogers and Weber 1995, Weber and Jennings 1996, Moser *et al.* 1998).

Background on Shortnose Sturgeon

Shortnose sturgeon occur in estuaries and rivers along the east coast of North America (Vladykov and Greeley 1963). Their northerly distribution extends to the Saint John River, New Brunswick, Canada, which has the only known population in Canada (Scott and Scott 1988). Their southerly distribution historically extended to the Indian River, Florida (Everman and Bean 1898). Shortnose sturgeon spend most of their life in their natal river systems, only occasionally entering the marine environment. The species appears to be estuarine anadromous in the southern part of its range, but in some northern rivers, it is "freshwater amphidromous" (i.e., adults spawn in freshwater but regularly enter saltwater habitats during their life (Kieffer and Kynard 1993). Adult sturgeon occurring in freshwater or freshwater/tidal reaches of rivers in summer and winter often occupy only a few short reaches of the total river length (Buckley and Kynard 1985).

This EA focuses on the Atlantic sturgeon portion of this project given that permitted activities for shortnose sturgeon require NEPA compliance, normally in the form of an Environmental Assessment. Further descriptions of shortnose sturgeon and the affected environment are provided in the Environmental Assessments for shortnose sturgeon from permit nos. 1505 (*Environmental Assessment of the Issuance of Scientific Research Permit to Dr. James P. Kirk, U.S. Army Engineer Research and Development Center (File No. 1489), Mr. Douglas W. Cooke, South Carolina Department of Natural Resources (File No. 1505), and Mr. Thomas F. Savoy, Connecticut Department of Environmental Protection (File No. 1516)*), 10037 (*Environmental Assessment of Issuance of a Scientific Research Permit to Dr. Douglas Peterson, University of Georgia, (File No.10037) to Conduct Research on Endangered Shortnose Sturgeon*), 10115 (*Environmental Assessment on the Effects of the Issuance of a Scientific Research Permit to Conduct Research on Shortnose Sturgeon in the Saint Marys River and Satilla Rivers, Georgia and Florida),* 14394 (*Environmental Assessment on the Effects of the Issuance of a Scientific Research Permit (File No. 14394) to Conduct Research on Shortnose Sturgeon in the Altamaha River, Georgia*), and 14759 (*Draft Environmental Assessment on the Effects of the Issuance of a Scientific Research Permit (File No. 14759) to Conduct Scientific Research on Shortnose Sturgeon in North Carolina Rivers*) and are hereby incorporated by reference. These EAs will be made available by NMFS Office of Protected Resources permitting division upon request.

Non-Target ESA Listed Species

Highlighted below is a listing of all the non-target ESA-listed species (threatened or endangered) under NMFS and/or USFWS jurisdiction occurring in the action area.

NMFS species include — green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), Leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), humpback whale (*Megaptera novaeangliae*), and North Atlantic right whale (*Balaena glacialis*).

USFWS species include —bog turtle (*Clemmys muhlenbergii*), seabeach amaranth (*Amaranthus pumilus*), Canby's dropwort (*Oxypolis canbyi*), swamp pink (*Helonias bullata*), small whorled pogonia (*Isotria medeoloides*), piping plover (*Charadrius melodus)*, dwarf wedgemussel (*Alasmidonta heterodon*), Knieskern's beaked-rush (*Rhynchospora knieskernii*), American chaffseed, (*Schwalbea americana*), sensitive joint-vetch, (*Aeschynomene virginica*), small whorled pogonia (*Isotria medeoloides*), northeastern beach tiger beetle, (*Cicindela dorsalis dorsalis*), Indiana bat (*Myotis sodalis*), roseate tern (*Sterna dougallii dougallii*), flatwoods salamander (*Ambystoma cingulatum*); eastern indigo snake (*Drymarchon couper*); bald eagle (*Haliaeetus leucocephalus*) [Delisted July 2007]; red-cockaded woodpecker (*Picoides borealis*); wood stork (*Mycteria Americana*); hairy rattleweed (*Baptisia arachnifera*), and Florida manatee (*Trichechus manatus*).

Interactions with Non-Target ESA-Listed Species
Based on the reported ranges of protected species under the jurisdiction of the USFWS occupying preferred habitat outside of the defined action area of the proposed permit application, NMFS determined the researcher's impact would not affect most of the species recorded in this assessment (the only exception is the Florida manatee – see below). Discussion of non-target species interaction of listed species under USFWS jurisdiction is therefore concluded here and summarized in Section IX, Compliance with Endangered Species Act.

Several of the above listed species under NMFS jurisdiction have varying potential for interaction with the proposed research activity including: humpback whale, North Atlantic right whale, leatherback sea turtle, Kemp's ridley sea turtle, hawksbill sea turtle, loggerhead sea turtle, and green sea turtle. These interactions are described in detail in the Environmental Assessments and/or the Biological Opinions that accompany ESA research permits nos. 1505, 10037, 10115, 14394, and 14759 and are hereby incorporated by reference. These interactions are summarized below.

<u>Florida Manatee</u>
Manatees are listed as endangered under the ESA and protected under the Marine Mammal Protection Act (MMPA). They inhabit both marine and fresh water of sufficient depth (1.5 meters to usually less than 6 meters) throughout their range of the southeastern U.S. The West Indian manatee stock is divided into two subspecies, the Antillean manatee (*Trichechus manatus manatus*) and the Florida manatee (*Trichechus manatus latirostris*). Florida manatees may be encountered in canals, rivers, estuarine habitats, saltwater bays, and on occasion have been observed as much as 3.7 miles off the coast. Researchers do not expect to interact with the Florida manatee however in this study. The USFWS (Nicole Adimey, ES Office, Jacksonville

FL) was contacted regarding the potential impacts of the proposed activity (the general shortnose sturgeon research permits in Georgia) on the endangered Florida manatee and was asked for concurrence with the NMFS finding that the activity was not likely to adversely affect this species. Measures to avoid adverse affects are summarized in Section VII of this EA.

Potential Whale Interactions

While North Atlantic right and humpback whales have been documented in the area, no listed whales are known to occur in the action area. Although the likelihood of interaction with whales by research activity is highly unlikely, in all boating activities (including travel to acoustic receiver arrays) researchers would keep a close watch for all marine mammals to avoid harassment or interaction and will adhere to the NMFS Northeast Region Marine Mammal Approach and Viewing Guidelines located online at http://www.nero.noaa.gov/prot_res/mmv/ and the NMFS Southeast Region bottlenose dolphin and manatee guidelines at http://www.nmfs.noaa.gov/pr/education/regional.htm#se.

Potential Sea Turtle Interactions

Four species of sea turtle have been reliably documented within the action area. Loggerhead sea turtles are the most commonly encountered followed by juvenile Kemp's ridley and more rarely, juvenile green turtles. The hawksbill is considered extremely rare in the Mid-Atlantic, but a few have been documented as far north as New England, carried by storm events from tropical waters. Further, leatherback sea turtles are also considered very rare. As such, these later two species are discounted in this analysis.

Principal investigators have indicated that in previous field work in the action area involving extensive gill netting, that sea turtles have never been captured during sampling, and they are not aware of any other researchers capturing one (W. Post; *pers. comm.*; email, March 11, 2010).

Potential Marine Mammal Interactions

Following is a listing of marine mammals protected under the MMPA that have some potential to enter the action of area of the proposed research. These interactions are described in detail in the Environmental Assessments and/or the Biological Opinions that accompany ESA research permits nos. 1505, 10037, 10115, 14394, and 14759 and are hereby incorporated by reference. These interactions are summarized here.

Harbor seal, *Phoca vitulina* (very rare occurrence)
Harbor porpoise, *Phocoena phocoena* (periodical occurrence)
Bottlenose dolphin *Tursiops truncatus* (relatively common occurrence)

Bottlenose dolphin, harbor seal, and harbor porpoise are the most abundant marine mammal species potentially affected by the proposed research. However, only occasionally are these reported in locations affected by netting activities. Nevertheless, the Mitigation Measures Section of this EA requires that the applicants adhere to boating and sampling conditions in the Atlantic Large Whale, Bottlenose Dolphin, and Harbor Porpoise Take Reduction Plans. These conditions include: not deploying nets when animals are observed within the vicinity of the research; and allowing animals to either leave or pass through the area safely before net setting is

initiated. Additionally, in all boating activities (including travel to acoustic receiver arrays outside of the netting area) a close watch would be made for marine mammals to avoid harassment or interaction. Researchers would also adhere to the NMFS Northeast Region Marine Mammal Approach and Viewing Guidelines located online at http://www.nero.noaa.gov/prot_res/mmv/ and the NMFS Southeast Region bottlenose dolphin and manatee guidelines at http://www.nmfs.noaa.gov/pr/education/regional.htm#se.

Other Non-Listed Non-Target Species

Due to the nature of netting, researchers would expect some other non-target species such as American shad (*Alosa sapidissima*), Atlantic menhaden (*Brevoortia tyrannus*), blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), gizzard shad (*Dorosoma cepedianum*), striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), white perch (*Morone americana*), common carp (*Cyprinus carpio*), crappie (*Pomoxis* sp.); channel catfish (*Ictalurus punctatus*), brown bullhead (*Ictalurus nebulosus*), white catfish (*Ameiurus catus*), and various sucker species (*Castomidae sp*.) would become enmeshed. However, nets would typically be checked at short intervals and it is believed virtually all bycatch would be released alive.

Aquatic Nuisance Species

The U.S. Geological Survey has documented several aquatic nuisance species potentially occurring in the action area including: bowfin (*Amia calva*); flathead catfish (*Pylodictis olivaris*); Grass carp (*Ctenopharyngodon idella*); Threadfin shad (*Dorosoma petenense*); Asian clam (*Corbicula fluminea*); Charru mussel (*Mytella charruana*); Green mussel (*Perna viridis*); Island applesnail (*Pomacea insularum*); Indo-Pacific crab (*Charybdis hellerii*); Greenhouse Frog (*Eleutherodactylus planirostris*); Australian tubeworm; (*Ficopomatus enigmaticus*); Alligatorweed (*Alternanthera philoxeroides*); Giant salvinia (S*alvinia molesta*); water hyacinth (*Eichhornia crassipes*); hydrilla (*Hydrilla verticillata*); parrot feather (*Myriophyllum aquaticum*); Eurasian water milfoil (*Myriophyllum spicatum*) and water chestnut (*Trapa natans*). Because the proposed research activities have the potential to spread such aquatic nuisance species to other watersheds, measures proposed by NMFS, outlined in Section VII of this EA and the research permits authorizing concurrent work on shortnose sturgeon, were agreed to by the researcher to be implemented as standard research protocol.

VI. Environmental Consequences

This chapter represents the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives. Regulations for implementing the provisions of NEPA require consideration of both the context and intensity of a proposed action (40 CFR Parts 1500-1508).

A. Proposed Action

Under the proposed action any impacts would be limited primarily to the biological environment, specifically the animals or habitat that would be studied or affected by the research. The type of actions proposed in the grant application would be unlikely to affect the socioeconomic or physical environment or pose a risk to public health and safety. There are no significant social

or economic impacts of the proposed action interrelated with significant natural or physical environmental effects.

Effects of Proposed Research Activities

Effects of Capturing

The applicant proposes to use gill nets and trammel nets to capture up to 420 Atlantic sturgeon annually, or 1260 total Atlantic sturgeon over three years. Entanglement in nets could result in injury and/or mortality, reduced fecundity, and delayed or aborted spawning migrations of sturgeon (Moser and Ross 1995, Collins *et al.* 2000, Moser *et al.* 2000). To evaluate these impacts, a surrogate species, shortnose sturgeon, is discussed here; comparable data are not currently available for Atlantic sturgeon. Historically, the majority of shortnose sturgeon mortality during scientific investigations using gill or trammel nets has been related to such factors as water temperature, low dissolved oxygen concentration, netting duration, mesh size, net composition, and netting experience of the researcher (Table 2).

Table 2: The number and percentage of shortnose sturgeon killed by gill nets or trammel nets associated with scientific research permits prior to 2005

	Permit Number					
	1051	1174	1189	1226	1239	1247
Time Interval	1997, 1999 – 2004	1999– 2004	1999, 2001 – 2004	2003– 2004	2000 – 2004	1988 – 2004
Sturgeon captured	126	3262	113	134	1206	1068
Sturgeon mortality	1	7	0	0	5	13
Percentage	0.79	0.22	0	0	0.41	1.22

In 2005, NMFS PR began analyzing the results of previous research and updating permit conditions to reduce the chances of stress and mortality to shortnose sturgeon during capture. The primary causes of mortality identified during a review of permits issued prior to 2005 were high temperatures, low dissolved oxygen, and long net set durations. Since that time and after the implementation of the new permit conditions, there have been no mortalities caused during the capture of shortnose sturgeon (Table 3). Despite the permit modifications reducing mortality of sturgeon in nets, there is a chance of delayed mortality occurring without being reported. There is no way to estimate the rate of delayed mortality, but NMFS believes it would be less than one percent based on reports of various species of sturgeon captured and transported to rearing facilities.

Table 3: Number of shortnose sturgeon killed during capture under existing scientific research permits

Permit Number	Shortnose sturgeon captured	Shortnose sturgeon mortalities
1420 (2005-2009)	1472	0
1447 (2006-2009)	107	0
1449 (2007-2008)	50	0
1486 (2006-2009)	416	0
1505 (2006-2009)	276	0

1516 (2007-2009)	160	0
1547 (2006-2009)	112	0
1549 (2006-2009)	390	0
1575 (2007-2009)	12	0
1580 (2007-2008)	66	0
1595 (2007-2009)	505	0
10037 (2007-2009)	235	0
10115 (2008-2009)	1	0
Totals	3802	0

To limit stress and mortality of sturgeon due to capturing with gill nets, at lower water temperatures (< 15°C) soak times must not exceed 10 hours; at water temperatures between 15°C and 20°C, net sets must not exceed 4 hours; and at water temperatures between 20°C and 28°C, soak times must not exceed 2 hours. Netting activities must cease at 28°C or higher until consulting with NMFS Office of Protected Resources. Further, dissolved oxygen would also be measured prior to each net set to ensure that at least 5.0 mg/L concentration is maintained.

The applicant also proposes to use trammel nets to capture sturgeon in Georgia. Trammel nets are a variation on gill nets that can entangle the entire fish instead of just the gills. Although trammel nets can only be used effectively at slack tide, while gill nets can be fished during all tidal periods, trammel nets provide a wider net area than gillnets thus potentially allowing for a greater number of fish to be caught. Other researchers currently permitted by NMFS have used trammel nets in other river systems without mortality, and the NMFS guidelines, "*A Protocol for Use of Shortnose and Atlantic Sturgeon*" (Moser *et al.* 2000), indicates that it is a legitimate method for sturgeon capture and is often less stressful than gillnets because the fish are frequently entangled rather than gilled.

Effects of Handling (*e.g., holding, measuring, weighing*)
Sturgeon are hardy species, but sensitive to handling stress when water temperatures are high or dissolved oxygen is low. Handling stress can escalate if sturgeon are held for long periods after capture; and conversely, stress is reduced the sooner fish are returned to their natural environment to recover (D. Peterson, *pers. comm.* November 2008). Signs of handling stress are redness around the neck and fins and soft fleshy areas, excess mucus production on the skin, and a rapid flaring of the gills. Additionally, sturgeon tend to inflate their swim bladder when stressed and when handled in air (Moser *et al.* 2000). If not returned to neutral buoyancy prior to release, sturgeon tend to float and would be susceptible to sunburn and bird attacks. In some cases, if pre-spawning adults are captured and handled, it is possible that they would interrupt or abandon their spawning migrations after being handled (Moser and Ross 1995).

Although sturgeon are sensitive to handling stress, the proposed methods of handling fish are the same methods as currently permitted for endangered shortnose sturgeon and described in the associated permits (permit nos. 1505, 10037, 10115, 14394, and 14759). These methods are also consistent with the best management practices recommended by Moser *et al*. (2000) and endorsed by NMFS and, as such, should minimize the potential handling stress and therefore minimize indirect effects resulting from handling in the proposed research.

Effects of T-bar Tags
The applicant proposes to use T-bar tags to mark fish in North Carolina. These activities would cause stress during restraint and minor wounds from attachment. Direct effects to sturgeon due to the external placement of tags can include skin irritation, causing the sturgeon to rub the tag against submerged items in an effort to dislodge it. This behavior can create external sores and increase the potential for infection. However, while possible, injuries have not been reported on wild fish tagged with these types of tags. As such, it is unlikely that the attachment and retention of external tags would affect any of the sturgeon. To address the concerns, the researchers propose to use the best management practices as endorsed by NMFS in the sturgeon Protocol (Moser et al. 2000). These practices would minimize or eliminate potential short-term adverse effects from tagging and greatly lower the risk of injury and mortality.

The attachment and retention of these tags is not known to have any other direct or indirect effects on these sturgeon. All external tags are designed to fall off from the fish after a maximum of 2-year life span. Those tags are small in size (about 2 inches long and 1 inch in diameter), and do not contain any hazardous material. Therefore, the impact of lost tags to the environment is considered negligible.

Effects of PIT Tags
The applicant proposes to use PIT tags on all fish over 300 mm captured to ensure unique identification upon capture or recapture for population and growth estimates. To avoid duplicate tagging, all sturgeon would be scanned with a PIT tag reader prior to the insertion of a PIT tag. Tagging procedures would mainly cause stress during restraint and minor wounds from attachment. To address these concerns, the researchers propose to use the best management practices as endorsed by NMFS in the sturgeon protocol (Moser *et al.* 2000). These practices would minimize or eliminate potential short-term adverse effects from sampling and greatly lower the risk of injury and mortality. The attachment and retention of PIT tags is not known to have any other direct or indirect effects on sturgeon. As such, the tagging of sturgeon with PIT tags is unlikely to have significant impacts on the reproduction, numbers, or distribution of sturgeon in proposed action areas.

Effects of Dart Tags
The applicant proposes to use dart tags on fish in SC rivers. The procedure has been in use there for 20 years and helps commercial fishers or other researchers identify the fish if they do not have a PIT tag reader available. Tagging procedures would mainly cause stress during restraint and minor wounds from attachment. To address these concerns, the researchers propose to use the best management practices as endorsed by NMFS in the sturgeon protocol (Moser *et al.* 2000). These practices would minimize or eliminate potential short-term adverse effects from sampling and greatly lower the risk of injury and mortality. The attachment and retention of dart tags is not known to have any other direct or indirect effects on sturgeon. As such, the tagging of sturgeon with dart tags is unlikely to have significant impact on the reproduction, numbers, or distribution of sturgeon in proposed action areas.

Effects of Tissue Sampling

The applicant proposes to take a small (1 cm^2), non-deleterious tissue sample, clipped with surgical scissors from a section of soft fin rays of captured sturgeon. Tissue sampling does not appear to impair the sturgeon's ability to swim and is not thought to have any long-term adverse impact. Many researchers, including the applicant, have removed tissue samples according to this same protocol with no adverse effects; therefore, we do not anticipate any long-term adverse effects to the sturgeon from this activity (Wydoski and Emery 1983).

Effects of Anesthesia

The protocols proposed for anesthetizing Atlantic sturgeon in this project would follow those outlined in the researchers' permits for shortnose sturgeon (permit nos. 1505, 10037, 10115, 14394, and 14759) and are summarized here. The researcher proposes to use tricaine methane sulphonate (MS-222) to anesthetize sturgeon at concentrations up to 100 mg/L to prevent captured sturgeon from stress during surgery. Because MS-222 is acidic (resulting in a prolonged induction time), sodium bicarbonate ($NaHCO_3$) would be used to buffer the water.

MS-222 is one of the most broadly used anesthetic and tranquilizing agents for poikilotherms and is recommended as safe by Moser *et al.* (2000). Risks associated with MS-222 to anesthetize shortnose sturgeon would be overdosing to lethal or harmful levels due to inexperience at recognizing the proper stage of surgical anesthesia (Coyle *et al.* 2004). The proposed rate of 100 mg/L dose is considered a moderate rate and the induction time would be approximately five minutes; complete recovery times would range from five to six minutes (Brown 1988). The researchers are experienced in using MS-222, having performed the surgical procedure approximately 500 times in shortnose and Atlantic sturgeon research in these 3 states over the past five years. Fish would be monitored closely during induction to determine when the proper surgical stage of narcosis is reached. When recovering from anesthesia, sturgeon would be placed in boat-side net pens prior to release. Therefore, NMFS believes that sturgeon anesthetized in this manner would not be at risk, and long term effects to the fish and the environment would be minimal.

An existing US Food and Drug Administration 21 day withdrawal period for MS-222 applied to food fish would not be applicable to Atlantic sturgeon because of the existing moratorium on fishing. Thus there would not be a legitimate health risk by accidental consumption by humans (F. Pell, FDA *pers. comm*., email; 2/24/2009). Moreover, MS-222 has been documented to be excreted from fish urine within 24 hours and tissue levels decline to near zero in the same amount of time (Coyle *et al.* 2004).

Effects of Implanting Acoustic Transmitters

In each year of the study, the researchers propose to collect ~30 sub-adult ($\leq$ 80cm-170cm) or adult (175cm and up) Atlantic sturgeon to implant light-weight Vemco V-16 (69 kHz) internal sonic transmitters using the outlined protocol presented in Section III of this EA. All tagging surgeries would follow protocols described in the associated permits for shortnose sturgeon (permit nos. 1505, 10037, 10115, 14394, and 14759).

To minimize the effects caused by internally implanting transmitter tags, the researchers propose to use standardized protocols endorsed by NMFS (Moser *et al*. 2000). Researchers would use

sterile surgical techniques and tags would be coated with an inert elastomer polymer to avoid tag rejection. Invasive tools used would be sterilized between uses on each fish' and the incision area would be swabbed with Nolvasan® prior to making the incision. A tissue adhesive would also be used to help keep the wound closed and the sutures in place until healing can occur. After surgery a Vaseline betadyne mixture would be spread over the area to deter bacteria from entering the wound. Moreover, implanting transmitters would only be attempted when fish are in excellent condition and would not be attempted on pre-spawning fish in spring or fish on the spawning ground, nor if the water temperature exceeds 27°C (to reduce handling stress), or is less than 7°C (as incisions do not heal rapidly in lower water temperatures). To ensure normal mobility and swimming behavior of the juvenile sturgeon receiving internal transmitters, the total weight of all transmitters and tags would not exceed 2% of the weight of the fish.

Although more invasive surgical procedures are required for internal implantation, this tagging procedure provides greater retention rates than external attachment. In general, adverse effects of the proposed tagging procedure could include pain, handling discomfort, hemorrhage at the site of incision, risk of infection from surgery, affected swimming ability, and/or abandonment of spawning runs. However, using proper anesthesia, sterilized conditions, and the surgical techniques described above, potential short-term adverse effects from tagging would be minimized or eliminated and the risk of injury and mortality would be greatly lower. NMFS expects the tagging would result in no more than short-term stress to the animal.

Lastly, many fish have sensitivity to sound energy from 200 Hz up to 800 Hz, and some species are able to detect lower frequency sounds (Popper 2005). However, the frequency of the acoustic tags used in the proposed research (69 kHz) is well above the hearing threshold of most fish and would thus be inaudible, causing little effect.

Effects of Water Quality Sampling

The applicant proposes to sample water quality with YSI 85 water quality meters. This sampling would occur from the research boat and would only remove small volumes of water. No substances are likely to enter natural waterways from this procedure. Thus there is likely to be little effect from this component of the research.

B. No Action

An alternative to the proposed action is no action, i.e., denial of the grant. This alternative would eliminate any potential risk to the environment from the proposed research activities. However, the no action alternative would not allow the research to be conducted and would deny the opportunity for collection of important information that would advance our understanding of shortnose and Atlantic sturgeon populations and improve current management practices.

VII. Minimization and Mitigation Measures

The activities authorized under proposed Award NA10NMF4720036, if approved, would follow certain procedures in order to minimize and mitigate effects of the proposed action. If the grant is awarded, a Special Award Condition (SAC) would be placed on the award to ensure compliance with appropriate research protocols.

General Measures

- The grantee must apply all capture, handling, tagging, tissue sampling, anesthesia, manatee interaction, and aquatic nuisance species protocols to Atlantic sturgeon as outlined in the companion ESA section 10 research permits for shortnose sturgeon (permit nos. 1505, 10037, 10115, 14394, and 14759) and take all necessary precautions to ensure sturgeon are not harmed during the course of the research. The grantee must also comply with all permit conditions during the course of all research activities, whether the activity targets Atlantic or shortnose sturgeon. Such protocols and permit conditions are hereby incorporated by reference.

- Location (GPS), temperature, dissolved oxygen., gear used (e.g., mesh size, gill net, trammel), soak time, species captured, and any mortalities will be measured and recorded (at the depth fished) each time nets are set to ensure appropriate values according to the conditions below. These data must be made available to NMFS in annual reports or upon request.

- Researchers must carry a second net pen in the research vessel to accommodate larger catches; overcrowded fish must be transferred to the spare net pen or else released.

- During lower water temperatures (<15°C), soak times of gill nets must not exceed 10 hours; at water temperatures between 15°C and 20°C, net sets must not exceed 4 hours; at water temperatures between 20°C and 25°C, net sets must not exceed two hours; and at water temperatures above 25°C, net sets must not exceed one hour. Netting activities must cease at 28°C unless NMFS is consulted (See Table 1 below).

- Gear must be deployed only in waters with D.O. levels > 5 mg/L at the deepest depth sampled by the gear for the entire duration of deployment, with one exception; that is, if D.O. is between 4 – 5 mg/L, netting may still occur, but at the next lower net set duration.

- In all boating and research activities within the study area, a close watch must be made for marine mammals and sea turtles to avoid interaction and harassment. Researchers will adhere to the marine mammal approach and viewing guidelines online at http://www.nero.noaa.gov/prot_res/mmv/ and the bottlenose dolphin and manatee guidelines at http://www.nmfs.noaa.gov/pr/education/regional.htm#se. All sampling and boating activities must also comply, as applicable, with the relevant portions of the Atlantic Large Whale, the Bottlenose Dolphin, and Harbor Porpoise Take Reduction Plans.

- In the unlikely event a marine mammal or sea turtle is captured, the animal must be assessed and, if possible, and if safe for the researchers and animal, the animal must be supported to prevent it from drowning. The NOAA Southeast Region Marine Mammal and Sea Turtle Stranding and Entanglement Hotline must be immediately contacted as well as the North Carolina Stranding Hotline at NOAA Fisheries

Beaufort Lab (in North Carolina waters) and/or the South Carolina Stranding Hotline (in South Carolina waters), and/or the Georgia Stranding Hotline (in Georgia waters).

- In the unlikely event a captured marine mammal or sea turtle dies, or is severely injured, all permitted activities must cease and researchers must contact the NOAA, SE Region Marine Mammal and Sea Turtle Stranding and Entanglement Hotline at 877-433-8299, as well as the Chief, Permits Division and/or the permit analyst at (301) 713-2289.

Acoustic Tagging

- Surgical implantation of sonic tags must not occur when water temperatures are greater than 27°C or less than 7°C, nor will they be implanted in pre-spawning sturgeon in the spring.

- The total weight of tags will not exceed 2% of the sturgeon's body weight unless otherwise authorized by NMFS/OPR.

Aquatic Nuisance Species

- To prevent potential spread of aquatic nuisance species identified in the watershed, all
equipment assigned to the research will not be reassigned to other watersheds until the research is completed or is suspended.

- If the research has been completed or is suspended, all gear and equipment used will be bleached, washed and air dried before being redeployed to another location.

***Interaction with Endangered Florida Manatee*:** (The following conditions are provided by the USFWS to limit interactions and avoid injury to endangered Florida manatee)

A. <u>Methods provided to avoid capture of Florida manatee</u>

1) Personnel must be informed that it is illegal to harm, harass, or otherwise "take" manatees, and to obey posted manatee protection speed zone, Federal manatee sanctuary and refuge restrictions, and other similar state and local regulations while conducting in-water activities. Such information shall be provided in writing to all vessel personnel.
2) Crew involved in research activities must wear polarized sunglasses to reduce glare while on the water and keep a look out for manatee. The crew shall include at least one member dedicated to watching for manatee during all in-water activities.
3) All vessels engaged in netting and trapping shall operate at the slowest speed consistent with those activities. All netting and trapping shall be restricted to the hours between one-half hour after sunrise to one-half hour before sunset.
4) Rope attaching floats to nets will not have kinks or contain slack to entangle manatee.

5) All nets must be continuously monitored. Netting activities must cease if a manatee is sighted within a 100-foot radius of the research vessel or net, and may resume only when the animal is no longer within this safety zone, or 30 minutes has elapsed since the manatee was observed.

B. Methods provided to avoid injury if manatee are accidentally captured

1) Devote all research staff efforts to freeing the animal. Remember that a manatee must breathe and surface approximately every 4 minutes. The PI must brief all research participants to ensure that they understand that freeing a manatee can be dangerous. This briefing would caution people to keep fingers out of the nets, that no jewelry should be worn, that they be careful to stay away from the manatee's paddle, and that they give the animal adequate time and room to breathe as they are freeing it.

2) As appropriate, turn off vessel or put engine in neutral to avoid injury.

3) Release tension on the net allowing the animal to free itself. Exercise caution when attempting to assist the animal. Manatees are docile animals but can thrash violently if captured or become entangled. A 1,200 to 3,500 pound manatee can cause extensive damage to nets while trying to escape or breathe, so quick action is essential to protect both the manatee and the net. Ensure that the animal does not escape with net still attached to it.

4) Report any gear or vessel interactions with manatees and immediately contact Nicole Adimey of the U.S. Fish and Wildlife Service; OR contact the Georgia Department of Natural Resources, Wildlife Res. Div., Non-game & Endangered Wildlife Program**,** and NMFS, Chief, Permits, Conservation and Education Division as soon as possible. Interactions with manatees should also be documented with location, date, estimated size, water & air temp, any scar patterns and photos if possible, using the Manatee Sighting Report published by the Georgia DNR.

VIII. Cumulative Impacts

In addition to the direct and indirect effects assessed above, in accordance with NEPA, this EA considers the potential for cumulative effects. Cumulative effects are those that result from the incremental impacts of the proposed action when added to the impacts of other past, present, and reasonably foreseeable future threats or actions, regardless of which agency (federal or nonfederal) or person(s) undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time. For shortnose and Atlantic sturgeon range-wide, these effects include: bycatch, poaching, dams, dredging, water quality, contaminants, boat strikes, and research.

These activities and threats are expected to continue into the future. Synthesis of the information about the status of the species, past and present activities affecting the species, possible future

actions that might affect the species, and effects of the proposed action provide a basis for determining the additive effects of the activities supported by the proposed grant. Given the cumulative threats information and the known effects of the proposed action, NMFS concludes that the proposed action would not likely reduce the species' likelihood of survival and recovery in the wild by adversely affecting their birth rates, death rates, or recruitment rates. In particular, NMFS would not expect the proposed research activities to affect spawning success in a way that appreciably reduces the reproductive success of adult sturgeon, the survival of larval sturgeon, or the number of juvenile sturgeon that annually recruit into spawning populations.

This EA considers the cumulative effect the research would have on live animals that are occupying fresh, estuarine and marine waters. The short-term stresses resulting from the research activities proposed are expected to be minimal. Taking into account the effects and impacts resulting from the handling and surgeries, NMFS expects that the additional short-term stress of the research activities would not significantly affect the sturgeon. The proposed activities would be completed as quickly as possible, typically taking less than 15 minutes per animal. The award would contain conditions (see Section VII. Minimization and Mitigation Measures) to mitigate potential adverse impacts to sturgeon. Overall, the proposed actions would be expected to have no more than short-term effects. The incremental impact of the action when added to other past, present, and reasonably foreseeable future actions discussed here would be minimal and not significant. The data generated by the research activities associated with the proposed action would help improve management and recovery efforts and further the conservation of these species. The proposed action would not be expected to have any effects on any other marine species or other portions of the environment and would not result in any significant cumulative effects to either.

IX. Compliance with Endangered Species Act

Section 6 of the Endangered Species Act (ESA) provides that states and territories maintaining an adequate and active program for the conservation of endangered and threatened species may receive federal funds for the purpose of conserving listed and monitoring candidate species. To remain eligible for this funding, states must enter into a section 6 agreement with NMFS and undergo subsequent annual reviews of their program to reconfirm the finding that the state's program is adequate and active in accordance with section 6(c) of the ESA. Annual renewal of SCDNR's section 6 agreement with NMFS, which includes both Atlantic and shortnose sturgeon, was successfully completed, and the agreement has been renewed through October 1, 2010. Activities supported through this financial assistance are authorized by regulation (50 CFR 17.21) and have been determined to comply with the requirements therein.

To comply with Section 7 of the ESA Regulations (50 CFR 402.14(c)), a Section 7 informal consultation was initiated by the NMFS PR, under the ESA. In accordance with Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.), a not likely to adversely affect memo was prepared for this proposed action that concluded that issuance of Award No. NA10NMF4720036, as proposed, is not likely to jeopardize the continued existence any NMFS ESA-listed species and is not likely to destroy or adversely modify designated critical habitat.

The NMFS Southeast Regional Office was also consulted (Amanda Johnson; Carrie Upite, *pers. comm*., by email 8/31/09) to confirm that negative interactions with sea turtles and marine mammals would not be anticipated if the safeguards as outlined above are followed.

The USFWS Southeast (Region 4) Office was also contacted by email (Melissa Bimbi, *pers. comm*., by email 4/01/10) with regard to potential impacts on listed species (and/or habitats) under the USFWS's jurisdiction as a result of planned research activities on shortnose sturgeon.

X. Compliance with the Marine Mammal Protection Act

To comply with the Marine Mammal Protection Act, NMFS has determined that while the award creates the possibility of interactions with marine mammals, the possibility of incidental take through such interactions is considered remote. The awarding of the grant, therefore, will not require the recipient to obtain authorization for incidental take under the MMPA in order to conduct the research activities.

XI. Coordination with the National Ocean Service (NOS)

The actions supported by Award NA10NMF4720036 would not occur in a National Marine Sanctuary nor impact any National Marine Sanctuaries, so no consultation with NOS was conducted.

XII. Recommendation

It is recommended that the proposed action be determined to not have a significant impact on the quality of the human environment and that preparation of an environmental impact statement is not required.

XIII. List of Preparers and Agencies Consulted

Preparers:
Office of Protected Resources
National Marine Fisheries Service
Endangered Species Division
Silver Spring, MD 20910

Agencies Consulted:
Office of Protected Resources
National Marine Fisheries Service
Permits, Conservation and Education Division (shortnose sturgeon analyst)
Silver Spring, MD 20910

Office of Protected Resources
National Marine Fisheries Service
Endangered Species Division (section 7 team)
Silver Spring, MD 20910

Southeast Regional Office
National Marine Fisheries Service

Habitat Conservation Division
St. Petersburg, FL 33701

Charleston Field Office (Southeast Region)
U.S. Fish and Wildlife Service
Ecological Services Division
Charleston, SC 29407

XIV. References

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NMFS ESA section 10(a)(1)(A) permit number 10037. Allows for capture, tagging with PIT

tags, and implantation of transmitters in the Ogeechee River, GA. Expires on 4/30/2013.

NMFS ESA section 10(a)(1)(A) permit number 14394. Allows for capture, tagging with PIT tags, and implantation of transmitters in the Altamaha River, GA. Expires on 9/30/2014.

NMFS ESA section 10(a)(1)(A) permit number 14759. Allows for capture , tagging with PIT and t-bar, measuring and weighing, photography and videography, fin clips for DNA, and surgical implantation of transmitters in Albemarle Sound and the Chowan, Roanoke and Cape Fear rivers. Permit in review.

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Appendix 1. Upper and lower limits for project research locations by state and river system.

North Carolina			
Roanoke River	UPPER LIMIT:	36° 28’ 50.35”N	77° 40’ 38.96"W
	LOWER LIMIT:	35° 57’ 31.73”N	76° 41’ 19.59"W
Meherrin River	UPPER LIMIT:	36° 41’ 40.31”N	77° 34’ 26.22W
Chowan River	LOWER LIMIT:	36° 01’ 17.82"N	76° 39’ 46.52"W
Cape Fear River	UPPER LIMIT:	34° 24’ 31.91”N	78° 17’ 48.00"W
	LOWER LIMIT:	34° 11’ 01.97”N	77° 57’ 46.05"W
Albermarle Sound	LOWER LIMIT:	36° 00’ 10.23”N	75° 50’ 12.38"W
South Carolina			
Pee Dee River	Sampling Site	33° 24’ 07.04”N	79° 14’ 52.27”W
Black River	Sampling Site	33° 24’ 07.04”N	79° 14’ 52.27”W
Santee River	UPPER LIMIT:	33° 27’ 34.83”N	80° 09’ 40.64”W
	LOWER LIMIT:	33° 08’ 47.06”N	79° 19’ 12.33”W
Cooper River	Sampling Site	33° 14’ 34.08”N	79° 59’ 22.67”W
Combahee River	UPPER LIMIT:	32° 40’ 32.38”N	80° 43’ 51.42”W
	LOWER LIMIT:	32° 34’ 53.55”N	80° 34’ 32.90”W
Edisto River	UPPER LIMIT:	32° 51’ 54.67”N	80° 23’ 58.88”W
	LOWER LIMIT:	32° 37’ 10.02”N	80° 25’ 37.60”W
Savannah River	UPPER LIMIT:	32° 12’ 19.57”N	81° 09’ 04.49”W
	LOWER LIMIT:	32° 08’ 25.79”N	81° 08’ 30.13”W
Goergia			
Ogeechee River	UPPER LIMIT CANOOCHEE RIVER:	31° 59’ 01.29”N	81° 20’ 26.28”W
	UPPER LIMIT Ogeechee River:	32° 00’ 53.33”N	81° 19’ 05.81”W
	LOWER LIMIT:	31° 49’ 30.88”N	81° 00’ 10.88”W

Altamaha River	UPPER LIMIT OCONEE:	33° 08’ 22.15”N	83° 12’ 12.90”W
	UPPER LIMIT OCULGEE:	32° 32’ 33.46”N	83° 32’ 11.19”W
	LOWER LIMIT:	31° 18’ 48.3”N	81° 14’ 40.50”W
Satilla River	UPPER LIMIT:	31° 59’ 58.21”N	81° 24’ 34.97”W
	LOWER LIMIT:	31° 02’ 41.90”N	81° 41’ 10.00”W

Appendix 2. Upper and lower limits for project research receiver locations by state and river system.

North Carolina			
Roanoke River	UPPER LIMIT:	36° 28’ 50.35”N	77° 40’ 38.96"W
	LOWER LIMIT:	35° 57’ 31.73”N	76° 41’ 19.59"W
Meherrin River	UPPER LIMIT:	36° 41’ 40.31”N	77° 34’ 26.22W
Chowan River	LOWER LIMIT:	36° 01’ 17.82"N	76° 39’ 46.52"W
Cape Fear River	UPPER LIMIT:	34° 24’ 31.91”N	78° 17’ 48.00"W
	LOWER LIMIT:	34° 11’ 01.97”N	77° 57’ 46.05"W
Albermarle Sound	Eastern boundary:		
	From:	35° 48' 22.16" N	75° 43' 43.39" W
	To:	35° 44' 10.26" N	75° 31' 3.12" W
South Carolina			
Winyah Bay	UPPER LIMIT:	33° 21’ 44.04”N	79° 15’ 24.60”W
	LOWER LIMIT:	33° 10’ 27.09”N	79° 12’ 00.10”W
Pee Dee River	UPPER LIMIT:	34° 58’ 59.87”N	79° 52’ 29.81”W
	LOWER LIMIT:	33° 22’ 01.78”N	79° 15’ 57.84”W
Black River	UPPER LIMIT:	33° 29’ 20.85”N	79° 32’ 43.84”W
	LOWER LIMIT:	33° 22’ 01.78”N	79° 15’ 57.84”W
Little Pee Dee River	UPPER LIMIT:	34° 03’ 23.66”N	79° 14’ 52.77”W
	LOWER LIMIT:	33° 42’ 24.56”N	79° 11’ 30.71”W
Sampit River	UPPER LIMIT:	33° 22’ 11.81”N	79° 25’ 30.64”W
	LOWER LIMIT:	33° 21’ 03.55”N	79° 16’ 48.73”W
Waccamaw River	UPPER LIMIT:	33° 48’ 50.09”N	79° 02’ 46.62”W
	LOWER LIMIT:	33° 21’ 54.29”N	79° 14’ 55.23”W
Santee River	UPPER LIMIT:	33° 44’ 32.56”N	80° 37’ 10.41”W
	LOWER LIMIT:	33° 07’ 14.06”N	79° 16’ 22.93”W
Wateree River	UPPER LIMIT:	34° 19’ 52.77”N	80° 41’ 48.19”W

	LOWER LIMIT:	33° 44’ 41.51”N	80° 37’ 07.04”W
Broad River	UPPER LIMIT:	33° 02’ 04.86”N	81° 04’ 13.11”W
Congaree River	LOWER LIMIT:	33° 44’ 39.30”N	80° 37’ 10.59”W
Cooper River	UPPER LIMIT:	33° 14’ 36.96”N	79° 59’ 24.51”W
	LOWER LIMIT:	32° 4’9 04.99”N	79° 55’ 42.74”W
Ashepoo River	UPPER LIMIT:	33° 46’ 16.45”N	80° 32’ 32.41”W
	LOWER LIMIT:	32° 29’ 24.01”N	80° 25’ 18.14”W
Combahee River	UPPER LIMIT:	33° 05’ 04.43”N	81° 09’ 11.93”W
	LOWER LIMIT:	32° 31’ 14.06”N	80° 30’ 55.11”W
Edisto River	UPPER LIMIT:	33° 27’ 50.26”N	81° 16’ 36.92”W
	LOWER LIMIT:	32° 28’ 22.75”N	80° 21’ 27.78”W
Savannah River	UPPER LIMIT:	33° 22’ 18.42”N	81° 56’ 13.96”W
	LOWER LIMIT:	32° 02’ 06.32”N	80° 53’ 13.97”W
Georgia			
Ogeechee River	UPPER LIMIT CANOOCHEE RIVER:	31° 59’ 01.29”N	81° 20’ 26.28”W
	UPPER LIMIT Ogeechee River:	32° 00’ 53.33”N	81° 19’ 05.81”W
	LOWER LIMIT:	31° 49’ 30.88”N	81° 00’ 10.88”W
Altamaha River	UPPER LIMIT OCONEE:	33° 08’ 22.15”N	83° 12’ 12.90”W
	UPPER LIMIT OCULGEE:	32° 32’ 33.46”N	83° 32’ 11.19”W
	LOWER LIMIT:	31° 18’ 48.3”N	81° 14’ 40.50”W
Satilla River	UPPER LIMIT:	31° 59’ 58.21”N	81° 24’ 34.97”W
	LOWER LIMIT:	31° 02’ 41.90”N	81° 41’ 10.00”W