UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

OCT 7 2009

To All Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act (NEPA), an environmental review has been performed on the following action.

TITLE:	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
LOCATION:	The proposed research would occur in the Altamaha River, Georgia, between the Altamaha Sound and the confluence of the Oconee and Ocmulgee Rivers (rkm 215). Most sampling, however, would occur in the tidally influenced portions of the river to river kilometer 65.

SUMMARY: The current EA analyzed the effects of shortnose sturgeon research on the environment in the Altamaha River. This proposed research is a continuation of similar research objectives conducted under Permit 1420-01 which expired on September 30, 2009. The permit would be valid for five years from the date of issuance and would authorize non-lethal sampling methods on up to 500 shortnose sturgeon annually, but not to exceed 1,500 over the life of the permit. Research activities would include netting, measurement (length, weight, photos), genetic and fin-ray tissue sampling, PIT and sonic tagging, anesthesia, laparoscopy, and gastric lavage. To document spawning in the river, up to 20 eggs or larvae would be lethally collected with artificial substrates annually. Additionally, one incidence of unintentional mortality or serious injury is proposed over the life of the permit.

The proposed action analyzed in the EA would not have significant environmental effects on the target or non-target species; public health and safety would not affected; no unique geographic area would be affected; and the effects of this study would not be highly uncertain, nor would they involve unique or unknown risks. Issuance of this permit would not set a precedent for future actions with significant effects, nor would it represent a decision in principle about a future consideration. There would not be individually insignificant but cumulatively significant impacts associated with the proposed action, and there would not be adverse effects on historic resources. The permit would contain mitigating measures to avoid unnecessary stress to the subject animals.

RESPONSIBLE OFFICIAL: James H. Lecky
Director, Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910
(301) 713-2332

The environmental review process led us to conclude this action will not have a significant effect on the human environment. Therefore, an environmental impact statement will not be prepared. A copy of the finding of no significant impact (FONSI) including the supporting EA is enclosed for your information.

Although NOAA is not soliciting comments on this completed EA/FONSI, we will consider any comments submitted assisting us to prepare future NEPA documents. Please submit any written comments to the responsible official named above.

Sincerely,

for Paul N. Doremus, Ph.D.
NOAA NEPA Coordinator

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

OCT - 5 2009

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

October 2009

Lead Agency:	USDC National Oceanic and Atmospheric Administration National Marine Fisheries Service, Office of Protected Resources
Responsible Official:	James H. Lecky, Director, Office of Protected Resources
For Further Information Contact:	Office of Protected Resources National Marine Fisheries Service 1315 East West Highway Silver Spring, MD 20910 (301) 713-2289
Location:	Altamaha River and Estuary, Georgia

Abstract: The National Marine Fisheries Service (NMFS) proposes to issue a scientific research permit for takes of shortnose sturgeon (*Acipenser brevirostrum*) in the wild, pursuant to the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*). The primary objective of the proposed research would be to assess the distribution, movements and abundance of shortnose sturgeon in the Altamaha River, Georgia. This research project would also collect current information about abundance, age structure, and critical habitats of shortnose sturgeon in the Altamaha River with the unifying goal to identify specific habitat requirements of the various life stages of shortnose sturgeon within the river.

The permit would be valid for five years from the date of issuance and would authorize non-lethal sampling methods on up to 500 shortnose sturgeon annually, but not to exceed 1,500 over the life of the permit. Research activities would include netting, measurement (length, weight, photos), genetic/fin-ray tissue sampling, PIT and sonic tagging, anesthesia, laparoscopy, and gastric lavage. To document spawning in the river, up to 20 eggs or larvae would be lethally collected with artificial substrates annually. Additionally, one incidence of unintentional mortality or serious injury is proposed over the life of the permit. This proposed research is a continuation of similar research objectives conducted under Permit 1420-01 expiring on Sept 30, 2009.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

SEP 2 2 2009

MEMORANDUM FOR: James H. Lecky
Director, Office of Protected Resources

FROM: Christopher Holmes
Acting NMFS HQ NEPA Coordinator

SUBJECT: 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 to the University of Georgia (PI: Dr. Douglas Peterson)

I have reviewed the Environmental Assessment (EA) and proposed Finding of No Significant Impact (FONSI). My specific comments on these documents were provided to the technical staff processing these documents for approval, and have been incorporated appropriately into the documents.

Thank you for the opportunity to review these draft documents, and, as always, I am available to discuss comments with you and/or your program staff should that be helpful.

cc: GCF (O'Brien)
F/PR1 (Mohead)

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CHAPTER 1 PURPOSE AND NEED FOR ACTION

1.1 DESCRIPTION OF ACTION

In response to receipt of a request from Douglas Peterson, PhD, University of Georgia (File No. 14394), the National Marine Fisheries Service Office of Protected Resources (NMFS OPR) proposes to issue a scientific research permit authorizing takes[1] of shortnose sturgeon (*Acipenser brevirostrum*) in the wild pursuant to the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq*.) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226).

1.1.1 *Purpose and Need*

The purpose of the aforementioned scientific research would be to gather information used to help inform conservation management decisions to recover shortnose sturgeon in the wild. Section 10(a)(1)(A) of the ESA allows NMFS to issue permits and permit modifications to take ESA-listed shortnose sturgeon. The applicant requires a permit to conduct the proposed research.

The primary purpose of the permit, therefore, is to provide an exemption from the take prohibitions under the ESA to allow "takes" of shortnose sturgeon for bona fide scientific research. The need for issuance of the permit is related to NMFS's mandates under the ESA. Specifically, NMFS has a responsibility to implement the ESA to protect, conserve, and recover threatened and endangered species under its jurisdiction. The ESA prohibits takes of threatened and endangered species, respectively, with only a few very specific exceptions, including for scientific research and enhancement purposes. Permit issuance criteria require that research activities are consistent with the purposes and policies of these federal laws and will not have a significant adverse impact on the species.

1.1.2 *Objectives of the research*

The goals of the proposed research are to assess the distribution, abundance and movements of adult and sub-adult shortnose sturgeon in the Altamaha River system of Georgia. The specific objectives of the proposed project would be to: (1) re-assess the current population of shortnose sturgeon in the Altamaha River to evaluate current population trend, (2) analyze the age structure of the current population to identify potential shifts in demographic structure since last estimates were completed in 2004; (3) to identify, quantify and define critical habitats of shortnose sturgeon in the Altamaha River; (4) better understand recruitment processes and critical habitats of juvenile shortnose sturgeon; and (5) better understand interspecific interactions with sympatric population of juvenile Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) by studying the overlap in diet and habitat selectivity among both species. In addition, data specific to other critical habitat and use patterns would be obtained. Genetic samples from this study, in combination with samples from other river systems, would aid in evaluation of range wide population structure.

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1 The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The term "harm" is further defined by regulations (50 CFR §222.102) as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns including breeding, spawning, rearing, migrating, feeding, or sheltering."

1.2 OTHER EA/EIS INFLUENCING THE SCOPE OF THIS EA

A number of EAs have been prepared on the effects of similar research techniques related to the proposed action. The original EA for File No. 1420 was prepared by NMFS on September 1, 2004 entitled "*Environmental Assessment of Issuance Scientific Research Permit to Dr. Douglas Peterson from University of Georgia, (File No. 1420)*." An additional Supplemental Environmental Assessment (SEA) was prepared December 12, 2006 entitled "*Supplemental Environmental Assessment of the Issuance of a Scientific Research Permit Modification (File No. 1420-01) to Dr. Douglas Peterson, University of Georgia, for Conducting Research on Endangered Shortnose Sturgeon*."

There were two alternatives considered in the original EA: (1) the Proposed Action alternative (*i.e.*, approving the permit request), and (2) the No Action alternative (*i.e.*, not approving the requested permit). The Proposed Action of issuing the specific scientific research permit to allow for non-lethal capturing (up to 200 juvenile and adults shortnose sturgeon), handling, weighing, measuring, anesthetizing, scanning for tags, PIT, Carlin tagging, taking genetic tissue samples, fin ray sectioning, implanting sonic transmitters, and lethal taking of eggs was the preferred alternative. Based on the best available information, a Finding of No Significant Impact (FONSI) was signed by the Assistant Administrator for Fisheries on September 1, 2004, finding the activities analyzed and the issuance of the permit would not significantly impact the quality of the human environment, including the target species, shortnose sturgeon, or any non-target species. The No Action alternative was not preferred because the opportunity to collect information that would contribute to the better understanding of shortnose sturgeon and provide information to NMFS, needed to implement NMFS management activities, would be lost. The proposed action would also help conserve, manage, and recover shortnose sturgeon as required by the ESA and implementing regulations.

Following issuance of Permit No. 1420, a major modification was applied for (File 1420-01) to increase the total non-lethal take of juvenile and adult shortnose sturgeon from the Altamaha River to 1,000 annually and to also include laparoscopy and venipunction as permitted research activities. Additionally, Dr. Peterson proposed two lethal incidental takes of shortnose sturgeon annually. Further impacts were considered in a December 12, 2006 SEA using the two alternatives considered in the original 2004 EA: (1) the Proposed Action alternative (*i.e.*, approving the permit request), and (2) the No Action alternative (*i.e.*, not approving the requested permit). Based on the best available information, a Finding of No Significant Impact (FONSI) was signed by the Assistant Administrator for Fisheries on December 12, 2006, finding the activities analyzed and the issuance of the permit would not significantly impact the quality of the human environment, including the target species, shortnose sturgeon, or any non-target species. The No Action alternative was not preferred because the opportunity to collect information contributing to the better understanding of shortnose sturgeon and provide information to NMFS, needed to implement NMFS management activities, would be lost. The proposed action was concluded to help conserve, manage, and recover shortnose sturgeon as required by the ESA and implementing regulations.

1.3 SCOPING SUMMARY

The purpose of scoping is to identify significant issues to be addressed related to the proposed action, as well as identify and eliminate from detailed study issues not significant or not previously covered by prior environmental review. An additional purpose of the scoping process is to identify concerns of the affected public and Federal agencies, states, and Indian tribes. CEQ regulations implementing the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) do not require a draft EA be made available for public comment as part of the scoping process. A Notice of Receipt of the application was published in the *Federal Register*, announcing the availability of the permit application and related documents for public comment (File No. 14394; June 24, 2009; 74 FR 30054). All agency and expert reviewer comments received were appropriately addressed and documented in decision memos. These comments were supportive of the research but also made suggestions to refine methods, including more timely transfers of genetic tissue samples to the NOAA archive, and limitations on the number of invasive procedures performed on individual fish. These suggestions resulted in specific changes in the scope of this EA and were implemented. No comments were received from the public regarding this application.

1.4 APPLICABLE LAWS AND NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action, as well as who is responsible for obtaining them. Even when it is the applicant's responsibility to obtain such permissions, NMFS is obligated under NEPA to ascertain whether the applicant is seeking other federal, state, or local approvals for their action.

1.3.1 *National Environmental Policy Act*

The National Environmental Policy Act (NEPA) was enacted in 1969 and is applicable to all "major" federal actions significantly affecting the quality of the human environment. A major federal action is an activity that is fully or partially funded, regulated, conducted, or approved by a federal agency. NMFS issuance of permits for research represents approval and regulation of activities. While NEPA does not dictate substantive requirements for permits, licenses, etc., it requires consideration of environmental issues in federal agency planning and decision making. The procedural provisions outlining federal agency responsibilities under NEPA are provided in the Council on Environmental Quality's implementing regulations (40 CFR Parts 1500-1508).

NMFS has, through NOAA Administrative Order (NAO) 216-6, established agency procedures for complying with NEPA and the implementing regulations issued by the Council on Environmental Quality. NAO 216-6 specifies that issuance of scientific research permits under the MMPA and ESA is among a category of actions that are generally exempted (categorically excluded) from further environmental review, except under extraordinary circumstances. When a proposed action that would otherwise be categorically excluded is the subject of public controversy based on potential environmental consequences, has uncertain environmental impacts or unknown risks, establishes a precedent or decision in principle about future proposals, may result in cumulatively significant impacts, or may have an adverse effect upon endangered or threatened species or their habitats, preparation of an EA or EIS is required.

While issuance of scientific research permits is typically subject to a categorical exclusion, as described in NAO 216-6, NMFS is preparing an EA for this action to provide a more detailed analysis of effects to ESA-listed species. This Environmental Assessment is prepared in accordance with NEPA, its implementing regulations, and NOAA 216-6.

1.3.2 *Endangered Species Act*

Section 9 of the ESA, as amended, and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption such as by a permit. Permits to take ESA-listed species for scientific purposes, or for the purpose of enhancing the propagation or survival of the species, may be granted pursuant to Section 10(a)(1)(A) of the ESA.

NMFS has promulgated regulations to implement the permit provisions of the ESA (50 CFR Part 222) and has produced OMB-approved application instructions that prescribe the procedures necessary to apply for permits. All applicants must comply with these regulations and application instructions in addition to the provisions of the ESA.

Section 10(d) of the ESA stipulates that, for NMFS to issue permits under section 10(a)(1)(A) of the ESA, the Agency must find that the permit: was applied for in good faith; if granted and exercised will not operate to the disadvantage of the species; and will be consistent with the purposes and policy set forth in Section 2 of the ESA.

Section 2 of the ESA sets forth the purposes and policy of the Act. The purposes of the ESA are to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in section 2(a) of the ESA. It is the policy of the ESA that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA. In consideration of the ESA's definition of conserve, which indicates an ultimate goal of bringing a species to the point where listing under the ESA is no longer necessary for its continued existence (i.e., the species is recovered), exemption permits issued pursuant to section 10 of the ESA are for activities that are likely to further the conservation of the affected species.

Section 7 of the ESA requires consultation with the appropriate federal agency (either NMFS or the U.S. Fish and Wildlife Service, (USFWS)) for federal actions that "may affect" a listed species or adversely modify critical habitat. NMFS issuance of a permit affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these Section 7 consultation requirements. Section 7 requires federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. NMFS is further required to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of habitat for such species. Regulations specify the procedural requirements for these consultations (50 Part CFR 402).

CHAPTER 2: ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the range of potential actions (alternatives) determined reasonable with respect to achieving the stated objectives. This chapter also summarizes the expected outputs and any related mitigation of each alternative. Alternative Number 1 is the "No Action" alternative where the proposed permit would not be issued. The No Action alternative is the baseline for the rest of the analyses. Alternative No. 2 is the "Proposed Action" alternative representing the research proposed in the submitted application for a permit, with standard permit terms and conditions specified by NMFS.

2.1 ALTERNATIVE No. 1: NO ACTION

Under this alternative, the No Action alternative, the scientific research permit (File No. 14394) to capture, handle, anesthetize, laparoscope, PIT/Sonic tag, genetic tissue/fin ray sample, gastric lavage, tag, and release shortnose sturgeon, would not be issued at this time.

2.2 ALTERNATIVE No. 2: PROPOSED ACTION –ISSUANCE OF PERMIT WITH STANDARD CONDITIONS

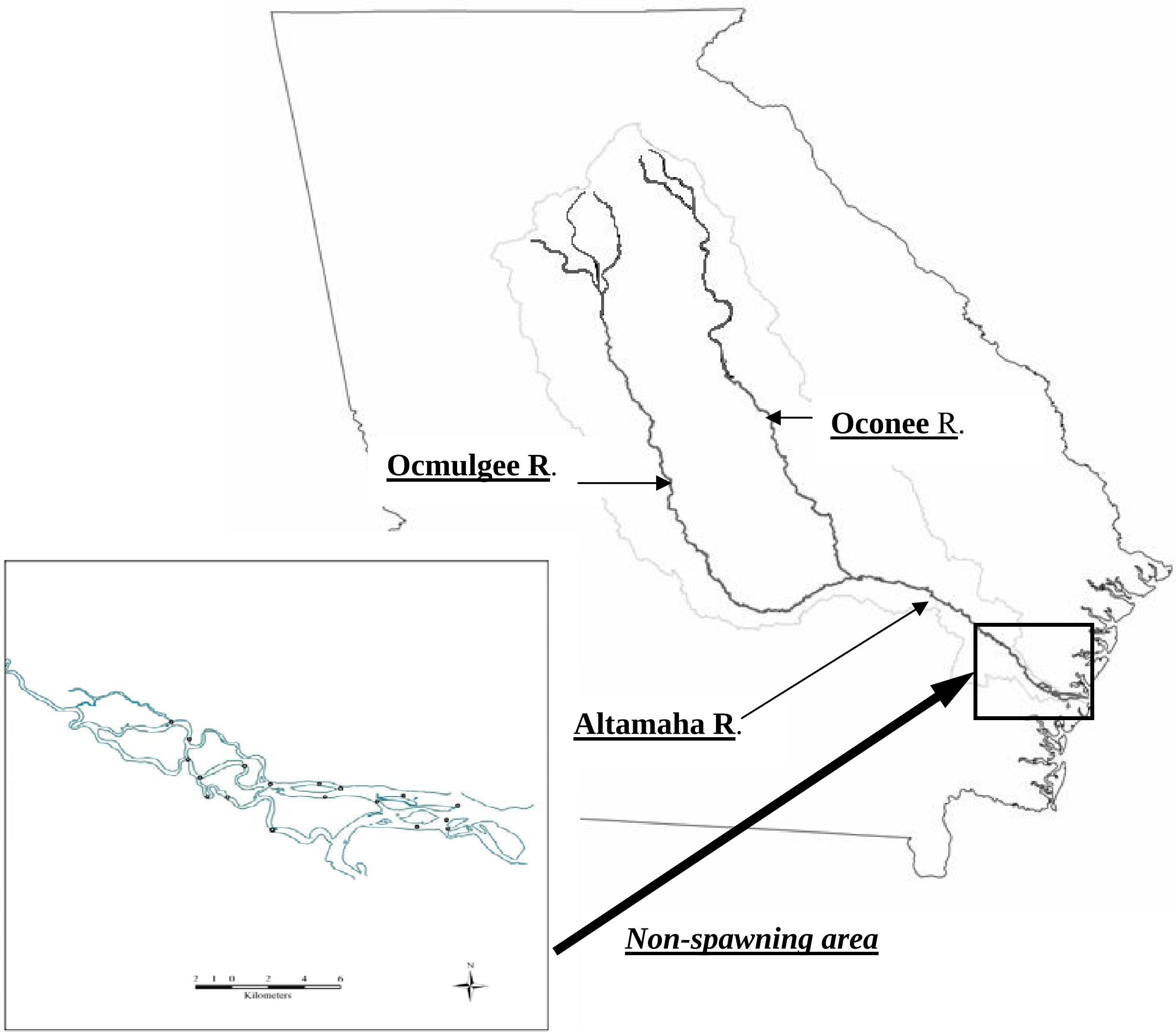
Under the Proposed Action alternative, a permit would be issued for activities by the applicant for five years, with the permit terms and conditions standard to such permits as issued by NMFS. To accomplish these goals, the researcher would annually capture up to 500 shortnose sturgeon by gill and trammel nets from January to December. Each fish would be captured, handled, weighed, measured, and PIT tagged, tissue sampled, allowed to recover and released. Additionally, a subset of 50 fish would be anesthetized and fin-ray sampled for age, mortality, and recruitment estimates, and also to analyze population structure. Another subset of 50 would be selected to sample sturgeon diets using gastric lavage. Also, up to 10 sturgeons annually would be laparoscoped and fitted with internal sonic transmitters. Further, up to 20 shortnose sturgeon eggs would be lethally collected annually using artificial substrates to document spawning periodicity. Lastly, an incidence of one unintentional mortality of sturgeon over the life of the permit is requested (Table 1).

Table 1: Activities proposed to be authorized on endangered shortnose sturgeon (*Acipenser brevirostrum*) in the Altamaha River, GA under Permit No. 14394.

	Number	Life Stage	Species/Population	Take Activity Category	Location
1.	Up to 390 annually (But not to exceed 1,170 total over 5 yr)	Adult and juveniles	Shortnose sturgeon, Altamaha River, GA	Capture*, handle, weigh, measure, PIT tag, genetic tissue sample	Altamaha River and Estuary
2.	Up to 50 annually (But not to exceed 150 total over 5 yr)	Adult and juveniles	Shortnose sturgeon, Altamaha River, GA	Capture*, handle, weigh, measure, anesthetize, PIT tag, genetic tissue samples, and fin ray section	Altamaha River and Estuary
3	Up to 50 annually (But not to exceed 150 total over 5 yr)	Adult and juveniles	Shortnose sturgeon, Altamaha River, GA	Capture*, handle, weigh, measure, anesthetize, PIT tag, genetic tissue samples, and gastric lavage.	Altamaha River and Estuary
4.	Up to 10 annually (But not to exceed 30 total over 5 yr)	Adult and juveniles	Shortnose sturgeon, Altamaha River, GA	Capture*, handle, weigh, measure, PIT tag, genetic tissue sample, anesthetize, laparoscopy, and sonic tag implantation	Altamaha River and Estuary
5.	Up to 20 annually	Eggs	Shortnose sturgeon, Altamaha River, GA	Lethal take* by egg matt	Altamaha River and Estuary
6.	1 (Over 5 yr)	Adult and juveniles	Shortnose sturgeon, Altamaha River, GA	Lethal take	Altamaha River and Estuary

* Capture methods include trammel nets, gill nets and egg matts.

2.2.1 *Figure 1: Map of Action Area*



2.2.2 *Description of Action Area*

The non-spawning sampling area of this study would include the entire tidally influenced portion of the lower river from the Altamaha Sound upstream to river kilometer (rkm) 65 (Fig 1). Also, egg sampling would take place at confirmed spawning areas located at the confluence of the Oconee and Ocmulgee Rivers with the Altamaha River (rkm 215), and two others located at rkm 110 to 120 and rkm 160 to 170. To identify potential sampling sites, the river bottom would be surveyed with a Furuno LS-6100 depth finder prior to gear deployment to ensure that the river bottom is clear of debris or structure that might otherwise damage sampling gear. Sites where sampling is not possible, either through loss of gear or having extensive bottom structure, would be eliminated from sampling.

2.2.3 *Research Activities*

The following sections provide a description of the proposed research activities:

2.2.2.1: <u>Capture</u>

In consultation with NMFS, the researcher proposed to capture up to 500 adult/juvenile sturgeon annually (not exceeding 1,500 total during permit) using standardized netting protocol (anchored gill net and trammel nets and drift gill nets) approximately 3-5 days per week, typically at slack tide. The sampling effort would be conducted primarily during summer months when the population is most likely congregated in deepwater areas (holes) located near the fresh-saltwater interface. However, sampling eggs/larvae with egg mats would also be conducted at likely spawning sites (as determined from habitat assessments) during January through March. Efforts would also be made in the fall of the year to capture and telemeter adults with sonic tracking devices.

All sampling and handling of 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 4 and 6" (stretch measure). Trammel nets would consist of mesh sizes of 2-4" for the inner panes, 8-12" in the outer panels. Netting material would consist of heavy multifilament nylon (size 208-233) mesh instead of monofilament or light twine and both types of nets would measure 100 m long by 2 m deep.

The following net-setting protocol summarized in Table 2 below would be adhered to by researchers. All nets would be attended to avoid marine mammal and manatee interactions, and in waters having minimum dissolved oxygen (D.O.) concentrations of 5 mg/L, with one exception (i.e., Soak times would be reduced to the next lower duration when D.O. measured between 4 and 5 mg/L.

Table 2: 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.

2.2.2.2: <u>*General Handling (e.g., holding, measuring, weighing*</u>)

Once removed from nets, captured sturgeon would be recovered in a floating net pen (2 ft x 4 ft x 3 ft) for 10-15 minutes. Additional net pens would be onboard to accommodate excess holding of sturgeon and/or bycatch. Once recovered, sturgeon would be transferred to an onboard processing station and holding tanks for weighing, measuring, and further processing. To minimize handling stress, each fish would be moved and handled by researchers using latex gloves. When in onboard holding tanks, 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 D.O. would be supplemented with compressed oxygen to ensure the D.O. 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 weighing platform. Total length of each sturgeon would be measured a standard measuring board.

The time required to complete routine, non-invasive methods (*i.e.,* PIT tagging, measuring, weighing) would be less than one minute per fish. The time required for procedures such as anesthetizing, telemetry tagging, laparoscoping, fin-ray sectioning, and genetic tissue sampling 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.

2.2.2.3: *PIT Tag*

All shortnose sturgeon captured (>250 mm TL) 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 less than 330 mm TL would be marked with 11 x 2.1 mm PIT tags; whereas larger fish would be marked with 14 mm x 2.1 mm tags.

NMFS currently recommends intramuscular injection of PIT tags using a sterilized 12-gauge steel standard needle proximate and anterior to the base of the dorsal fin, and for consistency, on the left side. However, the researcher requests to continue using his long-term alternate technique of inserting PIT tags under the hollow of the 4^{th} dorsal scute of the fish. Because tag retention in this position has not been established, the researcher would be required to conduct a tag retention study over the life of the permit.

To insert the PIT tag, without penetrating the flesh of the fish, the researcher would first carefully wedge the needle-tip under the lip of the scute and advance it into position within the hollow of the scute. Next, by depressing the hypodermic's plunger the PIT tag would be injected and then the needle removed. The last step would verify the PIT tag code using a tag reader.

2.2.2.4: *Genetic Tissue Sample*

Immediately prior to release, a (1.0 to 2.0 cm^2) soft tissue sample would be collected from the trailing margin of the caudal or dorsal fin using sharp sterilized scissors. Tissue samples would be preserved in individually labeled vials containing 95% ethanol. The Permit Holder will provide in a timely manner genetic tissue samples collected from shortnose sturgeon for archival purposes to the NOAA/NOS Tissue Archive in Charleston, South Carolina, or to Co-investigators identified in the permit. Proper certification, identity, and chain of custody of samples would be maintained. Genetic information obtained from tissue samples would help characterize the genetic "uniqueness" of the Altamaha population and would also help quantify the current level of genetic diversity within the population.

2.2.2.5: *Fin Ray Sample*

A total of 50 shortnose sturgeon annually (no more than 150 total for the five year permit) would be collected for age and population analyses. A small section (~1 cm^2 notch), of the leading pectoral fin ray would be collected on sampled fish, and no other invasive procedure would be performed on fish undergoing fin ray sectioning. The recommended method requires researchers, using a hacksaw or bonesaw, to make two parallel cuts across the leading pectoral fin-ray approximately 1cm deep and 1cm wide. The blade of the first cut is positioned no closer than 0.5cm from the point of articulation of the flexible pectoral base to avoid an artery at this location (Rien and Beamesderfer 1994, Rossiter *et al.* 1995, Collins 1995, Collins and Smith 1996). The second cut is made approximately 1cm distally (Everett *et al.* 2003, Fleming *et al.* 2003, Hurley *et al.* 2004, Hughes *et al.* 2005), where a pair of pliers is then used to remove the fin-ray section. The ray section is placed in an envelope and allowed to air-dry for several days or weeks and later it is cut into thin slices (usually about 0.5 to 2mm thickness) typically using a jeweler's saw or a double bladed saw (Stevenson and Secor 1999, Everett *et al.* 2003, Fleming *et al.* 2003, Hurley *et al.* 2004, Hughes *et al.* 2005, Johnson *et al.* 2005, Collins *et al.* 2008). The sections are then mounted using any number of materials including clear glue, fingernail polish, cytosel, or thermoplastic cement. The annuli are then readable using stereoscopic readers.

2.2.2.6: *Gastric Lavage*

The Recovery Plan for shortnose sturgeon (NMFS 1998) places high priority on understanding the range-wide foraging habits and ecology of shortnose sturgeon. Gastric lavage on up to 50 shortnose sturgeon taken annually from the Altamaha River (not exceeding a total of 150 during the life of the permit) is requested in the application. Researchers would be using methods described by Haley (1998); Murie and Parkyn (2000); and Collins *et al*. (2008); each researcher that would be authorized by this permit would receive intensive training in performing gastric lavage.

The method of lavage would include a sedation dose of anesthetic (100 mg/L of MS-222) to relax the fish and alimentary canal prior to the procedure. Variable sized flexible polyethylene tubes, depending on the size of the sturgeon, would be passed carefully through the sturgeon's alimentary canal and verified to be properly positioned in the stomach by feeling the tubing from fish's ventral surface. Gastric lavage would be then be carried out by gently flooding the stomach cavity with water delivered from a lightly pressurized garden sprayer. To minimize stress, sturgeon between 250 mm and 350 mm (FL) would be lavaged using 1.90 mm outside diameter (O.D.) tubing; sturgeon between 350 mm to 1250 mm, would be lavaged with a 4.06 mm O.D. tube; and sturgeon above 1250 mm would be lavaged with flexible tubing of 10.15 mm O.D. Prey items dislodged from the stomachs of sampled sturgeon would be collected by a 500 micron sieve, preserved (using 95% ethanol), and identified later in the laboratory. The applicant would then allow fish to recover within a floating net pen along side the boat prior to release back to the river. The entire procedure, including anesthetizing, would take from seven to eleven minutes (Collins *et al* 2008). No other invasive procedure would be performed on fish undergoing gastric lavage.

2.2.2.7: *Anesthetizing*

Each sturgeon prepared for surgery for procedures requiring anesthetization — laparoscopy, transmitter implantation, or fin-ray sectioning — would be placed in a water bath solution containing buffered tricaine methane sulfonate (MS-222) for anesthetization (Summerfelt and Smith 1990). Concentrations of MS-222 of up to 100 mg/L would be used to sedate sturgeon to a state of surgical anesthesia (total loss of equilibrium, no reaction to touch stimuli, cessation of movement, except for opercula movement). The resulting time required for anesthetization and recovery would vary depending on the existing water temperature and water quality (Small 2003 and Coyle *et al*. 2004); however, once anesthesia is administered, sturgeon would be continuously monitored and checked for signs of proper sedation by squeezing the tail and gauging the fish's movement and equilibrium, while also checking for steady opercula movement. Just prior to procedures requiring anesthetizing, sturgeon would be removed from the anesthetic to a moist surgery rack where respiration would be maintained by directing fresh ambient water pumped across the gills with tube inserted in the animals' mouth. After surgery, sturgeon would be allowed to recover to normal swimming behavior in boat-side net pens prior to release.

2.2.2.8: Laparoscopic Sex Determination

Laparoscopic procedures used in fish (Murray, et. al. 1998; Moccia et. al. 1984; Ortenberger *et. al.* 1996; and Stoskopf 1993) have been refined for sturgeon and used extensively by Warm Springs Regional Fisheries Center. The principal investigator was trained in the use of these procedures by the staff at Warm Springs National Fish Hatchery who has subsequently trained his field co-investigators in the proposed project.

To determine sex and stage of reproductive condition of each animal upon selecting animals for telemetry sonic tags, up to 10 captured fish annually (total of 30 for permit) would be removed from the net pen and anesthetized in a 100mg/L solution of buffered MS-222. No other invasive procedure would be performed on fish undergoing laparoscopy and tag implantation. After immobilized, animals would be positioned in lateral recumbence on a portable surgical table. A small (~5 mm) incision would then be made in the ventral body wall slightly off midline at a level midway between the pectoral girdle and the cloaca. A 5 mm trocar would be inserted through the incision. If necessary, the body cavity would be insufflated with ambient air by attaching a battery-powered air pump to the insufflation port on the trocar. (Insufflation increases the working space within the body cavity to afford a better view of the internal cavity). A 5 mm rigid laparoscope would then be inserted through the trocar to allow visualization of gonads so that sex and reproductive condition can be determined. The laparoscope and the trocar would then be removed from the body and the incision would be closed with a single suture in a cruciate pattern using 2 PDS suture material.

2.2.2.9: Internal Sonic Transmitters

In each fall or early winter of the study, a maximum of 10 adult fish (total of 30 over permit) would be collected for surgical implantation of sonic transmitters using the following 3-5 minute procedure. All implanted devices would be limited in size to less than 2% of the fish's total body weight.

1. Adult shortnose sturgeon would be gill netted during late fall and early winter. Duration of gill net sets would be less than 40 minutes.
2. Captured fish would be anesthetized using buffered tricain (MS 222) at 100 mg/L.
3. Anesthetized fish would be held on their backs in a small cradle. The incision site would disinfected and a surgical opening of 2 to 3cm would then be made in the belly of the fish immediately posterior of the pelvic girdle. A separate sterile surgical packet, containing all surgical instruments and supplies, will be used for each individual fish.

4. Once the incision has been completed, a sterilized, sonic transmitter would be inserted into the surgical opening.
5. The incision would then be closed with resorbable suture and sealed with a layer of surgical glue.
6. The fish would then be allowed to recover (to equilibrium) in a net pen and released.

The sonic transmitters used would be manufactured by Sonotronics (either model CT-05-36-I or model CT-05-48-I). Specifications of these transmitters are as follows:

Model	Length	Diameter	Weight (H20)	Weight (O2)	Lifetime
CT-05-36-I	62mm	16mm	10g	22g	36 months
CT-05-48-I	79mm	16mm	14.5g	29g	48 months

2.2.2.10: *Lethal Take of Eggs/Larvae (egg mats)*

The positions and early spring movements of previously telemetered sturgeon would be monitored to locate spawning areas and document spawning activity. Positions of tagged fish would be identified and recorded using portable GPS units, after which, measures of key habitat attributes (water temperature, depth, current velocity, substrate, etc.) would be obtained. Once spawning activity is noted, artificial substrate samplers would be deployed downstream (anchored to the river bottom) of to verify spawning activity in February through mid-March. The samplers used would be 56cm diameter circular polyester floor-buffing pads which passively collect eggs adrift at the spawning site. They would be checked and reset at least once daily during the spawning season. Collected eggs would immediately be transported to shore, removed from artificial substrates, and preserved for later laboratory analysis. Density and distribution of eggs would be closely monitored throughout the spawning season so that annual egg deposition could be estimated for all major spawning areas located through telemetry. This information would be used in assessing current levels of recruitment and in evaluating existing spawning habitat.

2.2.4 *Unintentional Mortality of Shortnose Sturgeon*

The researcher has requested one unintentional mortality over the life of the permit. This request was based on the cumulative stress resulting from the volume of research activity required to sample fish to meet research objectives. If a greater incidence of mortality or serious injury occurs, NMFS OPR would need to be consulted to determine the cause and to discuss any remedial changes in research. The Permits Division could grant authorization to resume permitted activities based on review of the incident depending on the circumstances, or suspend activities.

Additionally, it is possible that activities (gill and trammel netting) could also result in unintentional mortality of non-target species. However, from past experience of the researchers and their practice of monitoring nets with short soak-times, NMFS anticipates that by-catch would be released alive.

CHAPTER 3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

This EA evaluates the potential impacts to the human environment from issuance of the proposed permit and the potential impacts on the social, economic, physical, and biological environment (*i.e.*, targeted shortnose sturgeon), specifically those that may result from the proposed research activities requested.

3.1 SOCIAL AND ECONOMIC ENVIRONMENT

Although economic and social factors are listed in the definition of effects in the NEPA regulations, 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 related to effects on the natural or physical environment. The social and economic effects of the proposed action mainly involve the effects on the people involved in the research, as well as any industries that support the research, such as suppliers of equipment needed to accomplish the research. There are no significant social or economic impacts of the proposed action interrelated with significant natural or physical environmental effects. Thus, the EA does not include any further analysis of social or economic effects of the proposed action.

3.2 PHYSICAL ENVIRONMENT

The following section provides a description of the critical resources within the action area.

3.2.1 *EFH, Critical Habitat and National Marine Sanctuaries*

There are no National Marine Sanctuaries, designated essential fish habitat (EFH), or designated critical habitat located within the study area for the proposed activities. Additionally, there are no protected areas (e.g., National Estuarine Research Reserves or state protected aquatic areas) present affected by the research activities, nor are there eligible historic resources in the project location. Therefore, no further discussion of EFH or critical habitat is warranted in this analysis.

3.2.2 *Altamaha River System Description*

Located entirely within Georgia, the Altamaha River and its main tributaries, the Oconee and Ocmulgee Rivers, flow over 800 km from the headwaters near Atlanta, Georgia to the Atlantic Ocean near Darien draining nearly one-third of the state (See Figure 1, Section 2.2.1). The River encompasses roughly 36,000 km^2 and is one of the largest watersheds on the east coast of the United States and was listed in 2002 as the seventh most endangered river in the United States by the advocacy group American Rivers. The Altamaha River is also second only to the Pascagoula River in Mississippi in length of unimpounded stretch of river from the ocean east of the Mississippi River. Dynesius and Nilsson (1994) attributed the more than 600 km of unimpounded river to a lower rate of exploitation by a smaller regional population. The Altamaha is formed at the convergence of the Ocmulgee and Oconee Rivers 215 river kilometers (rkm) inland. It averages 50 to 70 m in width and 2 to 3 m in depth with a maximum depth of 18 m (Heidt and Gilbert 1978). The Oconee and Ocmulgee Rivers contain the only impoundments within the watershed; however, none are found farther downstream than 361 rkm, which is well upstream of the known habitat of shortnose sturgeon in this system (Rogers and Weber 1994). Vegetation along the lower reaches of the watershed progresses from mixed hardwood to cypress swamp to salt marsh (*Spartina* spp.) near the estuary.

The average gradient over the lower 200 rkm is 0.13m per km (GEPD 2003). Average annual discharge is $381m^3s$-1, or 18% of the freshwater input to the South Atlantic (Rogers & Weber 1994).

For further information on the affected physical environment, please refer to the Biological Opinion (signed October 2009) written for this proposed action.

3.3 BIOLOGICAL ENVIRONMENT

The following is a brief summary of the status and occurrence of targeted shortnose sturgeon range-wide, including the proposed study area. Further descriptions of the status of these species can be found in the Biological Opinion accompanying this document as well as NMFS Recovery Plans and other documents at http://www.nmfs.noaa.gov/pr/publications/.

3.3.1 *ESA Target Species Under NMFS Jurisdiction*

ESA Endangered: Shortnose sturgeon *Acipenser brevirostrum*

3.3.1.1: Range-wide Distribution of shortnose sturgeon

Shortnose sturgeon occur along the east coast of North America in rivers, estuaries and the sea. They were once present in most major rivers systems along the Atlantic coast (Kynard, 1997). Their current distribution extends north 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) but the southern limit of their range is currently believed to be in the Saint Johns River, FL (NMFS 1998). They are sympatric with the Atlantic sturgeon throughout much of their range. However, the Atlantic sturgeon spends more of its life cycle in the open ocean. In rivers, shortnose sturgeon and Atlantic sturgeon may share foraging habitat and resources but shortnose sturgeon generally spawn farther upriver and earlier than Atlantic sturgeon (Kynard 1997, Bain 1997).

Although there is substantial evidence in the literature for shortnose sturgeon occurrence at sea (Vladykov and Greely 1963, Fried and McCleave 1973, Wilk and Silverman 1976, Dadswell 1979, Smith *et al.* 2002), most researchers believe that coastal movements are rare (Dadswell 1984, NMFS 1998) holding shortnose sturgeon seldom venture beyond their natal rivers. Magnin (1964) theorized that the species was primarily found in freshwater on the basis of growth (i.e., if shortnose sturgeons spent more time in the ocean they would grow to larger sizes). In recent years, telemetry data and genetic analyses have demonstrated that coastal migrations of shortnose sturgeon between adjacent rivers may be relatively common in some areas (Maine Rivers Fernandes 2008, Southeast Rivers J. Fleming, pers. comm. 2008. The Satilla and Saint Marys Rivers are relatively small coastal plain drainages emptying into the Atlantic Ocean between the Altamaha River, Georgia and Saint Johns River, Florida. Collections of shortnose sturgeon were made in the estuaries of both systems during the late 1980's and early 1990's during crustacean monitoring. However, current population levels in these rivers remains unknown, though some have classified these rivers as extirpated based on surveys for sturgeon in the Saint Marys (1994 and 1995, 117 net hours) and in the Satilla (1995, 74 net hours) which failed to yield any shortnose sturgeon (Rogers and Weber 1995b).

3.3.1.2: Shortnose sturgeon in the Altamaha River – Georgia

Distribution and abundance: Shortnose sturgeon were first documented in the Altamaha River in the early 1970's (Dadswell et al. 1984) and later by Heidt and Gilbert (1978). Since then, numerous studies have been conducted to evaluate population size and habitat use in the Altamaha system. Population estimates were calculated several times for the shortnose sturgeon in the Altamaha between 1988 and 1993 with abundance ranging between 400 and 2900 fish (Flournoy et al. 1992, Weber 1996). Most recently, the population estimate of 6,320 individuals (95% C.I. 4387-9249) was calculated for the river with a disproportionate number of juveniles (DeVries 2006) , suggesting the Altamaha River system shortnose sturgeon population likely remains the largest population south of Cape Hatteras, North Carolina and may be increasing in size. Mortality between shortnose juvenile and adults stages is unusually high possibly as a result of incidental mortality associated with the commercial shad fishery and the simultaneous spawning migration (DeVries 2006).

Spawning: Studies on the Altamaha River indicate that shortnose sturgeon successfully spawn (beginning in January lasting through March) as demonstrated through the presence of spawning adults, eggs, and young-of-year fish in the system. While recent surveys suggest a single step spawning migration occurs in the river with no overwintering in upstream areas prior to spawning (DeVries 2006, Heidt and Gilbert 1978, Flournoy *et al*. 1992, Rogers and Weber 1994), Rogers and Weber (1995a) previously suggested a fall "pre-spawn" migration may also occur in at least a portion of the adult population.

Early studies suggest that shortnose spawned in upstream areas near limestone bluffs with gravel-size to boulder-size hard substrate in the Altamaha River (Rogers and Weber 1995a). More recently DeVries (2006) collected eggs on coarse sand substrate near the converging currents of the Ocmulgee and Oconee Rivers. Moreover, there appears to be numerous spawning areas between Fort Barrington upstream to the confluence of the Ocmulgee and Oconee Rivers (DeVries 2006, Rogers and Weber 1995a). The exact spawning location may vary annually and may be determined by environmental conditions during any given spawning season. In earlier studies, spawning appeared to occur between January and March (Heidt and Gilbert 1978, Rogers and Weber1995a). More recently shortnose sturgeon eggs were collected on March, 20, 2005, when the water temperature was 12^0 C (DeVries 2006), confirming evidence of the January to March spawning period.

Foraging: Shortnose sturgeon not engaged in spawning activity typically remain within the tidal portions of the river and estuary, as they do in most southeastern rivers. During periods of low-discharge during the summer season, most of the population becomes concentrated to a few relatively deep holes slightly upstream of the saltwater/freshwater interface. As river discharge increases and temperatures decrease, fish tend to occupy a greater downstream portion of the river, but still typically remain in areas above the saltwater/freshwater interface during the summer (Dadswell *et al*. 1984, Buckley and Kynard 1985, Rogers and Weber 1994, Weber 1996, Collins and Smith 1997). During the winter, fish are still typically found near the freshwater/saltwater interface but also routinely inhabit more saline waters for brief periods of time.

Although most relatively deep areas above saltwater/freshwater interface are utilized to some extent by shortnose during the summer months, at least two areas in the Altamaha appear to be of particular importance. The first area is called Ebenezer Bend which is located in the main segment of the Altamaha Delta and the second area is a hole in the Champney River segment of the delta, just downstream of Interstate Highway 95 (DeVries 2006, Rogers and Weber 1995a). As the saltwater/freshwater interface moves from year to year during the warmer seasons with varying flow patterns, and areas of suitable shortnose sturgeon habitat change, these areas are nearly always inhabited by shortnose sturgeon.

Seasonal movements: Rogers and Weber (1995a) suggested that a fall "pre-spawn" migration may occur in at least a portion of this population. Fish in this study migrated into an area in the upper tidal portion of the river in the fall and appeared to complete their migration in the spring. The spawning migration for the majority of shortnose sturgeon in the Altamaha River is from January to March, beginning when water temperatures reach approximately 10^{o} C (Heidt and Gilbert 1978, Rogers and Weber1995a; DeVries 2006).

3.3.2 *Non Target Species*

3.3.2.1: *ESA or Marine Mammal Protection Act Protected Species Potentially Affected by the Proposed Action*

Highlighted in this EA (Appendix A), are several ESA-listed species documented by the Georgia DNR, Wildlife Resources Division (2007) as occurring in the lower-Altamaha River and estuary. NMFS initial determination from this list was that Dr. Peterson's research activity, due to its limited proximity or contact with the listed species, would be highly discountable for the following ESA-listed species including: Northern Atlantic right whale (*Eubalaena glacialis*); 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*); and hairy rattleweed (*Baptisia arachnifera*). Although the researcher does not anticipate adverse impact with Florida manatee (*Trichechus manatus*), NMFS determined that informal consultation with the USFWS was necessary to receive concurrence the researcher's activities were not likely to adversely affect listed manatee and/or its habitat occurring in the proposed action area.

- Florida Manatee: Manatees are listed as endangered under the ESA and protected under the 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 Florida Gulf 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 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. Mitigation measures resulting from that discussion are summarized in comments in Section 4.5.5 of this EA.

Bottlenose dolphins (*Tursiops truncatus*): Bottlenose dolphins are marine mammals protected under the MMPA but not listed as threatened or endangered under the ESA. They are known to occur periodically in the lower part of the action area, in the estuary and upstream within the tidally influenced portions of the river. However, due to the following mitigation measures, interaction with dolphins is not be expected, and therefore, this species is not considered further in this analysis:

> Nets would not be put in the water when marine mammals are observed within the vicinity of the research, and the marine mammals would be allowed to either leave or pass through the area safely before net setting is initiated. Should any marine mammals enter the research area after the nets have been set, the lead line would be raised and dropped in an attempt to make marine mammals in the vicinity aware of the net. If marine mammals remain within the vicinity of the research area, nets would be removed.

3.3.2.2: *Non-Listed By-catch Species*

Due to the nature of netting, the researchers would expect that some other non-target species such as American shad (*Alosa sapidissima*), common carp (*Cyprinus carpio*), gizzard shad (*Dorosoma cepedianum*), striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), crappie (*Pomoxis* sp.); channel catfish (*Ictalurus punctatus*), brown bullhead (*Ictalurus nebulosus*), various sucker species (*Castomidae sp.*) would become enmeshed. However, nets would typically be checked at short intervals and it is believed that virtually all by-catch would be released alive. Because potential for capturing Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) in the Altamaha River is likely, the following discussion is highlighted below.

- Atlantic sturgeon: Atlantic sturgeon is considered a "species of concern" and co-occurs in the Altamaha River study area with shortnose sturgeon; thus, there is the potential for Atlantic sturgeon to be caught during research activities. NMFS and USFWS received a petition to list the Atlantic sturgeon as endangered, which was reviewed in 1998. The endangered status was denied but the species remained as a 'species of concern'. However, since issuance of the original permit in 2006, another status review for the Atlantic sturgeon has begun and is currently ongoing. NMFS considered that should there be a subsequent listing of Atlantic sturgeon which coincides with the proposed research activities, the effects of Dr. Peterson's research on Atlantic sturgeon would be analyzed at that time. Appropriately, the researchers would monitor their nets closely, and if an Atlantic sturgeon is captured prior to listing, measures would be taken to ensure its survival (See Section 4.5.8 of this EA).

3.3.2.3: *Aquatic Nuisance Species*

The U.S. Geological Survey has documented several aquatic nuisance species (USGS 2009) occurring in the lower watersheds of the Altamaha River including: Greenhouse Frog (*Eleutherodactylus planirostris*); Australian tubeworm; (*Ficopomatus enigmaticus*); Asian clam (*Corbicula fluminea*); Charru mussel (*Mytella charruana*); Green mussel (*Perna viridis*); Island applesnail (*Pomacea insularum*); Indo-Pacific crab (*Charybdis hellerii*); Grass carp (*Ctenopharyngodon idella*); Threadfin shad (*Dorosoma petenense*); Flathead catfish (*Pylodictis olivaris*); Alligatorweed (*Alternanthera philoxeroides*); Giant salvinia (S*alvinia molesta*); Water hyacinth (*Eichhornia crassipes*); and Hydrilla (*Hydrilla verticillata*). Because the proposed research activities have the potential to spread such aquatic nuisance species to other watersheds, mitigations measures proposed by NMFS, outlined in Section 4.5.9 of this EA, were agreed to by the researcher to be implemented as standard research protocol.

For further information on the affected biological environment, please refer to the Biological Opinion (signed October 2009) written for this proposed action.

CHAPTER 4: 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).

4.1 EFFECTS OF ALTERNATIVE 1: NO ACTION

An alternative to the proposed action is no action, i.e., denial of the permit request. This alternative would eliminate any potential risk to all aspects of the environment from the proposed research activities. However, it would also prohibit researchers from gathering information that could help endangered and protected shortnose sturgeon.

4.2 EFFECTS OF PROPOSED ALTERNATIVE 2: ISSUANCE OF PERMIT WITH STANDARD CONDITIONS

Any impacts of the proposed action would be limited primarily to the biological environment, specifically the animals that would be studied or affected by the research. The type of action proposed in the permit request would minimally affect the physical environment and would be unlikely to affect the socioeconomic environment or pose a risk to public health and safety.

4.2.1 *Effects of Capture*

The applicant proposes to use gill nets and trammel nets to capture shortnose sturgeon. Entanglement in nets could result in injury and mortality, reduced fecundity, and delayed or aborted spawning migrations of sturgeon (Moser and Ross 1995, Collins *et al.* 2000, Moser *et al.* 2000). However records from NMFS annual reports, indicate the majority of shortnose sturgeon mortality during scientific investigations has been directly related to netting mortality (Table 3).

Table 3: Number and percentage of shortnose sturgeon killed by gill nets or trammel nets associated with existing scientific research permits.

	Permit Number					
	1051	1174	1189	1226	1239	1247
Time Interval	1997, 1999 – 2004	1999 – 2004	1999, 2001 – 2004	2003 – 2004	2000 – 2004	1988 – 2004
No. sturgeon captured	126	3262	113	134	1206	1068
No. sturgeon died in gill nets	1	7	0	0	5	13
Percentage	0.79	0.22	0	0	0.41	1.22

Mortality rates due to the netting activities ranged from 0 to 1.22% prior to 2004. Of the total 5,911 shortnose sturgeon captured by gill nets or trammel nets, 23 died, yielding an average incidental mortality rate of 0.39%. Under Permit Number 1247, about 4 to 7% of the shortnose sturgeon captured died in gillnets prior to 1999, although between 1999 and 2005, none of the more than 600 shortnose sturgeon that were gillnetted died as a result of their capture. Under Permit Number 1174, all seven of the reported shortnose sturgeon mortalities occurred during one sampling event. Moser and Ross (1995) reported gill net mortalities approached 25% when water temperatures exceeded 28ºC even though soak times were often less than 4 hours. The primary causes of mortality identified during a review of all permits issued prior to 2005 were due to high water temperature, low D.O. concentration, and extended net set duration.

In 2005, NMFS began analyzing the results of previous research and modifying permit conditions to reduce the chances of stress and mortality to shortnose sturgeon during capture. Since that time, as indicated in Table 4 below, there have been no mortalities caused during their capture.

Table 4: Number of shortnose sturgeon killed during capture under existing scientific research permits

Permit Number	Shortnose sturgeon captured	Shortnose sturgeon mortalities
1420 (2005-2007)	706	0
1447 (2006-2008)	42	0
1449 (2007-2008)	50	0
1486 (2006)	54	0
1505 (2006-2008)	100	0
1516 (2007-2008)	74	0
1547 (2006-2007)	85	0
1549 (2006-2007)	140	0
1575 (2007)	10	0
1580 (2007)	46	0
1595 (2007-2008)	284	0
10037 (2007)	114	0
Totals	1705	0

As stated, all researchers have eliminated reported mortality since 2005 including the applicant conducting shortnose sturgeon research under Permit Numbers 1420, 1489, 10037, and 10115. The low mortality rates reported is due to mitigation measures implemented by the researchers such as reduced soak times during high temperatures and suspending research when DO concentrations are below 5ppm.

To limit stress and mortality of sturgeon due to capture efforts, Dr. Peterson proposes even less stressful netting conditions than is currently recommended by the NMFS protocol. He proposes to limit the soak times of trammel and gill nets to 1 hour or less at water temperatures up to 25 °C and soak times would be reduced to no more than 30 minutes when water temps exceed 25°C. Dissolved oxygen would also be measured prior to each net set to ensure at least minimal D.O. concentration is maintained. Also, to minimize injury, heavy multifilament nylon (size 208-233) mesh would be used instead of monofilament or light twine, which is more apt to cut into the fish causing injury. Due to the low ventilation rate and open operculum, the use of trammel nets is encouraged, as they allow the fish to become entangled rather than gilled. However, trammel nets would not be required as a permit condition because the risk from use of gill nets is considered very low.

While it is possible that interaction with the capture methods described above could result in fewer adults reaching spawning grounds, by capturing and tagging pre-spawning fish in the fall and early winter, as proposed by the applicant, NMFS anticipates spawning runs of shortnose sturgeon would not be interrupted and the research action would not result in a reduction of spawning adults.

4.2.2 *Effects of General Handling* (*e.g., holding, measuring, weighing*)

Sturgeon are a hardy species, but are sensitive to handling stress when water temperatures are high or D.O. is low. Additionally, sturgeon tend to inflate their swim bladder when stressed and when handled in air (Moser *et al.* 2000). If they are not returned to neutral buoyancy prior to release, they 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).

To minimize capture and handling stress, Dr. Peterson plans to hold shortnose sturgeon in net pens until they are processed, at which time they would be transferred to a processing station on board the research vessel. During processing, each fish would be immersed in a continuous stream of water supplied by a pump/hose assembly mounted to over the side of the research vessel. For most procedures planned, the total time required to complete routine handling and tagging would be no more than 15 minutes. Moreover, following processing, fish would be returned to the net pen for observation to ensure full recovery prior to release. Total holding time would be no longer than one hour from the time of capture until release.

Although sturgeon are sensitive to handling stress, the proposed methods of handling fish described in the application are 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.

4.2.3 *Effects of PIT Tag*

The applicant proposes to insert PIT tags under the hollow of the 4th dorsal scute in all fish over 250 mm to ensure unique identification upon capture or recapture for population and growth estimates. This method of PIT tagging varies from NMFS's previously analyzed intramuscular injection of PIT tags proximate and anterior to the base of the dorsal fin. Because effects of this alternate technique have not yet been analyzed, the researcher would be required to conduct a tag retention study over the life of the permit.

Tagging procedures would mainly cause some stress during restraint and minor scrapes from attachment under the scute. The attachment and retention of PIT tags using this method is not known to have any other direct or indirect effects on shortnose sturgeon. Although NMFS considers it is unlikely to have significant impact shortnose sturgeon tagged in this manner, to address concerns of tagging smaller sturgeon between 250 and 330 mm, researchers would not use PIT larger than 11.5 mm in sturgeon less than 330 mm TL and no fish smaller than 250 mm TL would receive a PIT tag.

4.2.4 *Effects of Genetic Tissue Sample*

The applicant proposes to take a small (1 to 2 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). To ensure timely transfer of genetic tissues to the NOAA archive in Charleston, South Carolina, NMFS will require tissue samples be submitted in a timely manner no sooner than six months and not later than one year after collection.

4.2.5 *Effects of Fin-ray Section*

The researcher proposes to section-notch (~1cm^2) the leading pectoral fin ray on up to 50 shortnose sturgeon captured for age-determination annually; however, no more than 150 total would be authorized over the five year permitting period.

Kohlhorst (1979) first reported potentially deleterious effects, including mortality, associated with fin spine removal from white sturgeon during a mark recapture study. However, the mortality noted could have been influenced by small sample size; nevertheless, this concern triggered additional research in the laboratory by Collins (1995) and Collins and Smith (1996). Using methods removing the entire spine from the base, these researchers found that wounds healed quickly and the pectoral fin rays behind the leading spine "bulked up" growing in circumference and later appeared similar to the original fin spine. Further, there were no significant differences in growth or survival between treatment and control sturgeon. In other laboratory studies testing fin spine function, Wilga and Lauder (1999) concluded that pectoral fins are used to orient the body during rising or sinking, but are not used during locomotion. Following this study, Parsons *et al.* (2003) removed pectoral fin spines from shovelnose sturgeon and placed them in tanks to test sturgeons' ability to hold position in currents. Without fin spines, sturgeon were able to hold their positions in a current as well as controls.

More recently, while conducting mark and recapture surveys of Atlantic and shortnose sturgeon, Collins *et al.* (2008) discovered that some secondary fin spines on larger mature sturgeon had enlarged abnormally when the sturgeon were recaptured. It was thought this growth could potentially be detrimental to the affected sturgeons' health when removing the entire fin ray. At this point, their team decided to no longer remove entire fin spines from adult sturgeon, reasoning that this condition was related to slower growth in larger adult fish.

The researcher (D. Peterson, pers. comm. April 21, 2009) reported his method of notching the fin-rays has had no deleterious effects on re-sampled sturgeon examined. Photographic evidence submitted to NMFS by the researcher (D. Peterson, pers. comm., June 12, 2009) showed no obvious signs of unhealed lesions on fish. In 2004, Dr. Peterson's research team developed a population estimate for shortnose sturgeon in the Altamaha River using Program MARK and age structure described from a catch curve constructed from age estimates derived from pectoral fin rays. The study results indicated a population size of 6,320 (95% C.I. 4387-9249) with ages of captured shortnose ranging from 2 to 14 years, supported by several strong juvenile year-classes.

Despite some difficulties documented in age validation of sturgeon (especially for older mature fish) (Rien and Beamesderfer 1994, Paragamian and Beamesderfer 2003, Hurley et al. 2004, Whiteman et al. 2004), NMFS considers age determination using marginal fin rays, a viable, non-lethal means to obtain necessary information on growth, recruitment, and mortality of shortnose sturgeon when generating population estimates, and is also valuable when detecting a shift or bottle-neck in recruitment. This procedure would be expected to cause short-term discomfort to individuals, but it is not expected to have a significant impact on the survivability or the normal behavior of individuals.

To minimize adverse effects, the samples would be collected using sterilized surgical instruments to remove the 1 cm sections of pectoral fin rays while fish are under anesthesia. Additionally, no other research method requiring anesthesia (e.g., laparoscopy, gastric lavage, or sonic tag implanting) would be conducted on the same fish selected for fin-ray sectioning. Finally, each researcher authorized to conduct fin-ray sectioning would be required to have had adequate training in the procedure.

4.2.6 *Effects of Gastric Lavage*

The researcher proposes to use gastric lavage to sample diets from up to 50 shortnose sturgeon annually (not exceeding 150 total during the project). The proposed methods were adopted from those described by Collins *et al.* 2008, Foster (1977), Haley (1998), Moser *et al*. (2000), and Murie and Parkyn (2000), and Savoy (2003).

Due to the "J-shaped" morphology of the gut and insertion point of the swim bladder within the alimentary canal of sturgeon, the gastric tube must be properly seated prior to collecting stomach contents. If done incorrectly, potential injury could result to sturgeon including various forms of abrasion of the gut wall by the gastric tube, trauma caused by prematurely injecting water into the air bladder, and potential negative growth responses of sturgeon (going off-feed) after gastric lavage.

To minimize adverse effects of gastric lavage, the applicant proposes to first anesthetize sturgeon with MS-222 to allow easier penetration and proper positioning of the gastric tube. To avoid abrasion and bleeding, care would be taken inserting and positioning the lavage tube within the gut. Accordingly, a soft pliable tubing of a prescribed outside diameter and material would be used (See Section 2.2.2.6). Further, to verify the proper seating of the tube within the stomach, researchers would first detect the tubing from the ventral surface of the fish before attempting lavage. To further minimize adverse effects, no other research method requiring anesthesia (e.g., fin ray sectioning, laparoscopy, or sonic tag implanting) would be conducted on the same fish selected for lavage. Finally, each researcher authorized to conduct lavage would be required to have had adequate training in the procedure.

Savoy (2003) reported results using similar methods of gastric lavage on 246 shortnose sturgeon collected in the Connecticut River between 2000 and 2003. All fish tolerated the procedure well and recovered without stress. Similarly, Collins *et al.* (2008) reported capturing and lavaging 256 Atlantic and 47 shortnose sturgeon from the Edisto and Savannah Rivers. All fish recovered rapidly and were released unharmed after the procedure. The lavage technique was successful in evacuating stomach contents effectively of both Atlantic and shortnose sturgeon of all sizes without internal injury. Recaptured sturgeon (lavaged an average of 76 days between recapture), experienced typical interim weight gains indicating that the procedure did not negatively influence sturgeon growth. Furthermore, Collins *et al.* (2008) also demonstrated no damage to internal linings of stomachs of three sacrificed Atlantic sturgeon.

Several team members assisting the research have already reported the required training using the methods for gastric lavage at workshops sponsored by the American Fisheries Society in 2008, or at training sessions held at the University of Georgia using non-listed sturgeon. Based on research results reported for gastric lavage, it is believed that sturgeon undergoing gastric lavage as proposed, would experience handling discomfort, but would be exposed to only minimal short-term risks associated with the procedure.

4.2.7 *Effects of Anesthesia*

The researcher proposes to use tricaine methane sulphonate (MS-222) to anesthetize shortnose sturgeon. MS-222 is one of the most broadly used anesthetic and tranquilizing agents for poikilotherms and is recommended by Moser *et al.* (2000). MS-222 is rapidly absorbed through the gills. Its mode of action prevents the generation and conduction of nerve impulses and directly affects the central nervous system, cardiovascular system, neuromuscular junctions, and ganglion synapses. The risk associated with using MS-222 to anesthetize sturgeon is overdosing to lethal or harmful levels. Lower doses tranquilize and sedate fish while higher doses fully anesthetize them (Taylor and Roberts 1999).

The researcher proposes to anesthetize sturgeon with MS-222 at concentrations up to 100 mg/L to prevent captured sturgeon from thrashing and injuring themselves. Because MS-222 is acidic and poorly absorbed, resulting in a prolonged induction time, Sodium bicarbonate ($NaHCO3$) would be used to buffer the water to a neutral pH. At the proposed rate, induction time would be approximately three to five minutes and complete recovery times would range from five to six minutes (Brown 1988). MS-222 would be excreted in fish urine within 24 hours and tissue levels would decline to near zero in the same amount of time (Coyle *et al.* 2004). All fish would be allowed to recover in boat-side nets prior to release. It is believed that sturgeon anesthetized in this manner would not be at risk, and long term effects to the fish and environment would be minimal.

4.2.8 *Effects of Laparoscopy*

The researcher intends to use laparoscopy to determine the general morphological health and to visually identify the sex of up to 10 fish annually and no more than 30 fish during the five year permit. Laparoscopy is a modified minimally invasive procedure refined for sturgeon research. This procedure has been used in fish extensively (Murray, et. al., 1998; Moccia et. al., 1984; Ortenberger *et. al.*, 1996; Stoskopf, 1993) and has been advanced for sturgeon by Warm Springs Regional Fisheries Center (Hernandez-Divers *et al*. 2004). During the procedure, lasting 1 to 3 minutes, Dr. Peterson proposes to make a 5 mm incision in the ventral body wall slightly off midline at a level midway between the pectoral girdle and the cloaca. A 5 mm trocar would then be inserted through the incision and a 5 mm rigid laparoscope would then be inserted through the trocar to allow visualization of the internal anatomy of the animal.

The procedures would increase the risk of complications associated with the added stress of the surgical procedures and the extended time under anesthesia. The small incision and insertion of the laparoscope has potential of mortality or producing sub-lethal effects. Because the sutures used to close the laparoscopy sites penetrate the body wall, they would also provide a route of possible infection. To combat this, the researcher would use as small an incision as possible, which would minimize the amount of suture necessary and decrease the healing time. Finally, suture ties would be kept as short as possible and povidone iodine ointment would be applied to the sutures prior to recovering the animal from anesthesia. This treatment would help prevent fungal growth on the sutures potentially infecting the animal prior to healing of the incision wounds.

To minimize stress, all of the project staff responsible for performing the laparoscopy have received extensive training by veterinarian staff at the Warm Springs National Fish Health Center and have routinely performed similar procedures on shortnose sturgeon without complication in other NMFS permitted activity (Permit 1420). To further minimize adverse effects, no other research method requiring anesthesia, with exception of telemetry tag implantion (e.g., fin ray sampling, or gastric lavage), would be conducted on the same fish selected for laparoscopy.

4.2.9 *Effects of Transmitter Implantation*

In each year of the study, the applicant proposes to collect 10 adult sturgeon to implant internal sonic transmitters using the protocol presented in Moser *et al.* (2000). Although more invasive surgical procedures are required for internal implantation, these tags provide greater retention rates than external attachment.

Dr. Collins of the South Carolina DNR (M. Collins, *pers. comm.,* September 9, 2009) reported no mortality due to surgical implantation of internal transmitters in his shortnose sturgeon research. Additionally, Kieffer and Kynard (*In press*) report that tag rejection internally is reduced by coating tags with an inert elastomer and by anchoring tags to the body wall with internal sutures. Fish retained tags for their operational life, and in most cases, lasted much longer (mean, 1,370.7 days). Devries (2006) reported movements of 8 male and 4 female (≥ 768 mm TL) shortnose sturgeon internally radio-tagged between November 14, 2004 and January 14, 2005 in the Altamaha River. Eleven of these fish were relocated a total 115 times. Nine of these fish were tracked until the end of 2005. The remaining individuals were censored after movement was not detected, or they were not relocated, after a period of 4 months. Periodic checks for an additional 2 months also showed no movement. Although there were no known mortalities directly attributable to the implantation procedure; the status of the 3 unrelocated individuals was unknown (Devries 2006).

To minimize the effects caused by internally implanting transmitter tags, the researcher proposes to use standardized protocols endorsed by NMFS (Moser *et al*. 2000). Moreover, with the surgical experience he has gained in the past five years on the Altamaha and Ogeechee Rivers in Georgia; the researcher does not anticipate mortality from the procedure. To ensure the sturgeon can endure the weight of these tags, a condition would be imposed stating that the total weight of all transmitters and tags would not exceed 2% of the fish's body weight. Because transmitter tags are often useful in research to track pre-spawning or late-stage females to target spawning behavior, Dr. Peterson would implant these tags in fish only during the late fall and early winter to lessen abnormal behavior. Additionally, he proposes to document the adaptation to these tags by individually monitoring how fish fare with implanted transmitters by tracking their swimming behavior and recording their growth and apparent health of recaptured animals. Finally, to minimize adverse effects, no other research method requiring anesthesia, with exception of laparoscopy (e.g., fin ray sampling, or gastric lavage), would be conducted on the same fish selected for implanting telemetry sonic tags.

In general, adverse effects of these proposed tagging procedures 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, by using proper anesthesia, sterilized conditions, and proper surgical techniques described previously, these procedures would not be expected to have a significant impact on the normal behavior, reproduction, numbers, distribution or survival of shortnose sturgeon.

4.2.10 *Effects of Lethal Take of Eggs/Larvae* (*egg mats*)

Dr. Peterson proposes to document spawning activity by collecting up to 20 shortnose sturgeon early life stages (ELS) using artificial substrates positioned downstream of suspected spawning areas. The artificial substrates used to collect ELS are low anchored pads that passively collect eggs or larvae adrift in the water during spawning activity. Drifting or dislodged embryos would settle on the pads, be identified, and preserved. Should there be an excess of the authorized take, they would immediately be returned to the river. Due to their relatively small size, these pads would not disrupt the flow water flow or habitat.

Each adult female sturgeon produces between 94,000 and 200,000 eggs every 3 years (COSEWIC 2005). The survival from egg to juvenile is likely the most critical aspect in determining the strength of the year class (COSEWIC 2005). However, as the annual proposed take of 20 eggs or larvae is small compared to the potential total release of eggs, such take would be considered to have minimal impact on the shortnose sturgeon population of the river.

4.2.11 *Effects of Incidental Mortality* (*or Serious Harm*)

The permit would authorize research related mortality (or serious harm) to shortnose sturgeon over the five-year permitting period. Although the researcher has maintained a record of low verifiable mortality in other authorized research, he anticipates at least one mortality from his newly proposed research (capture, anesthesia, implanting telemetry devices, gastric lavage, and laparoscopic procedures) objectives over the five year term.

The Altamaha River population of shortnose sturgeon is one of the larger and healthier stocks within its range. The most recent shortnose sturgeon population estimate on the Altamaha River was completed by Devries (2006) estimating the population at 6,320. The anticipated impact of one sturgeon mortality (or serious harm) on the population, therefore, would be small based on the 2006 abundance estimate, or 0.016%

4.2.12 *Summary of Proposed Research Efforts*

It is possible that interactions with the proposed capture methods and other proposed research activities could result in some infrequent mortality and fewer adults reaching spawning grounds and a greater overall reduction in recruitment potential. Although there are few alternatives to document indirect effects associated with the proposed research activities, the applicant has not noted long-term altered movement of adult or juvenile shortnose sturgeon tracked with radio transponders in over ten years of previous research. Moreover, the permit would contain conditions summarized in Section 4.5 of this EA to mitigate adverse impacts to sturgeon. Additionally, the applicant would be required to exercise care when handling animals to minimize any possible injury. The potential for incidental mortality of 1 animal during the five years of research would not be considered detrimental to the overall population. Based on current population estimates in the Altamaha River by Devries (2006) (~6,320), this would represent about 0.016% of the total population.

4.3 SUMMARY OF COMPLIANCE WITH APPLICABLE LAWS, NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

4.3.1 *Compliance with Endangered Species Act* (*ESA*)

To comply with Section 7 of the regulations (50 CFR 402.14(c)), a Section 7 consultation was initiated by the NMFS, OPR under the ESA. In accordance with Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq*.), a Biological Opinion was prepared for this proposed action concluding that, after reviewing the current status of shortnose sturgeon, the environmental baseline for the action areas, the effects of the take authorized in the permits, and probable cumulative effects, that it is NMFS' biological opinion that issuance of the proposed permit would not likely jeopardize the continued existence of shortnose sturgeon or any other NMFS ESA-listed species, nor would it likely destroy or adversely modify designated critical habitat.

Additionally, biologist Nicole Adimey (USFWS, ES Office, Jacksonville, FL) was contacted by email regarding the potential impacts of the proposed activity on the endangered Florida manatee, and/or its habitat. Ms. Adimey agreed (by email dated May 06, 2009) with NMFS's initial finding that Dr. Peterson's research would not likely adversely affect this species. The USFWS, however, asked that precautionary measures be implemented to ensure that interactions were avoided. Accordingly, the permit would contain conditions, included in Section 4.5.7 of this EA, designed to prevent interactions with endangered Florida manatees.

4.4 COMPARISON OF ALTERNATIVES

While the "no action" alternative would have no environmental effects, the opportunity to conduct this particular research would be lost. Initiation of this research is important to collect information that would contribute to better understanding of shortnose sturgeon and to provide information to NMFS that would be needed to implement NMFS management activities if shortnose sturgeon are present in this river system. This is important information that would help conserve and manage shortnose sturgeon as required by the ESA and implementing regulations.

The preferred alternative affecting the environment would mainly be individual shortnose sturgeon. However, effects would be minimal and this alternative would allow collection of valuable information helping NMFS' efforts to recover shortnose sturgeon. Neither option is expected to have adverse population nor stock-level effects on shortnose sturgeon. Given the preferred option's minimal impact to the environment and the potential positive benefits of the research, NMFS believes the information gained would outweigh any likely negative affect to the target species.

4.5 MITIGATION MEASURES

4.5.1 *Netting, Holding, and Handling Conditions*

- The Permit Holder must take all necessary precautions to ensure sturgeon are not harmed during capture, including use of appropriate net mesh size and twine preventing shutting gill opercula, restricting gill netting activities and decreasing the time of net sets.

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

- After removal from capture gear, researchers must hold sturgeon in floating net pens or in onboard live cars while shielding them from direct sunlight.

- 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.

- Any sturgeon overly stressed from capture, must be resuscitated and/or allowed to recover inside a net pen and released without further handling.

- During lower water temperatures (<15^{O}C), soak times of gill nets must not exceed 10 hours; at water temperatures between 15^{O}C and 20^{O}C, net sets must not exceed 4 hours; at water temperatures between 20^{O}C and 25^{O}C, net sets must not exceed two hours; and at water temperatures above 25^{O}C, net sets must not exceed one hour. Netting activities must cease at 28^{O}C unless NMFS is consulted (See Table 2).

- Gear must be deployed only in waters with D.O. levels $\geq$ 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 (See Table 2).

- When fish are onboard for processing, they must be placed in an aerated flow-through holding tank (live well) allowing for total replacement of water volume every 10-15 minutes. Backup oxygenation of holding tanks with compressed oxygen is necessary to ensure sturgeon are not stressed onboard and D.O. levels remain above 5 mg/L.

- The total holding time of shortnose sturgeon, after removal from the capture gear, must not exceed two hours, unless the fish has not recovered from anesthesia.

- During processing, the total handling time (outside of net pen or live well) must not exceed 15 minutes.

- Fish must be handled with care and kept in water to the maximum extent possible during processing procedures.

- For weight measurements, sturgeon must be supported using a sling or net, and handling should be minimized throughout the procedure.

- Smooth rubber gloves must be worn to reduce abrasion of skin and removal of mucus.

- Shortnose sturgeon (and bycatch) must be allowed to recover in a floating net pen(s) for 10-15 minutes before they are released to ensure full recovery.

- Sturgeon must be treated with an electrolyte bath prior to release to help reduce stress and restore slime coat.

- Sturgeon are extremely sensitive to chlorine; therefore, thorough flushing of holding tanks sterilized with bleach would be required between sampling periods.

4.5.2 *Artificial Substrates*

- The total number of eggs and/or larvae collected annually by artificial substrates must not exceed 20. Any additional must be returned back to the river at the site of collection.

- Eggs or larvae collected by substrate may be preserved and transported back to the lab.

- Once a total of 20 eggs and/or larvae have been taken annually, artificial substrates must be removed from the river and sampling may not be resumed until the following year.

- All artificial substrates must be removed from the river upon completion of this project or by the expiration date of this permit (whichever comes first).

4.5.3 Tagging Conditions

- PIT tags must be used to individually identify all captured fish not previously tagged. Prior to placement of PIT tags, the entire dorsal surface of each fish must be scanned with a waterproof PIT tag reader and visually inspected to ensure detection of fish tagged in other studies. Previously PIT-tagged fish must not be retagged.

- PIT tags may be inserted under the 4th dorsal scute; however, NMFS requires a study conducted on PIT tag retention using this procedure.

- Researchers must not use PIT tags larger than 11.5 mm x 2.1 mm on shortnose sturgeon less than 330 mm in length; and no sturgeon less than 250 mm (10 in TL) should be PIT tagged or have other surgical procedures performed without first consulting NMFS.

- Surgical implantation of sonic tags must not occur when water temperatures are greater than 27^{o} C or less than 7^{o} C, nor should they be implanted in pre-spawning in the spring.

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

- No other research method requiring anesthesia, with exception of laparoscopy (i.e., fin ray sampling, gastric lavage), may be conducted on the same fish selected for sonic tag implantation.

4.5.4 *Tissue Sampling*

- Collection and archival of genetic samples (barbel clip/fin clip) must be coordinated with Julie Carter at the NOAA-NOS tissue archive (843)762-8547.

- Genetic tissue samples submitted by the researcher to the NOAA-NOS archive may only be used by other researchers with signed permission from both the researcher and NOAA.

- The researcher must submit genetic tissue samples to the NOAA-NOS tissue archive between six months and one year after collection; but the researcher may also be required to submit samples sooner than one year if requested by NOAA for recovery planning.

- Extreme care must be used when collecting genetic samples and fin ray samples. Instruments should be changed or disinfected and gloves changed between each fish sampled to avoid possible disease transmission or cross contamination of genetic material.

- No other research method requiring anesthesia (i.e., laparoscopy, sonic tag implantation or gastric lavage), may be conducted on the same fish selected for fin-ray sectioning.

- The terms and conditions concerning samples collected under this authorization will remain in effect as long as the material taken is maintained under the authority and responsibility of the Permit Holder.

- The Permit Holder may not transfer biological samples to anyone not listed in the application without obtaining prior written approval from NMFS. Any such transfer will be subject to such conditions as NMFS deems appropriate.

- Careful and detailed records should be kept on the time of recovery and other responses from anesthesia, handling, tissue sampling, spine removal, as well the condition and health and tag retention of any recaptured shortnose sturgeon. This information must be reported to NMFS in annual reports.

4.5.5 *Anesthesia*

- Researchers performing anesthesia on shortnose sturgeon must first receive supervised training on shortnose sturgeon or another surrogate species. The Responsible Party or PI must report this training to NMFS prior to the activity.

- Researchers may use MS-222 for anesthetizing shortnose sturgeon using concentrations up to 150 mg/L, but such solutions should be made fresh daily.

- When using MS-222 to anesthetize shortnose sturgeon, researchers must saturate the solution with oxygen and buffer it to a neutral pH with sodium bicarbonate.

- To avoid injury to anesthetized sturgeon, researchers must use restraint in containers preventing the animals from jumping or falling out.

- When sturgeon are anesthetized, researchers must observe fish at all times to establish the proper level of anesthesia has been reached.

- During procedures requiring anesthetization, researchers must irrigate the gills of sturgeon with ample oxygenated water flow to ensure respiration.

- Researchers must observe shortnose sturgeon during anesthetic recovery in boat-side net pens prior to their release to their environment.

- All researchers are required to wear protective clothing, gloves, and goggles when handling MS-222 powder.

- Unused MS-222 solutions must be disposed of using state adopted procedures.

4.5.6 *Gastric Lavage*

- Researchers performing gastric lavage on shortnose sturgeon must first receive supervised training on shortnose sturgeon or another surrogate sturgeon species. The PI must document training to NMFS prior to the activity.

- To avoid injury to shortnose sturgeon, researchers must take precaution when passing lavage tubes in position through the alimentary canal and into the fish's stomach.

- Prior to gastric lavage, researchers must anesthetize sturgeon with MS-222 to relax alimentary canal and provide ease of penetration by the tubing to proper positioning in the gut.

- Researchers may carry out gastric lavage on shortnose sturgeon between 250 mm and 350 mm (FL) using flexible tubing up to 1.90 mm outside diameter (O.D.); sturgeon between 350 mm and 1250 mm, may be lavaged with tubing up to 4.06 mm O.D; and sturgeon above 1250 mm may be lavaged with flexible tubing up to 10.15 mm O.D.

- No other research method requiring anesthesia, (i.e., fin ray sampling, laparoscopy or sonic tag implantation), may be conducted on the same fish selected for gastric lavage.

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

4.5.7.1: *<u>Methods provided to avoid capture of Florida manatee</u>*

- Vessel personnel must be informed that it is illegal to harm, harass, or otherwise take manatees, and to obey posted manatee protection speed zones, 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.

- 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.

- 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.

- Rope attaching floats to nets should not have kinks or contain slack to entangle manatee.

- 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 the net, and may resume only when the animal is no longer within this safety zone, or 30 minutes has elapsed since the manatee was last observed within the safety zone.

4.5.7.2: *Methods provided to avoid injury of manatee if accidentally captured*

- 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 will 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.

- As appropriate, turn off the vessel or put engine in neutral to avoid injury.

- Release tension on the net to allow the animal the opportunity to free itself. Exercise caution when attempting to assist the animal in freeing itself. Manatees are docile animals but can thrash violently if captured or become entangled in a net. 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.

- Report any gear or vessel interactions with manatees and immediately contact Nicole Adimey of the U.S. Fish and Wildlife Service at 904-731-3079 (direct), fax 904.731.3045, and 904-655-0730 (cell); OR contact the Georgia Department of Natural Resources, Wildlife Resources Division, Non-game & Endangered Wildlife Program, 912-269-7587 (Clay George) and NMFS, Chief, Permits, Conservation and Education Division at 301-713-2289 as soon as possible. Interactions with Manatee 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 (Appendix B).

4.5.8 *Atlantic Sturgeon*

- If an Atlantic sturgeon is incidentally captured, NMFS requests that it be PIT tagged, genetically sampled, and released.

- The Permit Holder should report any Atlantic sturgeon interactions to Kim Damon-Randall, NMFS PR at 978-281-9300 x 6535; (Kimberly.Damon-Randall@noaa.gov). This report should contain: the description of the take, location, and final disposition of the sturgeon (*i.e.*, released in good health, *etc*.).

- The permit holder is requested to collect and document any lethal takes of Atlantic sturgeon by completing the sturgeon salvage form which would be appended to any permit issued. Any specimens or body parts should be preserved (preferably on ice or refrigeration) until sampling and disposal procedures are discussed with NMFS.

4.5.9 *Aquatic Nuisance Species*:

- To prevent potential spread of aquatic nuisance species identified in the watershed, all equipment assigned to the research shall 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 must be bleached, washed and air dried before being redeployed to another location.

In addition, this permit would be conditioned such that if the authorized level of take were exceeded, or if circumstances indicate that such an event were imminent, the research would immediately cease and the Permit Holder would notify the NMFS Office of Protected Resources, Permits, Conservation and Education Division by phone as soon as possible, but no later than two days following the event. The Permit Holder would then submit a written report to the above contact describing the circumstances of the event. The Permit Holder would re-evaluate the techniques used and revise techniques accordingly to prevent further injury or death. Pending review, NMFS may suspend research activities or amend the permit to allow research activities to continue. Additional mitigation measures may be conditioned in the permit and also monitored and enforced.

4.6 UNAVOIDABLE ADVERSE EFFECTS

The research activities would cause unavoidable disturbance, stress, and injury to the captured shortnose sturgeon and other non-target species (temporarily interrupting normal activities such as feeding). The proposed research could also have some incidental lethal effects on some individuals based on planned invasive surgery and risk from capture, the effect on the animals and the removal of a limited number of eggs/larvae is not expected to have an adverse or long-term effect on target or non-target individuals or populations.

The measures required by permit conditions are intended to reduce, to the maximum extent practical, the potential for adverse effects of the research on all species. However, because the research involves wild animals not accustomed to being captured, the research activities would unavoidably result in harassment.

4.7 CUMULATIVE EFFECTS

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 incremental impacts of a proposed action which when added to 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 sturgeon range-wide, these effects include: research, artificial propagation, dams, dredging, blasting, bycatch, poaching, water quality and contaminants.

4.7.1 *Other Shortnose Sturgeon Research Permits*

Shortnose sturgeon have been the focus of field studies since the 1970's. The primary purposes of studies are for monitoring populations and gathering data for physiological, behavioral and ecological studies. Over time, NMFS has issued dozens of permits for takes of shortnose sturgeon within its range for a variety of activities, examples of which include, capture, handling, lavage, laparoscopy, attachment of scientific instruments, and release. Research on shortnose sturgeon in the U.S. is carefully controlled and managed so that it does not operate to the disadvantage of the species. As such, all scientific research permits are also conditioned with mitigation measures to ensure that the research impacts target and non-target species as minimally as possible.

Range wide, there are currently 17 scientific research permits targeting shortnose sturgeon having similar objectives as the proposed study in the Altamaha River (Appendix C). Current shortnose sturgeon research in the state of Georgia is ongoing in the Altamaha River (Permit 1420-01), in the Ogeechee River (Permit 10037), and in the Satilla and St. Marys River (Permit 10115). The Altamaha River system contains a healthy, expanding population of shortnose sturgeon (DeVries 2006), and has been documented to contribute significantly to other shortnose sturgeon populations in the Southeast (T. King, *pers. comm.* May 2009).

A Biological Opinion was issued for each of the permits below, including the requirement for consideration of cumulative effects to the species (as defined for ESA). For each permit, the Biological Opinion concluded that issuance, as proposed, was not likely to jeopardize the continued existence of the shortnose sturgeon, either individually or cumulatively.

4.7.2 *Artificial Propagation*

There are currently two companies producing shortnose sturgeon in Canada. Both are located on the Saint John River and one is currently operating at a commercial scale. In the United States, the USFWS has been raising shortnose sturgeon (NMFS Permit No. 1604) for approximately 22 years. Until recently Bears Bluff National Fish Hatchery on Wadmalaw Island in South Carolina raised the bulk of these fish while some fish were also reared at the USFWS' Warm Springs, GA and Orangeburg, SC hatcheries. Propagation of shortnose sturgeon at the Bears Bluff facility ended in the spring of 2008 but a subset of the broodstock and offspring are still maintained at the Warm Springs and Orangeburg National Fish Hatcheries.

Staff at Bears Bluff raised the progeny of wild fish inhabiting the Savannah River which have served as broodstock for generations of hatchery bred and raised shortnose sturgeon. These fish were a valuable means of gathering valuable information about shortnose sturgeon recovery. They supported a wide array of research projects that would not have otherwise been possible because of the endangered status of shortnose sturgeon. Additionally, siblings of the original broodfish were used to the stock the Savannah River from 1985–1992 (Smith *et al*. 2002).

Captive shortnose sturgeon are also maintained by the USGS at the Conte Anadromous Fish Research Center (Permit No. 1549) located on the Connecticut River. These stocks are held in quarantine and are primarily used as test animals for upstream and downstream fish passage studies, but some progeny are also made available to other research facilities and educational display aquaria when requested. The F-1 progeny are produced periodically using wild native fish from the Connecticut River in a "living stream" natural spawning environment; however, hatchery protocol is not a research objective at the facility.

Since there are aquaculture facilities currently raising captive shortnose sturgeon on watersheds of native shortnose sturgeon, there is a potential for escapement. Potential threats from aquaculture escapement include the genetic alterations to native populations and potential competition for space and resources between hatchery-reared and wild fish. Further, since most sturgeon diseases have been documented in captive-reared fish, there is also the chance that escapees could spread pathogens and disease. To date, there have been no reports of escapees from the two facilities in Canada or from the USFWS facilities in South Carolina and Georgia. However, on the Connecticut River six fish artificially spawned from adults captured at Holyoke were released with radio tags upstream of the Holyoke Dam in 1989 and 1990 and they were subsequently never recovered. Additionally, several juveniles were accidentally released in 2006 and unrecovered.

4.7.3 *Dams*

Dams are used to impound water for water resource projects such as hydropower generation, irrigation, navigation, flood control, industrial and municipal water supply, and recreation. Dams can have profound effects on diadromous fish species by fragmenting populations, eliminating or impeding access to historic habitat, modifying free-flowing rivers to reservoirs and altering downstream flows and water temperatures. Direct physical damage and mortality can occur to diadromous fish that migrate through the turbines of traditional hydropower facilities or as they attempt to move upstream using fish passage devices.

In addition to dams impeding anadromous fish migration and associated mortalities, Hill (1996) identified the following potential impacts from hydropower plants: altered DO concentrations; artificial destratification; water withdrawal; changed sediment load and channel morphology; accelerated eutrophication and change in nutrient cycling; and contamination of water and sediment. Furthermore, activities associated with dam maintenance, such as dredging and minor excavations along the shore, can release silt and other fine river sediments that can be deposited in nearby spawning habitat. Dams can also reduce habitat diversity by forming a series of homogeneous reservoirs; these changes generally favor different predators, competitors and prey, than were historically present in the system (Auer 1996a).

The effects of dams on populations of shortnose sturgeon are generally well documented (Kynard 1998, Cooke *et al.* 2004). However, there may be some rivers where shortnose sturgeon have been extirpated almost without notice due to the construction of impassable dams. In these rivers historical presence of shortnose sturgeon was likely but unknown; there are historical accounts of sturgeon but it is unclear if both Atlantic and shortnose sturgeon used the river and if the river supported spawning of either species. For example, the Susquehanna River is the second largest river on the east coast of the U.S. and there are historical and anecdotal accounts of plentiful “sturgeon” upriver. Currently the Susquehanna has four mainstem dams, the lowermost of which is at approximately rkm 16. The dam has a fish lift but it is not used by shortnose sturgeon. If the Susquehanna River once supported a population of shortnose sturgeon, it is no longer available to them.

Perhaps the biggest impact dams have on shortnose sturgeon is the loss of upriver spawning and rearing habitat. Migrations of shortnose sturgeon in rivers without barriers are wide-ranging with total distances exceeding 200 km or more depending on the river system (Kynard 1997). The construction of dams has blocked upriver passage for the majority of the shortnose sturgeon populations. Dams have restricted spawning activities to areas below the impoundment, often in close proximity to the dam (Kynard 1997, Cooke *et al.* 2004). The suitability of riverine habitat for shortnose sturgeon spawning and rearing depends on annual fluctuations in flow, which can be greatly altered or reduced by the presence and operation of dams (Cooke *et al*. 2004). Effects on spawning and rearing may be most dramatic in hydropower facilities that operate in peaking mode (Auer 1996a). Daily peaking operations store water above the dam when demand is low and release water for electricity generation when demand is high, creating substantial, daily fluctuations in flow and temperature regimes. Kieffer and Kynard (*in press*), have documented that flow fluctuations for hydroelectric power generation affected access to spawning habitat and possibly deterred spawning of shortnose sturgeon on the Connecticut River. Similar results were reported in studies conducted for lake sturgeon *A. fulvescens* in the Sturgeon River, Michigan (Auer 1996b) and white sturgeon *A. transmontanus* in the Columbia River, Oregon and Washington (Parsley and Beckman 1994). Kieffer and Kynard (in review), have also observed flow regimes from an upstream hydroelectric facility that were either so forceful that they scoured the shortnose sturgeon rearing shoals or so low that the shoals were dry and exposed. Auer (1996b) demonstrated that there is greater spawning success of lake sturgeon on the Sturgeon River, MI, when facilities operated in the more natural "run-of-the-river" mode.

4.7.4 *Dredging and Blasting*

4.7.4.1: <u>Dredging</u>

Many rivers and estuaries are periodically dredged for flood control or to support commercial shipping and recreational boating. Dredging also aids in construction of infrastructure and in marine mining. Dredging may have significant impacts on aquatic ecosystems including the direct removal/burial of organisms; turbidity/siltation effects; contaminant resuspension; noise/disturbance; alterations to hydrodynamic regime and physical habitat and actual loss of riparian habitat (Chytalo 1996, Winger *et al.* 2000).

Dredges are generally either mechanical or hydraulic. Mechanical dredges are used to scoop or grab bottom substrate and are capable of removing hard-packed materials and debris. Mechanical dredge types are clamshell buckets; endless bucket conveyor, or single backhoe or scoop bucket types; however, these dredge types often have difficulty retaining fine materials in the buckets and do not dredge continuously. Material excavated from mechanical dredging is often loaded onto barges for transport to a designated placement site (USACOE 2008).

Hydraulic dredges are used principally to dredge silt, sand and small gravel. Hydraulic dredges include cutterhead pipeline dredges and self-propelled hopper dredges. Hydraulic dredges remove material from the bottom by suction, producing slurry of dredged material and water, either pumped directly to a placement site, or in the case of a hopper dredge, into a hopper and later transported to a dredge spoil site. Cutterhead pipeline dredges can excavate most materials including some rock without blasting and can dredge almost continuously (USACOE 2008).

The impacts of dredging operations on sturgeon are often difficult to assess. Hydraulic dredges can lethally take sturgeon by entraining sturgeon in dredge drag arms and impeller pumps (NMFS 1998). Mechanical dredges have also been documented to lethally take shortnose sturgeon (Dickerson 2006). In addition to direct effects, indirect effects from either mechanical or hydraulic dredging include destruction of benthic feeding areas, disruption of spawning migrations, and deposition of resuspended fine sediments in spawning habitat (NMFS 1998).

Another, yet critical impact of dredging operations is the encroachment of low D.O. and high salinities upriver after channel deepening through dredging operations (Collins *et al.* 2001). Adult shortnose sturgeon can tolerate at least short periods of low D.O. and high salinities, but juveniles have been shown to be less tolerant of these conditions in laboratory studies. Collins *et al*. (2001) concluded that harbor modifications in the lower Savannah River have changed the hydrographic conditions for juvenile nursery of shortnose sturgeon by extending high salinities and low D.O. upriver.

In addition to the impacts of dredging noted above, Smith and Clugston (1997) reported that dredging and filling eliminates deep holes, and alter rock substrates. Nellis *et al.* (2007) documented that dredge spoil drifted 12 km downstream over a 10 year period in the Saint Lawrence River, and that those spoils have significantly less macrobenthic biomass compared to control sites. Using an acoustic trawl survey, researchers found that Atlantic and lake sturgeon were substrate dependent and avoided spoil dumping grounds (McQuinn and Nellis, 2007). Similarly, Hatin *et al*. (2007) tested whether dredging operations affected Atlantic sturgeon behavior by comparing CPUE before and after dredging events in 1999 and 2000. The authors documented a three to seven-fold reduction in Atlantic sturgeon presence after dredging operations began, indicating that sturgeon avoid these areas during operations.

4.7.4.2 *<u>Blasting</u>*

Bridge demolition and other projects may include plans for blasting with powerful explosives. Fish are particularly susceptible to the effects of underwater explosions and are killed over a greater range than other organisms (Lewis 1996). Unless appropriate precautions are made to mitigate the potentially harmful effects of shock wave transmission to physostomous (i.e., air-bladder connected to the gut) fish like shortnose sturgeon, internal damage and/or death may result (NMFS 1998).

A study testing the effects of underwater blasting on juvenile shortnose sturgeon and striped bass was conducted in Wilmington Harbor, NC in December of 1998 and January of 1999 Moser (1999). There were seven test runs that included 32-33 blasts (3 rows with 10-11 blast holes per row and each hole ~ 10 ft apart) with about 24-28 kg explosives per hole. For each blast 50 hatchery reared shortnose sturgeon and striped bass were placed in cages three feet from the bottom at distances of 35, 70, 140, 280 and 560 ft upstream and downstream of the blast area. A control group of 200 fish was held 0.5 miles from the blast site (Moser 1999). Test blasting was conducted with (3) and without (4) an air curtain placed 50 ft from the blast area. External assessments of impacts to the caged fish were conducted immediately after the blasts and 24 h later. After the 24 h period, a subsample of the caged fish, primarily from those cages nearest the blast at 35 ft and some from 70 ft, were sacrificed for later necropsy.

Shortnose sturgeon selected for necropsy appeared to be in good condition externally and behaviorally having survived the blast and living through the 24 hour observation period. However, results of the tests, including necropsies, indicated that fish had substantial internal injuries. Moser concluded that many of the injuries would have resulted in eventual mortality (Moser 1999). The necropsy results also indicated that fish held in cages at 70 ft were less seriously impacted by the test blasting than those held at 35 ft from the blast. Lastly, shortnose sturgeon juveniles suffered fewer, less severe internal injuries than juvenile striped bass tested. There appeared to be no reduction of injury in fish experiencing blasts while an air curtain was in place (Moser, 1999).

4.7.5 *Bycatch and Poaching*

4.7.5.1: Bycatch

Directed harvest of both shortnose and Atlantic sturgeon is prohibited. As stated earlier, shortnose sturgeon are listed as endangered under the ESA and therefore prohibited from take. In 1998, the Atlantic States Marine Fisheries Commission (ASMFC) imposed a coast-wide fishing moratorium on Atlantic sturgeon until 20 year classes of adult females could be established (ASMFC 1998). NMFS followed this action by closing the Exclusive Economic Zone (EEZ) to Atlantic sturgeon take in 1999. Shortnose sturgeon has likely benefited from this closure as any bycatch in the fishery targeting Atlantic sturgeon (primarily for meat since the 1950s) has been eliminated.

Although directed harvest of shortnose sturgeons has been prohibited since 1967, bycatch of this species has been documented in other fisheries throughout its range. Adults are believed to be especially vulnerable to fishing gears for other anadromous species (such as shad, striped bass and herring) during times of extensive migration – particularly the spawning migration upstream, followed by movement back downstream (Litwiler 2001). Additionally, bycatch in the southern trawl fishery for shrimp *Penaerrs* spp. was estimated at 8% in one study (Collins *et al*. 1996).

The 1998 Recovery Plan for shortnose sturgeon lists commercial and recreational shad fisheries as a source of shortnose bycatch. Although shortnose sturgeon are primarily captured in gillnets, they have also been documented in the following gears: pound nets, fyke/hoop nets, catfish traps, shrimp trawls and hook and line fisheries (recreational angling).

Bycatch in the gillnet fisheries can be quite substantial. The catch rates in drift gillnets are believed to be lower than for fixed nets and longer soak times appear to be correlated with higher rates of mortalities. In an American shad gillnet fishery in SC, of 51 fish caught, 16% was bycatch mortality and another 20% of the fish were visibly injured (Collins *et al*. 1996).

4.7.5.2: Poaching

Shortnose sturgeon are probably targeted by poachers throughout their range and particularly where they appear in abundance (such as on the spawning grounds) but the extent that this is occurring is difficult to assess (Dadswell 1979, Dovel *et al*. 1992, Collins *et al*. 1996). There have been several documented cases of shortnose sturgeon caught by recreational anglers. One shortnose sturgeon illegally taken on the Delaware River was documented by a NJ DFW conservation officer in Trenton New Jersey (NJCOA 2006). Additionally, citations have been issued for illegal recreational fishing of shortnose in the vicinity of Troy, New York on the Hudson River and on the Cooper River in South Carolina.

Poaching has also been documented for other sturgeon species in the United States. Cohen (1997) documented poaching of Columbia River white sturgeon sold to buyers on the U.S. east coast. Poaching of Atlantic sturgeon has also been documented by law enforcement agencies in Virginia, South Carolina and New York and is considered a potentially significant threat to the species, but the present extent and magnitude is largely unknown (ASPRT 2008).

4.7.6 *Water Quality and Contaminants*

The quality of water in river/estuary systems is affected by human activities conducted in the riparian zone and those conducted more remotely in the upland portion of the watershed. Industrial activities can result in discharges of pollutants, changes in water temperature and levels of D.O., and the addition of nutrients. In addition, forestry and agricultural practices can result in erosion, run-off of fertilizers, herbicides, insecticides or other chemicals, nutrient enrichment and alteration of water flow. Coastal and riparian areas are also heavily impacted by real estate development and urbanization resulting in storm water discharges, non-point source pollution, and erosion.

The water quality over the range of shortnose sturgeon varies by watershed but is notably poorer in the north than in the south. The U.S. Environmental Protection Agency (EPA) published its second edition of the National Coastal Condition Report (NCCR II) in 2004, which is a "report card" summarizing the status of coastal environments along the coast of the United States (USEPA 2004; Table 6). The report analyzes water quality, sediment, coastal habitat, benthos, and fish contaminant indices to determine status. The northeast region and the Chesapeake Bay received grades of F. The Southeast region received an overall grade of B-, which was the best rating in the nation.

Table 6. Summary of the National Coastal Condition Report (NCCR II) for the U.S. east coast published by the U.S. Environmental Protection Agency (2004) that grades coastal environments. Northeast Region is ME through VA; southeast region is NC-FL. Chesapeake Bay central region.

	Region		
Status Index	**Northeast**	**Chesapeake Bay**	**Southeast**
Water Quality	D	F	B
Sediment	F	F	B
Coastal Habitat	B	-	C
Benthos	F	F	C
Fish Tissue	F	F	A
Overall	**F**	**F**	**B-**

Areas of concern that had poor index scores were: 1) Hudson River – water quality, sediment, and tissue contaminants, 2) Delaware River – water quality and tissue contaminants, 3) Upper Chesapeake Bay – water quality and sediment, 4) Potomac River – sediment, 5) Pamlico Sound – water quality, 6) ACE Basin – water quality, and 7) St. Johns River – sediment. There was also a mixture of poor benthic scores scattered along the Northeast and Southeast region.

Although the south scored relatively well in terms of water quality, it appears that low D.O. and elevated temperatures in the south may limit available habitat and survival of juvenile shortnose sturgeon. Secor (1995) noted a correlation between low abundances of sturgeon during this century and decreasing water quality caused by increased nutrient loading and the increased spatial and temporal frequency of hypoxic conditions. Further, Secor and Gunderson (1998) and Collins *et al* (2001) have hypothesized that survival of juvenile sturgeon in estuaries may be compromised due to the combined effects of increased hypoxia and temperature in nursery areas impacted by anthropogenic activity. Hypoxia affects sturgeon species more than other fish species because of their limited ability to oxyregulate at low D.O. levels (Secor and Gunderson 1998, Secor 2002). The first year of life may be particularly susceptible to hypoxia owing to high sensitivities to low D.O. at early life stages and the limited means to escape from hypoxic waters (Secor and Niklitschek 2001).

Niklitschek (2001) modeled suitable habitat availability for juvenile shortnose and Atlantic sturgeon in the Chesapeake Bay using a multivariable bioenergetics and survival model. Results indicated that the cumulative stresses of hypoxia, high temperatures and salinity during summer months caused large reductions in potential nursery habitat for both species during 1990-1999 (Niklitschek 2001). Further the modeling demonstrated that during dry years when persistent hypoxia in deeper areas consistently precluded access to thermal refuges, there may be almost no suitable habitat for juvenile sturgeons (Niklitschek 2001).

It is interesting to note that the EPA adjusted open water minimum DO-criteria for the Chesapeake Bay (increased from ~2 ppm to 3.5 ppm) to provide protection specifically for sturgeon species, requiring higher levels of D.O. than other fish species (USEPA 2003). Niklitschek and Secor (2005) modeled the achievement of EPA's D.O. criteria for Atlantic sturgeon and predicted that available habitat for Atlantic sturgeon increased by 13% per year, while an increase of water temperature by just 1°C would reduce available habitat by 65%. Similar results may occur for sturgeons in southern rivers where high water temperatures and low D.O. are a common occurrence during the summer months.

Life history characteristics of shortnose sturgeon (i.e., long lifespan, extended residence in estuarine habitats, benthic foraging) predispose the species to long-term and repeated exposure to environmental contamination and potential bioaccumulation of heavy metals and other toxicants (Dadswell 1979, NMFS 1998). However, there has been little work on the effects of contaminants on shortnose sturgeon to date.

Chemicals and metals such as chlordane, dichlorodiphenyl dichloroethylene (DDE), DDT, dieldrin, PCBs, cadmium, mercury, and selenium settle to the river bottom and are later consumed by benthic feeders, such as macroinvertebrates, and then work their way higher into the food web (e.g. to sturgeon). Some of these compounds may affect physiological processes and impede a fish's ability to withstand stress, while simultaneously increasing the stress of the surrounding environment by reducing DO, altering pH, and altering other physical properties of the water body.

Although there have been very few analyses of shortnose sturgeon tissues for contaminants, shortnose sturgeon collected from the Delaware and Kennebec rivers had total toxicity equivalent concentrations of polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), PCBs, DDE, aluminum, cadmium, and copper above adverse effect concentration levels reported in the literature (ERC 2002, 2003). In the Hudson, six fish have been tested over the past 37 years. Most fish carried very high burden load of PCBs, or one of its derivatives (DDT).

Dioxin and furans were detected in ovarian tissue from shortnose sturgeon caught in the Sampit River/Winyah Bay system (SC). Results showed that four out of seven fish tissues analyzed contained tetrachlorodibenzo-*p*-dioxin (TCDD) concentrations greater than 50 pg/g (parts-per-trillion), a level which can adversely affect the development of sturgeon fry (J. Iliff, NOAA Habitat Restoration Division, Silver Spring, MD, unpublished data).

Heavy metals and organochlorine compounds accumulate in sturgeon tissue, but their long-term effects are not known (Ruelle and Henry 1992, Ruelle and Keenlyne 1993). Elevated levels of contaminants, including chlorinated hydrocarbons, in several other fish species are associated with reproductive impairment (Cameron *et al*. 1992, Longwell *et al*. 1992, Hammerschmidt *et al*. 2002, Giesy *et al*. 1986, Mac and Edsall 1991, Matta *et al*. 1998, Billsson *et al*. 1998), reduced survival of larval fish (Berlin *et al*. 1981, Giesy *et al*. 1986), delayed maturity (Jorgensen *et al*. 2003) and posterior malformations (Billsson *et al*. 1998). Pesticide exposure in fish may affect anti-predator and homing behavior, reproductive function, physiological development, and swimming speed and distance (Beauvais *et al*. 2000, Scholz *et al*. 2000, Moore and Waring 2001, Waring and Moore 2004).

Sensitivity to environmental contaminants also varies by life stage. Early life stages of fish appear to be more susceptible to environmental and pollutant stress than older life stages (Rosenthal and Alderdice 1976). Dwyer *et al*. (2005) compared the relative sensitivities of common surrogate species used in contaminant studies to 17 listed species including shortnose and Atlantic sturgeons. The study examined 96-hour acute water exposures using early life stages where mortality is an endpoint. Chemicals tested were carbaryl, copper, 4-nonphenol, pentachlorophenal (PCP) and permethrin. Of the listed species, Atlantic and shortnose sturgeon were ranked the two most sensitive species tested (Dwyer *et al*. 2005). Additionally, a study examining the effects of coal tar, a byproduct of the process of destructive distillation of bituminous coal, indicated that components of coal tar are toxic to shortnose sturgeon embryos and larvae in whole sediment flow-through and coal tar elutrtraite static renewal (Kocan *et al*. 1993).

Lastly, the operation of power plants can have unforeseen and detrimental impacts to water quality which can affect shortnose sturgeon. For example, the St. Stephen Power Plant near Lake Moultrie, South Carolina was shut down for several days in June 1991 when large mats of aquatic plants entered the plant's intake canal and clogged the cooling water intake gates (Balciunas *et al.* 2002). Decomposing plant material in the tailrace canal coupled with the turbine shut down (allowing no flow of water) triggered a low D.O. water condition downstream and a subsequent fish kill. The South Carolina Wildlife and Marine Resources Department reported that twenty shortnose sturgeon were killed during this low D.O. event.

4.7.7 *Summary of Cumulative Impacts*

Effects of past and ongoing human and natural factors and current threats (fisheries, water quality, dams, existing NMFS research permits, and other actions) are occurring (or have occurred) in or near the action area that have contributed to the current status of the species, are described above, and are also included in the baseline section of the Biological Opinion issued for this proposed research activity. These activities and threats are expected to continue into the future.

Overall, the preferred alternative would not be expected to have more than short-term effects on shortnose sturgeon if sturgeon are present in the research locations. The impacts of the non-lethal research activities are not expected to have more than short-term effects on individual animals and any increase in stress levels from the capture and handling would dissipate rapidly. Even if an animal was exposed to additional capture (e.g., a week later), no significant cumulative effects from the research itself would be expected given the nature of the effects. Based on the analysis in this EA and supported by the Biological Opinion (signed October, 2009) NMFS expects that the proposed authorization of shortnose sturgeon research activities of the preferred alternative would not appreciably reduce the species likelihood of survival and recovery in the wild nor would it adversely affect spawning, mortality rates, or recruitment rates. In particular, NMFS expects the proposed research activities not to affect adult reproductive adults in a way that appreciably reduces their reproductive success, the survival of young, or the number of young that annually recruit into the breeding populations.

The incremental impact of the proposed research on these animals, when added to other past, present, and reasonably foreseeable future actions discussed here, would not be significant at an individual or a population level. Therefore, no species level events would result from the capture, handling, and release. The data collected during sampling activities linked with the proposed action would help to assess the population and the movement and habitat use of shortnose sturgeon found in the Altamaha River action area. The research would provide information that would help manage, conserve, and recover these species and would outweigh any adverse impacts that may occur.

Moreover, the Biological Opinion prepared for File No. 14394 provides an integration and 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 to provide a basis for determining the additive effects of the take authorized in this permit on ESA listed sturgeon, in light of their present and anticipated future status. The conclusion of the biological opinion for File No. 14394 was that the proposed action would not likely jeopardize the continued existence of the species.

The opinion also indicated that NMFS is not aware of any future State, tribal, local, or private actions in the action area that may have a bearing on the risk assessment, and finds that the that the issuance of the proposed permit would have only negligible impacts to shortnose sturgeon. The analysis of past, present and reasonably foreseeable actions indicates that no cumulatively significant impacts would occur associated with the proposed action.

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Appendix A

Known Occurrences of Special Concern Plants, Animals and Natural Communities in Altamaha River Watershed (HUC8: 03070106)

Find details for these species at www.georgiawildlife.com and at www.natureserve.org/explorer.

"US" indicates species with federal status (Protected or Candidate).
Species that are federally protected in Georgia are also state protected.
"GA" indicates Georgia protected species.

ANIMALS (45 Known Elements)

US - *Acipenser brevirostrum* (Shortnose sturgeon)
GA - *Aimophila aestivalis* (Bachman's sparrow)
GA - *Alasmidonta arcula* (Altamaha arcmussel)
US - *Ambystoma cingulatum* (Flatwoods salamander)
Aramus guarauna (Limpkin)
US - *Caretta caretta* (Loggerhead sea turtle)
US - *Charadrius melodus* (Piping plover)
GA - *Charadrius wilsonia* (Wilson's plover)
GA - *Clemmys guttata* (Spotted turtle)
GA - *Cordulegaster sayi* (Say's spiketail)
GA - *Corynorhinus rafinesquii* (Rafinesque's big-eared bat)
Crotalus adamanteus (Eastern diamond-backed rattlesnake)
US - *Drymarchon couperi* (Eastern indigo snake)
GA - *Elanoides forficatus* (Swallow-tailed kite)
US - *Elliptio spinosa* (Altamaha spinymussel)
US - *Eubalaena glacialis* (Northern atlantic right whale)
Eumeces egregius similis (Northern mole skink)
GA - *Falco sparverius paulus* (Southeastern american kestrel)
Farancia erytrogramma erytrogramma (Common rainbow snake)
Fundulus chrysotus (Golden topminnow)
GA - *Gopherus polyphemus* (Gopher tortoise)
GA - *Haematopus palliatus* (American oystercatcher)
US - *Haliaeetus leucocephalus* (Bald eagle)
Himantopus mexicanus (Black-necked stilt)
Lampropeltis triangulum triangulum (Eastern milk snake)
Limnothlypis swainsonii (Swainson's warbler)
Micrurus fulvius (Coral snake)
US - *Mycteria americana* (Wood stork)
Myotis austroriparius (Southeastern myotis)
Nycticorax nycticorax (Black-crowned night-heron)
Ophisaurus attenuatus attenuatus (Slender glass lizard)
Ophisaurus compressus (Island glass lizard)
GA - *Ophisaurus mimicus* (Mimic glass lizard)
US - *Picoides borealis* (Red-cockaded woodpecker)
Pituophis melanoleucus mugitus (Florida pine snake)
Plegadis falcinellus (Glossy ibis)
Pseudobranchus striatus striatus (Broad-striped dwarf siren)
Pyganodon gibbosa (Inflated floater)
GA - *Rana capito* (Gopher frog)
Rhadinaea flavilata (Pine woods snake)
Sciurus niger shermani (Sherman's fox squirrel)
Seminatrix pygaea pygaea (Northern florida swamp snake)

GA - *Sterna antillarum* (Least tern)
GA - *Sterna nilotica* (Gull-billed tern)
US - *Trichechus manatus* (Manatee)

PLANTS (44 Known Elements)

GA - *Balduina atropurpurea* (Purple honeycomb head)
US - *Baptisia arachnifera* (Hairy rattleweed)
Callirhoe triangulata (Clustered poppy-mallow)
GA - *Carex dasycarpa* (Velvet sedge)
Carex decomposita (Cypress-knee sedge)
Carex reniformis (Reniform sedge)
GA - *Coreopsis integrifolia* (Floodplain tickseed)
Dalea feayi (Feay pink-tassels)
GA - *Dicerandra radfordiana* (Radford's mint)
GA - *Elliottia racemosa* (Georgia plume)
GA - *Epidendrum conopseum* (Greenfly orchid)
Evolvulus sericeus var. sericeus (Creeping morning-glory)
GA - *Fothergilla gardenii* (Dwarf witch-alder)
Franklinia alatamaha (Franklin tree)
Hypericum denticulatum var. denticulatum (St. johnswort)
Ilex amelanchier (Serviceberry holly)
Ipomoea macrorhiza (Large-stem morning-glory)
Iris tridentata (Savanna iris)
Isoetes appalachiana (Bigspore engelmann's quillwort)
GA - *Leitneria floridana* (Corkwood)
Liatris pauciflora (Few-flower gay-feather)
GA - *Litsea aestivalis* (Pond spice)
GA - *Marshallia ramosa* (Pineland barbara buttons)
GA - *Matelea alabamensis* (Alabama milkvine)
GA - *Matelea pubiflora* (Trailing milkvine)
Peltandra sagittifolia (Arrow arum)
GA - *Penstemon dissectus* (Cutleaf beardtongue)
Phaseolus polystachios var. sinuatus (Trailing bean-vine)
Physostegia leptophylla (Narrowleaf obedient plant)
Plantago sparsiflora (Pineland plantain)
Polygala leptostachys (Georgia milkwort)
Quercus austrina (Bluff white oak)
Quercus chapmanii (Chapman oak)
Rhexia nuttallii (Nuttall meadowbeauty)
Rhynchospora decurrens (Swamp-forest beaksedge)
Ruellia noctiflora (Night-blooming wild petunia)
GA - *Sarracenia flava* (Yellow flytrap)
GA - *Sarracenia minor* (Hooded pitcherplant)
GA - *Sideroxylon macrocarpum* (Ohoopee bumelia)
GA - *Sideroxylon thornei* (Swamp buckthorn)
Spermacoce glabra (Smooth buttonweed)
Tephrosia chrysophylla (Sprawling goats rue)
Tillandsia bartramii (Bartram's air-plant)
Vigna luteola (Wild yellow cowpea)

Appendix B

Georgia Department of Natural Resources
Manatee Sighting Report

Sighting Information

Date of Sighting:____________________ Time of Sighting:_____________________

Number of Manatees:_________________ Number of Calves (<4 ft):______________

Direction of Travel (check one): North South East West Stationary Unknown

Location (detailed description):

____

Location Coordinates (decimal degrees):________________N _________________W

Photos Taken: Yes No Type: Digital Prints Slides Video

Comments (behavior, was animal tagged, etc.; additional space on back):

____

Contact Information

Date of Report: _______________ Name:_________________________________

Address or Affiliation:____

Telephone:_______________________Email:_______________________________

Please Mail of Fax Report to:
Georgia Department of Natural Resources
Nongame – Endangered Wildlife Program
1 Conservation Way, Suite 310, Brunswick, GA 31520
Phone: (912) 264-7218 Fax: (912) 262-3143

Report Dead or Injured Manatees Immediately – Call 1-800-2-SAVE-ME

DNR USE ONLY Recorded By:___________________
Report No.:__________________ MIPS ID: ______________________
Entered By:__________________ Precision: P S M Q U

Appendix C

Existing shortnose sturgeon research permits authorized for wild populations.

Permit No.	Location	Authorized Take	Research Activity
10115 Expires: 8/3/2013	Saltilla & St. Marys Rivers, GA & FL	85 adult/juv 20 ELS	Capture, handle, measure, weigh, PIT tag, tissue sample, collect ELS
1420-01* Expires: 9/30/09	Altamaha River and Estuary, GA	1,000 adult/juv. (2 lethal), 100 ELS	Capture, handle, weigh, measure, PIT tag, transmitter tag, tissue sample, anesthetize, laparoscopy, blood collection, fin ray section, collect ELS
10037 Expires: 4/30/2013	Ogeechee River and Estuary, GA	150 adult/juv. (2 lethal), 40 ELS	Capture, handle, measure, weigh, PIT tag, tissue sample, fin-ray section, anesthetize, laparoscopy, blood collection, radio tag, collect ELS
1447 Expires: 2/28/2012	S. Carolina Rivers and Estuaries	100 adult/juv. (2 lethal), 100 ELS	Capture, handle, measure, weigh, PIT and DART tag, transmitter tag, anesthetize, tissue sample, gastric lavage, collect ELS
1505 Expires: 5/15/2011	S. Carolina Rivers and Estuaries	98 adult/juv. (2 lethal), 200 ELS	Capture, handle, measure, weigh, PIT and DART tag, transmitter tag, anesthetize, laparoscopy, blood collection, tissue sample, gastric lavage, collect ELS
1542 Expires: 7/31/2011	Upper Santee River Basin, SC	5 adult/juv.; 100 ELS	Capture, handle, weigh, measure, PIT and dart tag, tissue sample, ELS collection
1543 Expires:11/30/2011	Upper Santee River Basin, SC	3 adult/juv.	Capture, handle, weigh, measure, tissue sample
1444 Expires: 7/31/2009	Potomac River and Estuary, MD	50 adult/juv., 2500 ELS	Capture, handle, measure, weigh, PIT tag, T-Bar tag, CART tag, anesthetize, Temperature-depth logger, tissue sample, borescope, ELS collection
1486 Expires: 1/31/2010	Delaware River and Estuary NJ & DE	1,750 adult/juv. (10 lethal), 1000 ELS	Capture, handle, measure, weigh, Floy & T-bar tag, PIT tag, tissue sample, anesthetize, ultrasonic tag, laparoscopy, blood collection, collect ELS
1547 Expires:10/31/2011	Hudson River, (Haverstraw & Newburgh), NY	500 adults/juv.	Capture, handle, weigh, measure, PIT & Carlin tag, tissue sample
1575 Expires11/30/2011	Hudson River (Tappan-Zee), NY	250 adult/juv.	Capture, handle, measure
1580 Expires: 3/31/2012	Hudson River and Estuary, NY	82 adult/juv.; 40 ELS	Capture, handle, measure, weigh, PIT tag, Carlin tag, photograph, tissue sample, collect ELS
1449 Expires: 3/31/2010	Upper Conn. River, MA	80 adult/juv.; 200 ELS	Capture, handle, measure, weigh, PIT tag, external radio tag, collect ELS
1549 Expires: 1/31/2012	Upper Conn. River, MA	673 adult/juv (5 lethal), 1,430 ELS from East Coast rivers	Capture, handle, measure, weigh, anesthetize, PIT tag, TIRIS tag, radio tag, temperature/depth tag, tissue sample, borescope, laboratory tests, photographs, collect ELS
1516 Expires: 5/15/2011	Lower Conn. River & Estuary., CT	500 adult/juv (2 lethal); 300 ELS	Capture, handle, measure, weigh, PIT tag, sonic/radio tag, gastric lavage, fin ray section, collect ELS
1578 Expires: 11/30/2011	Kennebec River and Estuary, ME	500 adult/juv.; 30 ELS	Capture, handle, measure, weigh, tissue sample, PIT tag, acoustic tag, anesthetize, collect ELS
1595-02 Expires: 3/31/2012	Penobscot River and Estuary, ME	200 adult/juv. (2 lethal); 50 ELS	Capture, handle, measure, weigh, borescope, photograph, tissue sample, blood sample, Carlin tag, PIT tag, anesthetize, transmitter tag, collect ELS

***** The proposed permit will replace the current permit 1420-01 in the Altamaha River.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

OCT - 5 2009

Finding of No Significant Impact
For Issuance of a Scientific Research Permit (File No. 14394) to Douglas Peterson to Conduct Research on Endangered Shortnose Sturgeon (*Acipenser brevirostrum*)

National Marine Fisheries Service

On April 20, 2009, the National Marine Fisheries Service, Office of Protected Resources (NMFS PR) received an application (File 14394) from Douglas Peterson, PhD (University of Georgia), for a new permit to conduct shortnose sturgeon research on the Altamaha River, Georgia to replace Permit 1420.

In accordance with the National Environmental Policy Act (NEPA), NMFS prepared an Environmental Assessment (EA) analyzing the impacts on the human environment associated with permit issuance (*Environmental Assessment on the Effects of Issuance of a Scientific Research Permit (File No. 14394) to Conduct Research on Shortnose Sturgeon in the Altamaha river, Georgia, October 2009*). In addition, a Biological Opinion was issued under Section 7 of the Endangered Species Act (ESA) (Biological Opinion on the Permits, Conservation and Education Division's proposal to issue a Permit (Number 14394) to Douglas Peterson, PhD, University of Georgia, for research on shortnose sturgeon in the Altamaha River, Georgia, pursuant to section 10(a)(1)(A) of the Endangered Species Act of 1973.) The analyses in the EA, as informed by the Biological Opinion, support the following findings and determination.

The Permit Holder is requesting authorization to assess the distribution, movements and abundance of shortnose sturgeon in the Altamaha River, Georgia, and collect current information about its abundance, age structure, and critical habitats with the unifying goal of identifying specific habitat requirements of the various life stages within the river. This permit would replace the existing permit (Permit No. 1420) and would be valid through September 30, 2014.

The National Oceanic and Atmospheric Administration's Administrative Order 216-6 (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality (CEQ) NEPA implementing regulations at 40 C.F.R. 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

1. Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat (EFH) as defined under the Magnuson - Stevens Act and identified in Fishery Management Plans?

Response: The proposed action would take place in the lower one-third (rkm 15 to 65) of the Altamaha River, Georgia, and would not take place in national marine sanctuaries. No coral reef ecosystems occur in the action areas and thus would not be affected. There is also no designated EFH in the proposed activity location and thus none would be affected. The only impact to the river bottom would be during capture (gillnet, trammel net, and artificial substrates); however, with the mitigation measures set forth in the permit, only minimal disturbance of the benthic organisms/substrate is anticipated. Therefore, no damage to habitats is expected.

2. Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?

   Response: No new substantial impacts to biodiversity or ecosystem function are anticipated, as impacts to river habitats, target, or non-target species are identical to that already considered in the SEA prepared for NMFS Permit No. 1420-01 (Dec. 12, 2006).

3. Can the proposed action reasonably be expected to have a substantial adverse impact on public health or safety?

   Response: This action would involve the use of 95% ethanol for preservation, storage, and transportation of tissue samples pre-sealed 1-ml plastic tubes. The researchers would wear gloves during sampling; therefore, direct contact with shortnose sturgeon or the alcohol would be eliminated. Issuance of the permit is not expected to have substantial adverse impacts on public health or safety that could reasonably be expected by the proposed research activities.

4. Can the proposed action reasonably be expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species?

   Response: The proposed new research activities could potentially have adverse effects on individual endangered shortnose sturgeon which could include mortality, but the effects are not expected to be major at the individual or species level. Based on the stress and possible mortality caused by the proposed research activity, this permit requests one incidental mortality (or serious harm) of an adult or juvenile animal for the duration of the study NMFS concluded that the impact on the population of one sturgeon mortality would be small based on an estimated population of 6,100 animals in the river.

   The permit activities requires standard NMFS research and mitigation protocols to minimize stress and harmful effects on the species. In the Biological Opinion produced for this action, NMFS concluded that issuance of the permit would not likely jeopardize the continued existence of the endangered shortnose sturgeon. Critical habitat has yet to be designated for shortnose sturgeon; thus, none would be affected.

As concluded in the current EA and the previous 2006 SEA, most of the by-catch would be returned immediately to the water with minimal exposure to handling stress. Any fish held briefly in recovery tanks would receive an electrolyte restorative treatment. Because nets would typically be checked at short intervals, NMFS believes that virtually all by-catch would be released alive. Furthermore, Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) is considered a "species of concern" occurring in the Altamaha River in large numbers; hence, there is potential for Atlantic sturgeon to be caught as by-catch during expanded research activities. Accordingly, the researchers would monitor the nets closely and if this sturgeon species is captured, appropriate measures would be taken to ensure its survival. The permit would also be conditioned so that researchers must follow appropriate handling protocol and any by-catch netted be released alive. Additionally, should there be a subsequent Federal listing established for Atlantic sturgeon during the permitted time frame, the effects of the proposed research on Atlantic sturgeon would be analyzed at that time.

Also, in the unlikely event marine mammals are encountered while netting, researchers would be directed by permit conditions to avoid coming into contact with the animals. Additionally, contact information for the local Marine Mammal Stranding and Entanglement Hotline is provided.

5. Are significant social or economic impacts interrelated with natural or physical environmental effects?

   <u>Response</u>: There would be no significant social or economic impacts that are interrelated with natural or physical environmental effects.

6. Are the effects on the quality of the human environment likely to be highly controversial?

   <u>Response</u>: A *Federal Register* notice (74 FR 30054) was published on June 24, 2009, to allow other agencies and the public the opportunity to review and comment on the action. All agency comments were addressed and responses were included in the decision memos for the modified permit. None of the comments were considered controversial and none were received addressing the proposal's potential effects on the quality of the human environment. No comments from the public were received on this application.

7. Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat, or ecologically critical areas?

   <u>Response</u>: The research methods in the proposed permit have been analyzed under the current 2009 EA. The activities in this proposed permit would not be expected to result significant impacts to any unique areas mentioned above.

8. Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

    Response: The potential risks by proposed research methods are not unique or unknown, nor is there significant uncertainty about the impacts. Monitoring reports from previous permits of a similar nature, and published scientific information on impacts of shortnose sturgeon, indicate the proposed activities are not likely to result in significant adverse impacts to the human environment or the species. There is considerable scientific information available on the likely impacts of such activities.

9. Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

    Response: The proposed action is not related to other actions with individually insignificant, but cumulatively significant impacts. The incremental impact of the action when added to other past, present, and reasonably foreseeable future actions are similar to that discussed in the 2004 EA and the 2006 SEA (Permit 1420 and 1420-01).

10. Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

    Response: The action would not take place in any district, site, highway, structure, or object listed in or eligible for listing in the National Register of Historic Places, thus none would be impacted. The proposed action would also not occur in an area of significant scientific, cultural or historical resources and thus would not cause their loss or destruction.

11. Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?

    Response: The U.S. Geological Survey has documented several aquatic nuisance species occurring in the lower watershed the Altamaha River having potential to be spread by the actions of the proposed research. However, the researcher has agreed to follow certain conditions proposed by NMFS (outlined in Section 4.5.9 of the attached EA) to minimize the potential spread of these aquatic nuisance species; therefore, the proposed research activities would not be expected to result in the introduction or spread of non-indigenous species to other watersheds.

12. Is the proposed action likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

    Response: The decision to issue this modified permit would not be precedent setting and would not affect any future decisions. NMFS has issued numerous scientific research permits pursuant to section 10 of the Endangered Species Act, thus this is not the first permit NMFS has issued for this type of research activity. Issuance of a permit or permit modification, to a specific individual or organization for a given research activity, does not in any way guarantee or imply that NMFS would authorize other individuals or organizations to conduct the same research activity. Any future request received would be evaluated upon its own merits relative to the criteria established in the MMPA, ESA, and NMFS' implementing regulations.

13. Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

Response: Issuance of the proposed permit is not expected to violate any Federal, State, or local laws for environmental protection. NMFS has sole jurisdiction for issuance of such permits for shortnose sturgeon and has determined the proposed research to be consistent with all applicable provisions of the ESA. The permit currently contains language stating this permit does not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations. This condition would remain in effect.

14. Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

Response: NMFS concluded the proposed procedures would have potential for effects on individual shortnose sturgeon. However, because shortnose sturgeon are a robust species and have responded well to the types of handling in the proposed action, the cumulative effects on the population in the Altamaha River are not expected to be long-term or significant on the target species.

Since a new status review for the Atlantic sturgeon (*Acipenser oxyrinchus*) has begun, NMFS has considered the potential for cumulative effects on Atlantic sturgeon as bycatch. Accordingly, NMFS established provisions for monitoring interactions with Atlantic sturgeon and placed conditions in the permit stating if an Atlantic sturgeon is incidentally captured, it must be handled with similar protocols authorized for shortnose sturgeon and at least PIT tagged and genetically sampled. NMFS concluded that since researchers would be monitoring the nets closely and if Atlantic sturgeon are captured, appropriate measures would be taken to ensure survival. NMFS also concluded that should there be a subsequent listing of Atlantic sturgeon coinciding with the proposed research activities, the effects of the research on Atlantic sturgeon would be analyzed at that time.

Likewise, NMFS considered impacts upon potential marine mammal interactions during sturgeon research in the Altamaha River. Although interactions with marine mammals would be considered rare based on historical records in the river, the permit would be conditioned so that nets would not be set if marine mammals are seen in the vicinity of the research, and also mandate that the animals must be allowed to leave the area before the nets are set.

DETERMINATION

In view of the information presented in this document and the analysis contained in the Environmental Assessment (EA) prepared for Issuance of Permit No. 14394, pursuant to the ESA, and the ESA section 7 Biological Opinion, it is hereby determined that the issuance of Permit No. 14394 will not significantly impact the quality of the human environment as described above. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an Environment Impact Statement for this action is not necessary.

James H. Lecky
Director, Office of Protected Resources

OCT - 5 2009
Date