Environmental Assessment
Issuance of a Protected Species Conservation and Recovery Grant to the Mississippi Department of Wildlife, Fisheries, and Parks (Award File 4720034) to Conduct Research on Gulf Sturgeon in the Pascagoula River estuary, Mississippi

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) 713-2332
Location:	State of Mississippi

CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

1.1 DESCRIPTION OF PROPOSED ACTION

The National Marine Fisheries Service, Office of Protected Resources (NMFS PR) proposes to provide financial assistance in the form of a grant to the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) (Matt Roberts, P.I.). This award would be issued through the Protected Species Conservation and Recovery Grant Program (CFDA no. 11.472, Unallied Science Programs) authorized under section 6 of the Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. 1535). The federal government would provide 75 percent of the cost of the project, and the state would provide the remaining 25 percent. This financial assistance award is planned to extend for three years (three annual payments) and is subject to semi-annual review by NMFS. The grant would support conservation activities for the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*).

Purpose and Need
Under section 6 of the ESA, NMFS is authorized to cooperate with states to the maximum extent practicable in carrying out programs for the conservation of threatened and endangered species, and monitoring of candidate species. Scientific research is an important means of gathering valuable information about protected species to inform conservation and management measures to recovery listed species, and avoid the listing of candidate species. The purpose of this proposed action is to provide financial assistance to support research that helps identify feeding habitat for and movement of the juvenile/sub-adult cohort of Gulf sturgeon in the Pascagoula River estuary. Section 6(d) of the ESA allows NMFS to provide financial assistance to any State, through its respective State agency that has entered into a section 6 agreement with NMFS, to support conservation activities for threatened and endangered species, or to monitor the status of candidate species and recently de-listed species. Many of the specific activities that would be funded through the proposed action have been authorized under delegated authorities granted to the MDWFP by the USFWS under an ESA section 6 agreement for scientific collecting and handling permits for federally listed threatened species in Mississippi. MDWFP has delegated this responsibility to the Mississippi Museum of Natural Science.

1.2 PROPOSED AREA AND METHODS

The proposed research under Award File 4720034 to MDWFP would take place in the waters of the Pascagoula River estuary, Mississippi from June 2010 to May 2013. Extensive sampling for juveniles and sub-adults would occur from July-September 2010, February-September 2011 and 2012, and February-April 2013. The applicant would deploy up to 40 Vemco telemetry receivers from I-10 south in the west and east Pascagoula River to the M.S. Sound and adjacent nearshore areas. Sampling for benthic resources and sediment characterization would occur in either

January-February 2011 or August 2011 in areas covered by the acoustic arrays. The remainder of the project period would include offsite data and GIS analysis and educational program development and implementation.

Collection Methods

All sampling and handling of Gulf sturgeon would be conducted following the general methodology outlined in Heise et al. (2004, 2005) as modified from U.S. Fish and Wildlife standard operating procedures (USFWS 1993). All capture and handling protocols for Gulf sturgeon would be followed as described in the award and permit (Administrative Scientific Collecting Permit Number 0222101) conditions.

Sturgeon would be captured using 5.0 or 6.3 cm bar mesh, 1.83 m deep, or a 10.2 cm bar mesh, 2.4 m deep multifilament gillnets, 61 m long, fished between daylight and dusk. Netting for juvenile and sub-adult sturgeon would occur in February-late April in 2011, 2012, and 2013 near the mouths of the West and East Pascagoula River. Netting for juveniles and sub-adults would also occur (May-September, 2011 and 2012 only) attempting to recapture previously tagged fish.

Gillnetting would take place from daylight to dusk up to 3 days per week (weather and gear dependent). Once captured, sturgeon would be removed and placed in a live well on the boat, with continual water changes, while processing is occurring. The applicants would sample approximately 10 sturgeon per year for a total of about 30 for the entire project. Nets would be attended regularly (checked at least every 2 hours) and would be removed if marine mammals were present. Temperature, dissolved oxygen, salinity and water depth would also be measured.

Fish Sampling and Handling

Fish handling and tagging operations would adhere to the animal care policies of the American Association of Ichthyologists and the American Fisheries Society (ASIH, AFS, AIFRB, 1988). All University Animal Care and Use (IACUC) protocols would be in place prior to initiation of the project.

To minimize handling stress, each fish would be moved and handled by researchers using latex gloves. Each fish, minimum size approximately 50 cm total length (TL), would be measured for TL and wet weight (WW) and checked for any external tags and any potential PIT tags (recaptures). Sturgeon would be weighed with a standard hanging scale or 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 with a fiberglass tape measure to the nearest centimeter. The time required to complete the standard sampling (i.e., removing from net, measuring, weighing, move to live well) would be 5 minutes per fish.

Attachment of Vemco VR2L (for juvenile or small subadult) or V16-4L (for adults) external acoustic tags would follow the protocols of Heise et al. (2004, 2005). Ultrasonic tags are prepared prior to tagging by attaching heavy gauge (40 lbs) monofilament to each tag using 2 part marine epoxy and an external cover of shrink wrap tubing. Ultrasonic tags are attached to the fish at the base of the dorsal fin. A sterile needle is passed through the base of the dorsal fin, the trailing edge of the monofilament is threaded into the hollow needle, which is withdrawn,

pulling the monofilament through the fin. This step is repeated for the second monofilament tail. The tag is pulled flush against the dorsal fin, without putting stress on the tagging wounds. The monofilament tails are passed through a corrosive crimp, which is secured by applying pressure with vice grips to ensure secure attachment. Only fish in excellent condition would be tagged. The acoustic transmitter and other tags would not exceed 2% of the fishes total body weight. Sturgeon selected for external tagging would be netted at temperatures 27 ^{O}C or below.

Each sturgeon would also be tagged with both PIT and Floy tags. AVID 134.2 kHz PIT tags would be applied with a sterile single use disposable syringe. The PIT tag would be loaded into the syringe and the needle inserted anterior and horizontally into the center of the fleshy base of the dorsal fin on the left side of the fish. The syringe plunger would then be depressed thereby inserting the tag. Finger pressure would be applied to the site of tag insertion as the syringe is withdrawn to prevent the PIT tag from backing out through the tagging wound. FLOY T-bar anchor tags would be attached with a Mark III scissor grip fish tagger in the fleshy portion of the pectoral fin proximal to the body. The tagger needle would then be pressed through the skin, the trigger is depressed, and the tagger is withdrawn. The T-bar tag would be lightly pulled to set the tag.

Following USFWS standard operating procedures (1993), the applicant would remove a (1 cm^2 or less) non-deleterious tissue sample from the base of the dorsal (occasionally anal) fin for genetic work. These materials would be provided to Dr. Brian Kreiser at the University of Southern Mississippi for storage and ultimately for processing.

Following processing, all fish would be treated with slime coat restorative (Stress Coat, Aquarium Pharmaceuticals, Inc.) and released back to the water after full recovery. This portion of the handling would take an additional 10-15 minutes.

Benthic and Sediment Sampling:
A total of 210 infaunal and sediment samples would be collected in a systematic grid across the entire sampling area in either January-February 2011 or August 2011 in areas covered by the acoustic arrays. Near surface (0-5 cm) benthic samples would be collected using a Wildco petite ponar dredge sampler (15 x 17 cm opening), including sediments from at least three independent samplings within a 2 m^2 radius of each station. Samples would be immediately transported to the laboratory for processing and analysis. Temperature, dissolved oxygen, salinity and water depth would also be measured.

Acoustic Transmitters
Signals from the acoustic transmitters would be detected by an array of VEMCO VR2W units (submersible, single-channel hydrophone/receiver/ID detector/data logger/power source). While a number of VR2W units have been deployed in the past, new VR2W units coupled with the old ones would be placed throughout the study area to form an acoustic screen in the area described above (see Appendix 1). New VR2W units would be attached to buoys (see Peterson *et al*. 2008; Havrylkoff *et al*. 2009) or mounted on other stable structures. Coordination of placement of remote receivers would occur between MSDMR, the Pascagoula Port Authority, and the USCOE-Mobile District prior to deployment. The units (13 old and 15 new ones in year 1) would be deployed starting in late January 2011, and inspected and downloaded bi-weekly.

Additional units would be put into service as in years 2 and 3. In addition to the anchored array, researchers would search for tagged fish (May-Sept 2011 and 2012) at least once per week with a directional hydrophone (Vemco VH110) and receiver (Vemco VR100) deployed from a boat similar to methods described by Ross et al. (2009). Development of spatial models using remote sensing data and management of the database would take place within a laboratory or office setting and do not involve the taking or handling of fish or samples. Data from the VR2W units would be a date/time stamped sequence of detections of individually identified Gulf sturgeon.

1.3 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 recipients'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.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) was enacted in 1969 and its Environmental Impact Statement requirement 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. 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. 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.

NMFS is preparing an EA for this action primarily to provide a more detailed analysis of effects to ESA-listed species. This draft Environmental Assessment is prepared in accordance with NEPA, its implementing regulations, and NOAA 216-6.

Endangered Species Act

Section 7 of the ESA requires consultation with the appropriate federal agency (either NMFS or the U.S. Fish and Wildlife Service) for federal actions that "may affect" a listed species or adversely modify critical habitat. NMFS issuance of an award 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).

Section 6 of the ESA provides that states and territories maintaining an adequate and active program for the conservation of endangered and threatened species may receive federal funds for the purpose of conserving those species. To remain eligible for this funding, States must enter into a section 6 agreement with NMFS and undergo annual reviews of their program to reconfirm the finding that the state's program is adequate and active in accordance with section 6(c) of the ESA. Activities supported through this financial assistance are authorized by regulation (50 CFR 17.21) and have been determined to comply with the requirements therein.

Marine Mammal Protection Act: The MMPA prohibits takes of all marine mammals in the U.S. (including territorial seas) with a few exceptions. The act defines "take" to mean "to hunt harass, capture, or kill" any marine mammal or attempt to do so.

National Marine Sanctuaries Act
The NMSA (32 U.S.C. 1431 *et seq*.) authorizes the Secretary of Commerce to designate and manage areas of the marine environment with special national significance. The National Marine Sanctuary Program, operating under the NMSA and administered by NOAA's National Ocean Service (NOS) has the authority to issue special use permits for research activities that would occur within a National Marine Sanctuary. Obtaining special use permits is the responsibility of individual researchers. However, as a courtesy, the Office of Protected Resources consults with NOS when proposed research would occur in or near a National Marine Sanctuary. The actions supported by Award File 4720034 would not occur in a National Marine Sanctuary nor impact any National Marine Sanctuaries, so no consultation with the National Ocean Service (NOS) is required.

Magnuson-Stevens Fishery Conservation and Management Act: Under the MSFCMA Congress defined Essential Fish Habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802(10)). The EFH provisions of the MSFCMA offer resource managers means to accomplish the goal of giving heightened consideration to fish habitat in resource management. NMFS Office of Protected Resources is required to consult with NMFS Office of Habitat Conservation for any action it authorizes, funds, or undertakes, or proposes to authorize, fund, or undertake that may adversely affect EFH. This includes renewals, reviews or substantial revisions of actions.

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1

Under the No Action alternative, Award File No NA10NMF4720034 would not be approved. This alternative would not fund research that helps identify feeding habitat for and movement of the juvenile/sub-adult cohort of Gulf sturgeon in the Pascagoula River estuary.

2.2

Under the Proposed Action alternative, Award File No NA10NMF4720034 would be approved. This approval would allow financial assistance to support the conservation of Gulf sturgeon. Best practice sturgeon sampling and handling protocols, limited net soak times, avoidance of listed species and marine mammals, and live release of bycatch would help ameliorate any adverse impacts on the environment. The proposed action is described in more detail in pages 2-5 above.

CHAPTER 3 AFFECTED ENVIRONMENT

3.1 SOCIAL AND ECONOMIC ENVIRONMENT

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

3.2 BIOLOGICAL AND PHYSICAL ENVIRONMENT

Gulf sturgeon-Background

Historically, Gulf sturgeon occurred from the Mississippi River east to Tampa Bay. Sporadic occurrences were recorded as far west as the Rio Grande River in Texas and Mexico, and as far east and south as Florida Bay (Wooley and Creteau 1985). The sub-species' present range extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi respectively, east to the Suwannee River in Florida. The species is anadromous: feeding in the winter months in the marine waters of the Gulf of Mexico including bays and estuaries, migrating in the spring up freshwater rivers to spawn on hard substrates, and then spending summers in the lower rivers before emigrating back out into estuarine/marine waters in the fall. Currently, seven river drainages (Pearl, Pascagoula, Escambia, Yellow, Choctawhatchee, Apalachicola, and Suwannee) are known to support reproducing populations of Gulf sturgeon.

In the Pascagoula River, hurricane effects to the population are unknown as research has been extremely limited in that system since Hurricanes Ivan (2004) and Katrina (2005).

Gulf sturgeon travel great distances to use specific areas for spawning in the spring, for "holding" in the summer and fall, and for feeding in the winter. With the deployment of fixed-location telemetry receivers in the estuarine and marine environments, a picture of the behavior of age 3+ Gulf sturgeon is emerging of individual fish traveling relatively quickly between areas where they spend an extended period of time (Edwards *et al*. 2003, Edwards *et al*. 2007, Randall 2008). To date, published research directed at age 0-2 individuals has been limited to the Suwannee River population by Sulak and Clugston (1998 and 1999). Young-of-year (YOY) individuals have been found to disperse widely downstream of spawning sites, while sometimes traveling upstream of known spawning sites (Clugston *et al*. 1995, Sulak and Clugston 1999), and eventually arriving in estuarine feeding areas in winter months.

Sub-adult and adult Gulf sturgeon overwintering in Choctawhatchee Bay were generally found to occupy the sandy shoreline habitat at depths of 2-3 m (Parauka et al. 2001). The 1995 Recovery Plan devotes a paragraph to the possible importance of springs and other cool water refugia to Gulf sturgeon within the riverine environment. Sulak et al. (2007) examined temperature, prey availability, and summer movements of Gulf sturgeon in the Suwannee River and concluded that temperature and prey availability did not explain Gulf sturgeon selection of summer holding areas. Hightower et al. (2002) also found that water temperatures in holding areas where Gulf sturgeon were repeatedly found in the Choctawhatchee River were similar to temperatures where sturgeon were only occasionally found elsewhere in the river. While the factor responsible for concentrating Gulf sturgeon within small areas is unknown, it may be refuge from high-velocity currents.

Many researchers have improved our knowledge of sturgeon movement and habitat use. Rogillio et al. (2007) and Ross et al. (2009) both documented use of barrier-island passes in Mississippi Sound and the Chandeleur Islands for winter feeding. Spawning and associated movement patterns in the Pascagoula River were described by Heise et al. (2004, 2005).

Brooks and Sulak (2005) described the distribution of Gulf sturgeon food resources in the Suwannee River estuary. They found that benthic infauna biomass was greater in the summer than in the winter, and that the spatial distribution of likely prey items was patchy (high in certain areas and low in others).

Additional studies examining Gulf sturgeon prey have been conducted based on Heard et al.'s (2000) assessment of the benthic macro invertebrate assemblages in Choctawhatchee Bay suggesting that ghost shrimp, *Lepidophthalmus louisianensis,* was an important food for Gulf sturgeon greater than 1 m in length. McLelland and Heard (2004, 2005) later analyzed the benthic macro-invertebrate assemblages from two sites off the northern Gulf of Mexico coast of Florida and Alabama where Gulf sturgeon were located by telemetry and believed to be foraging during winter. They reported in 2004 that annelids comprised the main group of organisms collected at both sites and with the exception of the high density of tube building polychaetes collected at the Alabama site, little difference in the benthic invertebrate populations was noted

between the two sites. The density of benthic organisms did not substantially differ from 2004 to 2005. However, McLelland and Heard (2005) noted there were a few shifts in population structure: 1) an absence of the tube dwelling polychaete, *Hobsonia florida*, at the Alabama site that was predominate in 2004 and was replaced by the polychaete, *Mediomastusa ambiseta*; and 2) an increase in the number of mollusks with a decrease in arthropods at the Florida site. They speculated that the possible changes in the macro-invertebrate structure could reflect a response to increased nutrient loading from runoff or perhaps a physical shift due to the effects of Hurricane Ivan that made landfall in eastern Alabama in August 2004.

Edwards et al. (2003) tracked the movements of Gulf sturgeon in the Suwannee River estuary using ultrasonic tags and a fixed array of receivers. Tagged individuals displayed a pattern of directed slow, steady travel over several kilometers followed by periods of randomly directed travel. This pattern is consistent with a foraging strategy that is adapted to a patchy distribution of food resources by an animal that lacks advance knowledge of the location of the patches or an ability to detect the patches from afar. If applicable, this strategy may help to explain the regular detection of telemetry-tagged Gulf sturgeon from different natal river systems in the same marine foraging areas such as the nearshore islands. It is also possible that adults can learn the location of optimal foraging areas and revisit year after year. In a follow-up paper reporting results of satellite pop-up archival tags, Edwards et al. (2007) discussed mixing of Gulf sturgeon from different populations and overlap of winter habitat utilization. Similarly, in a multi-year study Ross et al. (2009) found Gulf sturgeon from both the Pascagoula and Pearl Rivers broadly overlap and use the shallow water along the Gulf barrier islands as foraging grounds in the winter. These marine habitats utilized by the Gulf sturgeon were all less than 7 m deep, generally well oxygenated, and with relatively clear water; bottom substrates were mostly coarse sand and shell fragments or fine sand (Ross *et al*. 2009). Also, Gulf sturgeon tagged in seven Florida panhandle river systems were monitored from Carrabelle, FL to Mobile Bay, AL during the winter period in the coastal waters of the Gulf of Mexico. Gulf sturgeon from different river systems were located occupying the same area of marine habitat.

Harris et al. (2005) also tracked the movements of Gulf sturgeon in the Suwannee River estuary using ultrasonic tags and sampled benthic infauna. Locations of tagged Gulf sturgeon were associated with sandy substrates and high abundances of known prey items. Gulf sturgeon individuals appeared to use different portions of the estuary in fall compared to spring. Randall and Sulak (2007) estimated yearly recruitment of Gulf sturgeon using 19 years of mark-recapture data for the Suwannee River population. Recruitment was positively correlated with high flows in September and December. They suggested that higher survival of age-0 sturgeon may be related to increased availability of lower-salinity estuarine feeding habitats in wet years. Similar to shortnose sturgeon, Randall and Sulak (2007) found some evidence to suggest a Gulf sturgeon fall spawning event in the Suwannee River. Limited data on both adult migration patterns and back-calculation to determine age of small fish indicate that a second spawning event may be occurring.

Flowers et al. (in-review) utilized field data from the Suwannee and Apalachicola Rivers to assess bioenergetics of Gulf sturgeon. Using length-at-age incremental growth data from mark-recapture studies, similar bioenergetic parameter estimates were found, except for slight

differences in growth between males from the Suwannee River. Given the common homogenous near-shore foraging areas utilized by the Gulf sturgeon, similarities in energy uptake and metabolism across the species are not unexpected.

Mark-recapture studies have confirmed the general fidelity of individual Gulf sturgeon returning to particular rivers (NOAA and USFWS 2003), presumably their natal rivers. Gulf sturgeon reproduction is not known to currently occur in several basins (e.g., Mobile Basin) where it most likely occurred historically. A recent survey collected two Gulf sturgeon in Mobile Bay near Fairhope, AL (Mettee *et al*. 2009) after intensive netting. In addition to slowly recolonizing its former range, insights have emerged from population models in recent years suggesting that Gulf sturgeon life history characteristics also render the species slow to recover in abundance within its current range. Working with data from the Suwannee River population, Pine et al. (2001) identified three parameters (i.e., egg-to-age-1 mortality, the percentage of females that spawn annually, and adult mortality) as those most sensitive in determining the trajectory of population size. Pine et al. (2001) predicted that slight increases in estimated annual adult mortality (from 16% to 20%) would shift the population from an increasing trend into a decline. Flowers (2008) used an age-structured model to conclude that the Apalachicola population is probably slowly recovering, but still needs many years before returning to anywhere near its pre-exploitation abundance.

Given the variety in methods, Gulf sturgeon population estimates are relatively imprecise. This is perhaps owing to the low capture/recapture probabilities associated with sampling this species, which was estimated to be < 10% using closed-system models by Zehfuss et al. (1999). Flowers (2008) describes the rapid decline in Gulf sturgeon landings as likely reflective of rapid erosion of the population age-structure of the large, older, highly fecund individuals being removed which led to a rapid change in the age-structure of the population and thereby reducing annual reproductive output and population recovery.

Other ESA Listed Species Potentially Affected by the Proposed Action
Below is a listing of all the non-target ESA-listed species (threatened or endangered) under NMFS and/or USFWS jurisdiction occurring in the action area.

Blue Whale (Balenoptera musculus), Humpback whale (Megaptera novaengliae), Fin whale (Balaenoptera physalus), Sei whale (Balaenoptera borealis), Sperm whale (Physeter macrocephalus), Leatherback sea turtle (Dermochelys coriacea), Hawksbill sea turtle (Eretmochelys imbricate), Kemp's ridley sea turtle (Lepidochelys kempii), Green sea turtle (Chelonia mydas), Loggerhead sea turtle (Caretta caretta), Smalltooth sawfish (Pristis pectinata), Alabama Sturgeon (*Scaphirhynchus suttkusi*), Bayou Darter (*Etheostoma rubrum*), Pallid Sturgeon (*Scaphirhynchus albus*), and West Indian Manatee (*Trichechus manatus*).

Based on the reported ranges of protected species under the jurisdiction of the USFWS and NMFS occupying preferred habitat outside of the defined action area of the research, interactions are expected to be limited. No take is anticipated.

Potential Sea Turtle Interactions

Five species of sea turtle have been documented within the action area (Loggerhead, Kemp's, Hawksbill, Green, and Leatherback sea turtles). In the 2 years previous that sturgeon work was conducted in the same action area the researchers did not encounter any sea turtles. From 1998-2003 Todd Slack conducted research in the same area and did not encounter sea turtles. As such, it is unlikely that this project will have impacts on sea turtles. No take is anticipated. However, sea turtles would be avoided or if accidentally captured, released immediately.

Potential Marine Mammal Interactions
Manatees are extremely rare in the proposed action area and are generally found only near the Gulfport power plant to the west of the study area and it is not expected that this action would have any impact on that species. Although the likelihood of interaction with whales by research activity is highly unlikely, in all boating activities (including travel to acoustic receiver arrays) researchers would be advised to keep a close watch for all marine mammals to avoid harassment or interaction and are also advised to review and follow the NMFS Northeast Region Marine Mammal Approach and Viewing Guidelines located online at http://www.nero.noaa.gov/prot_res/mmv/ and the NMFS Southeast Region bottlenose dolphin and manatee guidelines at http://www.nmfs.noaa.gov/pr/education/regional.htm#se.

Other State Listed Species Potentially Affected by the Proposed Action
Bigeye Shiner (*Notropis boops*), Crystal Darter (*Crystallaria asprella*), Frecklebelly Madtom (*Noturus munitus*), Frecklebelly Madtom (*Noturus munitus*), Greenside Darter (*Etheostoma blennioides*), Ironcolor Shiner (*Notropis chalybaeus*), Slender Madtom (*Noturus exilis*), Slenderhead Darter (*Percina phoxocephala*), Southern Redbelly Dace (*Phoxinus erythrogaster*), Suckermouth Minnow (*Phenacobius mirabilis*), Piebald madtom (*Noturus gladiator*), and Alabama shad (*Alosa alabamae*).

Bycatch Species Susceptible to Incidental Capture in Gillnet
Researchers could incidentally capture one of the listed fishes in Mississippi. However, the applicant expects the catch of these species either 1) would not likely occur or 2) that capture would be minimal because they occur in areas of the drainage that would not be sampling, or 3) the mesh size that would be used is too large for all fishes except Gulf sturgeon.

Between in 1998 – 2003, a total fishing effort of 364,620 net-m-hrs resulted in no captures of State or Federally listed threatened or endangered species other than Gulf sturgeon, and between 2008 – 2009, a total fishing effort of 81,865 net-m-hrs also resulted in no captures of threatened or endangered species other than Gulf sturgeon in the Pascagoula River system. Ross (2001) also noted that the Alabama shad (*Alosa alabamae*) is a species of concern regionally but is rare in coastal rivers of Mississippi and the researchers do not anticipate capturing this species.

Essential Fish Habitat (EFH)
Congress defined essential fish habitat for federally managed fish species as "those waters and substrate necessary for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802(10)). As such, EFH varies by species, geographic location, life stage, etc.
A description of specific designated EFH for species within the action area can be found at: http://ccma.nos.noaa.gov/products/biogeography/efh/gom-efh/index.shtml.

Critical Habitat On March 19, 2003 critical habitat was designed for the Gulf sturgeon under the ESA (68 FR 13370). A portion of this proposed action would take place in Gulf sturgeon critical habitat. A description of the specific designated critical habitat can be found at http://www.nmfs.noaa.gov/pr/pdfs/fr/fr68-13370.pdf.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

4.1 EFFECTS OF ALTERNATIVE 1: No action

An alternative to the proposed action is no action, i.e., denial of the grant. This alternative would eliminate any potential risk to the environment from the proposed research activities. However, the no action alternative would not allow research to be conducted and would deny the opportunity to benefit from the proposed research that would provide information needed to manage and recover this species.

4.2 EFFECTS OF ALTERNATIVE 2: Issue grant with standard conditions

Any impacts of the proposed action would be limited to the biological environment and physical environment since this proposed research targets sturgeon and their habitat. The impacts of affixing acoustic telemetry receivers (primarily to buoys) or netting activities would have a negligible impact on the physical environment. Sample collections and fish handling would be conducted by trained personnel according to standard scientific protocols. There are no significant social or economic impacts of the proposed action interrelated with significant natural or physical environmental effects.

Environmental Consequences to the Biological Environment- Sturgeon

Capture
The applicants propose to use gillnets to capture sturgeon which could possibly result in adverse impacts. Based on analysis of six comparable shortnose sturgeon research projects with similar sampling techniques and protocol involving gillnetting, handling, measuring, PIT-tagging, tissue sampling, and releasing in Connecticut River (CT), Delaware River (DE), Hudson River (NY), Chesapeake Bay, and Ogeechee River (GA) from 1988 till 2004, the mortality rates range from 0 – 1.22%. Of the 5,911 sturgeon captured, only 23 died, making the average incidental mortality rate 0.39%. All mortalities that occurred during gillnetting were due to high water temperature and low dissolved oxygen. This analysis indicates that, if done in accordance with the NMFS's sturgeon protocols, gill netting for Gulf sturgeon can be done very safely and with little risk of direct mortality. It is more difficult to directly assess the extent of any delayed mortality of sturgeon that may occur after individuals are released from gill nets.

However, many research studies have shown a high probability of recapturing sturgeon that were previously captured in gill nets, handled and tagged. Kieffer and Kynard (1993) tagged 25 shortnose sturgeon and proceeded to recapture two fish six times each. Twelve other fish were recaptured once with only one observed shortnose sturgeon mortality during recapture. It is important to note that each of the above studies involved not only the capture, but also the tagging of sturgeon, which subjects sturgeon captured in gill nets to an additional degree of stress.

To limit stress and mortality of sturgeon due to capturing with gill nets, the grant applicants would adhere to the following: that at lower water temperatures (< 15°C) soak times must not exceed 6 hours; at water temperatures between 15°C and 20°C, net sets would not exceed 4 hours; and at water temperatures between 20°C and 28°C, soak times of would not exceed 2 hours. Netting activities must cease at 28°C or higher. Further, dissolved oxygen would also be measured prior to each net set to ensure that at least 4.5 mg/L concentration is maintained.

Fish Sampling and Handling

The handling, measuring, and weighing procedures are simple and not invasive and NMFS expects that individual sturgeon would normally experience no more than short-term stresses as a result of these activities. No injury is expected from these activities, and sturgeon would be worked up as quickly as possible to minimize stresses resulting from their capture. The applicant would also be required to follow procedures designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen when handling animals. These activities would not injure or compromise the animal and would not add appreciably to the stress the animal would experience during capture and other activities discussed here.

The applicant proposes to use PIT tags which could cause stress during restraint and minor wounds from attachment. The attachment and retention of PIT tags is not known to have any other direct or indirect effects on Gulf sturgeon. As such, the PIT tagging of sturgeon is unlikely to have any significant impact on the reproduction, numbers, or distribution of Gulf sturgeon in the proposed action areas.

The applicant also requests the use of external transmitters which could cause pain and discomfort to the fish, as well as a risk of infection. To address these concerns, the researchers propose to use Gulf sturgeon handling and tagging procedures (USFWS, 1993) based on years of experience working on Gulf sturgeon. In general, adverse effects of the proposed tagging procedure could include pain, handling discomfort, risk of infection from surgery, affected swimming ability, and/or abandonment of spawning runs. However, using proper protocols and sterile conditions would minimize or eliminate potential short-term adverse effects from tagging and greatly lower the risk of injury and mortality. NMFS expects the tagging would result in no more than short-term stress to the animal.

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

It is possible that interaction with the capture methods described above could result in fewer adults reaching spawning grounds, and that this would exacerbate any reduced survival of eggs, larvae, and juveniles leading to a greater overall reduction in recruitment potential. However, the best available information indicates that, if handled correctly, these activities do not result in the mortality or significant injury of sturgeon, and that spawning runs are likely not interrupted.

Environmental Consequences to the Biological Environment-Other

We do not anticipate any significant impacts to the biological environment based on netting activities netting nor the benthic infaunal sampling.

Listed Species Bycatch
The proposed research is not likely to incidentally capture any federally listed species. The proposed netting activities could incidentally capture Alabama shad which is a NMFS Species of Concern (but not listed under the ESA). The applicant believes that the number of Alabama shad caught would be very small if any. Nets would be checked periodically to ensure that any bycatch is released as quickly as possible. The applicant would monitor and report all take of listed species to the NMFS Southeast Region Office of Protected Resources or the USFWS Region 4 office.

Non-Listed Non-Target Species Susceptible to Incidental Capture in Gillnet
The applicant could not estimate the exact potential mortality of bycatch organisms, but it is believed that virtually all bycatch would be released alive. The applicant believes that the fact that they would frequently observe the net would essentially restrict the number of bycatch organisms taken. The applicants believe that their quick response to any capture would considerably reduce potential mortality.

Marine Mammal and Sea Turtle Interactions
While interactions between trawling vessels and marine mammals and sea turtles in the sampled area is rare, the possibility exists that these animals could be struck by the boat, taken in the gillnet, or stressed by the presence of the boat. As advised by the NMFS Regional Office of Protected Resources and as noted in the award conditions, measures to minimize marine mammal and sea turtle interactions would be required. Namely, nets would not be deployed when animals are observed within the vicinity of the research; nets would be monitored in areas where marine mammals are known to occur; and animals would be allowed to either leave or pass through the area safely before net setting is initiated. In all boating activities (including travel to acoustic receiver arrays outside of the netting area) a close watch would be made for marine mammals and sea turtles to avoid harassment or interaction. Researchers would also be advised to review the NMFS Southeast Region Marine Mammal Approach and Viewing Guidelines located online at http://www.nmfs.noaa.gov/pr/education/southeast/. No take of marine mammals or sea turtles is expected.

Environmental Consequences- Physical Environment

While the researcher's boats would pass through and over the water column of the area, NMFS determined that this portion of the research activities would not adversely impact the physical environment (including any portion that is considered critical habitat and EFH). The Office of Protected Resources (PR) also considered the potential impact of the researcher's proposed netting activities. There would be very little bottom drag by nets on the bottom habitat. The effect of the net and anchor on the bottom habitat is expected to be minimal. It is anticipated that there would be minimal disturbance to benthic communities associated with our boat operations and benthic and sediment sampling. The latter two activities would probably be similar to grazing activities by a passing school of fish that would create new patches that would restart successional colonization by benthic fauna.

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

Compliance with Endangered Species Act: To comply with Section 7 of the ESA Regulations (50 CFR 402.14(c)), a formal Section 7 consultation was initiated by the NMFS PR, under the ESA. In accordance with Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.), a biological opinion was prepared for this proposed action and it concluded that after reviewing the current status of the Gulf sturgeon, the environmental baseline for the action area, and probable cumulative effects, it is NMFS' opinion that issuance of Award No. 4720034, as proposed, is not likely to jeopardize the continued existence of the Gulf sturgeon or any other NMFS ESA-listed species and is not likely to destroy or adversely modify designated critical habitat.

Compliance with the Magnuson-Stevens Act: Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) requires NMFS to complete an EFH consultation for any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by the agency that may adversely affect EFH. The issuance of the proposed award would not impact designated EFH. The Office of Habitat Conservation was contacted and concurred via email that the proposed action as it would be conditioned would have minimal impacts on EFH. Therefore, no further consultation was necessary.

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

Coordination with the National Ocean Service: The actions in the applications for Award No. 4720034 would not occur in a National Marine Sanctuary. The research activities would not impact any National Marine Sanctuaries, so no consultation was conducted.

4.4 MITIGATION MEASURES

The activities authorized under proposed Award NA10NMF4720034, if approved, would follow certain procedures in order to minimize and mitigate effects of the proposed action. If the grant is awarded, the following Special Award Conditions (SACs) would be placed on the award to ensure compliance with appropriate research protocols. The researcher's state in their application that only trained personnel would be allowed to handle the fish.
To minimize the potential adverse effects of the award activities, mitigating measures are included in the conditions of the permit and grant award. All permit conditions apply. Award conditions include:

1. Handling conditions:

a. Total handling time of any individual sturgeon will not exceed 15-20 minutes.

b. For weight measurements, sturgeon will be supported using a sling or net and handling should be minimized throughout the procedure. Researchers will wear smooth rubber gloves to reduce abrasion of skin and removal of mucus.

c. To reduce stress, all fish handled out-of-water will be transferred to a live well on the boat.

d. If fish are anesthetized, they will be allowed to recover before release.

2. Net conditions:

a. The awardees will take all necessary precautions to ensure that sturgeon are not harmed during captures. The following netting protocols will be followed.

Fishing protocols for Gulf sturgeon		
Net set	Temperature at sampling depth	DO at sampling depth
6 hours	Up to 15°C	4.5 mg/l
4	15° to 20°C	4.5 mg/l
2	20° to 25°C	4.5 mg/l
1	25° to 28°C	4.5 mg/l
No netting	Over 28°C	4.5 mg/l

b. To minimize injury, heavy multifilament mesh will be used instead of monofilament or light twine, which is more apt to cut into the fish causing injury.

3. Tagging Conditions:

a. Total weight of tags (external and internal) on any fish will not exceed 2% of the fish's total body weight.

b. External tagging will not occur when water temperatures exceed 27° C or are less than 7° C, or be implanted in pre-spawning fish or fish on their spawning grounds.

4. Sampling Conditions: Extreme care will be used when collecting tissue samples (tissue/fin ray/scute spine). Instruments will be cleaned between each fish sampled to avoid possible disease transmission.

5. ESA Listed Species: Should an federally listed endangered or threatened species be taken incidentally during the course of netting, researchers will suspend operations and notify and consult with either USFWS or NOAA Fisheries within 24 hours of any capture.

6. Marine Mammals and Sea Turtles: Should a marine mammal or sea turtle be taken incidentally during the course of netting, researchers will suspend operations and notify and consult with NOAA Fisheries Southeast Region Protected Resources Division within 24 hours.

a. In areas where marine mammals may be present, nets will not be deployed when animals are observed within the vicinity of the research; nets will be monitored in areas where marine mammals are known to occur; and animals will be allowed to either leave or pass through the area safely before net setting is initiated.

b. In all boating activities (including travel to acoustic receiver arrays outside of the netting area) a close watch will be made for marine mammals and sea turtles to avoid harassment or interaction.

c. Researchers are advised to review the marine mammal approach and viewing guidelines online at http://www.nero.noaa.gov/prot_res/mmv/ and the bottlenose dolphin and manatee guidelines at http://www.nmfs.noaa.gov/pr/education/regional.htm#se.

d. All sampling and boating activities will also comply, as applicable, with the relevant portions of the Atlantic Large Whale, the Bottlenose Dolphin, and Harbor Porpoise Take Reduction Plans.

7. Aquatic Nuisance Species

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

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

4.5 CUMULATIVE EFFECTS

Effects of past and ongoing human and natural factors (fisheries, maintenance dredging, existing NMFS research and other activities) occurring in or near the action area that have contributed to the current status of the species. Activities and threats are expected to continue into the future. NMFS expects that the proposed research activities will not appreciably reduce Gulf sturgeon likelihood of survival and recovery in the wild by adversely affecting their birth rates, death rates, or recruitment rates. In particular, NMFS expects the proposed research activities not to affect adult female sturgeon in a way that appreciably reduces the reproductive success of adults, the survival of young, or the number of young that annually recruit into the breeding populations of any of the species.

Effects of the research activities include stress and localized pain from the capture, tagging, and sampling methods. However, effects are short-term in nature and have been shown to have no long-lasting effects on the individual's ability to survive.

A review of the data from annual permit reports indicates that, if done in accordance with the NMFS's sturgeon protocols, gill netting for Gulf sturgeon can be done very safely with little risk of direct mortality. Of the approximately 5,000 captures documented between 1999 and 2002, only 12 shortnose sturgeon, or 0.2%, suffered direct mortality. In addition, studies have also shown that tagged fish appear to recover quickly and show no long-term effects from handling (Moser et al. 2000).

The short-term stresses (separately and cumulatively) resulting from the activities discussed above are expected to be minimal. NMFS expects the additional short-term stress of the activities would not significantly affect the sturgeon. The award and permit would contain conditions (outlined above) to mitigate adverse impacts to animals from these activities.

The proposed action would not be expected to have any more than short-term effects any marine life species or other portions of the environment and would not result in any cumulatively significant effects.

CHAPTER 5 LIST OF PREPARERS AND AGENCIES CONSULTED

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

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

Southeast Regional Office
National Marine Fisheries Service
Habitat Conservation Division
St. Petersburg, FL 33701

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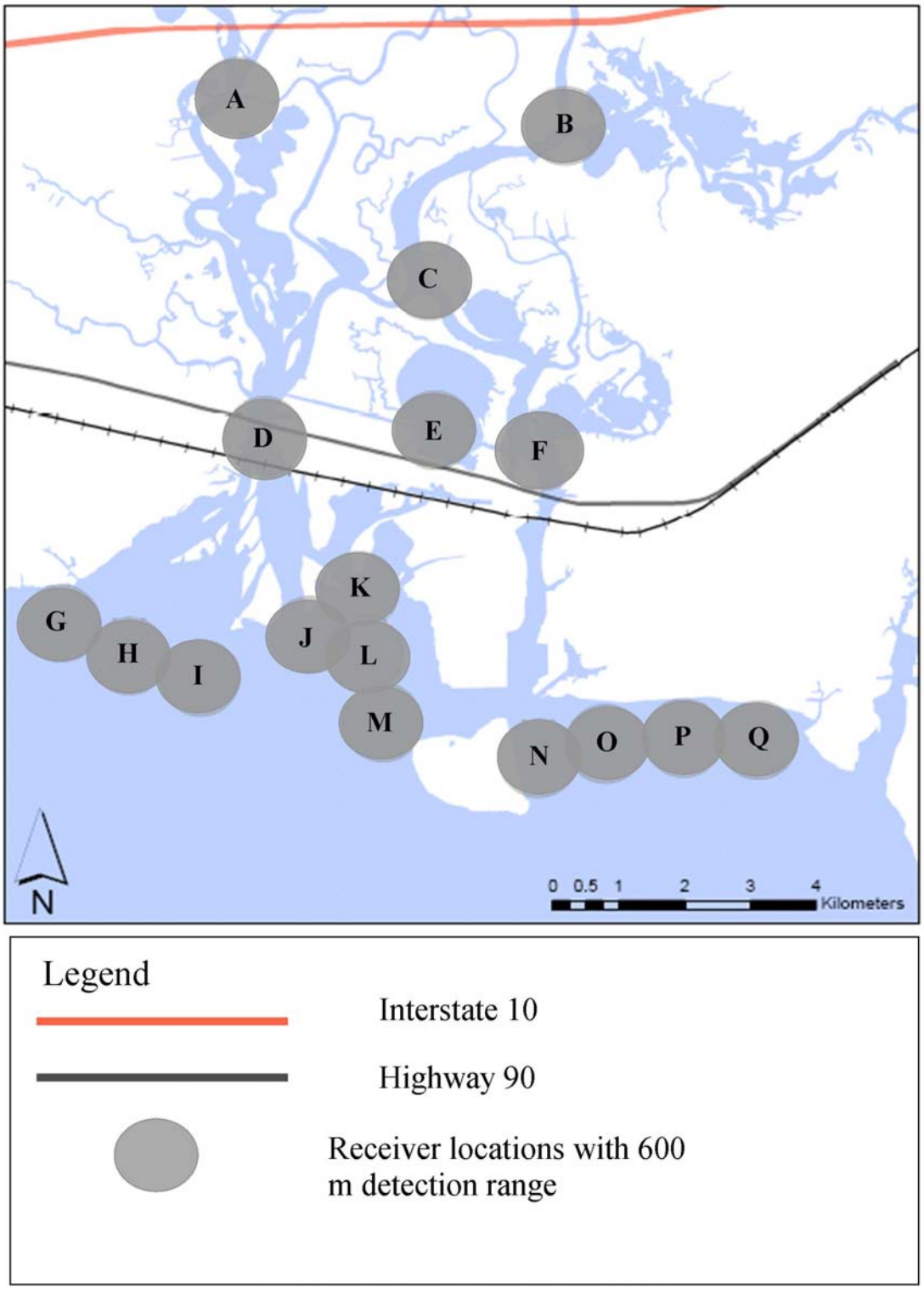
Appendix 1. Acoustic transmitter locations.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Highway 90
Receiver locations with 600 m detection range