DRAFT

Impact Analysis of Critical Habitat Designation for the Carolina and South Atlantic Distinct Population Segments of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

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EXECUTIVE SUMMARY

This report describes baseline economic and regulatory conditions, overall economic impacts, impacts on national security, and other relevant impacts associated with the proposed designation of fourteen separate occupied critical habitat units for the Carolina and South Atlantic distinct population segments (DPSs) of Atlantic sturgeon and three unoccupied units of critical habitat. Many impacts of the designation have not been quantified or monetized and so are described qualitatively. Information about numbers and types of past consultations in each critical habitat unit and input from federal agencies provided a basis for estimating the likely numbers of future consultations and related costs in different areas.

Based upon the best scientific data available, we determined that key habitat-based conservation objectives for these species are facilitating adult reproduction and facilitating juvenile recruitment into the adult population by protecting spawning areas, juvenile development habitat, and the migratory corridors that allow adults to reach the spawning areas and newly spawned sturgeon to migrate safely downstream and continue their development and maturation. We identified physical features within these areas that are essential to the conservation of the species because they provide habitat suitable for spawning and juvenile recruitment.

Those essential habitat features are:

- Suitable hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 ppt range) for settlement of fertilized eggs and refuge, growth, and development of early life stages;
- Transitional salinity zones inclusive of waters with a gradual downstream gradient of 0.5-30 ppt and soft substrate (e.g., sand, mud) downstream of spawning sites for juvenile foraging and physiological development;
- Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: (1) unimpeded movement of adults to and from spawning sites; (2) seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary; and (3) staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (at least 1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river.
- Water quality conditions, especially in the bottom meter of the water column, with temperature and oxygen values that support: (1) spawning; (2) annual and interannual adult, subadult, larval, and juvenile survival; and (3) larval, juvenile, and subadult growth, development, and recruitment. Appropriate temperature and oxygen values will vary interdependently, and depending on salinity in a particular habitat. For example, 6 mg/L D.O. for juvenile rearing habitat is considered optimal, whereas D.O. less than 5.0 mg/L for longer than 30 days is considered suboptimal when water temperature is greater than 25°C. In temperatures greater than 26°C, D.O. greater than 4.3 mg/L is needed to protect survival and growth. Temperatures of 13° C to 26° C for spawning habitat are considered optimal.

Our proposed designation for the Carolina DPS includes 8 critical habitat units (7 occupied and 1 unoccupied) totaling over 1,400 river miles in 2 states. Our proposed designation for the South Atlantic DPS includes 8 critical habitat units (7 occupied and 1 unoccupied) totaling over 1,800 river miles in 3 states.

Economic Impacts

The primary source of impacts of critical habitat designation is the cost of Section 7 consultations, which include administrative costs and costs of project modifications to avoid adverse effects to essential

features and unoccupied areas of critical habitat. For purposes of assessing the potential range of Section 7 impacts, the number of consultations likely to occur over the next ten years was projected for each critical habitat unit based on the numbers of consultations that took place during the past ten years in each unit and are judged likely to require consultation if they occur in the future because they have the potential to adversely affect one or more of the essential features or unoccupied areas of critical habitat. Correspondence with federal action agencies on the levels of activities anticipated over the next ten years indicated that numbers of consultations in each proposed critical habitat unit in the past are in most instances a reasonable basis for estimating future consultations; information on new types of activities that may require consultation in the future was added to the analysis.

Ten different federal entities implemented or approved 14 different categories of activities in the areas covered by the proposed critical habitat units that required consultations in the past. All categories of activities implemented by these federal entities were identified as having the potential to affect the essential features. The total number of projected consultations over 10 years is indicated in parentheses below.

1.	USACE --	Navigation maintenance dredging, harbor expansion (14)
2.	USACE --	WRDA flood control, ecosystem restoration studies (6)
3.	USACE --	WRDA dam operations, repair, fishway construction (3)
4.	USACE --	Section 404/RHA section 10 permitting – dredge, fill, construction (20)
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We estimate that 205 projects will require consultation over the next 10 years to analyze impacts to Atlantic sturgeon critical habitat. All the activities identified as having the potential to affect one or more of the proposed essential features, also have the potential to affect Atlantic sturgeon or shortnose sturgeon. For most if not all of the projected future activities, if the effects to critical habitat will be adverse and require formal consultation, those effects would also constitute adverse effects to one or both sturgeon species, either directly when they are in the project area, or indirectly due to the effects on their habitat. This is due to the conservation functions that the features are being designated to provide. For some of the projected activities, it may be feasible to conduct the action when sturgeon are out of the action area. If effects to critical habitat are temporary such that the essential features return to their pre-project condition by the time the sturgeon return and need to use the features, there might not be any adverse effects to either the species or the critical habitat. In these circumstances, consultations would be fully incremental consultations only on critical habitat, and the consultations would be informal (i.e., impacts to critical habitat would not be permanent and would not be significant). To be conservative and avoid underestimating incremental impacts of this designation, and based on the activities involved, we assumed that 2 categories of U.S. Army Corps of Engineers activities (numbers 3 and 4 above) could result in incremental informal consultations. EPA's consultations will be national in scope, and involve evaluating impacts to all listed species and designated critical habitat under NMFS's jurisdiction. Thus, the incremental impacts attributable solely to this proposed designation are much smaller than the cost of a single, local consultation.

All incremental impacts of the proposed designation consist of administrative costs of section 7 consultation; no incremental project modifications required solely to address impacts to critical habitat are predicted to result from this designation. Types of coextensive project modifications that might be required are described, and example costs for those types of activities are provided for illustrative purposes. Administrative costs include the cost of time spent in meetings, preparing letters, and in some cases, developing a biological assessment and biological opinion, identifying and designing RPMs, and so forth. For this impacts report, we estimated per-project administrative costs based on IEc 2014. We project that the costs that will result from the proposed designation will total $1,092,793 over the next ten years. The total incremental costs resulting from the designation for the Carolina DPS are $503,954, and the total incremental costs resulting from the designation for the South Atlantic DPS are $588,839 over 10 years. The per-unit costs vary widely. Annual per-unit costs range from $147 (Unoccupied Cape Fear River unit, Carolina DPS) to $23,051 (Occupied Savannah River unit, South Atlantic DPS).

All projected types of future federal actions that have routes of effects to one or more of the critical habitat essential features also have routes of effects to Atlantic sturgeon or shortnose sturgeon. The administrative cost estimates above are based on our best judgments that the vast majority of incremental impacts will consist of the administrative costs of adding critical habitat analyses to formal consultations. A small subset (23) of the projected future federal actions could have wholly incremental impacts resulting from the critical habitat designation (i.e., those categories of actions we assumed could be conducted when sturgeon are out of project areas). These potential incremental consultations would all be informal.

Projected 10 year and average annual Section 7 consultations and related administrative costs per critical habitat unit

DPS	Unit	Numbers of Section 7 Consultations Over Ten Years[1]	Annual Average	Annual Section 7 Costs	Total Administrative Costs over 10 Years
Carolina	Roanoke C1	13	1.3	$2,179.48	$21,794.84
	Tar-Pamlico C2[2]	20	2.0	$5,947.48	$59,474.84
	Neuse C3	14	1.4	$3,195.48	$31,954.84
	Cape Fear C4[2]	29	2.9	$10,731.48	$107,314.84
	Unoccupied Cape Fear CU1	9	0.9	$147.48	$1,474.84
	Pee Dee River C5[2]	35	3.5	$13,713.94	$137,794.84
	Black C6	10	1.0	$655.48	$6,554.84
	Santee-Cooper C7[2]	29	2.9	$11,579.48	$115,794.84
	Unoccupied Santee-Cooper system CU2	13	1.3	$2,113.94	$21,794.84
	DPS Total	**101[1]**	**10.1**	**$50,395[3]**	**$503,954[3]**
South Atlantic	Edisto SA1	13	1.3	$2,179.48	$21,794.84
	Combahee SA2	12	1.2	$1,671.48	$16,714.84
	Savannah SA3[2]	52	5.2	$23,051.48	$230,514.84
	Unoccupied Savannah SAU1	10	1.0	$655.48	$6,554.84

	Ogeechee SA4	23	2.3	$7,259.48	$72,594.84
	Altamaha SA5[2]	39	3.9	$18,691.48	$186,914.84
	Satilla SA6	18	1.8	$4,719.48	$47,194.84
	St. Marys SA7	10	1.0	$655.48	$6,554.84
	DPS Total	**114[1]**	**11.4**	**$58,884[3]**	**$588,839[3]**

[1] Given the nationwide nature of the EPA pesticide authorization consultations, 9 consultations are included in the total number of consultations for this report, 9 are included in the total for each unit, and 9 are included in each DPS's total. The costs of these consultations are $819.35 per unit. These costs were derived by spreading the costs of adding critical habitat analyses to 9 coextensive formal consultations across the 17 units of this proposed rule plus the 14 units of the companion rule proposing critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. This is a conservative overestimate of per-unit costs, given these consultations are considering impacts to all listed species and designated critical habitat under NMFS's jurisdiction.

[2] These units include incremental informal consultations

[3] Rounded to nearest dollar

We acknowledge that there is a great deal of inherent uncertainty in predicting the impacts of future federal actions, due to the lack of information on the scope, methods, exact locations, timing, and other facets of future activities. Thus, for illustration purposes, we also calculated what the future administrative costs might be if 50 percent of all future federal actions involve wholly incremental impacts due to the designation, and the other 50 percent consist of coextensive consultations as described above – i.e., the only incremental impacts are additional administrative costs of adding critical habitat analyses to a consultation required to address impacts to the species. We then estimated costs for a hypothetical circumstance that all of the incremental consultations are informal consultations, and for a hypothetical circumstance that all of the incremental consultations are formal (see Table 3-12). As with Table 3-20, for these hypothetical cases, we again applied the administrative costs estimates reported in Exhibit 2-1 of IEc 2014. Based on these estimates, administrative costs of wholly incremental consultations would total $7,200 per informal consultation and $15,000 per formal consultation. In the case where 50 percent of future incremental consultations per unit are informal, the costs over 10 years would increase by approximately 17 percent to $589,814 for the Carolina DPS and $688,475 for the South Atlantic DPS (Table 3-21). If 50 percent of future incremental consultations per unit are formal, the costs over 10 years in the table above would increase by approximately 88 and 90 percent, respectively, to $948,614 for the Carolina DPS and $1,117,819 for the South Atlantic DPS (Table 3-21).

National Security Impacts

NMFS reviewed information provided by the Department of the Defense regarding activities currently conducted within the critical habitat areas and that may be conducted over the next 10 years.

Based on a review of our consultation database, and the information provided by the Navy, Air Force, Army, and USCG on their activities conducted within the specific areas proposed for designation as Atlantic sturgeon critical habitat, we determined that the only incremental impact of this designation will be added administrative costs of consultation. Only one military action identified as a potential area of national security impact has routes of potential effects to proposed critical habitat – river channel dredging. As discussed in the report, this activity will require consultation due to potential adverse impacts to Atlantic and shortnose sturgeon, and any project modifications needed to address impacts to these species would also address impacts to critical habitat. Thus, no incremental project modification impacts are expected due to this designation. On this basis, we conclude there will be no national security impacts associated with the proposed critical habitat for the Carolina and South Atlantic DPSs of Atlantic sturgeon.

Other Relevant Impacts

Other relevant impacts of the designation include conservation benefits of the critical habitat, both to the species and to society. Because the features that form the basis of the critical habitat are essential to the conservation of the Carolina and South Atlantic DPSs of Atlantic sturgeon, the protection of critical habitat from destruction or adverse modification may at a minimum prevent loss of the benefits currently provided by these species and may contribute to an increase in the benefits of these species to society in the future. The identification and protection of the essential features of critical habitat and other components of the ecosystem that use or benefit from the essential features may result in continued provision of benefits to the ecosystem and user groups and economic sectors that utilize these habitats or ecosystem components, such as fishing and boating. While it is not possible to quantify or monetize the benefits, we believe they are not negligible and would be enhanced as a result of this action.

We have analyzed the economic, national security and other relevant impacts of the critical habitat. While we have utilized the best available information and an approach designed to avoid underestimating impacts, many of the potential impacts are speculative and may not occur in the future. The analysis indicates that there is no particular area within the critical habitat areas where economic impacts would be particularly high or concentrated. Other relevant impacts include conservation benefits, both to the species and to society. On the basis of our impacts analysis, we are not exercising our discretion to consider excluding any particular areas from the critical habitat.

As required under the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*, as amended by the Small Business Regulatory Enforcement Fairness Act of 1996), we conducted an Initial Regulatory Flexibility Analysis (IRFA), which is presented in Appendix A to this report. We considered various alternatives to the critical habitat designation for the Carolina and South Atlantic DPSs of Atlantic sturgeon. The alternatives considered include a no action alternative, the preferred alternative and an alternative which would designate a more expansive area as critical habitat. The alternative of not designating critical habitat would impose no economic, national security, or other relevant impacts, but would not provide any conservation benefit to the species. This alternative was considered and rejected because such an approach would not meet the legal requirements of the ESA and would not provide for the conservation of Atlantic sturgeon DPSs. Under the preferred alternative, 14 occupied river systems totaling over 3,300 river miles in 4 states that provide reproduction and recruitment functions for the Carolina and South Atlantic DPSs of Atlantic sturgeon are proposed for designation as critical habitat. These areas are located in the watersheds from the Roanoke River southward along North Carolina, South Carolina, Georgia, and Florida coastal areas to the St. Marys River. These areas contain the physical and biological features essential to the conservation of the Carolina and South Atlantic DPSs of Atlantic sturgeon. In addition, the preferred alternative includes 3 unoccupied areas currently blocked by dams that are essential to the DPSs' conservation to provide spawning habitat once access to these areas is attained. In addition to the no action alternative and the preferred alternative, we considered a more expansive designation that would include all large coastal rivers from the North Carolina/Virginia border southward to the St Johns River, Florida. Several large coastal rivers within the geographic area occupied by the Carolina and South Atlantic DPSs of Atlantic sturgeon do not appear to support spawning and juvenile recruitment or to contain suitable habitat features to support spawning. These rivers are the Chowan and New Rivers in North Carolina; the Waccamaw (above its confluence with Bull Creek which links it to the Pee Dee River), Sampit, Ashley, Ashepoo, and Broad-Coosawhatchie Rivers in South Carolina; and the St. Johns River, Florida. We elected instead to base the designation on rivers with evidence of actual current spawning by Atlantic sturgeon.

Third parties, which could be small entities, could conceivably be involved in 184 projected future federal actions requiring consultation over the next 10 years to assess impacts of proposed projects on critical habitat. Third parties would consist of permittees, applicants, grantees or their contractors, that are proponents for actions authorized or funded by federal agencies. Because we do not project that any project modifications will be required solely to address the impacts of predicted future activities on critical habitat, the impacts on third parties would consist solely of the costs of participating in section 7

consultations. Assuming a third party would be involved and incur costs for each of the 184 projects in all of the categories of federal activity that involved third parties in the past except the EPA consultations, the costs to third parties that could be involved in the projected future consultations would be between $880 and $2,080 for each action for coextensive formal consultations, and between $1,500 to $3,000 for each fully incremental informal consultation; the higher estimates involve the costs of producing a biological assessment for proposed actions. The total costs over the next 10 years to all third parties for these 2 classes of actions would be between $30,000 and $60,000 for the incremental informal consultations and between $136,400 and $322,400 for the coextensive formal consultations. Based on the nature of these activities, businesses in NAICS sectors 22 (utilities), 54 (professional, scientific and technical services), and construction might be involved in future consultations. Businesses in NAICS Subsector 325320, Pesticide and Other Agricultural Chemical Manufacturing, could be involved in the 9 nationwide EPA pesticide authorization consultations. Based on the national scope of these consultations, the total costs over the next 10 years to third parties involved are conservatively estimated to be $25,072 across all units.

Our consultation database does not track whether third parties involved in previous consultations were small entities. Even though we cannot determine relative numbers of small and large entities that may be affected by the designation of critical habitat, there is no indication that affected project applicants would be limited to, nor disproportionately comprised of, small entities. It is unclear whether small entities would be placed at a competitive disadvantage compared to large entities. Potential economic impacts of the action consist solely of administrative costs of participating in the consultation process.

Acronyms

CMPA – Coastal Marshlands Protection Act

CNPSP – Coastal Nonpoint Source Program

CPI – Consumer Price Index

CWA – Clean Water Act

CZMA – Coastal Zone Management Act

DO – Dissolved Oxygen

DOD – Department of Defense

DOT – Department of Transportation

DPS – Distinct Population Segment

EFH – Essential Fish Habitat

EIS – Environmental Impact Statement

EO – Executive Order

EPA – Environmental Protection Agency

ESA – Endangered Species Act

ESU – Evolutionary Significant Units

FEMA – Federal Emergency Management Agency

FERC – Federal Energy Regulatory Commission

FHWA – Federal Highway Administration

FMP – Fishery Management Plan

FPA – Federal Power Act

GADNR – Georgia Department of Natural Resources

GCMP – Georgia Coastal Management Program

GEPA – Georgia Environmental Policy Act

GAEPD – Georgia Environmental Protection Division

GDP – Gross Domestic Product

HCP – Habitat Conservation Plan

IEc – Industrial Economics, Inc.

INRMP – Integrated Natural Resources Management Plan

IRFA – Initial Regulatory Flexibility Analysis

NAICS – North American Industrial Classification System

NCDCM – North Carolina Division of Coastal Management

NCDENR – North Carolina Department of Environment and Natural Resources

NCDPR – North Carolina Department of Parks and Recreation

NCDWQ – North Carolina Division of Water Quality

NCDWR – North Carolina Division of Water Resources

NCFS – North Carolina Forestry Service

NCP – National Contingency Plan

NCWRC – North Carolina Wildlife Resources Commission

NEPA – National Environmental Policy Act

NERR – National Estuarine Research Reserve

NMFS – National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

NPDES - National Pollutant Discharge Elimination System

NPS – National Park Service

NRC – Nuclear Regulatory Commission

NSBLD – New Savannah Bluff Lock and Dam

NWR – National Wildlife Refuge

OHWM – Ordinary high water mark

OMB – Office of Management and Budget

PCA – Pollution Control Act

PCTS – Public Consultation Tracking System

ppt – parts per thousand

RFA – Regulatory Flexibility Act

RHA – Rivers and Harbors Act

RL – Revocable License

RPA – Reasonable and Prudent Alternative

RPM – Reasonable and Prudent Measure

SBA – Small Business Administration

SCDHEC – South Carolina Division of Health and Environmental Control

SCDNR – South Carolina Department of Natural Resources

SCDOT – South Carolina Department of Transportation

SCDPRT – South Carolina Department of Parks, Recreation and Tourism

SCFC – South Carolina Forestry Commission

SEPA – (North Carolina) State Environmental Policy Act

SIA – Sikes Improvement Act

SLOPES – State and Local Operating Procedures for Endangered Species

SPA – Shore Protection Act

TMDL – Total Maximum Daily Load

USACE – United States Army Corps of Engineers

USCG – United States Coast Guard

USDA – United States Department of Agriculture

USFS – United States Forest Service

USFWS – United States Fish and Wildlife Service

WMA – Wildlife Management Area

WTP – Willingness-to-Pay

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1 INTRODUCTION

This report contains an analysis of the impacts of the National Marine Fisheries Service (NMFS) designating critical habitat under Section 4 of the Endangered Species Act (ESA) for the Carolina and South Atlantic distinct population segments (DPS) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), which were listed as endangered under the ESA on February 6, 2012 (Volume 77 of the Federal Register 5914 [77 FR 5914]). This report describes the applicable laws, court rulings, Executive Orders (EOs), and policies, and then describes the methods used and processes followed to conduct the impact analysis.

1.1 Purpose and Structure of Report

This report documents NMFS's compliance with Section 4(b)(2) of the ESA regarding the impacts of designating critical habitat for the Carolina and South Atlantic DPSs of Atlantic sturgeon. Specifically, Section 4(b)(2) requires consideration of the economic impact, impacts on national security, and any other relevant impact, of specifying a particular area as critical habitat. Section 4(b)(2) also provides us with discretion to consider excluding particular areas from a designation. Areas may be excluded if the benefits of excluding that area outweigh the benefits of including them in the designation, and only if exclusion would not result in the extinction of the species. This report provides a basis for NMFS to decide whether to exercise its discretion to consider excluding particular critical habitat areas from the designation.

The remainder of the report is structured as follows. *Section 1.2* describes the preliminary determination of essential physical and biological features and specific areas for the Atlantic sturgeon that meet the definition of critical habitat in Section 3 of the ESA, and which form the basis for identifying impacts that may result from the designation. *Sections 1.3* and *1.4* summarize Section 4(b)(2) requirements, as informed by previous designations and key court rulings, and the requirements of other laws, EOs, and policies that are applicable to evaluating the impacts of federal regulatory actions. *Section 1.5* describes the framework for the impacts analysis. *Section 2* describes the regulatory and socioeconomic baselines applicable to the impact analysis. *Section 3* presents assessments of the economic impacts of the critical habitat designation. *Sections 4 and 5* consider national security impacts and other relevant impacts of the critical habitat designation, respectively. *Section 6* synthesizes the impacts resulting from the critical habitat designation.

1.2 Summary of Preliminary Endangered Species Act Section 3 Determinations

Section 3(5)(A) of the ESA defines critical habitat as:

> *(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 1533 of this title, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protections; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 1533 of this title, upon a determination by the Secretary that such areas are essential for the conservation of the species.* (Title 16 U.S. Code [U.S.C.] §1532(5)(A))

The application of this definition for the Carolina and South Atlantic DPSs of Atlantic sturgeon is described in detail in the proposed rule to designate critical habitat for the species, which is incorporated by reference and summarized herein.

Historically, Atlantic sturgeon were present in 38 river systems from Canada to Florida. More recently, species presence has been documented in 35 river systems (77 FR 5914) and spawning has been

documented in at least 14 rivers or river systems in the southeast: the Roanoke, Tar-Pamlico, Neuse, Cape Fear-Northeast Cape Fear, Pee Dee-Bull Creek-Waccamaw, Black, Santee-Cooper, Combahee-Salkehatchie, Edisto, Savannah, Ogeechee, Altamaha-Oconee-Ocmulgee, Satilla and St. Marys rivers. Two Southeastern riverine populations are believed to be extirpated (Sampit and St. Johns rivers).

Within the geographical area occupied, or the species' occupied ranges, critical habitat is defined as specific areas containing physical or biological features essential to the species' conservation, and which may require special management considerations or protection. Conservation is defined in the ESA as meaning "to use, and the use of, all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary" (16 U.S.C. §1532(3)). Features essential to a species' conservation are those features without which the process of conservation would fail, and the species would not achieve recovery for purposes of the ESA. Although features forming the basis of a critical habitat designation must be essential to the species' conservation, the features and the specific areas designated do not have to be the sole factor required to bring about recovery.

Based upon the best scientific data available, we determined that key habitat-based conservation objectives for these species are facilitating adult reproduction and facilitating juvenile recruitment into the adult population by protecting spawning areas, juvenile development habitat, and the migratory corridors that allow adults to reach the spawning areas and newly spawned sturgeon to migrate safely downstream and continue their development and maturation. We identified physical features within these areas that are essential to the conservation of the species because they provide habitat suitable for spawning and juvenile recruitment.

Those essential habitat features are:

- Suitable hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 ppt range) for settlement of fertilized eggs and refuge, growth, and development of early life stages;
- Transitional salinity zones inclusive of waters with a gradual downstream gradient of 0.5-30 ppt and soft substrate (e.g., sand, mud) downstream of spawning sites for juvenile foraging and physiological development;
- Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: (1) unimpeded movement of adults to and from spawning sites; (2) seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary; and (3) staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (at least 1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river.
- Water quality conditions, especially in the bottom meter of the water column, with temperature and oxygen values that support: (1) spawning; (2) annual and interannual adult, larval, and juvenile survival; and (3) larval and juvenile growth, development, and recruitment. Appropriate temperature and oxygen values will vary interdependently, and depending on salinity in a particular habitat. For example, 6 mg/L D.O. for juvenile rearing habitat is considered optimal, whereas D.O. less than 5.0 mg/L for longer than 30 days is considered suboptimal when water temperature is greater than 25°C. In temperatures greater than 26°C, D.O. greater than 4.3 mg/L is needed to protect survival and growth. Temperatures of 13° C to 26° C for spawning habitat are considered optimal.

Specific areas containing these essential features are identified as rivers or river systems where Atlantic sturgeon spawning populations are known to occur. In addition, we are including the Santee-Cooper River system, though there is uncertainty whether Atlantic sturgeon populations in this system are currently attempting to spawn, because of the importance of this large adult population to the DPS and

because fish passage allowing access to upstream spawning habitats has been prescribed by NMFS under the Federal Power Act. We are not including river systems where Atlantic sturgeon spawning populations are uncertain to occur or are believed to be extirpated. The Carolina DPS of Atlantic sturgeon contains seven occupied critical habitat units: the Roanoke River (Unit C1), Tar-Pamlico River (Unit C2), Neuse River (Unit C3) Cape Fear and Northeast Cape Fear Rivers (Unit C4), Pee Dee River System, including the Great Pee Dee River, Bull Creek and part of the Waccamaw River (Unit C5), Black River (Unit C6), and the Santee-Cooper River system (Unit C7).

The South Atlantic DPS contains seven occupied critical habitat units: the Edisto River (Unit SA1) and Combahee-Salkehatchie River (Unit SA2), both within the ACE (Ashepoo, Combahee, and Edisto Rivers) Basin, Savannah River (Unit SA3), Ogeechee River (Unit SA4), Altamaha, Oconee and Ocmulgee Rivers (Unit SA5), the Satilla River (Unit SA6), and the St. Marys River (Unit SA7).

The essential physical features of suitable spawning and juvenile foraging substrate, salinity, water depth and passage conditions, and water quality, may require special management considerations or protection. Barriers (e.g., dams, tidal turbines), to generate power or control water flow in rivers used by Atlantic sturgeon can damage or destroy bottom habitat needed for spawning and rearing of juveniles, restrict movement of adults to and from spawning grounds and prevent juveniles from accessing the full range of salinity exposure in the natal estuary, and alter water quality parameters, including water depth, temperature and dissolved oxygen, to the detriment of sturgeon growth and survival. Water withdrawals can similarly adversely impact water quality for Atlantic sturgeon spawning, recruitment and development. Land development and commercial and recreational activities on a river can contribute to sediment deposition that affects water quality necessary for successful spawning and recruitment. A build-up of fine silts and sediments may, for example, reduce the suitability of hard spawning substrate for Atlantic sturgeon egg adherence and reduce the interstitial spaces used by larvae for refuge from predators. Dredging to remove sediment build-up, to deepen harbors and facilitate vessel traffic, or to mine construction materials, may remove or alter hard substrate that is necessary for egg adherence and as refuge for larvae, and may change the water depth resulting in shifts in the salt wedge within the estuary or change other characteristics of the water quality (e.g., temperature, dissolved oxygen) necessary for the developing eggs, larvae, and juveniles. Southeast rivers used by sturgeon already threaten the species' survival and recovery due to exceedances of temperature and dissolved oxygen tolerances of sturgeon; these impacts will worsen as a result of global climate change and predicted warming of the southeast region. Many communities and commercial facilities withdraw water from the rivers containing the features essential to Atlantic sturgeon reproduction. Water withdrawals during drought events can affect the position of the salt wedge, further impacting the water flow necessary for successful sturgeon reproduction and affect dissolved oxygen levels.

We have determined that several areas outside the geographical area occupied by the species at the time of listing are essential for the conservation of the Carolina and South Atlantic DPSs and are therefore included in the proposed designation. The Cape Fear and Santee-Cooper river systems, and the Savannah River system, contain unoccupied areas we have determined are essential for the conservation of the Carolina and South Atlantic DPSs, respectively. These three areas are essential for the DPSs' conservation due to the lack or limitation of spawning habitat below the identified dams on these rivers.

In the Carolina DPS, fish passage designed to be capable of passing Atlantic sturgeon was installed at Lock and Dam #1 on the Cape Fear River in late 2012 and we anticipate the future presence of Atlantic sturgeon upstream of the structure. Occupied Atlantic sturgeon critical habitat includes areas with the essential features up to Lock and Dam #2. Telemetry data from the Cape Fear River (Loeffler and Collier in Post *et al*., 2014) indicates that Atlantic sturgeon make spawning movements up the Cape Fear River before being stopped at Lock and Dam #1; in one case the fish went downstream and then moved up the Northeast Cape Fear River. However, there have been reports of Atlantic sturgeon above Lock and Dam #1 (J. Hightower, NCSU, pers. comm. To J. Rueter, NMFS, July 21, 2015. It is likely the fish moving up to Lock and Dam #2 are attempting to reach historic upstream spawning areas. Using the fall line as

guide, only 33 percent of the historical habitat is available to Atlantic sturgeon below Lock and Dam #1 (96 km of 292 km). In some years, the salt water interface reaches the first lock and dam; therefore, spawning adults in the Cape Fear River either do not spawn in such years or spawn in the major tributaries of the Cape Fear River (i.e., Black River or Northeast Cape Fear rivers) that are not obstructed by dams. There are some exposed outcrops that would provide suitable substrate necessary for spawning between Lock and Dam #2 and Huske Lock and Dam (J. Facendola, NCDMF pers. comm. To J. Rueter, NMFS, July 20, 2015).

In the Santee-Cooper River System, spawning Atlantic sturgeon currently can only access portions of the rivers up to the Pinopolis Dam on the Cooper River, and up to the Wilson and St. Stephens dams on the Santee River. There are extremely limited critical habitat features below these dams, and the habitats do not support successful completion of all sturgeon life stages. Using the fall line as the upper region of spawning habitat, it is estimated that only 38 percent of the historical habitat is available to Atlantic sturgeon in the Santee-Cooper River system today. The Santee-Cooper Hydroelectric Project is located in the coastal plain of the Santee Basin on the Santee and Cooper Rivers, and coastal plains habitat contains little if any appropriate hard substrate spawning habitat. NMFS has prescribed that safe and effective fish passage be constructed for sturgeon at the Pinopolis and Wilson dams, through the Federal Power Act to facilitate increased spawning and population growth in sturgeon and other anadromous fish species. The prescription is a mandatory condition that must be included in the new license that FERC issues to the owner and operator of the hydropower project. Unoccupied critical habitat includes areas up to the Wateree Dam on the Wateree River and the Parr Shoals Dam on the Broad River. Suitable spawning habitat has been documented on both these rivers. Spawning shortnose sturgeon ascend from the reservoirs to the Congaree River. Eggs have been collected from a gravel bar at the city of Columbia, SC (Congaree River, rkm 70). Telemetered individuals have also recently ascended the Wateree River. Successful recruitment in the reservoirs has been verified by collection of a juvenile. Thus, we anticipate Atlantic sturgeon will be able to spawn successfully in habitats above the Wilson and Pinopolis Dams, once fish passage is constructed.

In the South Atlantic DPS, the Savannah River spawning population currently has access only up to the New Savannah Bluff Lock and Dam (NSBLD). Construction of a rock arch ramp capable of safely and effectively passing sturgeon at NSBLD is a mandatory condition of the Biological Opinion NMFS issued to the U.S. Army Corps of Engineers (USACE) on the effects of the Savannah Harbor Expansion Project, completed November 4, 2011. Construction of the fish passage must commence prior to, or concurrently with, the start of inner harbor dredging and must be completed within 2 years. Unoccupied Atlantic sturgeon critical habitat is being proposed for riverine habitat up to the Augusta Diversion Dam. The historical primary spawning habitat for Atlantic sturgeon (and only shoal habitat on the Savannah River), the Augusta Shoals, is not accessible to Atlantic sturgeon because it lies above the New Savannah Bluff Lock and Dam. Sturgeon are currently frequently seen at the base of the New Savannah Bluff Lock and Dam during spawning season, indicating either crowding below the dam or individual motivation to spawn further upriver, or both.

Finally, Section 4(a)(3)(B) prohibits designating as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense (DOD), or designated for its use, that are subject to an integrated natural resources management plan (INRMP), if it is determined that such plans have provisions that benefit the Atlantic sturgeon (16 U.S.C. §1533(a)(3)(B)). The legislative history to this provision explains:

> *"The conferees would expect the [Secretary] to assess an INRMP's potential contribution to species conservation, giving due regard to those habitat protection, maintenance, and improvement projects and other related activities specified in the plan that address the particular conservation and protection needs of the species for which critical habitat would otherwise be proposed. Consistent with current practice, the Secretary would establish criteria that would be*

used to determine if an INRMP benefits the listed species for which critical habitat would be proposed" (Conference Committee report, 149 Cong. Rec. H. 10563 (November 6, 2003)).

We requested input from DOD on INRMPs that may prohibit designation of critical habitat in certain areas. We received information on 2 INRMPs for DOD facilities on or near the banks of rivers included in the proposed designation – the Naval Submarine Base Kings Bay (GA), on the St. Marys River and Joint Base Charleston (SC), on the Cooper River. Neither base owns or controls lands or geographic areas being proposed as critical habitat. Thus, there are no areas where the INRMP prohibition is applicable.

1.3 Section 4(b)(2) Requirements

This section describes the statutory requirements of determining the impacts of designating areas as critical habitat. Interpretations of these provisions based on previous designations and key court opinions are discussed in the sections that follow.

1.3.1 The Statutory Language and Consideration of Potential Impacts of Designation

Section 4(b)(2) of the ESA states:

> *The Secretary shall designate critical habitat, and make revisions thereto, under subsection (a)(3) of this section on the basis of the best scientific data available and after taking into consideration the economic impact, impact on national security, and any other relevant impact, of specifying any particular area as critical habitat. The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species concerned.* (16 U.S.C. §1533(b)(2))

Impacts result from a critical habitat designation primarily through section 7 of the ESA (16 U.S.C. §1536). Section 7(a)(2) requires each federal agency to consult with NMFS (or the Fish and Wildlife Service (FWS), as applicable) to insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species or destroy or adversely modify the designated critical habitat of listed species. Federal agencies are required to enter into consultation with either NMFS or FWS whenever a proposed action "may affect" listed species or designated critical habitat. If a proposed federal action is likely to destroy or adversely modify critical habitat, NMFS must identify a reasonable and prudent alternative (RPA) to the proposed action that would avoid destruction or adverse modification of critical habitat. This is different from considering impacts to the continued existence of a listed species where NMFS must recommend implementation of an RPA to avoid jeopardy. If "take" might occur, then NMFS must identify in an Incidental Take Statement those Reasonable and Prudent Measures (RPM) and their implementing terms and conditions (T&Cs) to minimize the amount or extent of take. Thus, impacts that may result from section 7 consultations for projects that may affect both the species and its critical habitat include administrative costs of performing the consultation, costs of modifications to the proposed action in order to implement RPAs as well as any RPMs and T&Cs, and secondary costs to local or regional economies that result from the project modification or costs to third parties involved in the consultation. In addition, because critical habitat features found in the specific areas within the species' geographical range, and those areas outside the species' range, are by definition "essential to the conservation" of the species, conservation benefits to the listed species would be expected to result when the consultation process avoids destruction or adverse modification of critical habitat, or avoids lesser adverse effects to critical habitat that may not rise to the level of adverse modification. Adverse impacts to other components of the ecosystem may similarly be avoided through consultation and implementation of RPAs to avoid destruction or adverse modification of critical habitat.

Aside from the protections provided through section 7, the ESA imposes no requirements or limitations on any entities or individuals as a result of critical habitat designation. Benefits to the listed species and its critical habitat may nonetheless result from a designation if state or local governments voluntarily enact protective legislation or regulations to complement the ESA protections. Similarly, a designation may raise public awareness and sensitivity to the status of listed species and the importance of designated critical habitat areas for conservation. As a result, individuals or other entities may voluntarily modify their activities to avoid harm to the species or habitat, or contribute to conservation efforts.

1.3.2 Key Legal Interpretations

Prior to finalizing a critical habitat designation, section 4(b)(2) of the ESA and the joint NMFS-FWS regulations at 50 CFR 424.19 direct us to consider the probable economic, national security, and other relevant impacts of the designation upon proposed or ongoing activities. The regulations state that we may consider impacts at a scale that we determine to be appropriate and must "compare the impacts with and without the designation" (i.e., conduct an 'incremental analysis'; 50 CFR 424.19(b)). The impacts may be qualitatively or quantitatively described (50 CFR 424.19(b)).

NMFS may exclude particular areas that otherwise meet the definition of critical habitat from a designation if it is determined that the benefits of exclusion outweigh the benefits of including particular area(s), and the exclusion will not result in the species' extinction. This step is entirely discretionary and does not require exclusion in any circumstances (50 CFR 424.19(c)).

In a recent challenge, a court explicitly rejected the contention that a balancing test is required to conduct the required consideration of impacts. *Building Industry Ass'n of the Bay Area v U.S. Department of Commerce*, 2012 WL 6002511 (N.D. Cal. 2012). The court also held that the ESA section 4(b)(2) process to exclude habitat from a designation based on economic impacts is discretionary. Based on the plain meaning of ESA section 4(b)(2), even if NMFS decided to balance the benefits and determined the economic benefits of habitat exclusion would outweigh the benefits of critical habitat designation, the agency is still not obligated to exclude the area from designation. Finally, similar to previous opinions by courts in other circuits, the court held that ESA section 4(b)(2) does not provide any standard by which to judge an agency's decision not to exclude any area from critical habitat designation. As a result, the Administrative Procedure Act does not allow for court review of this agency decision, which is committed to agency discretion by law.

The ESA does not specify methods for identifying and considering the impacts of critical habitat designation, and previous designations have used a variety of approaches based on the relevant circumstances of the species and the habitat involved. As described below, the legislative history of the ESA informs these analyses, and several important court opinions have evaluated the legal sufficiency of these analyses, and clarified a number of important aspects of these statutory provisions. Section 4(b)(2) consists of two steps: an initial mandatory requirement that the agency consider certain impacts of critical habitat designation, and a discretionary step wherein the agency, informed by those considerations, may propose excluding particular areas from the designation. The ESA's legislative history explains the broad latitude afforded to NMFS in its consideration of impacts:

> *Economics and any other relevant impact shall be considered by the Secretary in setting the limits of critical habitat for such a species. The Secretary is not required to give economics or any other "relevant impact" predominant consideration in his specification of critical habitat. The consideration and weight given to any particular impact is*

completely within the Secretary's discretion. (H.R. Rep. No. 95-1625, at 16-17 (1978), 1978 U.S.C.C.A.N. 9453, 9466-67)[1].

1.4 Other Laws, Executive Orders, and Policies Applicable to Economic Impact Analysis

The consideration of impacts from a critical habitat designation is subject to other laws, E.O.s, and policies beyond the ESA. For example, the Regulatory Flexibility Act (RFA; 5 U.S.C. §601 et seq.) establishes a requirement that agencies shall endeavor, consistent with the objectives of a proposed rule and applicable statutes, to fit regulatory requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. The RFA does not contain decision criteria per se; rather, the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of a proposed action to ensure that the agency considers alternatives that minimize expected significant adverse impacts of the rule on substantial numbers of small entities, while meeting the goals and objectives of the proposed action. We have conducted an initial RFA analysis for this proposed designation (see Appendix A).

Executive Order (E.O.) 12866, Regulatory Planning and Review, provides guidance to federal agencies on the development and analysis of regulatory actions. The overarching regulatory philosophy established by E.O. 12866 is:

> *Federal agencies should promulgate only such regulations as are required by law, are necessary to interpret the law, or are made necessary by compelling public need, such as material failures of private markets to protect or improve the health and safety of the public, the environment, or the well-being of the American people. In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages, distributive impacts, and equity), unless a statute requires another regulatory approach.*

E.O. 12866 includes a list of 12 principles for regulatory program planning and development of individual proposed rules that agencies should adhere to, to the extent permitted by law and where applicable. These principles include identification of market failures or other problems intended to be addressed by the regulation, and whether existing regulations or laws have created or contributed to the problem to be addressed. If applicable, agencies are directed to identify non-regulatory alternatives to address the problem. Where regulations are necessary or required by law, agencies should design regulations in the most cost-effective manner available to achieve the regulatory objective and that impose the least burden on society. All costs and benefits of proposed regulations should be assessed. If feasible, agencies should specify performance objectives rather than behavior or compliance requirements. Agencies are directed to seek the views of appropriate state, local, and tribal officials if such would be significantly or uniquely affected by a proposed rule. Regulations must not be inconsistent, incompatible, or duplicative with other federal regulations, and must be simply drafted and easy to understand.

Office of Management and Budget (OMB) guidance to federal agencies on implementing E.O. 12866 states that good regulatory analyses include three basic elements: (1) a statement of the need for the proposed action; (2) an examination of alternative approaches; and (3) an evaluation of benefits and costs

[1] The provisions requiring consideration of impacts were originally discussed as applicable only to critical habitat designations for invertebrate species. However, Section 4(b)(2), as enacted, is not limited to invertebrates, and NMFS and USFWS have applied the provision to designations for vertebrate and invertebrate species.

of the proposed action and the main alternatives (OMB Circular A-4, Sept. 17, 2003). Further, OMB Circular A-4 states that proper evaluation of the benefits and costs of regulations requires: explaining how the actions required by the rule are linked to the expected benefits; identifying an appropriate baseline; and identifying the expected undesirable side-effects and ancillary benefits of the proposed rule. These regulatory principles have been integrated into the development of this 4(b)(2) impacts analysis to the extent consistent with the mandatory duty to designate critical habitat, as defined in the ESA.

1.5 Framework for Impact Analysis

Section 7 of the ESA requires federal action agencies to insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or destroy or adversely modify designated critical habitat. In practice, this requires federal action agencies to consult with NMFS whenever a proposed action may affect a listed species or its designated critical habitat. Because the requirement for Section 7 consultation only applies to activities with this "federal nexus," designation of critical habitat does not result in additional costs with respect to strictly private activities. The focus of this economic impact analysis is the incremental costs of compliance with Section 7 that result from the designation of critical habitat.

The potential incremental costs of Section 7 consultations associated with critical habitat designation are estimated by comparing the "without critical habitat" or "baseline" conditions with conditions under a "with critical habitat" scenario. Baseline conditions represent the level of protection that is currently afforded the proposed critical habitat, including levels of protection conferred by the listing of the species under the ESA and by other federal, state, and local laws. The "with critical habitat" scenario identifies activities likely to involve a federal nexus that will require future consultations under Section 7 of the ESA that may affect the designated critical habitat, and are not limited from adversely affecting the critical habitat by baseline regulatory conditions. The "with and without critical habitat" approach distinguishes between Section 7 costs that will likely be associated with the implementation of the jeopardy provisions of Section 7 and those that will likely be associated with the implementation of the adverse modification provision of Section 7. In many cases, costs associated with the jeopardy standard will be incurred even in the absence of designation of critical habitat and thus would not be considered an effect of a critical habitat rulemaking.

The costs of predicted Section 7 consultations associated with the critical habitat designation and the costs of any project modifications resulting from those consultations that are necessary to avoid adverse modification or destruction of the critical habitat represent changes from baseline conditions, and constitute direct economic impacts of the critical habitat designation. Other indirect economic impacts may result if the critical habitat designation "triggers" changes in state or local regulations that further restrict land-based or water-based activities; if public expectations about future Section 7 consultation result in "stigma" impacts that reduce property or business values; or, if any of these Section 7 related impacts are significant enough to result in structural changes in local or regional economies.

The proposed critical habitat designation for the Carolina and South Atlantic DPSs of Atlantic sturgeon encompasses state-owned lands beneath tidally influenced and navigable waters up to the ordinary high water mark (OHWM) in the states of Florida, Georgia, South Carolina, and North Carolina. The majority of riparian lands bordering riverine critical habitat units are in private ownership. Areas adjacent to the proposed critical habitat designation also encompass some lands under local or federal ownership, including federal lands being managed by the Forest Service, the Air Force, the Navy, the National Park Service, USACE, and USFWS.

1.5.1 Methodological Approach

The analytic approach used in this report to describe and consider the potential impacts of designation consists of the following steps:

- Determine "without Critical Habitat Designation" economic, regulatory, and environmental conditions to provide a description of baseline conditions for assessing potential impacts;
- Identify what current and projected future activities with a federal nexus could affect proposed critical habitat, and determine which of these may result in incremental impacts;
- Determine how many such "incremental" activities may occur over the defined 10-year time horizon and determine what types of project modifications may be required as a result of expected Section 7 consultations for critical habitat;
- If feasible, estimate the per-unit costs of expected Section 7 consultations, and the per-unit cost of resulting project modifications, and other economic impacts if applicable;
- Evaluate potential national security impacts;
- Determine what other relevant impacts may be associated with the designation of critical habitat, including conservation benefits to the Atlantic sturgeon DPSs, potential protections provided to other fish and water-dependent species, biodiversity, ecosystem services, new outreach and educational opportunities, impacts on natural resource agencies with existing management plans, and any secondary benefits to local and regional economies.

This report provides a comprehensive assessment of activities that could be affected by the critical habitat designation, but attempts to estimate only those impacts that are reasonably foreseeable, including, but not limited to, activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. Accordingly, the analysis bases estimates of impacts only on activities that are likely to result in Section 7 consultation within a ten-year time horizon. Similar to previous designations, predictions of impacts were limited to a 10-year time horizon due to the difficulty in estimating activities and costs beyond that timeframe.

2 RELEVANT BASELINE INFORMATION

As discussed in *Section 1.3*, the regulations for conducting Section 4(b)(2) analyses require that incremental impacts of critical habitat designation be measured against a relevant baseline, where the relevant "without critical habitat" baseline is the best assessment of the way the study area currently functions and will function in the future in the absence of the designation. For this critical habitat designation, the following sections characterize: 1) the relevant economic baseline, 2) the regulatory baseline, which consists of existing laws and regulations that may protect critical habitat essential features in the absence of the designation, and 3) baseline benefits and values provided by the essential features that will be afforded protection as a result of the designation. To the extent possible these baseline conditions will be characterized separately for each proposed critical habitat unit and quantified.

2.1 Economic Baseline

This section summarizes key economic information for the counties where the critical habitat units are located, and where activities are most likely to be affected by the designation. The 14 occupied and 3 unoccupied proposed critical habitat units and the counties where they are located are shown in Table 2-1. While the proposed critical habitat units are physically limited to river channels, activities on land adjacent to and upstream from the main river channels may affect the essential physical features (e.g., runoff from construction or erosion may impact river features). Thus it is reasonable to describe the broad baseline economic conditions in the counties bordering the reaches of the river channels proposed to be designated; this information will assist us in considering the economic impacts of the designation. This section presents baseline economic information for each proposed critical habitat unit organized from north to south for the Carolina and South Atlantic DPSs of Atlantic sturgeon. All of the data discussed is from the U.S. Census Bureau's website, unless otherwise specified, and data on county business practices without noise flags are presented in this report.

Table 2-1. Critical Habitat Units

DPS	Critical Habitat Unit	State	Counties
Carolina	Roanoke River, Unit C1	North Carolina	Bertie, Halifax, Martin, Northampton, and Washington
	Tar-Pamlico River, Unit C2	North Carolina	Beaufort, Edgecombe, Hyde, Nash, Pamlico, and Pitt
	Neuse River, Unit C3	North Carolina	Pamlico, Carteret, New Bern, Pitt, Lenoir, Wayne, Johnston and Wake
	Cape Fear -Northeast Cape Fear Rivers, Occupied critical habitat, Unit C4 Unoccupied Cape Fear River critical habitat, Unit CU1	North Carolina	Brunswick, Columbus, New Hanover, Pender, Duplin and Wayne Bladen
	Pee Dee River System Unit (Great Pee Dee River, Bull Creek, and part of the Waccamaw River), Unit C5	North Carolina, South Carolina	Brunswick, Columbus, Anson and Richmond counties in North Carolina; Georgetown, Horry, Chesterfield, Darlington, Dillon, Florence, Marion, Marlboro, and Williamsburg counties in South Carolina
	Black River, Unit C6	South Carolina	Georgetown, Williamsburg, Clarendon, Sumter, Lee and Kershaw
	Santee-Cooper Rivers - Occupied critical habitat, Unit C7 Unoccupied Santee-Cooper River System critical habitat (Wateree, Congaree and Broad Rivers), Unit CU2	South Carolina South Carolina	Berkeley, Charleston, Georgetown, Williamsburg and Clarendon Clarendon, Berkeley, Orangeburg, Calhoun, Sumter, Richland, Kershaw, Lexington, Fairfield, Newberry
South Atlantic	Edisto River, Unit SA1	South Carolina	Aiken, Bamberg, Barnwell, Charleston, Colleton, Dorchester, Edgefield, Lexington, and Orangeburg
	Combahee River, Unit SA2	South Carolina	Allendale, Bamberg, Barnwell, Beaufort, Colleton, and Hampton
	Savannah River, Unit SA3 Occupied Savannah River critical habitat, Unit SA3	South Carolina, Georgia	Aiken, Allendale, Barnwell, Hampton, and Jasper counties in South Carolina; Burke, Chatham, Effingham, Richmond, and Screven counties in Georgia and Aiken and Edgefield counties, SC;

	Unoccupied Savannah River critical habitat, Unit SAU1		Richmond and Columbia counties, GA
	Ogeechee River, Unit SA4	Georgia	Bryan, Bulloch, Burke, Chatham, Effingham, Emanuel, Glascock, Greene, Hancock, Jefferson, Jenkins, Screven, Taliaferro, and Washington
	Altamaha-Oconee-Ocmulgee Rivers, Unit SA5	Georgia	Appling, Baldwin, Ben Hill, Bibb, Bleckley, Coffee, Dodge, Glynn, Hancock, Houston, Jasper, Jeff Davis, Johnson, Jones, Laurens, Long, McIntosh, Monroe, Montgomery, Pulaski, Tattnall, Telfair, Toombs, Treutlen, Twiggs, Washington, Wayne, Wheeler, Wilcox, and Wilkinson
	Satilla River, Unit SA6	Georgia	Atkinson, Ben Hill, Brantley, Camden, Charlton, Coffee, Irwin, Pierce, and Ware
	St. Marys River, Unit SA7	Georgia, Florida	Camden and Charlton counties in GA; Baker and Nassau counties in FL

2.1.1 Carolina DPS

2.1.1.1 Roanoke River, Unit C1

The Roanoke River Unit passes through Bertie, Halifax, Martin, Northampton, and Washington Counties in North Carolina, and is located along the northeastern portion of the North Carolina coast (Figure 2-1).

County populations estimated in 2014 ranged from 12,570 in Washington Co., to 52,970 in Halifax Co. The total population of North Carolina in 2014 was estimated to be 9,943,964. All of the counties bordering this unit decreased in population between 2010 and 2014, ranging from a 3.1% decrease in Halifax Co. to a 7.4% decrease in Northampton Co. In comparison, the population of North Carolina increased by 4.3% during the same period. These are sparsely populated counties compared to the statewide average of 196.1 persons per square mile in 2010, ranging from 30.4 to 75.5 persons per square mile for Bertie and Halifax Counties, respectively. The median household income for 2009-2013 for all these counties was below the statewide average of $46,334, ranging from $30,768 in Bertie Co. to $35,111 in Martin Co. The percent of the population in these counties below the poverty level from 2009-2013 was higher than the statewide average of 17.5%, ranging from 23.2% in Martin Co. to 37.4% in Halifax Co.

The number of private nonfarm business establishments in 2013 ranged from 242 in Washington Co., to 992 in Halifax Co.; there were 218,285 private nonfarm establishments in North Carolina in 2013. The Health Care and Social Assistance sector ("health care") was the largest employer in all counties bordering this unit in 2013, in terms of number of paid employees (range = 643-2,974 employees, Northampton and Halifax Counties, respectively). The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Bertie Co., manufacturing, health care and wholesale trade;

Halifax Co., health care, manufacturing and retail trade; Martin Co., manufacturing, health care, and retail trade; Northampton Co., wholesale trade, manufacturing and construction; and Washington Co., health care, retail trade and transportation and warehousing.

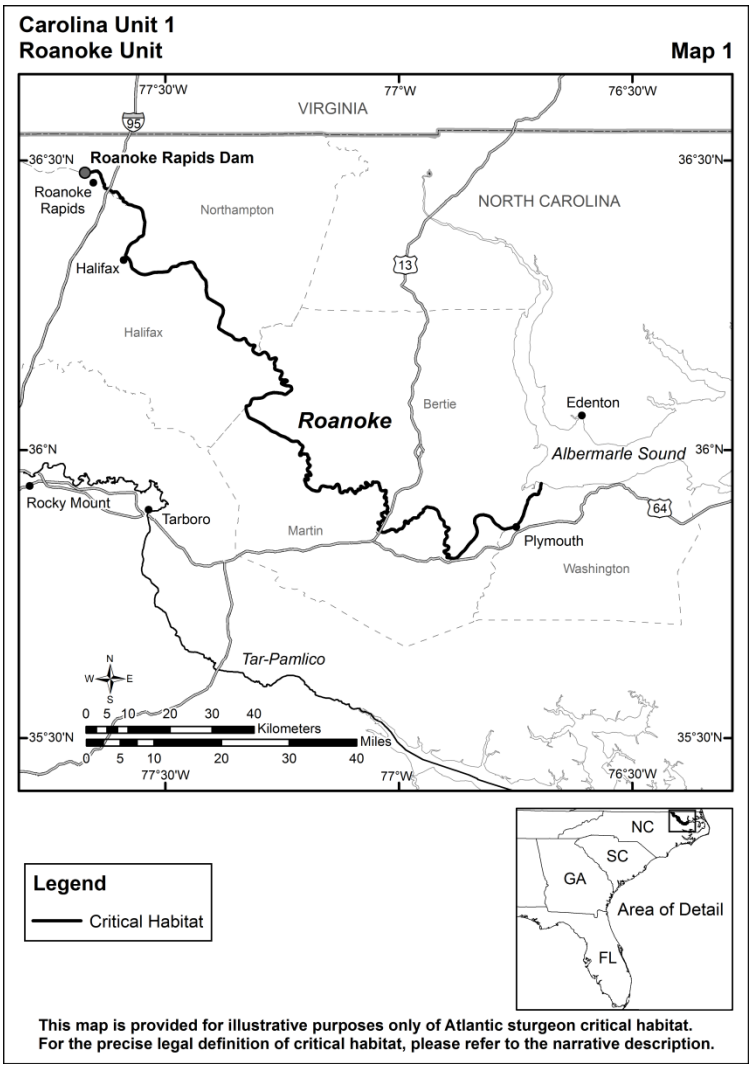


Figure 2-1. Location Map of Roanoke River Unit.

2.1.1.2 Tar-Pamlico Rivers, Unit C2

The Tar-Pamlico Rivers Unit passes through Beaufort, Edgecombe, Hyde, Nash, Pamlico, and Pitt Counties in North Carolina, and is located along the central portion of the North Carolina Coast (Figure 2-2). County populations estimated in 2014 ranged from 5,676 in Hyde Co. to 175,354 in Pitt Co. The total population of North Carolina in 2014 was estimated to be 9,943,964. Pitt Co. population increased by 4.3% between 2010 and 2014, mirroring the statewide increase in population for the same period. All other counties in the unit decreased in population between 2010 and 2014, ranging from a 0.4% decrease in Beaufort Co. to a decrease of 2.9% in Edgecombe Co. Population density varies widely in the unit counties, from 9.5 persons per square mile in Hyde Co., to 257.9 persons per square mile in Pitt Co.,

compared to the statewide average of 196.1 persons per square mile (2010 values). The median household income for 2009-2013 for all these counties was below the statewide average of $46,334, ranging from $33,960 in Edgecombe Co. to $43,853 in Pamlico Co. Compared to the statewide average of 17.5% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 13.8% in Pamlico Co. to 25.6% in Hyde Co.

Number of private nonfarm business establishments in 2013 ranged from 168 in Hyde Co. to 3,526 in Pitt Co.; there were 218,285 private nonfarm establishments in North Carolina in 2013. The Health Care and Social Assistance sector was the largest employer in 2013 in terms of paid employees in Nash and Pitt counties (5,567 and 15,790 employees, respectively). The Manufacturing sector had the largest number of paid employees in Beaufort and Edgecombe counties in 2013 (2,589 and 2,787 employees, respectively. In Hyde and Pamlico counties the Accommodation and Food Services sector had the highest number of paid employees in 2013 (211 and 652, respectively). The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Beaufort Co. - manufacturing, health care, wholesale trade; Edgecombe Co. – manufacturing, health care, transportation/warehousing; Hyde Co. – accommodation/food services, wholesale trade, construction; Nash Co. – health care, retail trade, wholesale trade; Pamlico Co. – health care, accommodation/food services, retail trade; and Pitt Co. – health care, manufacturing, retail trade.

Commercial fishing is also an important economic sector in the Tar-Pamlico River Unit which includes the ports of Bellhaven-Washington and Englehard-Swanquarter, North Carolina. Table 2-4 shows the most recent estimates of annual volume and value of commercial landings that are available for these ports.

Table 2-2. Volume and Value of Commercial Landings at Ports in Tar-Pamlico River Unit

Ports	Millions of lbs	Millions $
Bellhaven-Washington, NC[1]	3.3	3.1
Englehard-Swanquarter, NC[1]	6.9	8.0

[1] 2012 landings data

Source: NMFS Office of Science and Technology

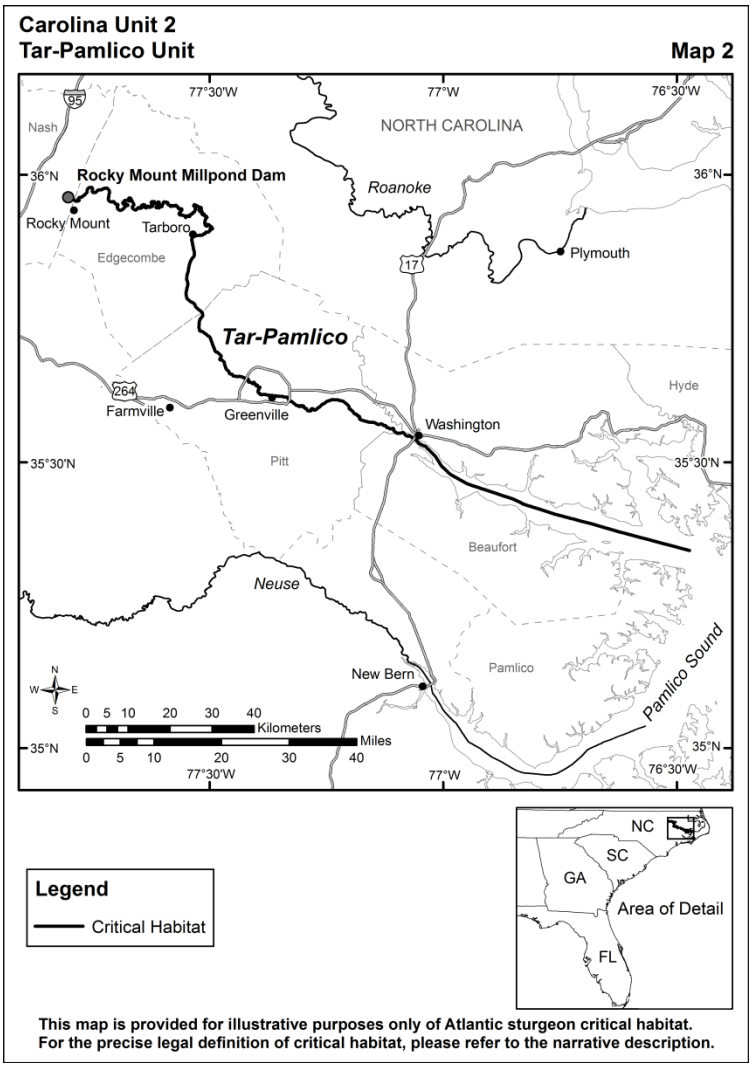


Figure 2-2. Location Map Tar-Pamlico River Unit.

2.1.1.3 Neuse River, Unit C3

The Neuse River Unit passes through Carteret, Craven, Johnston, Lenoir, Pamlico, Pitt, Wake, and Wayne Counties in North Carolina, and is located along the central portion of the North Carolina Coast (Figure 2-3). Both Pamlico and Pitt counties also contain portions of the Tar-Pamlico River Unit.

County populations estimated in 2014 ranged from 12,948 in Pamlico Co. to 998,691 in Wake Co. The total population of North Carolina in 2014 was estimated to be 9,943,964. Populations in the majority of counties in this unit increased between 2010 and 2014, ranging from 1.0% in Craven Co. to 10.8% in Wake Co. The statewide increase in population for the same period was 4.3%. Populations in Lenoir and Pamlico counties decreased in population between 2010 and 2014, by 1.7% and 1.5%, respectively. Population density varies widely in the unit counties, from 39.1 persons per square mile in Pamlico Co., to 1078.8 persons per square mile in Wake Co., compared to the statewide average of 196.1 persons per square mile (2010 values). The median household incomes for 2009-2013 for counties in this unit were both above and below the statewide average of $46,334; Lenoir Co. had the lowest at $35,770 and Wake Co. was highest at $66,006. Compared to the statewide average of 17.5% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 11.0% in Wake Co. to 24.3% in Pitt Co.

Number of private nonfarm business establishments in 2013 ranged from 271 in Pamlico Co. to 26,040 in Wake Co.; there were 218,285 private nonfarm establishments in North Carolina in 2013. The Health Care and Social Assistance sector was the largest employer in 2013 in terms of paid employees in Craven, Lenoir, Pitt, Wake and Wayne counties (ranging from 4,083 to 54,355 employees in Lenoir and Wake counties, respectively). The Retail Trade sector had the largest number of paid employees in Carteret and Johnston counties (3,949 and 7,633 employees, respectively), and provided substantial employment in Craven, Pitt, Wake and Wayne counties. The Accommodation and Food Services sector was the largest employer in 2013 in Pamlico Co. (652 employees), and provided substantial employment in Carteret, Johnston, Pitt, and Wake counties. The Professional, Scientific, and Technical Services sector was a substantial employer in Wake Co. in 2013, with 47,005 employees. The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Carteret Co. - health care, accommodation/food services, retail trade; Craven Co. – health care, manufacturing, retail trade; Johnston Co. – manufacturing, health care, retail trade; Lenoir Co. – manufacturing, health care, retail trade; Pamlico Co. – health care, accommodation/food services, retail trade; Pitt Co. – health care, manufacturing, retail trade; Wake Co. – professional/scientific/technical services, health care, wholesale trade; and Wayne Co. – health care, manufacturing, retail trade.

Commercial fishing is also an important economic component in the Neuse River Unit, which includes the ports of Beaufort-Morehead City and Oriental-Vandemere, North Carolina. Table 2-6 shows the most recent estimates of the annual volume and value of commercial landings that are available for these ports.

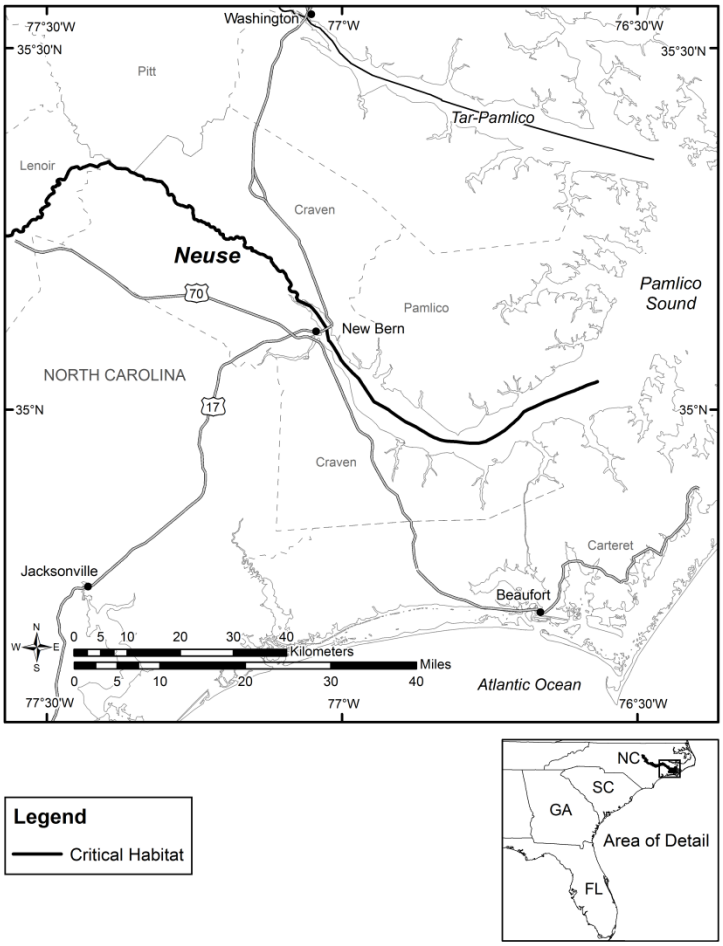
Table 2-3. Volume and Value of Commercial Landings at Ports in Neuse River Unit

Ports	Millions of lbs	Millions $
Beaufort- Morehead City, NC[1]	6.5	11.5
Oriental-Vandemere, NC[2]	3.5	6.2

[1] 2012 landings data
[2] 2011 landings data (most recent available for this port)
Source: NMFS Office of Science and Technology

Carolina Unit 3
Neuse Unit

Map 3.1



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Critical Habitat

This map is provided for illustrative purposes only of Atlantic sturgeon critical habitat.
For the precise legal definition of critical habitat, please refer to the narrative description.

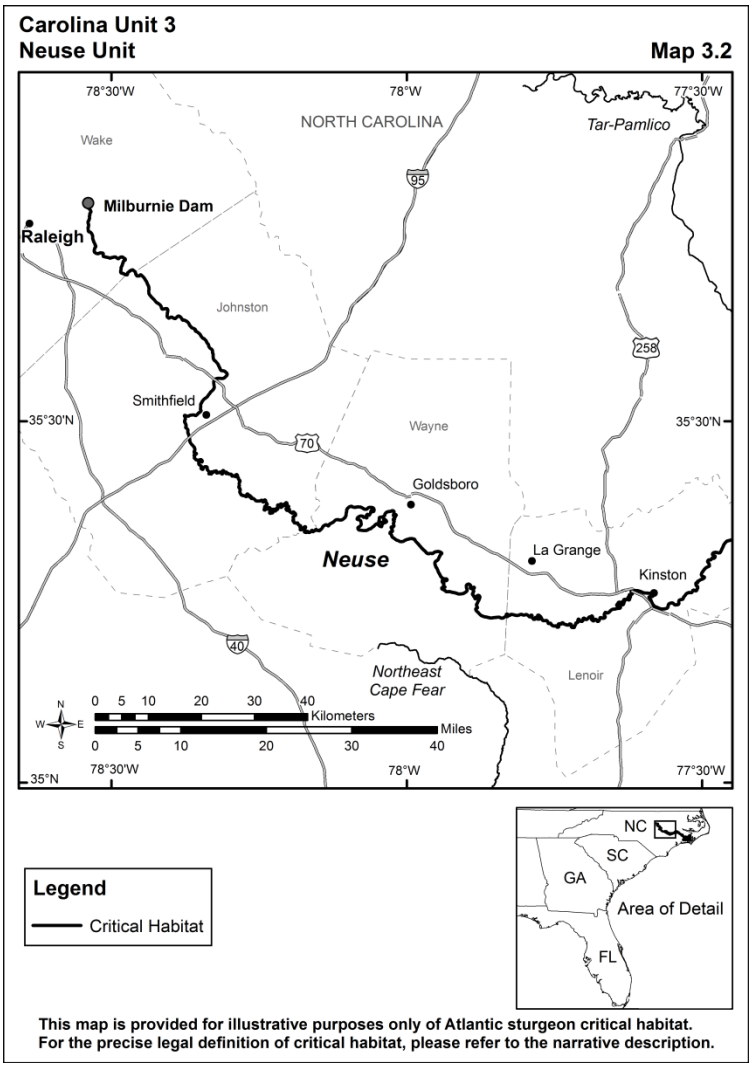


Figure 2-3. Location Maps of Neuse River Unit.

2.1.1.4 Cape Fear-Northeast Cape Fear Rivers, Unit C4

The Cape Fear River Unit comprises portions of Brunswick, Columbus, Duplin, New Hanover, Pender and Wayne Counties in North Carolina, and is located along the southeastern portion of the North Carolina coast near the South Carolina border (Figure 2-4). The upper extent of this occupied critical habitat unit is Lock and Dam #2 on the Cape Fear River. Wayne Co. also contains portions of the Neuse River Unit.

County populations estimated in 2014 ranged from 56,250 in Pender Co. to 216,928 in New Hanover Co. The total population of North Carolina in 2014 was estimated to be 9,943,964. Only Columbus County's population decreased between 2010 and 2014, by 2.0%. Populations in all other counties in this unit increased between 2010 and 2014, ranging from 1.5% in Wayne Co. to 10.6% in Brunswick Co. The statewide increase in population for the same period was 4.3%. Population density varies widely in the unit counties, from 60.0 persons per square mile in Pender Co., to 1058.1 persons per square mile in New Hanover Co., compared to the statewide average of 196.1 persons per square mile (2010 values). The median household incomes for 2009-2013 for counties in this unit were both above and below the statewide average of $46,334; Duplin Co. had the lowest at $34,433 and New Hanover Co. was highest at

$49,835. Compared to the statewide average of 17.5% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 16.6% in Brunswick Co. to 26.3% in Duplin Co.

Number of private nonfarm business establishments in 2013 ranged from 838 in Duplin Co. to 6,806 in New Hanover Co.; there were 218,285 private nonfarm establishments in North Carolina in 2013. The Health Care and Social Assistance sector was the largest employer in 2013 in terms of paid employees in Columbus, New Hanover, and Wayne counties (3,140, 15,700 and 7,132 employees, respectively) and provided substantial employment in Brunswick Co. The Retail Trade sector had the largest number of paid employees in Brunswick and Pender counties (4,508 and 1,421 employees, respectively), and provided substantial employment in Columbus, New Hanover and Wayne counties. The Manufacturing sector was the largest employer in 2013 in Duplin Co. (5,069 employees) and provided substantial employment in Wayne Co. The Accommodation and Food Services sector provided substantial employment in New Hanover and Pender counties. The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Brunswick Co. – health care, retail trade, construction; Columbus Co. – manufacturing, health care, retail trade; New Hanover – health care, retail trade, professional/ scientific/ technical services; Pender Co. – health care, construction, retail trade; and Wayne Co. – health care, manufacturing, retail trade.

2.1.1.5 Unoccupied Cape Fear River Unit, CU1

The Unoccupied Cape Fear River Unit passes through Bladen County in North Carolina, between Lock and Dam #2 and Huske Lock and Dam on the Cape Fear River (Figure 2-4).

Bladen Co. had a population of 34,657 people in 2014, which was a 1.5% decrease of the county population in 2010. There were 40.2 persons per square mile in the county in 2010. The median household income in the county between 2009 and 2013 was $30,164, below the statewide median of $46,334. The percentage of people in the county living below the poverty level between 2009 and 2013 was 25.8, above the statewide average of 17.5%.

The number of private nonfarm establishments in the county in 2013 was 507. The Health Care and Social Assistance sector was the top employer in the county in 2013 in terms of number of paid employees, with 1,251, followed by the Retail Trade and Administrative, Support, Waste Management and Remediation Services sector. The business sectors with the top 3 highest annual payrolls in 2013 were the health care, retail trade, and administrative/support/waste/remediation services sectors.

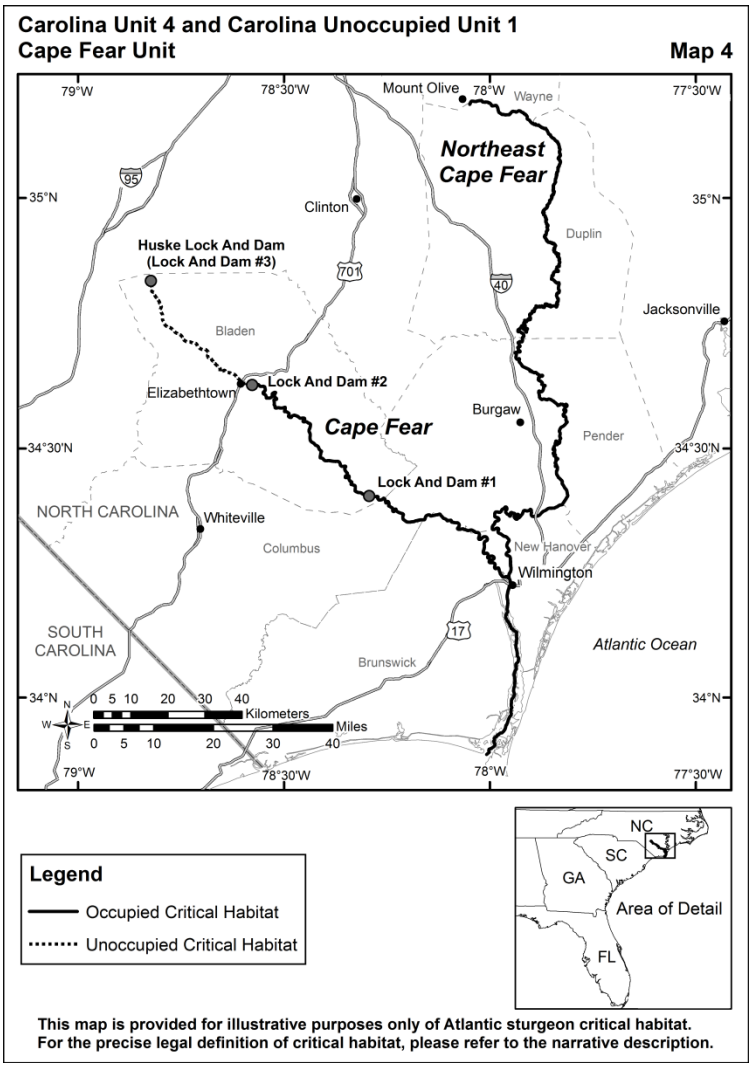


Figure 2-4. Location Map of Cape Fear River Units.

2.1.1.6 Pee Dee River System, Unit C5

The Pee Dee River System unit includes the Great Pee Dee River up to Blewett Falls Dam, the Waccamaw River up to Bull Creek (Big Bull Creek), and Bull Creek up to the Pee Dee River. The Pee Dee River System Unit passes through Anson, Brunswick, Columbus and Richmond Counties in North Carolina, and Chesterfield, Darlington, Dillon, Florence, Georgetown, Horry, Marion, Marlboro, and Williamsburg Counties in South Carolina, and is primarily located along the northeastern portion of the South Carolina coast with the upstream extent in southeastern North Carolina (Figure 2-5). Brunswick Co., North Carolina, also contains a portion of the occupied Cape Fear River unit.

The North Carolina county populations in this unit estimated in 2014 ranged from 25,765 in Anson Co. to 111,836 in Brunswick Co. The total population of North Carolina in 2014 was estimated to be 9,943,964. Only Brunswick County's population increased between 2010 and 2014, by 10.6%. Populations in all other North Carolina counties in this unit decreased between 2010 and 2014, ranging from 1.9% in Richmond Co. to 4.4% in Anson Co. The North Carolina statewide increase in population for the same period was 4.3%. Population densities are all fairly low in the North Carolina unit counties, from 50.7 persons per square mile in Anson Co., to 126.8 persons per square mile in Brunswick Co., compared to

the North Carolina statewide average of 196.1 persons per square mile (2010 values). The median household incomes for 2009-2013 for North Carolina counties in this unit were mostly below the statewide average of $46,334; Richmond Co. had the lowest at $32,384 and Brunswick Co. was highest at $46,438. Compared to the North Carolina statewide average of 17.5% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 16.6% in Brunswick Co. to 25.9% in Richmond Co.

Number of private nonfarm business establishments in 2013 ranged from 386 in Anson Co. to 2,300 in Brunswick Co.; there were 218,285 private nonfarm establishments in North Carolina in 2013. The Manufacturing sector was the largest employer in 2013 in terms of paid employees in Anson and Richmond counties (1,511 and 3,242 employees, respectively). The Retail Trade sector was the largest employer in Brunswick Co. (4,508 employees) and provided substantial employment in Brunswick Co. The Health Care and Social Assistance sector had the largest number of paid employees in Columbus Co. (3,140 employees). The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Anson Co. – manufacturing, health care, retail trade; Brunswick Co. – health care, retail trade, construction; Columbus Co. – manufacturing, health care, retail trade; and Richmond Co. – manufacturing, health care, retail trade.

The South Carolina county populations in this unit estimated in 2014 ranged from 27,924 in Marlboro Co. to 298,832 in Horry Co. The total population of South Carolina in 2014 was estimated to be 4,832,482. Florence, Georgetown and Horry counties' populations increased between 2010 and 2014, by 1.7%, 1.0% and 11.0%, respectively. Populations in all other South Carolina counties in this unit decreased between 2010 and 2014, ranging from 1.3% in Chesterfield and Darlington counties, to 5.0% in Williamsburg Co. The South Carolina statewide increase in population for the same period was 4.5%. Population densities were both above and below the South Carolina average of 153.9 persons per square mile in 2010, ranging from 36.8 persons per square mile in Williamsburg Co., to 237.5 persons per square mile in Horry Co. The median household incomes for 2009-2013 for South Carolina counties in this unit were all below the statewide average of $44,779; Williamsburg Co. had the lowest at $25,849 and Horry Co. was highest at $42,431. Compared to the South Carolina statewide average of 18.1% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 18.6% in Horry Co. to 31.5% in Dillon Co.

Number of private nonfarm business establishments in 2013 ranged from 328 in Marlboro Co. to 8,213 in Horry Co.; there were 101,545 private nonfarm establishments in South Carolina in 2013. The Manufacturing sector was the largest employer in 2013 in terms of paid employees in Chesterfield, Darlington, Dillon, and Marlboro counties (ranging from 1,979 employees in Marlboro Co. to 4,886 employees in Chesterfield Co). The Health Care and Social Assistance sector was the largest employer in Florence Co. (13,193 employees) and Georgetown Co. (3,616 employees). The Accommodation and Food Services sector had the largest number of paid employees in Horry Co. (26,352 employees). The Retail Trade sector was the largest employer in 2013 in Marion Co. (1,040 employees) and Williamsburg Co. (840 employees). The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Chesterfield Co. – manufacturing, transportation/warehousing, health care; Darlington Co. – manufacturing, health care, retail trade; Dillon Co. – manufacturing, health care, administrative/support/waste management/remediation; Florence Co. – health care, manufacturing, retail trade; Georgetown Co. – health care, manufacturing, retail trade; Horry Co. – accommodation/food services, retail trade, health care; Marion Co. – manufacturing, health care, retail trade; Marlboro Co. – manufacturing, health care, retail trade; and Williamsburg Co. – health care, retail trade, wholesale trade.

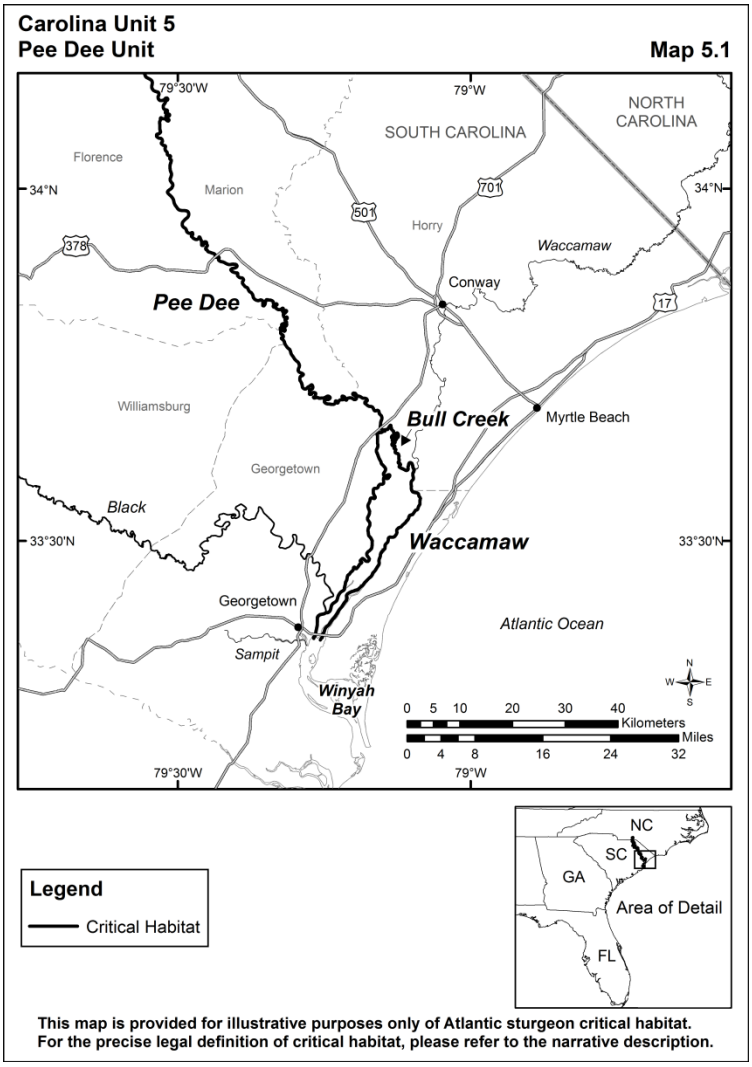
Commercial fishing is also an important economic component in the Pee Dee River System Unit in South Carolina, which includes the port of Georgetown, South Carolina. Table 2-9 shows the most recent annual volume and value of commercial landings that are available for this port.

Table 2-4. Volume and Value of Commercial Landings in Waccamaw River Unit

Port	Millions of lbs	Millions $
Georgetown, SC[1]	2.7	5.2

[1] 2011 landings data (most recent available for this port)

Source: NMFS Office of Science and Technology



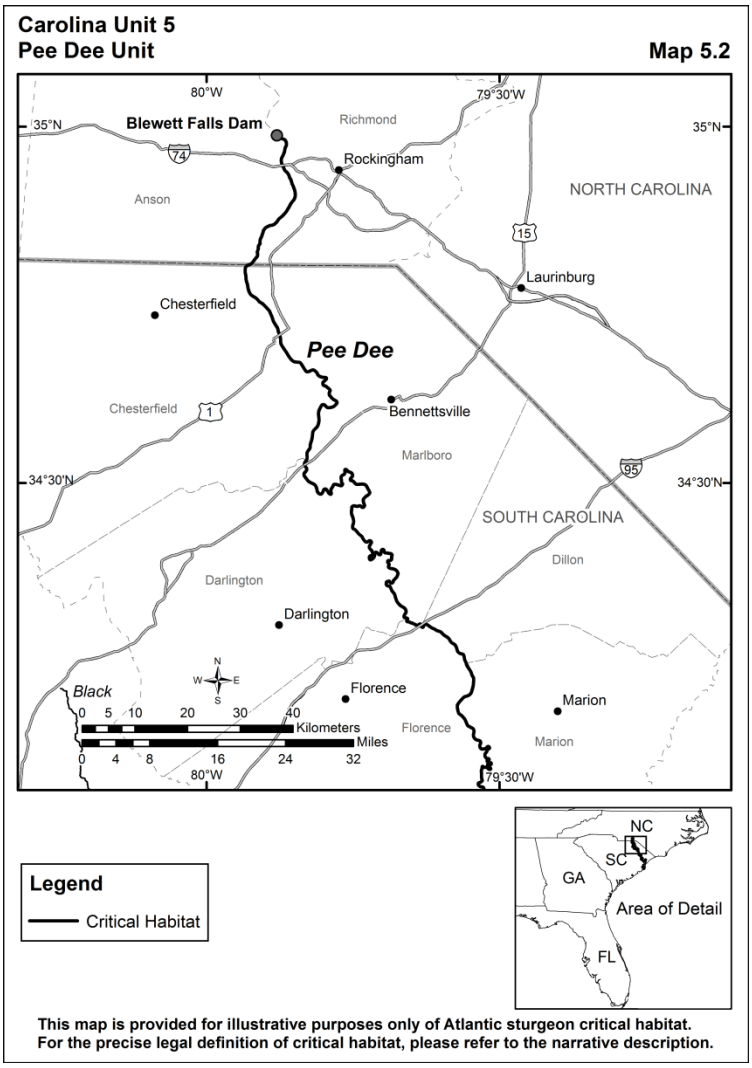


Figure 2-5. Location Maps of Pee Dee River Unit.

2.1.1.7 Black River, Unit C6

The Black River runs through Clarendon, Georgetown, Kershaw, Lee, Sumter and Williamsburg counties in South Carolina (Figure 2-6).

County populations in this unit estimated in 2014 ranged from 18,343 in Lee Co. to 107,919 in Sumter Co. The total population of South Carolina in 2014 was estimated to be 4,832,482. Clarendon, Lee and Williamsburg counties' populations decreased between 2010 and 2014, by 2.4%, 4.6% and 5.0%, respectively. Populations in Georgetown, Kershaw, and Sumter counties increased by 1.0%, 2.6% and 0.4%, respectively. The South Carolina statewide increase in population for the same period was 4.5%. Population densities were both above and below the South Carolina average of 153.9 persons per square mile in 2010, ranging from 36.8 persons per square mile in Williamsburg Co., to 161.6 persons per square mile in Sumter Co. The median household incomes for 2009-2013 for counties in this unit were all below the statewide average of $44,779; Williamsburg Co. had the lowest at $25,849 and Kershaw Co. was highest at $43,765. Compared to the South Carolina statewide average of 18.1% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 16.7% in Kershaw Co. to 30.8% in Williamsburg Co.

Number of private nonfarm business establishments in 2013 ranged from 189 in Lee Co. to 1,777 in Sumter Co.; there were 101,545 private nonfarm establishments in South Carolina in 2013. The Retail Trade sector was the largest employer in 2013 in terms of paid employees in Clarendon, Lee and Williamsburg counties (1,256, 409 and 840 employees, respectively). The Health Care and Social Assistance sector was the largest employer in Georgetown Co. (3,616 employees) and Sumter Co. (5,641 employees). The Manufacturing sector was the largest employer in Kershaw Co. in 2013 (3,243 employees). The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Clarendon Co. – retail trade, manufacturing, finance/insurance; Georgetown Co. – health care, manufacturing, retail trade; Kershaw Co. – manufacturing, health care, retail trade; Lee Co. – retail trade, health care, administrative/support/waste management/remediation services; Sumter Co. – manufacturing, health care, construction; and Williamsburg Co. – health care, retail trade, wholesale trade.

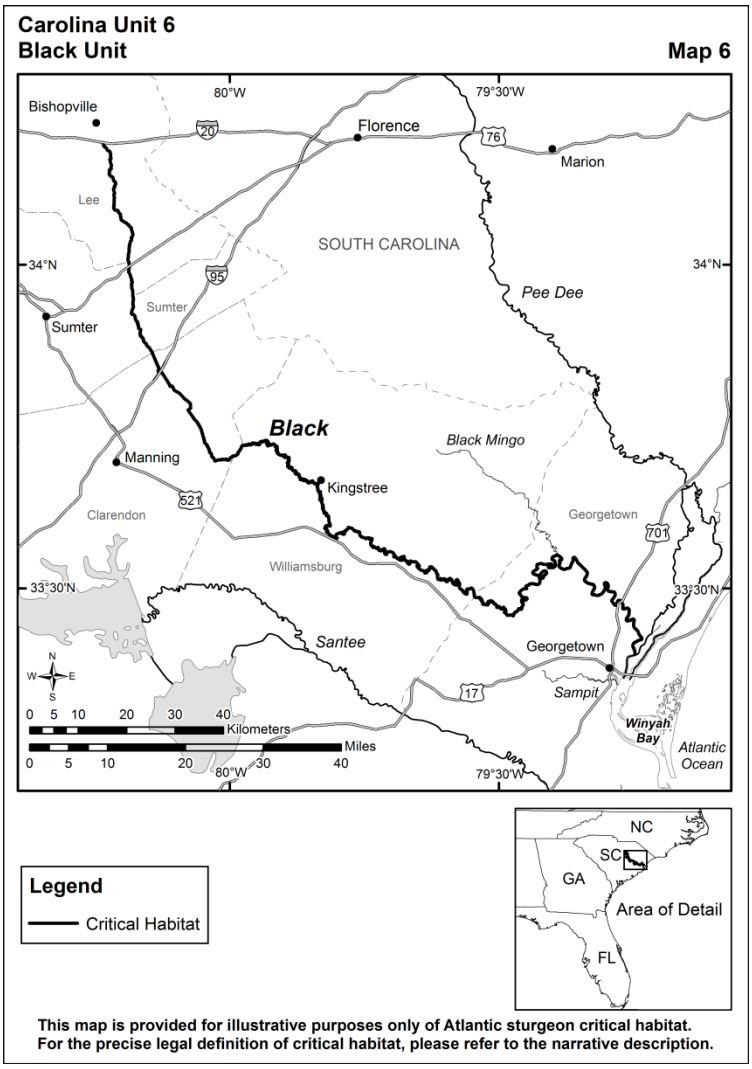


Figure 2-6. Location Map of Black River Unit.

2.1.1.8 Occupied Santee-Cooper Rivers, Unit C7

Unit C7 includes the lower Santee River up to the Wilson Dam and to the St. Stephen Dam, and the Cooper River up to the Pinopolis Dam. The occupied Santee-Cooper Rivers Unit passes through Berkeley, Charleston, Clarendon, Georgetown, , and Williamsburg Counties in South Carolina, and is primarily located along the central portion of the South Carolina coast (Figure 2-7). Georgetown and Williamsburg counties also contain portions of the Pee Dee River System Unit and the Black River Unit.

County populations in this unit estimated in 2014 ranged from 132,695 in Williamsburg Co. to 381,105 in Charleston Co. The total population of South Carolina in 2014 was estimated to be 4,832,482. Clarendon, Lee and Williamsburg counties' populations decreased between 2010 and 2014, by 2.4%, 4.6% and 5.0%, respectively. Populations in Berkely and Charleston counties increased by 11.4% and 8.8%, respectively, well above the South Carolina statewide increase in population of 4.5% for the same period. Georgetown Co. increased by 1%, Clarendon Co. decreased by 2.4%, and Williamsburg Co. decreased by 5.0% between 2010 and 2014. Population densities were both above and below the South Carolina average of 153.9 persons per square mile in 2010, ranging from 36.8 persons per square mile in Williamsburg Co., to 382.3 persons per square mile in Charleston Co. The median household incomes for 2009-2013 for counties in this unit were both above and below the statewide average of $44,779; Williamsburg Co. had the lowest at $25,849 and Berkeley Co. was highest at $52,427. Compared to the South Carolina statewide average of 18.1% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 14.4% in Berkeley Co. to 30.8% in Williamsburg Co.

Number of private nonfarm business establishments in 2013 ranged from 477 in Berkeley Co. to 12,138 in Charleston Co.; there were 101,545 private nonfarm establishments in South Carolina in 2013. The Retail Trade sector was the largest employer in 2013 in terms of paid employees in Berkeley, Clarendon and Williamsburg counties (4,959, 1,256 and 840 employees, respectively). The Health Care and Social Assistance sector was the largest employer in Charleston Co. (29,402 employees) and Georgetown Co. (3,616 employees). The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Berkeley Co. – manufacturing, professional/scientific/technical services, retail trade; Charleston Co. – health care, professional/scientific/technical services, manufacturing; Clarendon Co. – retail trade, manufacturing, finance/insurance; Georgetown Co. – health care, manufacturing, retail trade; and Williamsburg Co. – health care, retail trade, wholesale trade.

2.1.1.9 Unoccupied Santee-Cooper River System, Unit CU2

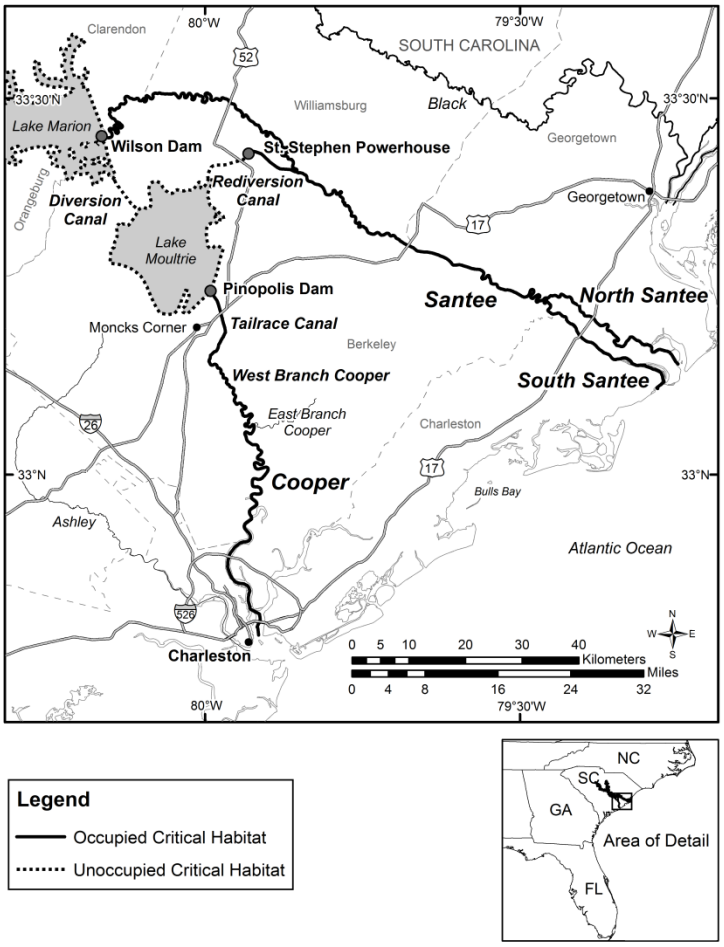
Unit CU2 includes water bodies created through construction of the Santee-Cooper hydropower project – the diversion canal, the rediversion canal above St. Stephen Dam, and Lakes Marion and Moultrie. The Unit also includes the Wateree River up to the Wateree Dam, the Congaree River, and the Broad River up to the Parr Shoals Dam. This unit passes through Berkeley, Calhoun, Clarendon, Fairfield, Kershaw, Lexington, Newberry, Orangeburg and Richland counties in South Carolina (Figure 2-7). Berkeley and Clarendon counties also contain portions of the occupied Santee-Cooper Rivers unit; Clarendon Co. also contains portions of the Black River unit, as do Kershaw and Sumter counties.

County populations in this unit estimated in 2014 ranged from 14,878 in Calhoun Co. to 401,566 in Richland Co. The total population of South Carolina in 2014 was estimated to be 4,832,482. Populations in Berkeley, Kershaw, Lexington, Newberry and Richland counties increased between 2010 and 2014 (ranging from 0.7% in Newberry Co. to 11.4% in Berkeley Co.) The South Carolina statewide population increased by 4.5% for the same period. Calhoun, Clarendon, and Orangeburg counties' populations all decreased between 2 and 2.4%, and Fairfield Co.' population decreased by 4.4% between 2010 and 2014. Population densities were both above and below the South Carolina average of 153.9 persons per square mile in 2010, ranging from 34.9 persons per square mile in Fairfield Co., to 507.9 persons per square mile in Richland Co. The median household incomes for 2009-2013 for counties in this unit were both above and below the statewide average of $44,779; Clarendon Co. had the lowest at $31,410 and Lexington Co. was highest at $54,061. Compared to the South Carolina statewide average

of 18.1% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 13.2% in Lexington Co. to 24.9% in Clarendon Co.

Number of private nonfarm business establishments in 2013 ranged from 238 in Calhoun Co. to 8,660 in Richland Co.; there were 101,545 private nonfarm establishments in South Carolina in 2013. The Retail Trade sector was the largest employer in 2013 in terms of paid employees in Berkeley, Clarendon and Lexington counties (4,959, 1,256 and 15,703 employees, respectively). The Manufacturing sector was the largest employer in Calhoun Co. (1,382 employees), Fairfield Co. (767 employees), Kershaw Co. (3,243 employees), Newberry Co. (4,525 employees), and Orangeburg Co. (6,835 employees). The Wholesale Trade sector was the largest employer in Lexington Co. (15,703 employees) and the Health Care and Social Assistance sector was the largest employer in Richland Co. in 2013 in terms of number of paid employees (26,514 employees). The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Berkeley Co. – manufacturing, professional/scientific/technical services, retail trade; Calhoun Co. – manufacturing, construction, wholesale trade; Clarendon Co. – retail trade, manufacturing, finance/insurance; Fairfield Co. – manufacturing, health care, retail trade; Kershaw Co. – manufacturing, health care, retail trade; Lexington Co. – manufacturing, health care, wholesale trade; Newberry Co. – manufacturing, health care, retail trade; Orangeburg Co. – manufacturing, health care, retail trade; and Richland Co. – health care, finance/insurance, professional/scientific/technical services.

Carolina Unit 7 and Carolina Unoccupied Unit 2
Santee - Cooper Unit **Map 7.1**



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Occupied Critical Habitat

Unoccupied Critical Habitat

This map is provided for illustrative purposes only of Atlantic sturgeon critical habitat.
For the precise legal definition of critical habitat, please refer to the narrative description.

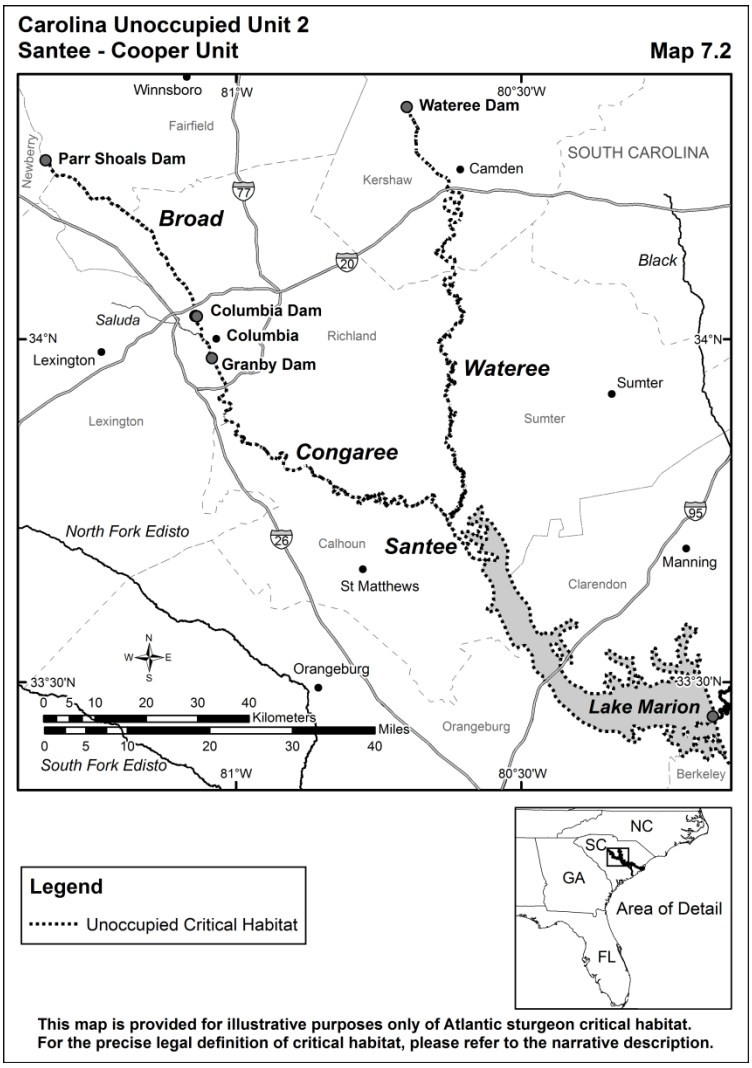


Figure 2-7. Location Maps of Santee-Cooper Rivers Unit.

2.1.2 South Atlantic DPS

2.1.2.1 Edisto River, Unit SA1

The Edisto River Unit includes the Edisto River, as well as portions of the North and South Fork Edisto Rivers. The Edisto River Unit passes through Aiken, Bamberg, Barnwell, Calhoun, Charleston, Colleton, Dorchester, Edgefield, Lexington, and Orangeburg Counties in South Carolina, and is located along the southeastern portion of the South Carolina coast, near the Georgia border (Figure 2-8). Charleston Co. also contains a portion of the occupied Santee-Cooper Rivers unit, and Lexington and Orangeburg Counties also contain portions of the unoccupied Santee-Cooper River System unit.

County populations in this unit estimated in 2014 ranged from 14,878 in Calhoun Co. to 381,015 in Charleston Co. The total population of South Carolina in 2014 was estimated to be 4,832,482. Populations in Aiken, Charleston, Dorchester and Lexington counties populations increased between 2010 and 2014 (ranging from 2.9% in Aiken Co. to 8.8% in Charleston Co.) The South Carolina statewide population increased by 4.5% for the same period. Bamberg, Barnwell, Calhoun, Colleton, Edgefield and Orangeburg counties' populations all decreased between 2010 and 2014 (ranging from 1.6% in Edgefield Co. to 5.0% in Bamberg Co.). Population densities were both above and below the

South Carolina average of 153.9 persons per square mile in 2010, ranging from 36.8 persons per square mile in Colleton Co., to 382.3 persons per square mile in Charleston Co. The median household incomes for 2009-2013 for counties in this unit were both above and below the statewide average of $44,779; Bamberg Co. had the lowest at $31,483 and Lexington Co. was highest at $54,061. Compared to the South Carolina statewide average of 18.1% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 12.1% in Dorchester Co. to 29.1% in Barnwell Co.

Number of private nonfarm business establishments in 2013 ranged from 238 in Calhoun Co. to 12,138 in Charleston Co.; there were 101,545 private nonfarm establishments in South Carolina in 2013. The Administrative and Support and Waste Management and Remediation sector was the largest employer in 2013 in terms of paid employees in Aiken Co. (7,031 employees). The Manufacturing sector was the largest such employer in 2013 in Bamberg, Barnwell, Calhoun, Dorchester, Edgefield, and Orangeburg counties (ranging from 784 employees in Bamberg Co. to 6,8 35 employees in Orangeburg Co.). The Health Care and Social Assistance sector was the largest employer in Charleston Co. with 29,402 employees. The Retail Trade sector was the largest employer in Colleton Co. (1,619 employees) and Lexington Co. (15,703 employees). The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Aiken Co. – administrative/support/waste management/remediation, manufacturing, health care; Bamberg Co. – manufacturing, health care, educational services; Barnwell Co. – manufacturing, health care, retail trade; Calhoun Co. – manufacturing, construction, wholesale trade; Charleston Co. – health care, accommodation/food services, retail trade; Colleton Co. – health care, retail trade, manufacturing; Dorchester Co. – manufacturing, retail trade, administrative/support/waste management/remediation; Edgefield Co. – manufacturing, transportation/warehousing, health care; Lexington Co. – manufacturing, health care, wholesale trade; and Orangeburg Co. – manufacturing, health care, retail trade.

Commercial fishing is also an important economic component in the Edisto River Unit, which includes the port of Charleston-Mt Pleasant, South Carolina. Table 2-13 shows the total volume and value of annual commercial landings at this port for the most recent years they are available.

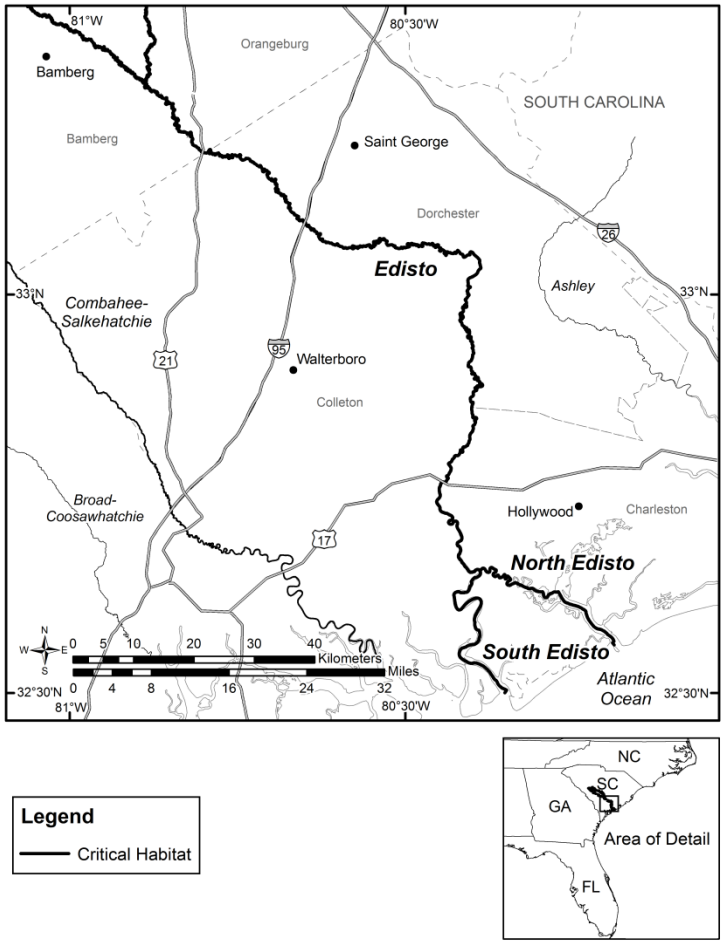
Table 2-5. Volume and Value of Commercial Landings in the Edisto River Unit

Port	Millions of lbs	Millions $
Charleston-Mt Pleasant, SC[1]	6.5	14.5

[1] 2011 landings data (most recent available for this port)

Source: NMFS Office of Science and Technology

South Atlantic Unit 1
Edisto Unit **Map 8.1**



This map is provided for illustrative purposes only of Atlantic sturgeon critical habitat.
For the precise legal definition of critical habitat, please refer to the narrative description.

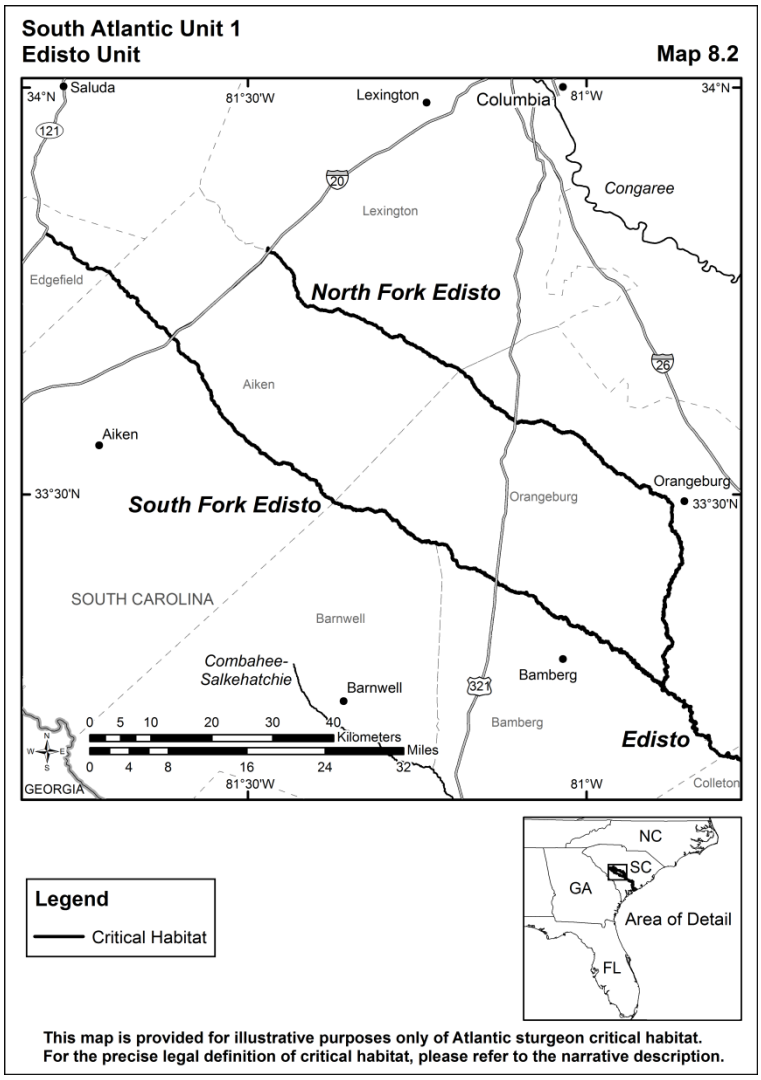


Figure 2-8. Location Maps of Edisto River Unit

2.1.2.2 Combahee-Salkehatchie River, Unit SA2

The Combahee Unit includes the Combahee-Salkehatchie River, as well as portions of the Salkehatchie River. The Combahee-Salkehatchie Unit passes through Allendale, Bamberg, Barnwell, Beaufort, Colleton, and Hampton Counties in South Carolina, and is located along the southeastern portion of the South Carolina coast, near the Georgia border (Figure 2-9). Bamberg, Barnwell and Colleton Counties also contain portions of the Edisto River unit.

County populations in this unit estimated in 2014 ranged from 9,695 in Allendale Co. to 175,852 in Beaufort Co. The total population of South Carolina in 2014 was estimated to be 4,832,482. The population in Beaufort Co. increased by 8.4% between 2010 and 2014; the South Carolina statewide population increased by 4.5% for the same period. The populations of all other counties in this unit decreased between 2010 and 2014, ranging from 2.9% in Barnwell and Colleton counties to 6.9% in Allendale Co. The population densities of all counties in the unit except Beaufort Co. were below the South Carolina average of 153.9 persons per square mile in 2010; Allendale Co. was lowest at 25.5 persons per square mile and Beaufort Co. had 281.5 persons per square mile in 2010. The median household incomes for 2009-2013 for all counties in this unit except Beaufort Co. were below the

statewide average of $44,779; Allendale Co. had the lowest at $25,252 and Beaufort Co. was highest at $57,316. Compared to the South Carolina statewide average of 18.1% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 12.5% in Beaufort Co. to 36.0% in Allendale Co.

Number of private nonfarm business establishments in 2013 ranged from 125 in Allendale Co. to 4,800 in Beaufort Co.; there were 101,545 private nonfarm establishments in South Carolina in 2013. The Manufacturing sector was the largest employer in 2013 in terms of paid employees in Allendale, Bamberg and Barnwell counties (848, 6,272, and 1,832 employees). The Accommodation and Food Services Sector was the largest such employer in 2013 in Beaufort Co. (10,841 employees). The Retail Trade sector was the largest employer in Colleton Co. (1,619 employees) and Hampton Co. (690 employees). The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Allendale Co. – manufacturing, health care, retail trade; Bamberg Co. – manufacturing, health care, educational services; Barnwell Co. – manufacturing, health care, retail trade; Beaufort Co. – health care, retail trade, finance/insurance; Colleton Co. – health care, retail trade, manufacturing; and Hampton Co. – manufacturing, health care, retail trade.

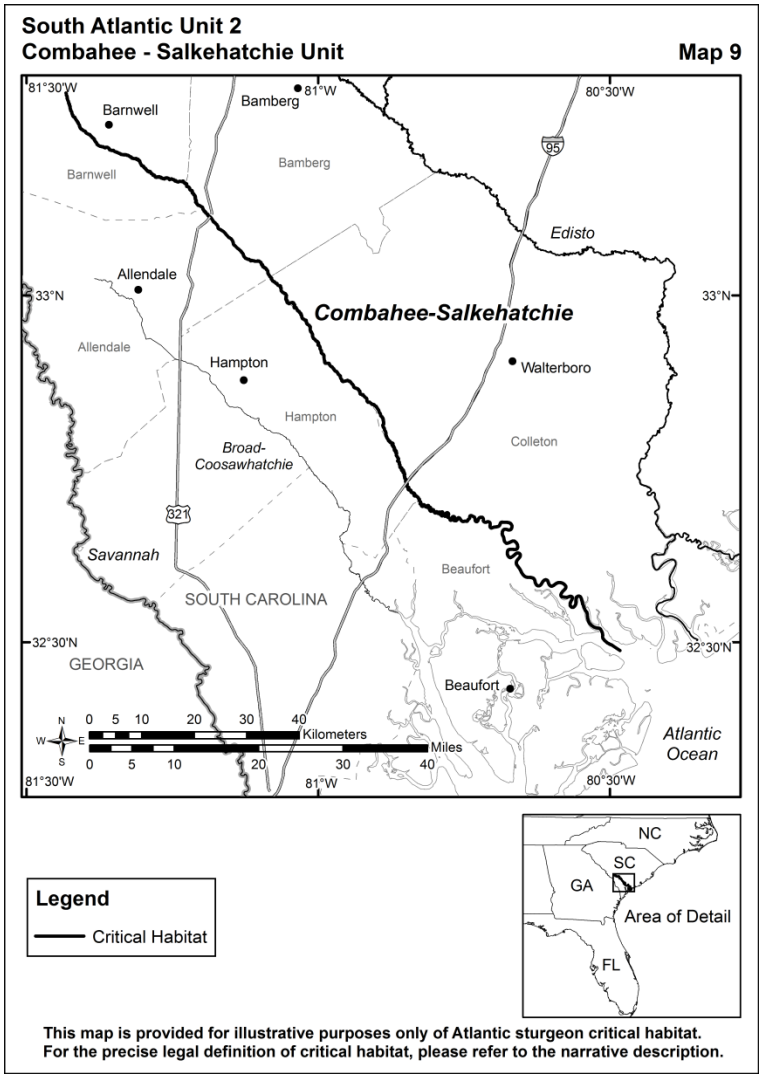


Figure 2-9. Location Map of Combahee-Salkehatchie River Unit

2.1.2.3 Savannah River, Unit SA3

The occupied Savannah River critical habitat unit extends from RKM 0 up to the New Savannah Bluff Lock and Dam. The Unit passes through Aiken, Allendale, Barnwell, Edgefield, Hampton and Jasper counties in South Carolina and Burke, Chatham, Effingham, Richmond and Screven counties in Georgia, and is primarily located along the border between South Carolina and Georgia (Figure 2-10). Barnwell and Hampton counties in South Carolina also contain portions of the Combahee River critical habitat unit.

The South Carolina county populations in this unit estimated in 2014 ranged from 9,695 in Allendale Co. to 164,753 in Aiken Co. The total population of South Carolina in 2014 was estimated to be 4,832,482. Aiken and Jasper counties' populations increased between 2010 and 2014, by 2.9% and 9.7%, respectively. Populations in Allendale, Barnwell and Hampton counties decreased between 2010 and 2014, by 6.9%, 2.9% and 3.2%, respectively. The South Carolina statewide population for the same period increased by 4.5%. Population densities in Allendale, Barnwell, Hampton and Jasper counties were all between 25 and 42 persons per square mile in 2010. Population density in Aiken Co. was 149.5 persons per square mile. The South Carolina statewide population density in 2010 was 153.9 persons per square mile. The median household incomes for 2009-2013 for South Carolina counties in this unit were all below the statewide average of $44,779; Allendale Co. had the lowest at $25,252 and Aiken Co. was highest at $44,509. Compared to the South Carolina statewide average of 18.1% of persons below the poverty level in 2009-2013, the South Carolina counties in this unit ranged from 18.9% in Aiken Co. to 36.0% in Allendale Co.

Number of private nonfarm business establishments in 2013 ranged from 125 in Allendale Co. to 2,674 in Aiken Co.; there were 101,545 private nonfarm establishments in South Carolina in 2013. The Administrative and Support and Waste Management and Remediation Sector was the largest employer in 2013 in terms of paid employees in Aiken Co., with 7,031 employees. The Manufacturing sector was the largest such employer in Allendale and Barnwell counties (848 and 1,832 employees, respectively). The Retail Trade sector was the largest employer in Hampton and Jasper counties (690 and 1,466 employees, respectively). The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Aiken Co. – administrative/support/waste management/remediation, construction, health care; Allendale Co. – manufacturing, health care, retail trade; Barnwell Co. – manufacturing, health care, retail trade; Hampton Co. – manufacturing, health care, retail trade; and Jasper Co. – retail trade, health care, construction.

The Georgia county populations in this unit estimated in 2014 ranged from 14,085 in Screven Co. to 283,379 in Chatham Co. The total population of Georgia in 2014 was estimated to be 10,097,343. Burke and Screven counties' populations decreased between 2010 and 2014, by 2.6%, and 3.5%, respectively. Populations in Chatham, Effingham and Richmond counties increased between 2010 and 2014, by 6.9%, 6.1% and 0.4%, respectively. The Georgia statewide increase in population for the same period was 4.2%. Population densities were both well above and well below the Georgia average of 168.4 persons per square mile in 2010, ranging from 22.6 persons per square mile in Screven Co., to 621.7 and 618.4 persons per square mile in Chatham and Richmond counties, respectively. The median household incomes for 2009-2013 for Georgia counties in this unit were all below the statewide average of $49,179, expect for Effingham Co. where the median income was $63,030. Among the other counties, the median income ranged from $31,494 in Burke Co. and $45794 in Chatham Co. Compared to the Georgia statewide average of 18.2% of persons below the poverty level in 2009-2013, the Georgia counties in this unit ranged from 11.2% in Effingham Co. to 33.5% in Burke Co.

Number of private nonfarm business establishments in 2013 ranged from 213 in Screven Co. to 7,229 in Chatham Co.; there were 217,559 private nonfarm establishments in Georgia in 2013. The

Manufacturing sector was the largest employer in 2013 in terms of paid employees in Burke Co., with 813 employees. The Accommodation and Food Services sector had the largest number of paid employees in Chatham Co., with 19,021 employees. The Retail Trade sector was the largest employer in 2013 in Effingham Co. (1,318 employees) and Screven Co. (370 employees). The Health Care and Social Assistance sector was the largest employer in Richmond Co., with 23,934 employees. The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Burke Co. – manufacturing, retail trade, health care; Chatham Co. – manufacturing, health care, retail trade; Effingham Co. – health care, retail trade, other services (non-public administration); Richmond Co. – health care, manufacturing, retail trade; and Screven Co. – health care, retail trade, finance/insurance.

Commercial fishing is also an important economic component in the Savannah River Unit which includes the ports of Savannah and Thunderbolt, Georgia. Table 2-19 shows the most recent estimates of the annual volume and value of commercial landings that are available for these ports.

Table 2-6. Volume and Value of Commercial Landings at Ports in Savannah River Unit

Ports	Millions of lbs	Millions $
Savannah, GA[1]	2.5	5.0
Thunderbolt, GA[2]	5.0	3.4

[1] 1998 landings data (most recent available for this port)
[2] 1981 landings data (most recent available for this port)
Source: NMFS Office of Science and Technology

2.1.2.4 Unoccupied Savannah River Unit SAU1

This unoccupied critical habitat unit extends from the New Savannah Bluff Lock and Dam to the Augusta Diversion Dam. The unit passes through Aiken and Edgefield counties in South Carolina, and Columbia and Richmond counties in Georgia (Figure 2-10). Aiken Co., South Carolina and Richmond Co., Georgia also contain portions of the occupied Savannah River unit, and Edgefield Co., Georgia contains of a portion of the Edisto River unit.

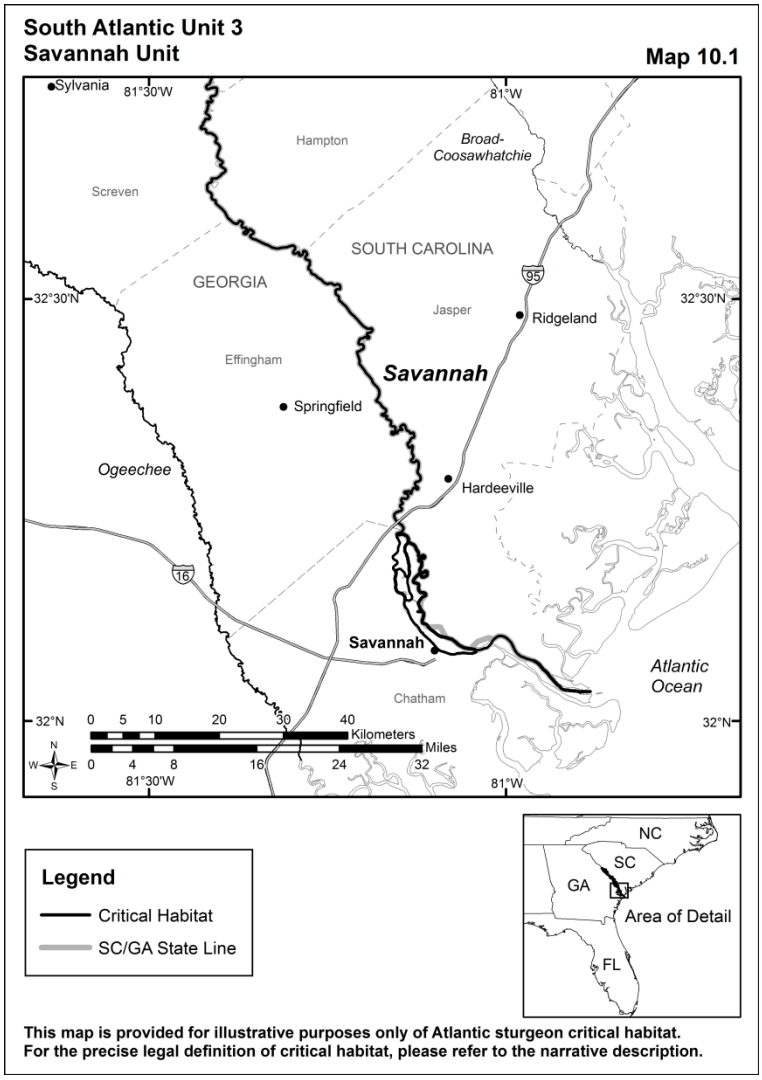
Aiken and Edgefield County populations estimated in 2014 were 164,753 and 26,553 respectively. The total population of South Carolina in 2014 was estimated to be 4,832,482. Aiken Co.'s population increased between 2010 and 2014 by 2.9%, whereas Edgefield Co.'s population decreased by 1.6%. The South Carolina statewide population for the same period increased by 4.5%. Population density in Aiken Co. was 149.5 persons per square mile in 2010, and Edgefield Co. had 53.9 persons per square mile. The South Carolina statewide population density in 2010 was 153.9 persons per square mile. The median household income for 2009-2013 for Aiken Co. was $44,509, just under the South Carolina statewide average of $44,779, and the median income of Edgefield Co. was slightly lower, at $43,861. Compared to the South Carolina statewide average of 18.1% of persons below the poverty level in 2009-2013, Aiken Co. had 18.9% of persons below the poverty level and Edgefield Co. had 19.9%.

Number of private nonfarm business establishments in 2013 was 2,674 in Aiken Co. and 312 in Edgefield Co.; there were 101,545 private nonfarm establishments in South Carolina in 2013. The Administrative and Support and Waste Management and Remediation Sector was the largest employer in 2013 in terms of paid employees in Aiken Co., with 7,031 employees. The Manufacturing Sector was the largest employer in Edgefield Co., with 10,325 employees. The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Aiken Co. – administrative/support/waste management/remediation, construction, health care; and Edgefield Co. -- manufacturing, transportation/warehousing, health care.

Columbia and Richmond County populations estimated in 2014 were 139,257 and 201,368 respectively. The total population of Georgia in 2014 was estimated to be 10,097,343. Columbia Co.'s population increased between 2010 and 2014 by 12.3%, whereas Edgefield Co.'s population increased by just 0.4%.

The Georgia statewide population for the same period increased by 4.2%. Population density in Columbia Co. was 427.6 persons per square mile in 2010, and Richmond Co. had 618.4 persons per square mile. The Georgia statewide population density in 2010 was 168.4 persons per square mile. The median household incomes for 2009-2013 were $69,306 for Columbia Co. and $37,749 for Richmond Co.; the Georgia statewide average median household income between 2009 and 2013 was $49,179. Compared to the Georgia statewide average of 18.2% of persons below the poverty level in 2009-2013, Columbia Co. had 8.3% of persons below the poverty level and Richmond Co. had 25.1%.

Number of private nonfarm business establishments in 2013 was 2,092 in Columbia Co. and 4,313 in Richmond Co.; there were 217,559 private nonfarm establishments in Georgia in 2013. The Retail Trade sector was the largest employer in 2013 in terms of paid employees in Columbia Co., with 5,281 employees. The Health Care and Social Assistance sector was the largest employer in Richmond Co., with 23,934 employees. The business sectors with the top 3 highest annual payrolls by county in 2013 were as follows: Columbia Co. – manufacturing, retail trade, wholesale trade; and Richmond Co. – health care, manufacturing, retail trade.



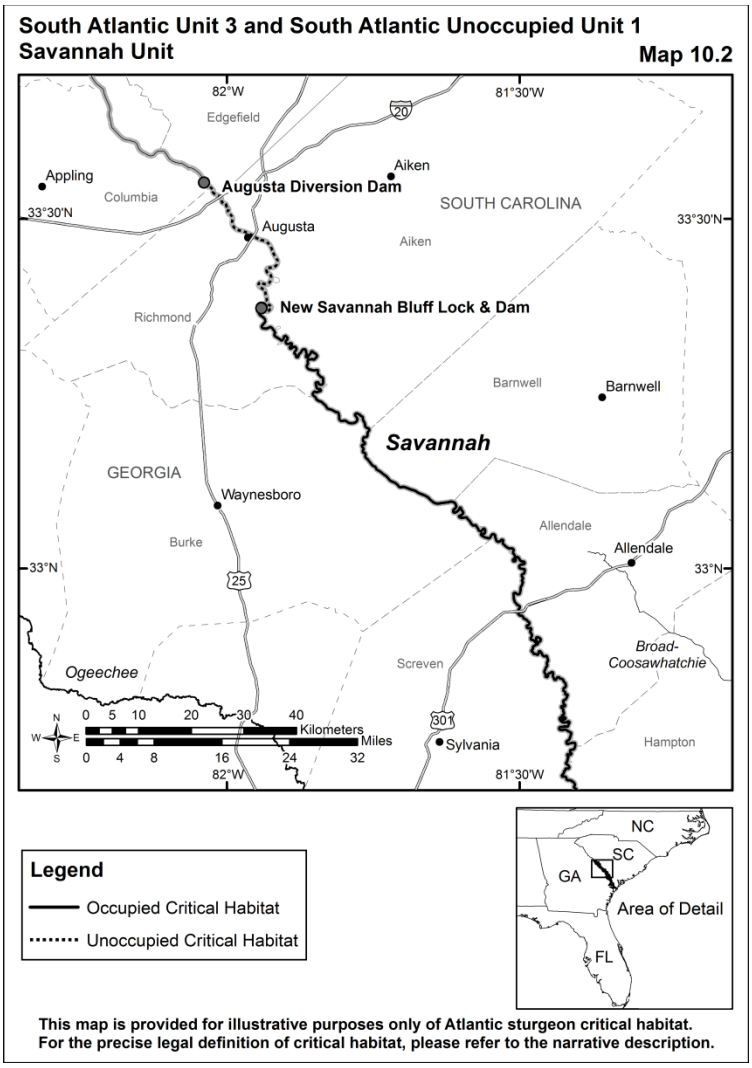


Figure 2-10. Location Maps of Savannah River Unit.

2.1.2.5 Ogeechee River, Unit SA4

The Ogeechee River Unit passes through Bryan, Bulloch, Burke, Chatham, Effingham, Emanuel, Glascock, Greene, Hancock, Jefferson, Jenkins, Screven, Taliaferro and Washington Counties in Georgia, and is primarily located along the northeastern portion of the Georgia coast near the border with South Carolina (Figure 2-11). Burke, Chatham, Effingham and Screven counties also contain portions of the occupied Savannah River unit.

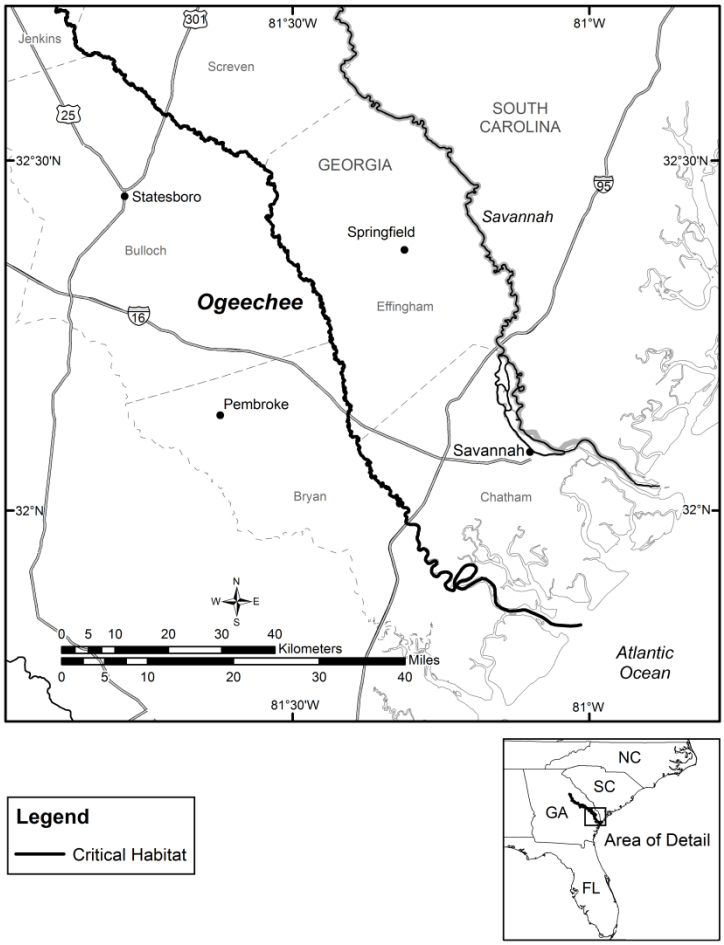
The county populations estimated in 2014 ranged between 1,693 in Taliaferro Co. to 283,379 in Chatham Co. The total population of Georgia in 2014 was estimated to be 10,097,343. Half of the counties' populations in this unit decreased between 2010 and 2014, ranging between a 0.9% decrease in Glascock Co. to a 9.5% decrease in Hancock Co. The increases in population ranged from 0.7% in Emanuel Co. to 12.1% in Bryan Co. The Georgia statewide population for the same period increased by 4.2%. Population density in 2010 ranged from 8.8 persons per square mile in Taliaferro Co. to 621.7 persons per square mile in Chatham Co. The Georgia statewide population density in 2010 was 168.4 persons per square mile. The median household incomes for 2009-2013 ranged from $25,000 in Hancock Co. to $64,707 in Hancock Co. The Georgia statewide average median household income between 2009 and

2013 was $49,179. Compared to the Georgia statewide average of 18.2% of persons below the poverty level in 2009-2013, the counties in this unit ranged from 11.2% in Effingham Co. to 33.5% in Burke Co.

Number of private nonfarm business establishments in 2013 ranged from 17 in Taliaferro Co. to 7,229 in Chatham Co.; there were 217,559 private nonfarm establishments in Georgia in 2013. For a number of counties in this unit, census data on employment and payroll was withheld in order to avoid disclosing data on individual companies, and data is only available for all business sectors combined. Glascock Co. had 22 business establishments in 2013, with no other data reported. Hancock Co. had 73 establishments with 601 paid employees. Jenkins Co. had 97 establishments with 946 paid employees. Taliaferro Co. had 17 establishments with 45 paid employees. The Retail Trade sector was the largest employer in 2013 in terms of paid employees in Bryan, Bulloch, Effingham and Screven counties (1,102, 3,300, 1,318 and 370 employees, respectively). The Manufacturing sector was the largest employer in Burke, Emanuel and Jefferson counties (813, 1,753 and 977 employees). The Accommodation and Food Services sector was the largest employer in 2013 in Chatham Co. (19,021 employees) and Greene Co. (1,043 employees). The Health Care and Social Assistance sector was the largest employer in Washington Co. (1,051 employees). The business sectors with the top 3 highest annual payrolls by reporting county in 2013 were as follows: Bryan Co. – retail trade, health care, wholesale trade; Bulloch Co. – health care, retail trade, manufacturing; Burke Co. – manufacturing, retail trade, health care; Chatham Co. – manufacturing, health care, retail trade; Effingham Co. – health care, wholesale trade, other services (non-public administration); Emanuel Co. – manufacturing, health care, retail trade; Greene Co. – accommodation/food services, health care, manufacturing; Jefferson Co. – manufacturing, health care, retail trade; Screven Co. – health care, retail trade, finance/insurance; and Washington Co. – health care, manufacturing, retail trade.

South Atlantic Unit 4
Ogeechee Unit

Map 11.1



Legend

Critical Habitat

This map is provided for illustrative purposes only of Atlantic sturgeon critical habitat.
For the precise legal definition of critical habitat, please refer to the narrative description.

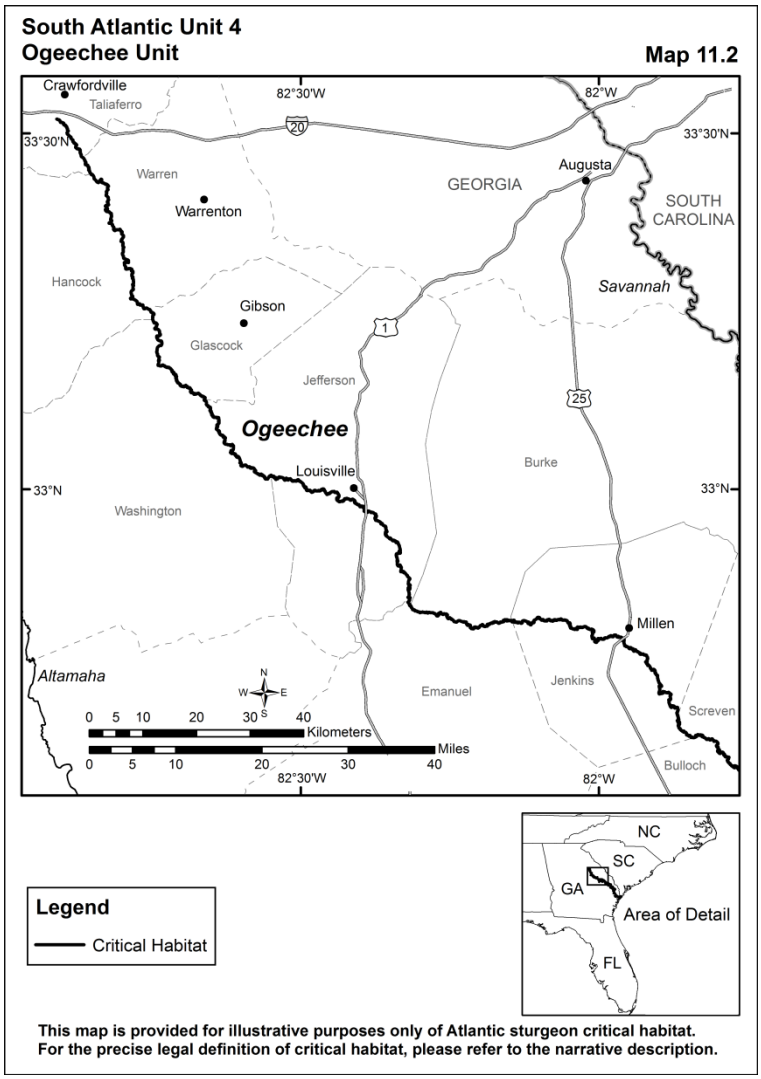


Figure 2-11. Location Maps of Ogeechee River Unit

2.1.2.6 Altamaha River, Unit SA5

The Altamaha River Unit includes the Altamaha River, as well as portions of the Oconee and Ocmulgee rivers in Georgia, and is located along the central portion of the Georgia Coast (Figure 2-12). The Altamaha River portion of the unit passes through Appling, Glynn, Long, McIntosh, Tatnall, Toombs, and Wayne counties. The Oconee River passes through Baldwin, Johnson, Laurens, Montgomery, Treutlen, Washington, Wheeler, and Wilkinson counties. The Ocmulgee River passes through Ben Hill, Bibb, Bleckley, Coffee, Dodge, Houston, Jasper, Jeff Davis, Jones, Monroe, Pulaski, Telfair, Twiggs, and Wilcox counties.

The county populations along the Altamaha River estimated in 2014 ranged between 14,214 in McIntosh Co. to 82,175 in Glynn Co. The total population of Georgia in 2014 was estimated to be 10,097,343. The populations in Appling, Glynn, Long and Toombs counties increased between 2010 and 2014, ranging between a 0.2% increase in Toombs Co. to an 18.4% increase in Long Co. The decreases in the other counties' populations were all less than 1.0%. The Georgia statewide population for the same period increased by 4.2%. Population density in 2010 ranged from 33.8 persons per square mile in McIntosh Co. to 189.7 persons per square mile in Glynn Co. The Georgia statewide population density in 2010 was

168.4 persons per square mile. The median household incomes for 2009-2013 ranged from $31,189 in Toombs Co. to $46,407 in Glynn Co. The Georgia statewide average median household income from 2009-2013 was $49,179. Compared to the Georgia statewide average of 18.2% of persons below the poverty level in 2009-2013, the counties along the Altamaha River ranged from 14.9% in McIntosh Co. to 27.4% in Tattnall Co.

Number of private nonfarm business establishments in 2013 ranged from 71 in Long Co. to 2,427 in Glynn Co.; there were 217,559 private nonfarm establishments in Georgia in 2013. About half of Long County's census data on employment and payroll was withheld in order to avoid disclosing data on individual companies; Long Co. had 71 business establishments with 252 paid employees in 2013. The Health Care and Social Assistance sector was the largest employer in 2013 in terms of paid employees in Appling, Tattnall and Toombs counties (960, 757, and 2,217 employees, respectively). The Accommodation and Food Services sector was the largest employer in Glynn Co., with 6,728 employees. The Retail Trade sector was the largest employer in McIntosh Co. with 401 employees and in Wayne Co. with 1,213 employees. The business sectors with the top 3 highest annual payrolls by reporting county in 2013 were as follows: Appling Co. – health care, manufacturing, retail trade; Glynn Co. – health care, manufacturing, accommodation/food services; McIntosh Co. – retail trade, accommodation/food services, health care; Tattnall Co. – health care, wholesale trade, construction; Toombs Co. – health care, manufacturing, retail trade; and Wayne Co. – health care, construction, retail trade.

Commercial fishing is also an important economic component in the Altamaha River Unit which includes the port of Darien-Bellville, Georgia. Table 2-22 shows the most recent estimates of the annual volume and value of commercial landings that are available for this port.

Table 2-7. Volume and Value of Commercial Landings in Altamaha River Unit

Port	Millions of lbs	Millions $
Darien-Bellville, GA[1]	4.8	6.8

[1] 2012 landings data

Source: NMFS Office of Science and Technology

The county populations along the Oconee River estimated in 2014 ranged between 6,778 in Treutlen Co. to 47,851 in Laurens Co. The total population of Georgia in 2014 was estimated to be 10,097,343. The populations in Baldwin and Wheeler counties increased between 2010 and 2014, by 0.2% and 7.7%, respectively. The decreases in the other counties' populations ranged between 1.2% in Laurens Co. to 9.5% in Hancock Co. The Georgia statewide population for the same period increased by 4.2%. Population density in 2010 ranged from 20.0 persons per square mile in Hancock Co. to 177.3 persons per square mile in Baldwin Co. The Georgia statewide population density in 2010 was 168.4 persons per square mile. The median household incomes for 2009-2013 were all below the statewide average of $49,179, ranging from $24,382 in Wheeler Co. to $37,894 in Treutlen Co. Compared to the Georgia statewide average of 18.2% of persons below the poverty level in 2009-2013, the counties along the Oconee River ranged from 21.3% in Wilkinson Co. to 31.3% in Wheeler Co.

Number of private nonfarm business establishments in 2013 ranged from 67 in Wheeler Co. to 1,037 in Laurens Co.; there were 217,559 private nonfarm establishments in Georgia in 2013. Montgomery, Wheeler and Wilkinson counties had large portions of 2013 census data on employment and payroll withheld in order to avoid disclosing data on individual companies. Montgomery Co. had 111 business establishments in 2013, and the largest annual payrolls reported were in the manufacturing, retail trade, and agriculture, forestry, fishing and hunting sectors. Wheeler Co. had 67 business establishments in 2013, and the largest sector with reported data by far was the Agriculture, Forestry, Fishing and Hunting sector. In Wilkinson co., there were 149 business establishments in 2013, with the Construction sector the largest sector with reported employment data. The Health Care sector was the largest employer in 2013 in terms of paid employees in Baldwin, Johnson, Laurens and Washington counties (3,671, 239, 3,053 and 1,051 employees, respectively). The Retail Trade sector was the largest employer in Treutlen

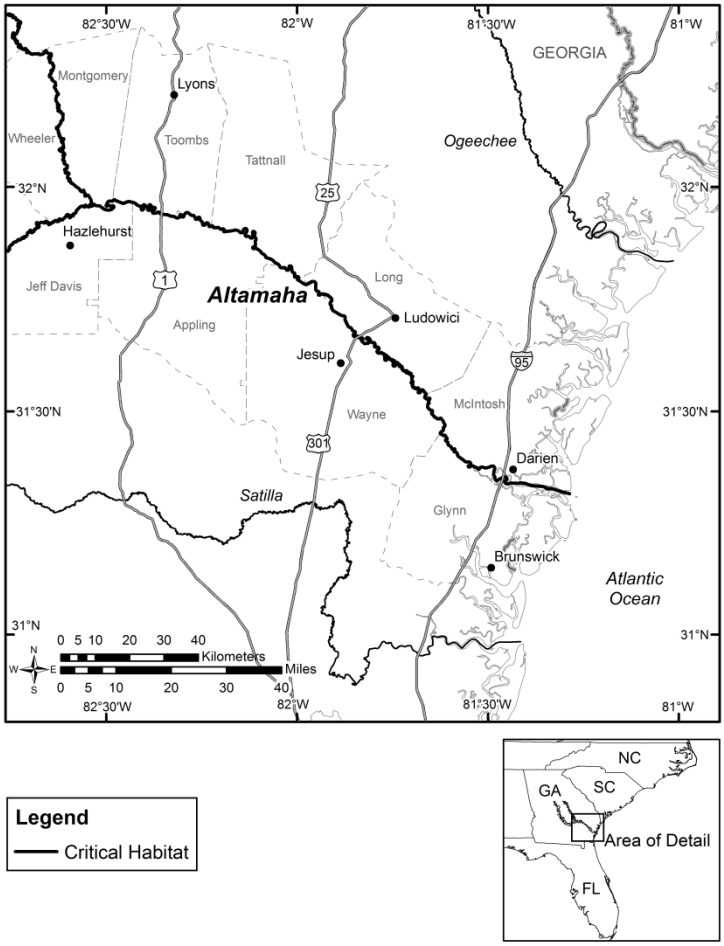
Co., with 150 employees. The business sectors with the top 3 highest annual payrolls by reporting county in 2013 were as follows: Baldwin Co. – health care, manufacturing, retail trade; Johnson Co. – transportation/warehousing, health care, manufacturing; Laurens Co. – health care, manufacturing, retail trade; Treutlen Co. – health care, retail trade, manufacturing; and Washington Co. – health care, manufacturing, retail trade.

The county populations along the Ocmulgee River estimated in 2014 ranged between 8,320 in Twiggs Co. to 153,905 in Bibb Co. The total population of Georgia in 2014 was estimated to be 10,097,343. The populations in Ben Hill, Bibb, Bleckley, Dodge, Jasper, Jeff Davis, Pulaski, Twiggs and Wilcox counties decreased between 2010 and 2014, ranging between a 1.0% decrease in Ben Hill and Bibb counties to a 7.8% decrease in Twiggs Co. The increases in the other counties' populations ranged between a 0.4% increase in Jones Co. to a 6.6% in Houston Co. The Georgia statewide population for the same period increased by 4.2%. Population density in 2010 ranged from 24.5 persons per square mile in Wilcox Co. to 622.8 persons per square mile in Bibb Co. The Georgia statewide population density in 2010 was 168.4 persons per square mile. The median household incomes for 2009-2013 ranged from $26,634 in Telfair Co. to $54,893 in Houston Co. The Georgia statewide average median household income between 2009 and 2013 was $49,179. Compared to the Georgia statewide average of 18.2% of persons below the poverty level in 2009-2013, the counties along the Ocmulgee River ranged from 12.9% in Monroe Co. to 38.1% in Ben Hill Co.

Number of private nonfarm business establishments in 2013 ranged from 75 in Twiggs Co. to 4,060 in Bibb Co.; there were 217,559 private nonfarm establishments in Georgia in 2013. Twiggs and Wilcox counties had large portions of 2013 census data on employment and payroll withheld in order to avoid disclosing data on individual companies. Twiggs Co. had 75 business establishments and Wilcox Co. had 92 business establishments in 2013. The Manufacturing sector was the largest employer in 2013 in terms of paid employees in Ben Hill, Coffee, Jasper and Jeff Davis counties (1,521, 2,522, 369 and 1,125 employees, respectively). The Health Care and Social Assistance sector was the largest such employer in Bibb, Dodge, Jones, Pulaski and Telfair counties (15,435, 873, 453, 717 and 396 employees, respectively). The Retail Trade sector was the largest employer in 2013 in Bleckley and Houston counties (352 and 6,820 employees, respectively). The Administrative and Support and Waste Management and Remediation sector was the largest employer in 2013 in Monroe Co. (1,238 employees). The business sectors with the top 3 highest annual payrolls by reporting county in 2013 were as follows: Ben Hill Co. – manufacturing, health care, retail trade; Bibb Co. – health care, finance/insurance, retail trade; Bleckley Co. – retail trade, health care, accommodation/food services; Coffee Co. – manufacturing, health care, transportation/warehousing; dodge Co. – health care, retail trade, accommodation/food services; Houston Co. – professional/scientific/technical services, health care, manufacturing; Jasper Co. – manufacturing, retail trade, administrative/support/waste management/remediation; Jeff Davis Co. – manufacturing, retail trade, health care; Jones Co. – construction, health care, retail trade; Monroe Co. – health care, administrative/support/waste management/remediation, retail trade; Pulaski Co. – health care, retail trade, information; and Telfair Co. – health care, retail trade, finance/insurance.

South Atlantic Unit 5
Altamaha Unit

Map 12.1



Legend

Critical Habitat

This map is provided for illustrative purposes only of Atlantic sturgeon critical habitat.
For the precise legal definition of critical habitat, please refer to the narrative description.

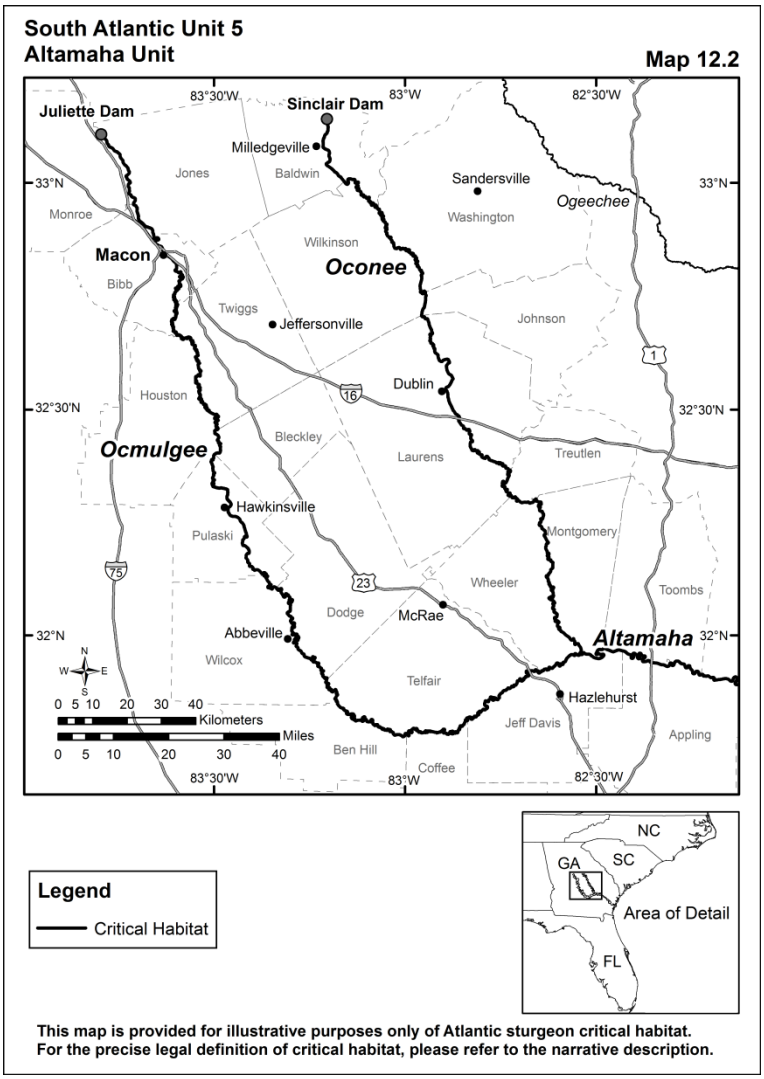


Figure 2-12. Location Maps of Altamaha River Unit.

2.1.2.7 Satilla River, Unit SA6

The Satilla River Unit is primarily located along the southern portion of the Georgia Coast (Figure 2-13), and passes through Atkinson, Ben Hill, Brantley, Camden, Charlton, Coffee, Irwin, Pierce, and Ware counties. Ben Hill and Coffee counties also contain portions of the Altamaha River unit.

The county populations estimated in 2014 ranged between 8,223 in Atkinson Co. to 52,027 in Camden Co. The total population of Georgia in 2014 was estimated to be 10,097,343. Four of the counties' populations in this unit decreased between 2010 and 2014, ranging between a 1.0% decrease in Ben Hill Co. to a 4.6% decrease in Irwin Co. The increases in counties' population ranged from less than 0.1% in Brantley Co. to 6.0% in Charlton Co. The Georgia statewide population for the same period increased by 4.2%. Population density in 2010 ranged from 15.7 persons per square mile in Charlton Co. to 82.4 persons per square mile in Camden Co. The Georgia statewide population density in 2010 was 168.4 persons per square mile. The median household incomes for 2009-2013 ranged from $28,547 in Ben Hill Co. to $51,990 in Camden Co. The Georgia statewide average median household income between 2009 and 2013 was $49,179. Compared to the Georgia statewide average of 18.2% of persons below the

poverty level in 2009-2013, the counties in this unit ranged from 15.7% in Camden Co. to 38.1% in Ben Hill Co.

Number of private nonfarm business establishments in 2013 ranged from 89 in Atkinson Co. to 849 in Ware Co.; there were 217,559 private nonfarm establishments in Georgia in 2013. For Brantley and Charlton counties, large portions census data on employment and payroll was withheld in order to avoid disclosing data on individual companies. Brantley Co. had 187 business establishments in 2013, with substantial payrolls reported in the retail trade, manufacturing and construction sectors. Charlton Co. had 146 business establishments in 2013, with substantial payrolls reported in the health care, retail trade and agriculture, forestry, fishing and hunting sectors. The Manufacturing sector was the largest employer in 2013 in terms of paid employees in Atkinson, Ben Hill and Coffee counties (557, 1,521 and 2,522 employees, respectively). The Retail Trade sector was the largest employer in Camden and Ware counties (2,378 and 2,472 employees, respectively). The Health Care and Social Assistance sector was the largest employer in Irwin Co. (611 employees). The Wholesale Trade sector was the largest employer in Pierce Co. (438 employees). The business sectors with the top 3 highest annual payrolls by reporting counties in this unit in 2013 were as follows: Atkinson Co. – manufacturing, retail trade, finance/insurance; Ben Hill Co. – manufacturing, health care, retail trade; Camden Co. – retail trade, health care, professional/scientific/technical services; Coffee Co. – manufacturing, health care, transportation/warehousing; Irwin Co. – health care, wholesale trade, retail trade; Pierce Co. – wholesale trade, manufacturing, transportation/warehousing; and Ware Co. – health care, retail trade, manufacturing.

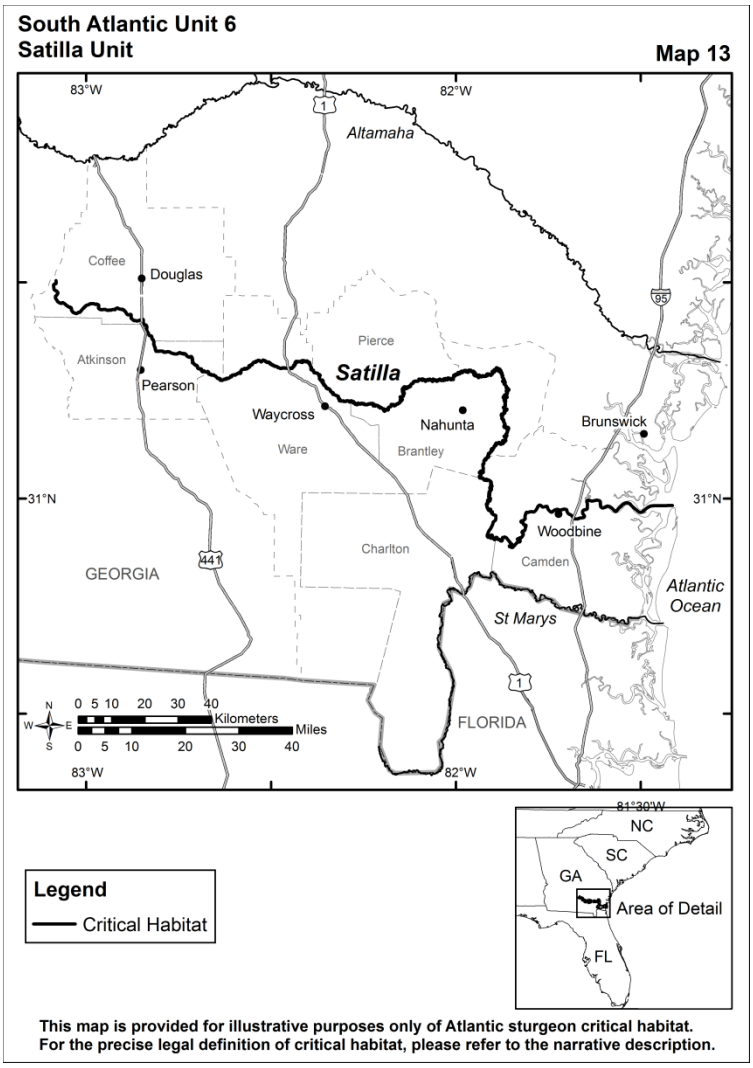


Figure 2-13. Location Map of Satilla River Unit.

2.1.2.8 St. Marys River, Unit SA7

This unit extends from RKM 0 up to the confluence of the St. Marys River with the Middle Prong of the St. Marys River. The St. Marys River unit passes through Camden and Charlton counties in Georgia, and Baker and Nassau counties in Florida (Figure 2-14). Camden and Charlton counties also contain portions of the Satilla River unit.

Camden and Charlton County, GA populations estimated in 2014 were 52,027 and 12,897 respectively. The total population of Georgia in 2014 was estimated to be 10,097,343. Both counties' populations increased between 2010 and 2014, by 3.0% in Camden Co. and 6.0% in Charlton Co. The Georgia statewide population for the same period increased by 4.2%. Population density in Camden Co. was 82.4 persons per square mile in 2010, and Charlton Co. had 15.7 persons per square mile. The Georgia statewide population density in 2010 was 168.4 persons per square mile. The median household incomes for 2009-2013 were $51,990 for Camden Co. and $40,111 for Charlton Co.; the Georgia statewide average median household income between 2009 and 2013 was $49,179. Compared to the Georgia statewide average of 18.2% of persons below the poverty level in 2009-2013, Camden Co. had 15.5% of persons below the poverty level and Charlton Co. had 19.7%.

Number of private nonfarm business establishments in 2013 was 792 in Camden Co. and 146 in Charlton Co.; there were 217,559 private nonfarm establishments in Georgia in 2013. For Charlton Co., a large portion of census data on employment and payroll was withheld in order to avoid disclosing data on individual companies. Charlton Co. had 146 business establishments in 2013, with substantial payrolls reported in the health care, retail trade and agriculture, forestry, fishing and hunting sectors. The Retail Trade sector was the largest employer in 2013 in terms of paid employees in Camden Co., with 2,378 employees. The business sectors with the top 3 highest annual payrolls in Camden co. 2013 were the retail trade, health care, and professional/scientific/technical services sectors.

Baker Co. and Nassau Co., FL populations estimated in 2014 were 27,093 and 76,619 respectively. The total population of Florida in 2014 was estimated to be 19,893,297. Compared to the Florida statewide population increase of 5.8% between 2010 and 2014, Baker County's population decreased by 0.1% whereas Nassau County's population increased by 4.5%. Population density in Baker Co. was 46.3 persons per square mile in 2010, and Nassau Co. had 113.0 persons per square mile. The Florida statewide population density in 2010 was 350.6 persons per square mile. The median household incomes for 2009-2013 were $49,236 for Baker Co. and $55,315 for Nassau Co.; the Florida statewide average median household income between 2009 and 2013 was $46,956. Compared to the Florida statewide average of 16.3% of persons below the poverty level in 2009-2013, Baker Co. had 17.3% of persons below the poverty level and Nassau Co. had 12.6%.

Number of private nonfarm business establishments in 2013 was 388 in Baker Co. and 1,648 in Nassau Co.; there were 510,389 private nonfarm establishments in Florida in 2013. For Baker Co., the Health Care and Social Assistance sector was the largest employer in 2013 in terms of paid employees with 1,787 employees; the largest such employer in Nassau Co. in 2013 was the Accommodation and Food Services sector, with 3,932 employees. The business sectors with the top 3 highest annual payrolls in Baker Co. in 2013 were the health care, retail trade and construction sectors. The business sectors with the top 3 highest annual payrolls in Nassau Co. in 2013 were the manufacturing, health care, and accommodation/food services sectors.

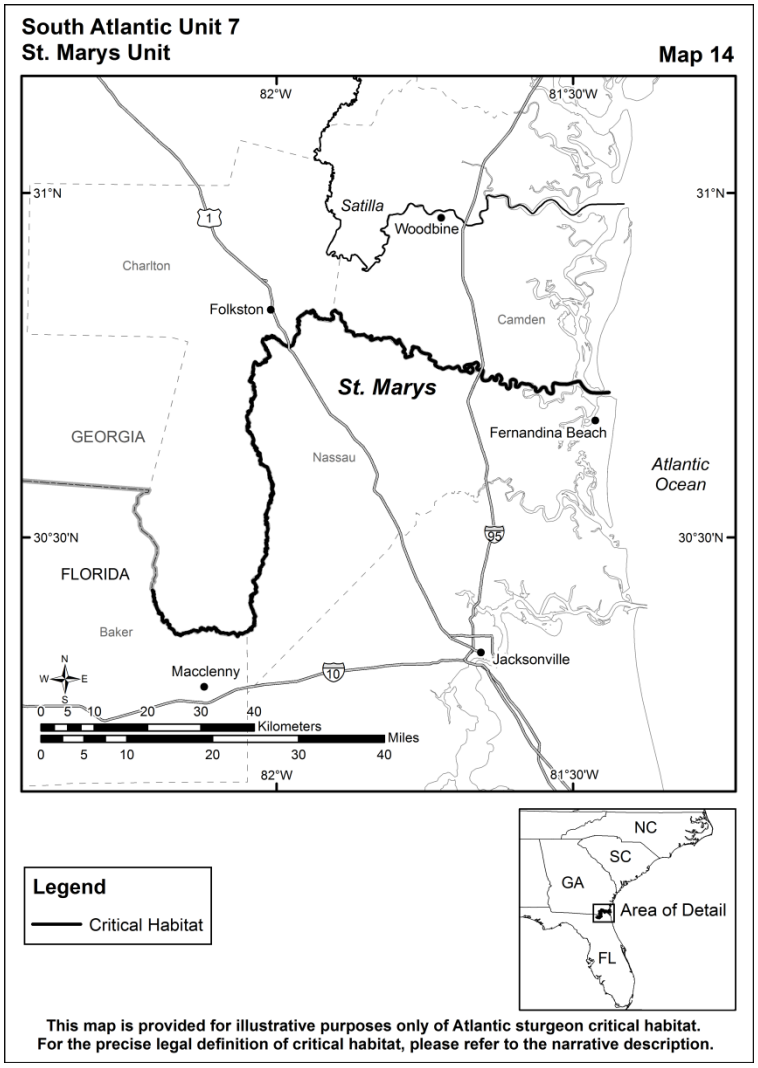


Figure 2-14. Location Map of St. Marys River Unit

2.2 Existing Laws and Regulations that May Protect Critical Habitat Features

The four essential features that form the basis of the critical habitat designation for Atlantic sturgeon are: suitable hard bottom spawning substrate in low salinity waters; transitional salinity waters over soft substrate downstream of spawning areas; water of appropriate depth and absent physical barriers to passage; and waters with appropriate combinations of temperature and oxygen to support spawning, survival, growth, development and recruitment. Existing federal, state, and local laws and regulations that provide some protection for these habitat features form the regulatory baseline (or "without critical habitat") conditions for assessing the incremental impacts of the critical habitat designation. These laws and regulations may also influence the outcomes and impacts of Section 7 consultation including whether project modifications may be required as a result of those consultations, to avoid destroying or adversely modifying critical habitat.

The most important existing laws and regulations that might minimize the incremental impacts of critical habitat designation are those that would provide protection specifically for the proposed essential features, and specifically for the benefit of Atlantic sturgeon. There are few existing laws or regulations that are this specific.

Federal laws that provide the most potential baseline protection for these habitat features include the ESA listing of Atlantic sturgeon as well as the shortnose sturgeon, and Sections 303, 401 and 404 of the Clean Water Act (CWA), and Section 10 of the Rivers and Harbors Act (RHA). State laws and county and local regulations, zoning ordinances, and permitting requirements may also indirectly provide protections to some of these features. Protected areas, such as federal and state parks, provide additional protection within their borders. The following subsections describe regulatory baseline protections that are provided in all proposed areas by federal laws and regulations, and in each specific designated area by state laws and regulations, as well as local ordinances and protected areas, that by their terms may provide some protection to the proposed critical habitat essential features or sturgeon.

2.2.1 Federal Laws and Regulations

The critical habitat provisions of the ESA focus on species recovery and, in this application, are intended to provide protection to Atlantic sturgeon beyond what is provided by other federal and state regulations. Table 2-24 lists and describes specific federal laws and regulations that already offer some protection for Atlantic sturgeon habitat.

Table 2-8. Federal laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
Endangered Species Act	The freshwater, estuarine, and marine habitats of the Atlantic sturgeon currently receive some level of protection through the Section 7 consultation process due to the ESA listing of these DPSs and the shortnose sturgeon as endangered. Under the Section 7 consultation process, habitat impacts are evaluated to determine if the proposed impacts may result in harm or take of the species by "impairing essential behavioral patterns," such as feeding or sheltering (50 CFR §222.102), that results in injury or death of individuals of the species. In the absence of a critical habitat designation, habitat impacts that constitute take could only be addressed through Section 7 if the impacts would jeopardize the continued existence of either of the DPSs of Atlantic sturgeon or the shortnose sturgeon, by appreciably reducing their likelihood of both survival and recovery (50 CFR §402.02). Lesser impacts to habitat that constitute indirect take of the species could be minimized through reasonable and prudent measures (RPMs) identified in biological opinions. In contrast, habitat features identified through the critical habitat designation are protected from destruction or adverse modification through the Section 7 consultation, based on the effects on the habitat's ability to conserve the listed species and not on impacts to both the survival and recovery of the species itself. http://www.nmfs.noaa.gov/pr/laws/esa/
National Environmental Policy Act	Federal agencies using federal funds or assets must comply with the requirements of the National Environmental Policy Act (NEPA) to assess the environmental impacts of major federal projects or decisions such as issuing permits, spending federal money, or affecting federal lands. An Environmental Impact Statement (EIS) is prepared and made available for public comment for projects that the federal agency views as having potentially significant environmental impacts. In-water construction activities and activities that affect water quantity or quality, substrate conditions, or that block fish passages

	have typically been subject to NEPA. EISs associated with these projects have considered potential environmental impacts, including impacts on Atlantic sturgeon, shortnose sturgeon, and other fish species that occupy or use areas designated as critical habitat, as well as potential impacts on the features of those habitats. http://www.epa.gov/compliance/nepa/
Clean Water Act	The objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The water quality standards (WQS) regulation at 40 CFR Part 131 describes the requirements and procedures for states and authorized tribes to develop, adopt, review, revise, and submit WQS as well as requirements and procedures for the EPA to review, approve, disapprove, and promulgate WQS as authorized by Section 303(c) of the CWA. WQS are the foundation for a wide range of programs under the CWA. They serve multiple purposes including establishing the water quality goals for a specific waterbody, or portion thereof, and providing the regulatory basis for establishing water quality-based effluent limits (WQBELs) beyond the technology-based levels of treatment required by CWA Sections 301(b) and 306. WQS also serve as a target for CWA restoration activities such as total maximum daily loads (TMDLs). Under Section 303(c) water quality standards define the goals for a water body and consist of four basic elements: designated uses (e.g., recreation, water supply, aquatic life, agriculture), water quality criteria to protect designated WQS consist of the following elements: • Designated use or uses such as "supporting aquatic life" or "recreation". • Water quality criteria necessary to protect the designated uses. • Antidegradation requirements. • General policies affecting the application and implementation of WQS that states and authorized tribes may include at their discretion (e.g., mixing zone, variance, and critical low-flow policies). States and tribes establish WQS to meet the objectives set forth in Section 101(a), which are as follows: • Restore and maintain the chemical, physical, and biological integrity of the Nation's waters. • Wherever attainable, achieve a level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water. These standards have the potential to provide significant protection for the critical habitat features of Atlantic sturgeon. Under Section 303(d) of the CWA, states, territories, and authorized tribes are required to develop lists of impaired waters. These are waters for which technology-based regulations and other required controls are not stringent enough to meet the water quality standards set by states. The law requires that states establish priority rankings for waters on the lists and develop Total Maximum Daily Loads (TMDLs) for these waters. A TMDL is a calculation of

	the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards. TMDLs are established for nutrient, pathogens, mercury, and other metals which protects water quality, and for sediments which affect both water quality and substrate features that may be critical habitat features. All of the states covered by the proposed critical habitat designation for the Carolina and South Atlantic DPSs have issued water quality standards for support of aquatic life, that pertain to one or more of the essential features of critical habitat, including dissolved oxygen and temperature. North Carolina's standard for dissolved oxygen (DO) in freshwater requires a DO of not less than a daily average of 5.0 mg/L, and a minimum instantaneous DO of not less than 4.0 mg/L. North Carolina also has a freshwater temperature standard specifying that stream temperatures are not to not to exceed 2.8 degrees C (5.04 degrees F) above the natural water temperature, and in no case to exceed 29 degrees C (84.2 degrees F) for mountain and upper piedmont waters and 32 degrees C (89.6 degrees F) for lower piedmont and coastal plain waters (Title 15A North Carolina Administrative Code 02B Surface Water Standards and Protective Values). South Carolina has dissolved oxygen and temperature standards for designated freshwaters. The daily average DO requirements vary based on the classification of the water body (S.C. Regulation 61-68, *Water Classifications and Standards*). The water temperature of all Freshwaters which are free flowing shall not be increased more than 5 degrees F (2.8 degrees C) above natural temperature conditions and shall not exceed a maximum of 90 degrees F (32.2 degrees C) as a result of the discharge of heated liquids unless a different site-specific temperature standard as provided for in C.12 has been established, a mixing zone as provided in C.10 has been established, or a Section 316(a) determination under the Federal Clean Water Act has been completed. . In Georgia, DO must be measured one meter below the water surface, or mid-depth if water depth is less than 2 m. The daily average DO must be 5.0 mg/L at all times and no less than 4.0 mg/L for waters supporting warm water fish species (non-trout). Freshwater temperature is not to exceed 90 degrees F, and at no time may temperature of receiving waters be increased by more than 5 degrees F, and no more than 1.5 degrees F in estuaries (Section 4 of Georgia's Rules and Regulations for Water Quality Control (Chapter 391-3-6-.03)). In Florida, Florida Administrative Code Chapter 62-302.520. Thermal Surface Water Criteria (4)(a) and (b), provide temperature standards. We have only included the provisions here that are relevant to the areas being proposed for designation. (4) Monthly and Maximum Temperature Limits. (a) Fresh Waters – Heated water with a temperature at the POD more than 5º F higher than the ambient (natural) temperature of any stream shall not be discharged into such stream. At all times under all conditions of stream flow the discharge temperature shall be controlled so that at least two-thirds (2/3) of the width of the stream's surface remains at ambient (natural) temperature. Further, no more than one-fourth (1/4) of the cross-section of the stream at a

	traverse perpendicular to the flow shall be heated by the discharge. Heated water with a temperature at the POD more than 3º F higher than the ambient (natural) temperature of any lake or reservoir shall not be discharged into such lake or reservoir. Further, no heated water with a temperature above 90º F shall be discharged into any fresh waters in Northern Florida regardless of the ambient temperature of the RBW. In Peninsular Florida, heated waters above 92º F shall not be discharged into fresh waters. (b) Coastal Waters – Heated water with a temperature at the POD more than 2º F higher than the ambient (natural) temperature of the RBW shall not be discharged into coastal waters in any zone during the months of June, July, August, and September. During the remainder of the year, heated water with a temperature at the POD more than 4º F higher than the ambient (natural) temperature of the RBW shall not be discharged into coastal waters in any zone. In addition, during June, July, August, and September, no heated water with a temperature above 92º F shall be discharged into coastal waters. Further, no heated water with a temperature above 90º F shall be discharged into coastal waters during the period October thru May. Florida Administrative Code 62-302.533 Dissolved Oxygen Criteria for Class I, Class II, Class III, and Class III-Limited Waters provides DO standards. 62-302.533 Dissolved Oxygen Criteria for Class I, Class II, Class III, and Class III-Limited Waters. (1) Class I, Class III predominantly freshwaters, and Class III-Limited predominantly freshwaters. (a) No more than 10 percent of the daily average percent dissolved oxygen (DO) saturation values shall be below the following values: …. 3. 34 percent in the Northeast and Big Bend bioregions. A map of the bioregions is contained in *SCI 1000: Stream Condition Index Methods* (DEP-SOP-003/11 SCI 1000) (http://www.flrules.org/Gateway/reference.asp?No=Ref-02959), which is incorporated by reference in Rule 62-160.800, F.A.C. (b) For lakes, the daily average DO level shall be calculated as the average of measurements collected in the upper two meters of the water column at the same location on the same day. For all other freshwaters, the daily average freshwater DO level shall be calculated as the average of all measurements collected in the water column at the same location and on the same day. In North Carolina, a Northeast Cape Fear River segment is impaired due to chloride (salinity). Several Cape Fear River segments are impaired due to DO. Tributaries to the Neuse River and the Tar River, and segments of the Tar River, are impaired due to DO. In South Carolina, segments of the Combahee, Black, Wateree, Edisto, and Pee Dee Rivers, and portions of Winyah Bay, Lakes Marion and Moultrie are impaired due to DO. In Georgia, segments of

	the Ogeechee and Satilla river watersheds are impaired due to DO. Section 401 of the CWA may provide additional protection to critical habitat by requiring that all applicants for a federal license or permit to conduct activity that may result in discharge to navigable waters submit a state certification to the licensing or permitting agency. The state certification must establish that the discharge complies with the requirements of Sections 301, 302, 303, 306, and 307 of the CWA. Section 404 of the CWA requires parties to obtain a permit from USACE prior to discharging dredge or fill material into "waters of the United States." In-water and coastal construction activities occurring within the critical habitat areas may require Section 404 permitting. Review by USACE of projects for the issuance of Section 404 permits requires Section 7 consultation with NMFS and USFWS under the ESA to the extent that a project may affect listed species or critical habitat. As part of the Section 404 permit process, USACE reviews the potential effects of the proposed action on plant and animal populations, and recommends efforts to avoid adverse effects to these populations, in addition to the wetlands and water systems on which they depend. In general, CWA-based conservation efforts for plants and animals include: • Select sites or manage discharges to ensure that habitat remains suitable for indigenous species; • Avoid sites having unique habitat or other value, including habitat of threatened or endangered species; • Utilize habitat development and restoration techniques to minimize adverse impacts and compensate for destroyed habitat; • Time discharge to avoid biologically critical time periods; and, • Avoid the destruction of remnant natural sites within areas already affected by development. Section 404 of the CWA also includes a permit program for the discharge of dredged or fill material into navigable waters that requires permit applicants to show that they have "taken steps to avoid wetland impacts, where practicable, minimized potential impacts to wetlands, and provided compensation for any remaining, unavoidable impacts through activities to restore or recreate wetlands." These steps frequently involve project modifications that reduce the flow of nutrients and sediments from impacted or restored wetlands in ways that protect critical in-water habitat features. http://www.epa.gov/owow/wetlands/facts/fact10.html
Rivers and Harbors Act	Section 10 of the Rivers and Harbors Act regulates the construction of any structure in or over any navigable water of the United States, as well as the excavating from or depositing of material in such waters and the accomplishment of any other work affecting the course, location, condition, or capacity of such waters. Under Section 10, these projects require approval from the Corps and are subject permit requirements. The permit review process includes adherence to 404(b)(1) guidelines. These guidelines, established by the EPA, constitute the substantive environmental criteria used in evaluating activities regulated under Section 404 of the CWA. For example,

	projects must be evaluated to identify appropriate and practicable changes to the project plan to minimize environmental impact of the discharges. Accordingly, permit conditions associated with Section 10 permits provide baseline protection for Atlantic sturgeon and its habitat.
Magnuson-Stevens Fishery Management and Conservation Act (Magnuson-Stevens Act): Essential Fish Habitat 16 (U.S.C. 1801 *et seq.*)	Fishery management plans developed under the Magnuson-Stevens Act are required to describe and identify essential fish habitat (EFH) for managed fishery species, and to provide protection of EFH by minimizing, to the extent practical, the adverse effects of fishing on EFH. (16 U.S.C. §1853(a)(7)). The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C. §1802(10)). The Magnuson-Stevens Act requires all federal agencies to consult with NMFS regarding actions they undertake or authorize that may adversely affect EFH. When NMFS recommends measures to protect or conserve EFH, federal agencies must respond in writing on measures proposed to avoid or offset impacts to EFH; or explain its reasons for proposing to proceed without following NMFS's recommendations (16 U.S.C. §1855 (b)). Atlantic sturgeon critical habitat areas have some overlap with EFH for some managed species. For example, EFH for penaeid shrimp includes inshore estuarine areas and tidal freshwaters from North Carolina to the Florida Keys. coastal barriers (coastal migratory pelagics).
Federal Power Act	Section 10(j) of the Federal Power Act (FPA) requires the Federal Energy Regulatory Commission (FERC) to consider both power and non-power resources during the licensing process and instructs FERC to actively solicit input regarding "adequate and equitable fish and wildlife measures from federal and state resource agencies." FERC must consider these recommendations during the licensing process, but does not have to incorporate the recommendations into the license if they "may be inconsistent with the purposes and requirements of the FPA" or if the recommendations are not supported by substantial evidence. Section 18 of the FPA provides that NMFS and the USFWS may prescribe fish passage requirements to be included as mandatory provisions of licenses FERC issues. The impacts of hydropower projects on fish habitats downstream of a project are typically evaluated during the licensing process.
Water Resources Development Act of 1992	The Water Resources Development Act (WRDA) is the main legislative vehicle authorizing and funding federal navigation projects, including construction or modification of harbors and channels and associated waterways and structures, such as dams, typically by the USACE. Section 204 "authorizes projects for the protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands, in connection with dredging an authorized federal navigation project." The USACE must consult with NMFS on the effects of their activities in connection with development or management of WRDA projects on listed species and their critical habitats. http://www.senate.gov/~epw/wrda92.pdf http://laws.fws.gov/lawsdigest/wat1992.html

2.2.2 State Laws and Regulations

In addition to the federal protections described above, state agencies in North Carolina, South Carolina, Georgia and Florida have management programs that may provide protection to Atlantic sturgeon habitat. This section describes protections provided by these plans that are relevant to the areas and features proposed to be designated as critical habitat for the Carolina and South Atlantic DPSs of Atlantic sturgeon.

2.2.2.1 North Carolina

The North Carolina Department of Environment and Natural Resources (NCDENR) implements the North Carolina Coastal Area Management Act, which requires that project proponents receive a permit for any sort of development within an Area of Environmental Concern, which includes coastal and estuarine areas that make up or have an effect on the essential features of Atlantic sturgeon critical habitat. State permitting processes include a determination regarding whether a proposed project meets the Coastal Resources Commission rules and provisions of local government land-use plans, and includes an agency and public comment period. Below is a list and brief description of specific North Carolina state laws and regulations that may offer some baseline protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-25).

Table 2-9. North Carolina state laws and regulations possibly providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
North Carolina Environmental Policy Act (NCEPA) of 1971	The North Carolina (or State) Environmental Policy Act of 1971 (SEPA) (G.S. 113A, Article 1) requires state agencies to review and report the environmental effects of all activities that involve an action by a state agency, an expenditure of public monies or private use of public land, and that may have a potential negative environmental effect on natural resources, public health and safety, natural beauty, or historical or cultural elements of the state. http://portal.ncdenr.org/web/wq/ps/sepa
Nutrient Offset and Riparian Buffer Mitigation	Nutrient offset mitigation may be required for any new or existing development where nutrient reduction requirements exist as part of a nutrient management strategy. In North Carolina, the Tar-Pamlico River Basin has a relevant nutrient management strategy. http://portal.ncdenr.org/web/wq/swp/ws/401/riparianbuffers/rules
Cape Fear River Basin Action Plan for Migratory Fish	A partnership of key federal, state, local, academic, and other organizations in the region is working together to develop a multi-year action plan that will use a broad range of tools and capabilities to provide long-term habitat-based solutions for the most pressing challenges for migratory fish. At more than 9,000 square miles, the Cape Fear River basin is one of the largest watersheds in North Carolina, stretching from the Atlantic Ocean to past Greensboro. Poor habitat quality in rivers and streams threatens fish, such as American shad, striped bass, river herring, and endangered Atlantic and shortnose sturgeon populations. Dams and other blockages prevent fish such as these from migrating upstream to spawn (lay eggs). The action plan identifies threats to healthy migratory fish populations, outlines actions to improve water quality, habitat conditions and fish passage, and determines community and economic benefits of improved migratory fish

	populations. http://www.habitat.noaa.gov/protection/capefear/
NC Coastal Nonpoint Source Program	Section 6217 of the federal 1990 Coastal Zone Act Reauthorization Amendments requires every state participating in the CZMA program to develop a Coastal Nonpoint Source Program (CNPSP). The purpose of this requirement, as stated in the CZMA, is to *strengthen the links between federal and state coastal zone management and water quality management programs and to enhance state and local efforts to manage land use activities that degrade coastal waters and coastal habitats***.** Within North Carolina, the state program is administered by the North Carolina Division of Water Quality and the North Carolina Division of Coastal Management (NCDCM) http://portal.ncdenr.org/web/wq/ps/nps/coastal
Coastal Habitat Protection Plan	North Carolina's Coastal Habitat Protection Plan was written and developed to: 1. Document the ecological role and function of aquatic habitats for coastal fisheries. 2. Provide status and trends information on the quality and quantity of coastal fish habitat. 3. Describe and document threats to coastal fish habitat, including threats from both human activities and natural events. 4. Describe the current rules concerning each habitat. 5. Identify management needs. 6. Develop options for management action using the above information. http://portal.ncdenr.org/web/mf/55
	Lower Cape Fear River Program – a large-scale water quality and environmental assessment program covering the Cape Fear River Estuary and a large portion of the lower Cape Fear River Watershed http://uncw.edu/cms/aelab/LCFRP/index.htm
***Water Use During Drought Rules (*G.S. 143-354(a)(1); 143-354(a)(8))**	The purpose of this Rule is to minimize harmful impacts of drought and water supply emergencies on public health and safety, environmental quality, and the economy by establishing minimum standards and practices for water shortage response planning, water use reporting, water conservation, and water reuse during droughts and water supply emergencies. http://www.ncwater.org/Water_Supply_Planning/Water_Conservation/hb1215/documents/rules.pdf
Water Use Act of 1967 (G.S. 143-215.11 through .22)	Designates a capacity use area where use of groundwater and/or surface water requires coordination and limited regulation for protection of the interests and rights of property owners and residents or of the public interest. http://www.ncwater.org/Rules_Policies_and_Regulations/Regulation/GS143-215.11-22.pdf
Dam Safety Law of 1967 ***G.S. 143-215.25***	Recommends conditions relating to release of flows from impoundments, location or design of the outlets and water intakes, the amount and timing of

(4)	withdrawals from a reservoir, and the construction of submerged weirs or other structures designed to satisfy minimum instream flow requirements. http://www.ncwater.org/Rules_Policies_and_Regulations/Regulation/index.php#G.S.%20143-215.25%20%284%29

2.2.2.2 South Carolina

South Carolina Department of Health and Environmental Control's (SCDHEC) Office of Ocean and Coastal Resource Management is responsible for managing coastal development activities through the South Carolina Coastal Management Program. Implementation of the program includes the direct regulation of impacts to coastal resources, including coastal and estuarine areas, beaches and beach dune systems. In addition, South Carolina Department of Natural Resources (SCDNR) Nongame and Endangered Species Conservation Act of 1976 affords protection of state and federally-listed endangered and threatened species. Under the Act, SCDNR reviews beach and shoreline construction projects and makes recommendations to federal or state permitting agencies regarding how the timing and extent of projects should be managed to avoid negative impacts on listed species and their habitat. Below is a list and brief description of specific South Carolina state laws and regulations that may offer some baseline protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-26).

Table 2-10. South Carolina state laws and regulations possibly providing baseline protection to Atlantic sturgeon critical habitat Essential Features

Regulation	Overview
Groundwater Use and Reporting Act [49-5-10]	The Groundwater Use and Reporting Program issues Groundwater Use Withdrawal Permits to all groundwater systems located in a designated Capacity Use Area. Current Capacity Use Areas are; Low Country (Beaufort, Colleton, Hampton, Jasper Counties), Pee Dee (Darlington, Dillon, Florence, Marion, Marboro, Williamsburg Counties), Trident (Berkeley, Charleston, and Dorchester) and Waccamaw (Georgetown, Horry Counties). Groundwater withdrawal permits are required to withdraw and use groundwater equal to or greater than 3 million gallons in any month in the counties in these areas. https://www.scdhec.gov/environment/water/capuse.htm
Pollution Control Act	The South Carolina Pollution Control Act (PCA) was enacted in 1972, two years before the federal CWA. While many requirements in this statute are covered in the CWA, the PCA has additional requirements not set forth in its federal counterpart (such as requiring a permit for construction of a wastewater treatment plant). SCDHEC is the primary regulatory agency responsible for administering the requirements of both the PCA and the CWA, although SCDNR also deals with water quality issues as related to the protection of wildlife. SCDHEC sets water quality standards, as required by the CWA, and issues National Pollutant Discharge Elimination System (NPDES) permits. http://www.scstatehouse.gov/code/t48c001.php
Stormwater Management and Sediment Reduction	Unless exempted, no person may engage in a land disturbing activity without first submitting a stormwater management and sediment control plan to the appropriate implementing agency and obtaining a permit to proceed.

Act [48-14-10]	(B) Each person responsible for the land disturbing activity shall certify, on the stormwater management and sediment control plan submitted, that all land disturbing activities will be done according to the approved plan. (C) All approved land disturbing activities must have associated therein at least one individual who functions as responsible personnel. http://www.scstatehouse.gov/code/t48c014.php

2.2.2.3 Georgia

Georgia Department of Natural Resources' (GADNR) Coastal Resources Division implements the state's Coastal Management Program. The program includes policies for managing activities that have a reasonably foreseeable effect on coastal resources, including development. Development activities are subject to the numerous provisions, including those of the Shore Protection Act, Coastal Marshlands Protection Act, Georgia Water Quality Control Act, and Georgia Endangered Wildlife Act. The Coastal Management Program designates "Special Management Areas," which may include regulatory or permit requirements applicable to areas of particular concern. Georgia also enforces an Endangered Wildlife Act.
The GA Environmental Protection Division (GAEPD) is charged with protecting Georgia's air, land, and water resources through the authority of state and federal environmental statutes. These laws regulate public and private facilities in the areas of air quality, water quality, hazardous waste, water supply, solid waste, surface mining, underground storage tanks, and others. GAEPD issues and enforces all state permits in these areas and has full delegation for federal environmental permits except Section 404 (wetland) permits.

The Watershed Protection Branch (WPB) manages water resources in Georgia through permits to local governments and industry to discharge treated wastewater and to local governments, industry, farmers and subdivisions for surface water and groundwater withdrawals. The WPB ensures that Georgia's public water systems are operating properly to supply safe drinking water to citizens, works to control nonpoint sources of pollution, including erosion and sedimentation, and manages storm water discharges. The WPB also conducts water quality monitoring and modeling of Georgia's waterways.

Below is a list and brief description of specific Georgia state laws and regulations that may offer some baseline protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-27).

Table 2-11. Georgia state laws and regulations possibly providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
Georgia Coastal Management Act (O.C.G.A. 12-5-320 *et. seq.*)	The Coastal Management Act authorizes Georgia's Coastal Management Program. The mission of the Georgia Coastal Management Program (GCMP) is to balance economic development in Georgia's coastal zone with preservation of natural, environmental, historic, archaeological, and recreational resources for the benefit of Georgia's present and future generations. The GCMP strives to balance economic development with the protection and preservation of invaluable coastal resources within its eleven-county coastal service area. Counties directly along the ocean are considered "first tier" counties and include Chatham, Bryan, Liberty, McIntosh, Glynn, and Camden.

	Immediately inland are the "second tier" counties: Effingham, Long, Wayne, Brantley, and Charlton. Each of the first and second tier counties, with the exception of Liberty, contain Atlantic sturgeon critical habitat. The core functions of the Program include: technical assistance to local governments, Coastal Incentive Grants, outreach and education, Coastal Advisory Council, federal consistency, Coastal Marshlands and Shore Protection Acts permits, compliance and enforcement, and coastal non-point source pollution management.
Revocable License Authority	The Revocable License (RL) authority of the State of Georgia allows for structures to occupy public trust lands water bottoms. The RL is issued as a standard component of the CMPA, PGP0083 Dock Permit, Individual Dock Permit, and Bank Stabilization permit processes. It is also issued for projects and entities that may be exempt from the CMPA process, such as Georgia Power and Georgia Ports Authority. As the name implies, this license can be revoked if project compliance is not met. http://www.coastalgadnr.org/msp
Georgia Erosion and Sedimentation Act [amended 2003] ***(OCGA 12-7-1)***	The Erosion and Sedimentation Act regulates land-disturbing activities which are defined as "any activity which may result in soil erosion from water or wind and the movement of sediments into state water or onto lands within the state, including, but not limited to, clearing, dredging, grading, excavating, transporting, and filling of land but not including agricultural practices as described in paragraph (5) of Code Section 12-7-17." The law also mandates stream buffer protection. http://www.gaepd.org/Documents/rules_exist.html
Georgia Environmental Policy Act (OCGA 12-16-1)	The Georgia Environmental Policy Act (GEPA) requires that all state agencies prepare an Environmental Impact Report as part of the decision-making process for all activities that may have an impact on the environment. Alternatives to the proposed project or activity must be considered as part of the report. GEPA states that any proposed governmental action which may "significantly adversely affect the quality of the environment", including the state's air, water, land, plants, and animals, requires an Environmental Effects Report. As outlined in GEPA, an Environmental Effects Report describes the environmental impact and any adverse environmental effects of the action, alternative actions, and mitigation measures proposed to avoid or minimize impact, and other effects of the action. The government agency responsible for the action authors the report and provides it to the director of the GAEPD. A notice that the report has been prepared is to be published in the newspaper of record of each county in which the action is to take place, which may lead to a public hearing regarding the action. The Act requires the director of the GAEPD to issue guidelines to assist government agencies in the preparation of environmental effects reports." http://www.gaepd.org/Documents/rules_exist.html
Georgia Ground-Water Use Act	The purpose of this Act is to establish procedures to be followed to obtain a permit to withdraw, obtain, or utilize ground water and for the submission of information concerning the amount of ground water withdrawal, its intended

(OCGA 12-5-90)	use, and the proposed aquifer or aquifers of withdrawal from the GAEPD. It is also intended to outline the procedures of the GAEPD in the granting, denial, revocation, modification, and granting with conditions of permits to withdrawal ground water. These regulations also provide for the gathering of information on the geologic and hydrologic character of the rock at and below the surface of the earth, well data, ground water levels and related material. The regulations include implementation of water conservation in conjunction with the withdrawal of ground water. http://www.gaepd.org/Documents/rules_exist.html
Georgia Water Quality Act (OCGA 12-5-20)	The Georgia Water Quality Control Act works in conjunction with the CWA to deal with waste water discharge, site selection, and wetlands mitigation requirements. http://www.gaepd.org/Documents/rules_exist.html
Georgia River Basin Management Planning Act (OCGA 12-5-520)	Georgia uses a river basin planning approach to watershed protection. This approach provides the framework for identifying, assessing, and prioritizing water resource issues, developing implementation strategies, and providing opportunities for targeted, cooperative actions to reduce pollution, enhance aquatic habitat, and provide a dependable water supply. River Basin Management Plans are prepared in accordance with legislation passed by the Georgia General Assembly that calls for the GAEPD to prepare plans for each major river basin in Georgia. The plans are developed in cooperation with the public and agency partners including the Georgia Forestry Commission, Georgia Soil and Water Conservation Commission, the GADNR Wildlife Resources Division, Natural Resources Conservation Service, the U.S. Geological Survey, and the EPA. http://www.gaepd.org/Documents/rules_exist.html

2.2.2.4 Florida

The primary laws for protecting water resources in the State of Florida are the Air and Water Pollution Control Act and the Water Resources Act of 1972. The Florida Department of Environmental Protection (DEP) implements a number of programs under those law and associated federal delegations; their characterizations of their responsibilities are included in the table below.

Table 2-12. Florida state laws and regulations possibly providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
The federal regulatory requirements governing Water Quality Standards are published in 40 CFR 131. Florida's surface water quality standards	"DEP is responsible for establishing Surface Water Quality Standards, subject to review and approval by the state Environmental Regulations Commission and by EPA. The state must certify that these standards are being met prior to the COE issuing a Section 404 "dredge and fill" permit."

system is published in 62-302 (and 62-302.530) of the Florida Administrative Code (F.A.C.).	http://www.dep.state.fl.us/water/wqssp/index.htm
Under Section 402 of the CWA, any discharge of a pollutant from a point source to surface waters (i.e. the navigable waters of the United States or beyond) must obtain an NPDES permit. The NPDES permit requires compliance with both technology-based as well as surface water quality standards [e.g., Water Quality Based Effluent Limitations or WQBELs].	"DEP implements this federally delegated permit program which controls water pollution by regulating point sources of pollution (wastewater treatment plants, industrial and manufacturing sites, etc.) and point source discharges of stormwater into surface waters of the State of Florida from certain municipal, industrial and construction activities." http://www.dep.state.fl.us/water/wastewater/permitting.htm#npdes
The threshold limits on pollutants in surface waters--Florida's surface water quality standards on which TMDLs are based--are set forth primarily in rule 62-302, Florida Administrative Code, and the associated table of water quality criteria.	"Under this program DEP develops a list of waters (rivers, lakes, streams, etc.) that are do not meet the state water quality standards; establishes priority rankings for these impaired waters; develops Total Maximum Daily Loads (TMDLs), which is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards; and develops Basin Management Action Plans (BMAPs) that identify the management strategies necessary to achieve the target TMDLs." under this program DEP develops a list of waters (rivers, lakes, streams, etc.) that are do not meet the state water quality standards; establishes priority rankings for these impaired waters; develops Total Maximum Daily Loads (TMDLs), which is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards; and develops Basin Management Action Plans (BMAPs) that identify the management strategies necessary to achieve the target TMDLs.
● State Stormwater Management Program Coordination, pursuant to Sections 403.061(32) and 403.0891, F.S. ● State Stormwater Management Program training and certification programs pursuant to Section	Florida's stormwater and nonpoint source management programs are "designed to minimize nonpoint source pollution such as stormwater runoff from urban and residential areas through federally funded grant program that conducts a variety of research projects and assists in the funding of local stormwater treatment systems in priority waterbodies." http://www.dep.state.fl.us/water/nonpoint/index.htm

403.0896, F.S. ● State Nonpoint Source Management Program pursuant to Section 319 of the Federal Clean Water Act.	
Florida Coastal Management Act, codified as Chapter 380, F.S., Part II, Coastal Planning and Management.	"The Florida Coastal Management Program is based on a network of agencies implementing 24 statutes that protect and enhance the state's natural, cultural and economic coastal resources. The goal of the program is to coordinate local, state and federal agency activities using existing laws to ensure that Florida's coast is as valuable to future generations as it is today. Florida's Department of Environmental Protection is responsible for directing the implementation of the state-wide coastal management program." Based upon the geography of Florida and the legal basis for the state Coastal Zone Management program, the entire state of Florida is included within the c http://www.dep.state.fl.us/cmp/oastal zone.
Chapter 68A-27, FAC	Atlantic sturgeon is protected as an Endangered species by the Federal Endangered Species Act and as a State-designated Threatened species by Florida's Endangered And Threatened Species Rule https://www.flrules.org/gateway/ChapterHome.asp?Chapter=68A-27
	The St. Marys River Management Committee (SMRMC) is an intergovernmental entity of elected and appointed members from four counties along the St. Marys River, Charlton and Camden counties in Georgia, and Nassau and Baker counties in Florida. The committee meets monthly to discuss, develop and implement plans and programs in regard to the St. Marys River. http://www.saintmarysriver.org/ http://www.saintmarysriver.org/plan.html
Water Resources Act Chapter 373, Florida Statutes, created water management districts.	The St. Johns River Water Management District's stated mission is "To protect our natural resources and support Florida's growth by ensuring the sustainable use of Florida's water for the benefit of the people of the District and the state." A core District mission is to protect and improve natural systems within the District, which includes the St. Marys River. http://floridaswater.com/ http://floridaswater.com/stmarysriver/

2.2.3 Protected Areas

The areas proposed to be designated as critical habitat for the Carolina and South Atlantic DPSs of Atlantic sturgeon contain numerous protected areas, including national and state parks, national wildlife

refuges, and state wildlife management areas. Activities within these areas are regulated by federal and state laws that are designed to preserve and protect the natural ecosystem features and values, and may provide indirect protection for the essential features of critical habitat.

2.2.3.1 Carolina DPS

Roanoke River Unit

Roanoke River National Wildlife Refuge

Established in 1989, and managed by USFWS, the Roanoke River National Wildlife Refuge (NWR) encompasses 20,978 acres (USFWS 2013a). The refuge includes 70 miles along the Roanoke River and two satellite tracts in other river basins; one is located near the town of Hamilton and the other at the mouth of the Roanoke River and flows into the western portion of Albemarle Sound. Habitats within the refuge include mixed hardwood flats and ridges, cypress/tupelo sloughs, and black and brown water streams. Among the objectives of the refuge is the provision of migratory, spawning, and nursery habitat for anadromous fish, and the protection and management of habitat for endangered and threatened wildlife species.

Tar-Pamlico Rivers, Unit C2

Table 2-13. State Protected Areas in the Tar-Pamlico Rivers Unit

Protected Area Name	Ownership	Link
Goose Creek State Park	NCDPR	http://www.ncparks.gov/Visit/parks/gocr/main.php

Croatan National Forest and Game Lands

The Croatan National Forest was established in 1936, and is managed by the USFS. The forest includes about 160,000 acres, and is bordered on three sides by Neuse River, Bogue Sound, and White Oak River. The forest contains diverse habitat types including longleaf pine forests, saltwater estuaries, bogs, and raised swamps, called pocosins. Goals and objectives of the forest are biological diversity, including the conservation of threatened and endangered species; recreational opportunities; special land allocations (e.g., wilderness areas, wild and scenic rivers); silviculture, forest products, and forest health; fire management; access; and local communities (U. S. Department of Agriculture (USDA) Forest Service 2002). As part of the State Game Land System, it is also managed by NCWRC. Catfish Lake South, Pocosin, Pond Pine and Sheep Ridge Wilderness Areas are also located within Croatan National Forest.

Neuse River, Unit C3

Table 2-14. State Protected Areas in the Neuse River Unit

Protected Area Name	Ownership	Link
Cliffs of the Neuse State Park	NCDPR	http://www.ncparks.gov/Visit/parks/clne/main.php
Clemmons State Forest	NCFS	http://www.ncesf.org/CESF/home.htm

Cape Fear-Northeast Cape Fear Rivers, Unit C4

Bladen Lakes State Forest

Bladen Lakes State Forest contains three parcels of land covering about 32,800 acres. It is the largest state owned forest in North Carolina and is adjacent to Turnbull Creek Educational State Forest and Jones Lake State Park, while Singletary Lake State Park is located within the forest. Bladen Lakes is a working forest, which means it is actively managed by the North Carolina Forest Service and creates its own income. The vast majority of the forest is also part of the State Game Lands program which is managed

by the NCWRC. Habitats with in the forest include Carolina bays, pocosins, sand ridges, river bottoms and swamps.

Table 2-15. State Protected Areas in the Cape Fear-Northeast Cape Fear Rivers Unit

Protected Area Name	Ownership	Link
Carolina Beach State Park	NCDPR	http://www.ncparks.gov/Visit/parks/cabe/main.php
Singletary Lake State Park	NCDPR	http://www.ncparks.gov/Visit/parks/sila/main.php
Bladen Lakes State Forest	NCFS	http://ncforestservice.gov/Contacts/blsf.htm
Cape Fear River Wetlands Game Land	NCWRC	http://www.ncwildlife.org/Portals/0/Hunting/GameLand_Maps/Coastal/cape_fear_river_wetlands.pdf
Bald Head Island Natural Area	NCDPR	http://www.ncparks.gov/About/system_natural_areas.php
Zekes Island National Estuarine Research Reserve	NCDCM	http://portal.ncdenr.org/web/crp/zekes-island

Pee Dee River System, Unit C5

Waccamaw National Wildlife Refuge

The Waccamaw NWR was established in 1997. The refuge is almost 27,000 acres in size, although the acquisition boundary includes about 55,000 acres. Managed by USFWS, the refuge includes large sections of the Waccamaw and Great Pee Dee Rivers, and a small section of the Little Pee Dee River (USFWS 2013b). Refuge objectives include the protection and management of diverse habitat components within coastal river ecosystems for the benefit of endangered and threatened species, freshwater and anadromous fish, migratory birds, etc., and to provide a variety of wildlife dependent recreational opportunities.

Table 2-16. State Protected Areas along the Waccamaw River

Protected Area Name	Ownership	Link
Lake Waccamaw State Park	NCDPR	http://www.ncparks.gov/Visit/parks/lawa/main.php
Samworth WMA	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=63
Waccamaw River Heritage Preserve/WMA	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=106

Table 2-17. State Protected Areas along the Pee Dee River

Protected Area Name	Ownership	Link
Great Pee Dee River Natural Heritage Preserve/WMA	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=22
Samworth WMA	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=63
Tom Yawkey Wildlife Center Heritage Preserve	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=64

Table 2-18. State Protected Areas along the Black River

Black River Scenic River	In June 2001, a 75-mile segment of the Black River became South Carolina's seventh and longest State Scenic River. This scenic river segment begins at Co. Road 40 in Clarendon Co. and extends southeast to pea House Landing at the end of Co. Road 38 in Georgetown Co.

	http://www.dnr.sc.gov/water/envaff/river/scenic/black.html
The Nature Conservancy, Black River Preserve	Since 1986, the Conservancy and partners have conserved over 14,000 acres along the river. http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/northcarolina/placesweprotect/black-river-preserve.xml

Santee-Cooper River System, Units C7 and CU2

Congaree National Park

Managed by the NPS, the Congaree National Park was established in 1976 to protect floodplain forest along the Congaree and Wateree Rivers (NPS 2013a). The stated purpose of the park is "to preserve and protect for the education, inspiration, and enjoyment of present and future generations an outstanding example of a near-virgin southern hardwood forest situated in the Congaree River floodplain in Richland County, South Carolina." (NPS 2013a). The park contains forested wetlands, oxbow lakes, creeks, and sloughs, as well as the largest tract of old growth bottomland hardwood forest left in the United States. The park comprises 26,546 acres, of which about 15,000 acres are designated wilderness area.

Francis Marion National Forest

The Francis Marion National Forest was designated in 1936, and occupies approximately 259,000 acres of Charleston and Berkeley Counties in South Carolina. The forest is on the coastal plain, and is bounded by the Santee River to the north, and by the Intracoastal Waterway and Atlantic Ocean to the east. Habitats found here include pine stands, hardwood forest, swamps, and marshes. Wilderness areas occupy nearly 14,000 acres of the forest. They include: Hellhole Bay, Wambaw Swamp, Little Wambaw Swamp, and Wambaw Creek (USDA Forest Service 1996).

The Land and Resource Management Plan for Francis Marion National Forest was published in February 1996, and is currently being revised. The goals for the national forest listed in the 1996 document are to provide for forest diversity; to protect and conserve unique areas; to provide for high quality recreational use; to contribute to local community and social considerations; to consolidate ownership and acquire unique areas; to establish and manage trees for present and future generations; to protect and manage habitat for sustainable populations of native wildlife; and to incorporate an ecological approach in the management of the forest (USDA Forest Service 1996).

Santee National Wildlife Refuge

The Santee NWR was established in 1941. The refuge occupies approximately 15,000 acres along Lake Marion, an impoundment of the Santee River. About 10,600 refuge acres are wetlands and open water, and the remaining 4,500 acres are mixed hardwood and pine plantation, croplands, and old fields.

Table 2-19. State Protected Areas along the Santee-Cooper Rivers Unit

Protected Area Name	Ownership	Link
Poinsett State Park	SCDPRT	http://southcarolinaparks.com/poinsett/introduction.aspx
Santee State Park	SCDPRT	http://southcarolinaparks.com/santee/introduction.aspx
Harbison State Forest	SCFC	http://www.state.sc.us/forest/refharb.htm
Manchester State Forest	SCFC	http://www.state.sc.us/forest/refman.htm

Congaree Bluffs Heritage Preserve	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=101
Congaree Creek Heritage Preserve	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=30
Crab Bank Seabird Sanctuary	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=215
Nipper Creek Heritage Preserve	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=37
Santee Coastal Reserve/WMA	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=61
Santee-Delta WMA	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=62
Tom Yawkey Wildlife Center Heritage Preserve	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=64

2.2.3.2 South Atlantic DPS

Edisto River, Unit SA1

ACE Basin National Wildlife Refuge

The ACE Basin NWR was established in 1990. At present, it is 11,815 acres in size, but may encompass 18,000 acres in the future (USFWS 2013c). The refuge is made up of two units: the Combahee River Unit (4,650 acres) and the Edisto River Unit (7,200 acres). Of the current acreage, 3,950 acres are tidal marsh, 3,000 acres are managed wetland impoundments, 1,200 acres are bottomland hardwood forest, 2,800 acres are upland forest, and about 700 acres are shrub land. Among the objectives of the refuge are to preserve, protect, and manage habitats for endangered and threatened species, and to manage the refuge for native species.

Table 2-20. State Protected Areas along the Edisto River Unit

Protected Area Name	Ownership	Link
Aiken State Park	SCDPRT	http://southcarolinaparks.com/aiken/introduction.aspx
Colleton State Park	SCDPRT	http://southcarolinaparks.com/colleton/introduction.aspx
Edisto Beach State Park	SCDPRT	http://southcarolinaparks.com/edistobeach/introduction.aspx
Givhans Ferry State Park	SCDPRT	http://southcarolinaparks.com/givhansferry/introduction.aspx
Bear Island WMA	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=56
Janet Harrison High Pond Heritage Preserve	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=676
Otter Island NERR	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=122

Combahee-Salkehatchie River, Unit SA2

Portions of the ACE Basin National Wildlife Refuge are found in the Combahee-Salkehatchie River Unit (see description in previous section).

Table 2-21. State Protected Areas in the Combahee-Salkehatchie River Unit

Protected Area Name	Ownership	Link
St Helena Sound Heritage Preserve/WMA	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=122

Savannah River, Units SA3 and SAU1

Savannah National Wildlife Refuge

The Savannah NWR was established in 1927, and is part of the Savannah Coastal Refuges Complex. The refuge is located along the lower Savannah River between mile markers 18 and 40, and includes 38 river miles and 25 miles of streams (USFWS 2013d). The refuge is 29,175 acres in size, of which about 3,000 acres are impoundment. Habitat types found here include bottomland hardwood forest, and palustrine, estuarine, and tidal wetlands. Shortnose sturgeon are among the threatened and endangered species that utilize the habitat within the refuge. Among the refuge objectives are the following: utilize the refuge property as refuge and breeding ground for native birds and wild animals, provide habitat and protection for threatened and endangered plants and animals, and maintain and enhance the habitats of all other species of indigenous wildlife and fishery resources.

Table 2-22. State Protected Areas in the Savannah River Unit

Protected Area Name	Ownership	Link
James W. Webb Wildlife Center	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=108
Palachucola WMA	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=73
Savannah River Bluffs Heritage Preserve	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=73
Tillman Sand Ridge Heritage Preserve/WMA	SCDNR	https://www.dnr.sc.gov/mlands/managedland?p_id=117
Tuckahoe WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region3/Tuckahoe_WMA_Line.pdf
Yuchi WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region3/Yuchi_WMA_Line.pdf

Ogeechee River, Unit SA4

Table 2-23. State Protected Areas in the Ogeechee River Unit

Protected Area Name	Ownership	Link
Fort McAllister State Park	GADNR	http://gastateparks.org/FortMcAllister
Oliver Bridge WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region6/Oliver_Bridge_WMA_Line.pdf
Ossabaw Island WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Ossabaw_WMA_Li

		ne.pdf
Richmond Hill WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Richmond_Hill_WMA/Richmond_Hill_WMA_Bryan_County_Tracts_Line.pdf

Altamaha River, Unit SA5

Wolf Island National Wildlife Refuge

Wolf Island NWR was established in 1930, and was designated a National Wilderness Area in 1975. It is part of the Savannah Coastal Refuges Complex. Wolf Island is 5,126 acres in size, of which more than 75% is salt marsh. Refuge objectives are similar to Wassaw NWR (USFWS 2009b).

Bond Swamp National Wildlife Refuge

Bond Swamp NWR was established in 1989, and is managed by the Piedmont NWR (USFWS 2011b). The refuge is 6,500 acres in size, and contains wetlands associated with the Ocmulgee River floodplain. The refuge includes diverse habitat types including mixed hardwood and pine ridges, and bottomland hardwood and swamp forests. The waters on and around the refuge provide habitat for a number of federally-protected species including, Atlantic and shortnose sturgeon (USFWS 2002). The objective of the refuge is to protect, maintain, and enhance the ecosystem of the Ocmulgee River floodplain.

Oconee National Forest

The Oconee National Forest was established in 1959, and comprises 116,731 acres of central Georgia. Several goals listed in the Revised Land and Resource Management Plan (USDA Forest Service 2004) deal with threatened and endangered species. These goals include contributing to the conservation and recovery of federally-listed threatened and endangered species through habitat management and/or enhancement, and to avoiding the necessity for federal listing of other species under the ESA.

Table 2-24. State Protected Areas in the Altamaha River Unit

Protected Area Name	Ownership	Link
Altamaha WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Altamaha_WMA/Altamaha_WMA_East_Line.pdf; http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Altamaha_WMA/Altamaha_WMA_West_Line.pdf
Balls Ferry State Park	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region4/Balls_Ferry_State_Park_Line.pdf
Beaverdam WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region6/Beaver_Dam_WMA_Line.pdf
Big Hammock WMA and Natural Area	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region6/Big_Hammock_WMA_Line.pdf
Bullard Creek WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region6/Bullard_Creek_WMA/Bullard_Creek_WMA_East_Line.pdf;

		http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region6/Bullard_Creek_WMA/Bullard_Creek_WMA_West_Line.pdf
Clayhole Swamp WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Clayhole_WMA_Line.pdf
Echeconnee Creek WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region4/Echeconnee_Creek_WMA/Echeconee_Creek_WMA_Ocmulgee_River_Tract_Line.pdf
Flat Tub WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region6/Flat_Tub_WMA_Line.pdf
Griffin Ridge WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Griffin_Ridge_WMA_Line.pdf
Horse Creek WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region6/Horse_Creek_WMA_Line.pdf
Moody Forest WMA and Natural Area	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region6/Moody_Forest_WMA_Line.pdf
Oaky Woods WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region4/Oaky_Woods_WMA_Line.pdf
Ocmulgee WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region4/Ocmulgee_WMA/Ocmulgee_WMA_Line.pdf
Penholoway Swamp WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Penholoway_Swamp_WMA/Penholoway_WMA_Line.pdf; http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Penholoway_Swamp_WMA/Boyles_Island_Tract_Line.pdf
River Bend WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region6/River_Bend_WMA/River_Bend_WMA_North_Tract_Line.pdf; http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region6/River_Bend_WMA/River_Bend_WMA_South_Tract_Line.pdf
Sansavilla WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Sansavilla_WMA_Line.pdf
Townsend WMA	GADNR	http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Townsend_WMA/Townsend_WMA_Buck_Island_Line.pdf; http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Townsend_WMA/To

		wnsend_WMA_South_Tract_Line.pdf; http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/maps/wma/region7/Townsend_WMA/Townsend_WMA_North_Tract_Line.pdf

Satilla River, Unit SA6

St. Marys River, Unit SA7

Table 2-25 State Protected Areas in the St. Marys River Unit

Protected Area Name	Ownership	Link
Ralph E. Simmons Memorial Forest; Ralph E. Simmons Wildlife Management Area	Florida Forest Service; St. Johns Water Management District	http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Our-Forests/State-Forests/Ralph-E-Simmons-State-Forest http://myfwc.com/viewing/recreation/wmas/cooperative/ralph-e-simmons
John M. Bethea State Forest	Florida Forest Service	http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Our-Forests/State-Forests/John-M.-Bethea-State-Forest

2.3 Baseline Benefits of Habitat Features Proposed to Be Included in the Designation

Existing habitat features in areas included in the proposed critical habitat designation for Atlantic sturgeon support a range of environmental and economic benefits besides those related to Atlantic sturgeon. These benefits may be protected or enhanced as a result of Section 7 consultations aimed at avoiding jeopardizing the continued existence of Atlantic sturgeon, in which case they constitute a relevant part of the baseline conditions that need to be used to assess the incremental impacts of critical habitat designations.

Some of these baseline benefits involve “use” values that are associated with water-based commercial and recreational activities, such as fishing, boating, swimming, snorkeling, and sightseeing. These values can sometimes be measured in terms of business sales, household income, jobs, user days, participation rates, or other quantitative measures. Other baseline benefits involve “non-use” values that people place on species or habitat features or water-based ecosystem services that accrue to society in general as public goods and are difficult or impossible to quantify or monetize. Non-use values are often described using terms like existence value, bequest value, and option value, and reflect the benefits that people associate with knowing that natural habitats and the species they support exist, will exist for future generations, and will be available for them to enjoy, perhaps, sometime in the future.

Other baseline benefits are associated with the values that people place on the educational and aesthetic opportunities associated with clean water and healthy river ecosystems that may be protected by this designation. Other baseline benefits are associated with the value people place on fish species that rely on the same habitat features as Atlantic sturgeon and generate use and non-use value indirectly, for example, by providing forage that support healthy populations of fish and waterfowl that have direct commercial, recreational, educational, or aesthetic value or are critical to ecosystem health.

The potential impacts of the critical habitat designation on these baseline benefits are associated with Section 7 consultation and potential project modifications that will be characterized later in *Section 3*. However, some Section 7 project modifications may have significant indirect impacts on baseline benefits that are reasonable to expect, but difficult or impossible to trace and measure. For example, a Section 7 consultation related to Atlantic sturgeon critical habitat that results in project modifications that include the installation of silt fences or wetland buffers at construction sites can result in benefits associated with shoreline protection, improved habitat for terrestrial species, reduced silting of river bottoms and associated dredging costs, and preserved open space that enhances adjacent and nearby property values. Estimating incremental values related to these types of additional habitat benefits would require bio-physical, food web, and economic valuation models and data that are not available at this time.

Non-use values associated with existing baseline conditions are usually estimated using stated preference or contingent valuation surveys that have not been conducted to identify which baseline non-use benefits are important in each critical habitat unit (see *Section 5.2.2* for more information on methods of measuring conservation benefits). *Section 3* describes, in qualitative terms, how various baseline benefits may be impacted by project modifications that result from Section 7 consultation. The potential impacts of the designation itself on baseline environmental benefits are addressed as "conservation benefits" as part of *Section 4*.

3 ECONOMIC IMPACTS

The following section identifies economic impacts that may result from the critical habitat designation. As discussed above, economic impacts result primarily through implementation of ESA section 7 consultations with federal agencies to ensure that their proposed actions are not likely to destroy or adversely modify designated critical habitat. Both positive and negative impacts[2] are identified (these terms are used interchangeably with benefits and costs, respectively). Impacts are evaluated in quantitative terms where feasible, but qualitative appraisals are used where that is more appropriate to particular impacts based on data availability. The impacts discussed in this section are primarily economic costs (negative impacts) of consultation; though some discussion of the environmental benefits of implementing project modifications through the section 7 consultation process is included, conservation benefits of consultation, including economic benefits of conservation, are discussed under Other Relevant Impacts below.

We consider each unit in total as a particular area for this analysis. The ESA does not define what "particular areas" means in the context of section 4(b)(2), or the relationship of particular areas to "specific areas" that meet the statute's definition of critical habitat. Because there is no biological basis to subdivide the specific areas on which are found the essential features characteristic of Atlantic sturgeon habitat into smaller units, each entire unit or area was treated as separate "particular areas" for the initial consideration of impacts of designation.

We begin with a brief overview of relevant court rulings and other important guidance regarding methods for economic impact analyses.

3.1 Economic Impact Analysis

The ESA provides the Services with broad discretion in how to consider impacts. (*See,* H.R. Rep. No. 95-1625, at 17, reprinted in 1978 U.S.C.C.A.N. 9453, 9467 (1978). "Economics and any other relevant

[2] As noted, consideration of economic impacts can include both positive and negative (Home Builders Ass'n of No. Calif. et al., v. USFWS, 2006 U.S. Dist. LEXIS 80255 at 45-46 (E.D. Cal., Nov. 1, 2006)).

impact shall be considered by the Secretary in setting the limits of critical habitat for such a species. The Secretary is not required to give economics or any other "relevant impact" predominant consideration in his specification of critical habitat...The consideration and weight given to any particular impact is completely within the Secretary's discretion."). Courts have noted the ESA does not contain requirements for any particular methods or approaches. (*See, e.g., Bldg.Indus.Ass'n of the Bay Area et al. v. U.S. Dept. of Commerce et al.*, No. 13-15132, 9th Cir., July 7, 2015 (upholding district court's ruling that the ESA does not require the agency to follow a specific methodology when designating critical habitat under section 4(b)(2)). No method can fully resolve the inherent uncertainty of analyzing impacts that depend on predicting future actions federal agencies may implement, and projects that applicants to federal agencies may propose. For this proposed rule, we followed the same approach to describing and evaluating impacts as we have for all of the previous critical habitat rulemakings in our region. These methods have worked reasonably well in explaining our reasoning to our stakeholders.

As discussed previously (in Section 1.4), the joint NMFS-FWS regulations at 50 CFR 424.19 direct us to conduct an "incremental analysis" by considering the probable economic impacts with and without the proposed designation and to describe the impacts either qualitatively or quantitatively. Thus, the goal of our impacts analysis was to examine the state of the world with and without the designation of critical habitat for the Atlantic sturgeon. The "without critical habitat" scenario represents the baseline for the analysis, considering habitat protections already afforded Atlantic sturgeon under its Federal listing and under other Federal, State, and local regulations.

Additional Guidance

Other cases and federal government guidance are relevant to the analysis of economic impacts resulting from critical habitat designations. For example, the Statement of Regulatory Philosophy and Principles in E.O. 12866, Regulatory Planning and Review, states in part:

> *"In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider."*

E.O. 12866 requires that the Office of Management and Budget review proposed regulatory programs that are considered to be "significant." E.O. 12866 defines "significant regulatory action" as an action that is likely to:

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, local or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

OMB Circular A-4 (2003) provides additional explanation:

"Benefit-cost analysis is a primary tool used for regulatory analysis. Where all benefits and costs can be quantified and expressed in monetary units, benefit-cost analysis provides decision makers with a clear indication of the most efficient alternative, that is, the alternative that generates the largest net benefits to society…"

"It will not always be possible to express in monetary units all of the important benefits and costs. When it is not, the most efficient alternative will not necessarily be the one with the largest quantified and monetized net-benefit estimate. In such cases, you should exercise professional judgment in determining how important the non-quantified benefits or costs may be in the context of the overall analysis."

"A complete regulatory analysis includes a discussion of non-quantified as well as quantified benefits and costs…When there are important non-monetary values at stake, you should also identify them in your analysis so policymakers can compare them with the monetary benefits and costs."

Cases reviewing critical habitat impacts analyses have applied principles similar to those of the OMB guidance, for example: all important costs and benefits should be included in an impacts analysis (See, e.g., Center for Biological Diversity v. Bureau of Land Management, 422 F. Supp. 2d 1155, 1153 (N.D. Cal. 2006) (FWS' impacts analysis was improperly unbalanced in ignoring available data in the record regarding economic benefits of designation)); and important impacts that can only be evaluated in non-monetary metrics can be included in the analysis (See, e.g., Home Builders Ass'n of No. Calif. et al, 2006 U.S. Dist. LEXIS 80255 (E.D. Cal., Nov. 1, 2006) (FWS properly determined that monetizing the benefits of designation was infeasible and that benefits were best expressed in biological terms)).

3.2 Section 7 Impacts

The ESA requires that federal agencies consult with NMFS on proposed actions that "may affect" designated critical habitat. Through the consultation process, NMFS suggests modifications to the proposed actions as necessary to avoid destroying or adversely modifying critical habitat. As previously discussed, consultations may result in economic impacts to federal agencies and proponents of proposed actions.

Overview of Section 7 Consultation Process

Section 7(a)(2) of the ESA requires federal agencies (action agencies) to consult with NMFS whenever activities they fund, authorize, or carry out may affect a listed species or designated critical habitat. In some cases, consultations will involve only NMFS and another federal agency, such as the USACE. Often consultations will also include a third party, such as private applicants conducting activities that require a federal permit, or public or private entities receiving federal funding.

During section 7 consultation, NMFS, the action agency, and, if applicable, the private permittee or grantee, communicate in an effort to minimize potential adverse effects on the species and/or critical habitat. The duration and complexity of these interactions depends on a number of variables, including the type of consultation, the species affected, the activity and methods proposed, the potential effects to the species and designated critical habitat and the parties involved. If an action agency determines that an activity "may affect" the listed species or its habitat, then one of two types of section 7 consultations may occur: informal or formal consultation.

Informal Consultation:

Informal consultations occur when an action agency determines that listed species or designated critical habitat are not likely to be adversely affected by a proposed action, and seeks NMFS's concurrence in that determination. The informal consultation process is also designed to identify and avoid potential adverse impacts (which require formal consultation) at an early stage in the planning process. No formal consultation is required if the action agency finds, with NMFS's written concurrence, that the proposed action "may affect, but is not likely to adversely affect" listed species or critical habitat. This finding can be made only if all of the reasonably expected effects of the proposed action will be beneficial, insignificant, or discountable. The action agency must request concurrence, in writing, from the Service for this finding.

Formal Consultation:

A formal consultation is required if the action agency or NMFS determines that a proposed action is likely to adversely affect a listed species or designated critical habitat. Formal consultations determine whether a proposed agency action is likely to jeopardize the continued existence of a listed species (jeopardy) or destroy or adversely modify critical habitat (adverse modification), through a biological opinion. Opinions determine the amount or extent of anticipated incidental take expected to result from an action determined not likely to jeopardize listed species.

Regardless of the type of consultation or proposed project, section 7 consultations can require substantial administrative effort on the part of all participants. The costs of both formal and informal consultations are important components of the economic impacts. The section 7 consultation process may also result in modifications to a proposed project either during informal consultation, prior to entering the formal consultation process, or during the course of the formal consultation process. Project modifications implemented prior to the formal consultation process, through mutual agreement between NMFS and the action agency regarding appropriate conservation measures, may achieve harm avoidance and preclude the need for entering the formal consultation process.

Alternatively, as part of the formal consultation process, project modifications agreed upon by the action agency and the applicant may be included in the project description as harm avoidance measures, or may be included in NMFS's biological opinion on the proposed action as RPMs to reduce the impact of take of the species. NMFS's consultation regulations specify that RPMs, along with the terms and conditions that implement them, cannot alter the basic design, location, scope, duration and timing of the action and may only involve minor changes (50 CFR § 402.14(i)(2)).

In cases where NMFS determines that a project or activity is likely to jeopardize the continued existence of the species and/or destroy or adversely modify its designated critical habitat, NMFS' biological opinion will include RPAs to the proposed project that avoid jeopardy of the listed species or the destruction or adverse modification of designated critical habitat. By definition, RPAs must be consistent with the intended purpose of the action and capable of being implemented consistent with the action agency's legal authority and jurisdiction, and be economically and technologically feasible (50 CFR §402.02). All of these project modifications have the potential to impose some direct costs to the action agency and/or the applicant.

Consultation Impacts for Atlantic Sturgeon Critical Habitat

Designation of critical habitat for the Atlantic sturgeon could potentially trigger consultation costs in three circumstances:

(1) A new consultation is necessary to address both the listed species and the designated critical habitat,;

(2) A new consultation is required solely because of the critical habitat designation; or
(3) An existing consultation must be re-initiated to include the designated critical habitat.

The analysis of whether the critical habitat designation results in incremental costs involves two steps:

Step 1: Identify action agencies and types of activities that may have direct or indirect effects in the proposed critical habitat areas (If there is "no effect" on the essential features, then consultation is not required, and the activity would not incur any incremental costs; such activities, therefore, do not enter into this impact analysis).

Step 2: Determine whether a possible future action may affect critical habitat alone, or both critical habitat and Atlantic sturgeon. If the proposed action affects both listed Atlantic sturgeon and essential features equally, some or most of the consultation costs may be coextensive. For example, if the same project modification would alleviate adverse impacts to both the species and the critical habitat, those project modification costs are coextensive and are not attributable to the critical habitat designation. In such cases, only the marginal increased administrative costs associated with conducting the consultation on the critical habitat would be included in our impacts analysis. On the other hand, if the proposed action affects solely the essential features, both the administrative and project modification costs would be attributable to the critical habitat designation and would be considered incremental impacts of the designation.

The designation of critical habitat, under certain circumstances, may affect actions that do not have a federal nexus and are not subject to the provisions of Section 7 under ESA, in ways that result in indirect economic impacts. These economic impacts may include changes in real estate prices and project values resulting from stigma effects, project delays, and uncertainty resulting from the designation, as well as related indirect impacts on regional markets and economies. The consultation process and related project modifications could directly affect the operations of federal agencies and private entities (e.g., dredging by the USACE, maintenance of oil and gas pipelines by private entities) and thereby disrupt regional economic activity enough to have secondary economic impacts associated with business sales, jobs, household incomes, and taxes.

Both public and private entities may experience incremental time delays in implementing projects and undertaking other activities due to requirements associated with the need to reinitiate the Section 7 consultation process and compliance with other laws triggered by the designation. In the case of land location within or adjacent to the designation, there may be a loss in property values due to regulatory uncertainty, or a loss or gain in property values resulting from public perceptions regarding the effects of critical habitat. In some cases, the public may perceive that the critical habitat designation may result in limitations on private property uses above and beyond those associated with anticipated project modifications and regulatory uncertainty described above. Public attitudes about the limits or restrictions that critical habitat may impose can cause real economic effects to property owners, regardless of whether such limits are actually imposed.

New information about the importance of critical habitat to the recovery of a threatened or endangered species that results from the designation could trigger more stringent state and local regulatory requirements and related compliance costs. Critical habitat designations may also provide new information to nearby communities about the sensitive ecological nature of the geographic region, potentially triggering changes in other state or local laws that could have additional economic impacts. Such state and local regulatory changes could have negative impacts associated with stigma effects and project delays similar to those associated directly with the critical habitat designation. However, they may also have positive impacts. For example, *Section 6* of this report describes how increased public awareness of species and habitat conditions, related changes in state and local regulations, and voluntary

changes in land and water use that result from the designation can generate significant environmental and economic benefits associated not only with Atlantic sturgeon, but with other fish, bird, and terrestrial species that directly or indirectly benefit from protecting essential sturgeon habitat features.

We did not find any information that would support non-speculative assessment of any of these indirect impacts from the proposed designation, and our analysis below is limited to direct section 7 impacts associated with the designation.

3.2.1 Activities That May Trigger Section 7 Consultation

A query of NMFS's Public Consultation Tracking System database (PCTS) was conducted to identify past activities that required ESA Section 7 consultations in the areas being proposed as critical habitat, that, if proposed in the future, would trigger consultation because they "may affect" either both Atlantic sturgeon and its critical habitat, or solely the critical habitat. This technique has been used consistently in evaluating the Section 7 impacts of critical habitat designations to produce a reasonable estimation of future federal actions that may require consultation. The PCTS database was searched over the last 10 years for relevant consultations that occurred in each of the proposed critical habitat areas or units that, if implemented in the future, could affect one or more of the proposed essential features, or could affect both the critical habitat and Atlantic sturgeon.

In addition to the query of the PCTS database, we also contacted federal agencies to determine whether there are any new categories of activities that might not be reflected in the consultation history, but which are anticipated in the next 10 years. Based on these inquiries there were no new categories identified beyond those already reflected in the PCTS analysis.

The next step of our analysis focused on determining whether an activity would likely have incremental impacts to critical habitat. We evaluated whether the action would affect Atlantic sturgeon, the essential features of the proposed critical habitat, or both, or whether there were other identifiable baseline impacts that might be coextensive with impacts to habitat features, such as impacts to shortnose sturgeon. If a proposed action affects only listed sturgeon or affects both listed sturgeon and essential features, the administrative and project modification costs are not attributable solely to critical habitat designation. In these circumstances, the added administrative costs associated with addressing critical habitat are considered incremental impacts of the proposed designation. In consultations on projects with coextensive impacts, there could be incremental project modification costs attributable to the critical habitat designation, if an action is considered likely to require unique project modifications to specifically address impacts to the critical habitat features. If a proposed action would only affect the essential features, the administrative and project modification costs would be attributable to the critical habitat designation and thus treated as incremental impacts of the designation.

The results of our analyses are presented in tables 3-1 through 3-17 below. Each table presents the number of past consultations by each federal agency in each proposed critical habitat unit, that may occur in the future and require consultation due to impacts to either critical habitat or both critical habitat and the species. We combined total numbers of past formal and informal consultations because that breakout from past consultations on various species is not necessarily representative of how many formal and informal consultations will be required in the future for impacts to newly designated critical habitat.

Of the types of past consultations that "may affect" some or all of the essential features in proposed critical habitat units, we determined that all of the activities also present routes of effects to Atlantic sturgeon. That is, all categories of the activities identified would also require consultation for potential impacts to either Atlantic sturgeon in the action area of a project (or shortnose sturgeon, in the case of one unoccupied unit).

Ten different federal entities implemented or approved 14 different categories of activities in the areas covered by the proposed critical habitat units that required consultations in the past. All categories of

activities implemented by these federal entities were identified as having the potential to affect the essential features. The total number of projected consultations over 10 years is indicated in parentheses below.

1.	USACE --	Navigation maintenance dredging, harbor expansion (14)
2.	USACE --	WRDA flood control, ecosystem restoration studies (6)
3.	USACE --	WRDA dam operations, repair, fishway construction (3)
4.	USACE --	Section 404/RHA section 10 permitting – dredge, fill, construction (20)
5.	FHWA --	Bridge repair, replacement (67)
6.	USCG --	Bridge repair, replacement permitting (3)
7.	FERC --	Hydropower licensing (5)
8.	FERC --	LNG facilities, pipelines authorization (5)
9.	NRC --	Nuclear power plant construction/operation licensing (8)
10.	NMFS --	ESA research or incidental take permitting (section 10) (46)
11.	USFWS --	Fishery management grants (11)
12.	EPA --	Pesticide authorizations (9 nationwide consultations)
13.	FEMA --	Disaster assistance/ preparation grants (5)
14.	DOE --	Nuclear fuel management (3)

As discussed in more detail in the action agency-specific subsections below the tables, none of the projected future activities in proposed critical habitat units were judged likely to require project modifications to avoid adverse effects to critical habitat features that would be different from modifications required to avoid adverse effects to sturgeon. Other activities (numbers 3 and 4 above) are conservatively projected to require incremental consultation due to impacts to critical habitat alone, and those consultations would be informal and would not require project modifications. The 9 pesticide approval consultations with EPA are national in scope and are considering the impacts to listed species and designated critical habitat across the entire country. We are including incremental administrative costs for these 9 consultations in each unit, and adding the 9 consultations to each unit's number of consultations. However, in our overall total of consultations we are only counting these as 9 consultations across all units. We have also split the expected costs of each consultation equally across all units of the designation.

Table 3-1: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Roanoke River Critical Habitat Unit C1 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9
ESA research permit	NMFS	3	3	3
Fishery management research grant	USFWS	1	1	1
Total Number of Future Consultations for Unit		**13**	**13**	**13**

Table 3-2: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Tar-Pamlico Rivers Critical Habitat Unit C2 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9
ESA section 10 incidental take permit	NMFS	2	2	2
ESA research permit	NMFS	2	2	2
Fishery management research grants	USFWS	4	4	4
Waterway maintenance dredging	USACE	1	1	1
Section 404/RHA permit, dredge/fill, construction	USACE	1	1	1
Bridge repair, replacement	FHWA	1	1	1

Total Number of Future Consultations for Unit	**20**	**20**	**20**

Table 3-3: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Neuse River Critical Habitat Unit C3 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
ESA research permit	NMFS	2	2	2
WRDA - river basin flood control, ecosystem restoration	USACE	1	1	1
Pesticide authorization	EPA	9	9	9
Disaster assistance, facility repair	FEMA	1	1	1
Bridge repair, replacement	FHWA	1	1	1
Total Number of Future Consultations for Unit		**14**	**14**	**14**

Table 3-4: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Cape Fear-Northeast Cape Fear Rivers Critical Habitat Unit C4 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9
Nuclear, power plant operation	NRC	2	2	2
ESA research permit	NMFS	6	6	6

Waterway maintenance dredging	USACE	3	3	3
Fishway construction	USACE	1	1	1
Section 404/RHA permits; dredge/fill, construction	USACE	2	2	2
Bridge replacement, road improvement	FWHA	5	5	5
Disaster assistance grants, shoreline stabilization	FEMA	1	1	1
Total Number of Future Consultations for Unit		**29**	**29**	**29**

Table 3-5: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Unoccupied Cape Fear River Critical Habitat Unit CU1 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	**9**	**9**	**9**
Total Number of Future Consultations for Unit		**9**	**9**	**9**

Table 3-6: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Pee Dee River System Critical Habitat Unit C5 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species

Pesticide authorization	EPA	9	9	9
Bridge replacement, road improvement	FHWA	14	14	14
ESA research permits	NMFS	5	5	5
Bridge repair, replacement	USCG	2	2	2
Disaster assistance grants, construction	FEMA	1	1	1
Hydropower project relicensing	FERC	1	1	1
Fishery management grant	USFWS	1	1	1
Section 404/RHA permits; dredge/fill, construction	USACE	2	2	2
Total Number of Future Consultations for Unit		**35**	**35**	**35**

Table 3-7: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Black River Critical Habitat Unit C6 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9
Bridge repair, replacement	FHWA	1	1	1
Total Number of Future Consultations for Unit		**10**	**10**	**10**

Table 3-8: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Santee-Cooper Rivers Occupied Critical Habitat Unit C7 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9
Hydropower project relicensing	FERC	1	1	1
ESA research permits	NMFS	7	7	7
Waterway maintenance dredging	USACE	2	2	2
WRDA watershed ecosystem restoration feasibility study	USACE	1	1	1
WRDA dam modification, repair	USACE	1	1	1
Section 404/RHA permits; dredge/fill, construction	USACE	5	5	5
Bridge repair, replacement	FHWA	2	2	2
Bridge repair, replacement	USCG	1	1	1
Total Number of future Consultations for Unit		**29**	**29**	**29**

Table 3-9: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Unoccupied Santee-Cooper River System Critical Habitat Unit CU2 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9

Hydropower project relicensing	FERC	2	2	2
Waterway maintenance dredging	USACE	1	1	1*
Nuclear power plant modifications	NRC	1	1	1*
Total Number of future Consultations for Unit		**13**	**13**	**13**

** These actions may affect shortnose sturgeon, which are present in the unit currently unoccupied by Atlantic sturgeon.*

Table 3-10: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Edisto River Critical Habitat Unit SA1 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
ESA research permits	NMFS	1	1	1
Bridge repair/replacement, road improvement	FHWA	3	3	3
Pesticide authorization	EPA	9	9	9
Total Number of Future Consultations for Unit		**13**	**13**	**13**

Table 3-11: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Combahee-Salkehatchie River Critical Habitat Unit SA2 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9
ESA research permits	NMFS	1	1	1
Bridge repair/replacement	FHWA	1	1	1
Waterway maintenance dredging	USACE	1	1	1
Total Number of Future Consultations for Unit		**12**	**12**	**12**

Table 3-12: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Savannah River Critical Habitat Unit SA3 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9
Waterway maintenance dredging	USACE	3	3	3
WRDA dam repair, operation	USACE	1	1	1
Drought contingency planning, flow modifications	USACE	3	3	3
Section 404/RHA permit; dredge/fill, construction	USACE	4	4	4
Regional flood control feasibility study	USACE	1	1	1
ESA research permits	NMFS	5	5	5

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Fishery management grants	USFWS	1	1	1
LNG terminal expansion authorization	FERC	1	1	1
LNG pipeline authorization	FERC	2	2	2
Spent nuclear fuel site operation, modification, construction	DOE	3	3	3
Stormwater facility construction grants	FEMA	2	2	2
Nuclear power plant licensing, construction, repair	NRC	4	4	4
Bridge repair/replacement, road improvements	FHWA	13	13	13
Total Number of Future Consultations for Unit		**52**	**52**	**52**

Table 3-13: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Unoccupied Savannah River Critical Habitat Unit SAU1 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9
Hydropower relicensing	FERC	1	1	1
Total Number of Future Consultations for Unit		**10**	**10**	**10**

Table 3-14: Past Consultations on Activities that May Occur ore Require Reinitiation in Proposed Ogeechee River Critical Habitat Unit SA4 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9
ESA research permits	NMFS	5	5	5
Bridge repair/replacement	FHWA	7	7	7
Fishery management grants	USFWS	1	1	1
Waterway maintenance dredging	USACE	1	1	1
Total Number of Future Consultations for Unit		**23**	**23**	**23**

Table 3-15: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Altamaha River Critical Habitat Unit3 SA5 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
ESA research permit	NMFS	4	4	4
Fishery management grants	USFWS	3	3	3
Section 404/RHA permits; dredge/fill, construction	USACE	6	6	6
Pesticide authorization	EPA	9	9	9

[3] Unit includes Oconee and Ocmulgee rivers

Nuclear plant operation, modification	NRC	1	1	1
Bridge repair/replacement, road improvement	FHWA	15	14	15
LNG pipeline construction	FERC	1	1	1
Total Number of Future Consultations for Unit		**39**	**39**	**39**

Table 3-16: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed Satilla River Critical Habitat Unit SA6 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
ESA research permits	NMFS	3	3	3
Bridge repair/replacement, road improvement	FHWA	4	4	4
LNG pipeline construction	FERC	1	1	1
Waterway maintenance dredging	USACE	1	1	1
Pesticide authorization	EPA	9	9	9
Total Number of Future Consultations for Unit		**18**	**18**	**18**

Table 3-17: Past Consultations on Activities that May Occur or Require Reinitiation in Proposed St. Marys River Critical Habitat Unit SA7 over a 10-Year Period.

Category	Agency	Total # of Consultations	May Affect Critical Habitat	May Affect the Species
Pesticide authorization	EPA	9	9	9
Waterway maintenance dredging	USACE	1	1	1
Total Number of Future Consultations for Unit		**10**	**10**	**10**

Below we discuss how we determined whether a category of activity that may occur or require reinitiation in the proposed critical habitat units in the future would have the potential to affect ("may affect") critical habitat alone, or both critical habitat and Atlantic sturgeon. In most instances potential impacts to shortnose sturgeon are also relevant to determining whether there will be any incremental impacts to critical habitat. As mentioned above, all the activities identified as having the potential to affect one or more of the proposed essential features, also have the potential to affect Atlantic sturgeon. For most if not all of the activities described below, if the effects to critical habitat will be adverse and require formal consultation, those effects would also constitute adverse effects to the species, either directly when they are in the project area, or indirectly due to the effects on their habitat. This is due to the conservation functions that the features are being designated to provide. For example, hard substrate is being designated to facilitate successful spawning that will lead to juvenile recruitment into the adult population, and subsequently population growth. Effects to the hard substrate feature that impede that conservation objective could injure or kill individual Atlantic sturgeon, for example by preventing adult reproduction, or rendering reproduction ineffective ,or resulting in mortality of larvae. In these circumstances, the same project modifications would be required to address effects to both the species and effects to the critical habitat. Thus, projects that adversely affect the proposed essential features are likely to always also adversely affect the species and the project impacts would not be incremental.

For some of the activities below, it may be feasible to conduct the action when sturgeon are out of the action area. If effects to critical habitat are temporary such that the essential features return to their pre-project condition by the time the sturgeon return and need to use the features, there might not be any adverse effects to either the species or the critical habitat. In these circumstances, consultations would be fully incremental consultations only on critical habitat, and the consultations would be informal (i.e., temporary insignificant effects to critical habitat). This would likely only apply to actions that affect just spawning habitat in the upper parts of the rivers, as sturgeon of various ages are present year-round in the lower reaches of the rivers and the estuaries. Because the costs of fully incremental informal consultations are higher than the marginal costs of adding critical habitat analyses to coextensive formal consultations, we will conservatively assume future actions will be incremental informal consultations, where applicable.

We discuss our conclusions about the incremental impacts of future section 7 actions for the specific activities in the sections below.

We note that the conclusions below are predictions based on past experience and projects, and may not be applicable to future specific projects. Future consultations will consider the specific scope and nature of federal activities and their potential to adversely affect the essential features if the rule is finalized as proposed.

3.2.1.1 U.S. Army Corps of Engineers

USACE civil works districts undertake projects to maintain navigation channels and water infrastructure (including dams), conduct environmental restoration and maintain flood control, and USACE regulatory districts grant permits for private activities that occur in or modify navigable waterways for construction and maintenance of structures under Section 404 of the CWA and Section 10 of the RHA. USACE typically consults with the Services when issuing individual standard permits for such projects, but the presence of critical habitat may also cause USACE to elevate nationwide and regional permits and consider them as individual permits, or seek reinitiation of consultation on several regional general permits covered by programmatic consultations.

Activities in Wilmington, North Carolina, Charleston, South Carolina, Savannah, Georgia, and Jacksonville, Florida, district offices of USACE are potentially affected by the proposed critical habitat for the Carolina and South Atlantic DPSs of Atlantic sturgeon.

Since the beginning of 2003, USACE district offices in the region have been engaged in 42 Section 7 consultations (~4 per year) in the areas being proposed as critical habitat, that, if conducted in the future may affect Atlantic sturgeon and one or more of the essential features of proposed critical habitat, and would therefore be expected to result in ESA Section 7 consultation.

3.2.1.1.1 Navigation maintenance dredging, harbor expansion and related activities

USACE is responsible for maintaining and improving waterways to support navigation. USACE uses dredges to maintain navigation channels at specified depths and widths to allow for transport of shipped goods and other boat traffic, or to widen and deepen waterways. USACE also conducts contract dredging projects for other federal agencies, such as the U.S. Coast Guard (USCG) and military facilities. In addition to large-scale projects at industrial port facilities, USACE issues section 404/RHA permits to private parties seeking to undertake small dredging projects to maintain local access to navigation channels. USACE conducts clearing and snagging activities in navigation channels on an as-needed basis, using barges to remove fallen trees and other debris from river channels. USACE plans the location and timing of dredging projects to ensure that channel reliability is always maintained. Frequency of dredging varies widely, from almost constant maintenance dredging to once every ten or twenty years, depending on the level of use of the waterway for shipping and the natural rate of sediment deposition, although USACE must occasionally engage in emergency dredging to repair the effects of tropical storms and hurricanes. Material dredged from navigation channels must be placed in suitable, USACE-approved disposal sites. The most common disposal methods are: ocean placement, downdrift disposal on coastal beaches, confined disposal facilities either in open water or upland, flow-lane or within-banks placement, and open water disposal.

Dredging to maintain navigation channels may affect several of the essential features of Atlantic sturgeon critical habitat. Dredging to deepen or widen navigation channels may involve removing rock, gravel or soft substrate that is providing adult sturgeon spawning habitat or juvenile foraging habitat. Extensive dredging for harbor expansion may allow saltwater to intrude further up a river, and adversely impact the area containing the salinity range necessary for young sturgeon. Other potential effects of dredging projects on the essential features of Atlantic sturgeon critical habitat are increased siltation on spawning substrate, and the blockage of migratory pathways through channels and inlets. We estimate that navigation maintenance dredging may result in 14 consultations over the next 10 years.

We have concluded that effects of dredging on critical habitat will be fully-coextensive with impacts to the species, and that any project modifications required to address adverse impacts to critical habitat will

be the same as modifications required to address adverse impacts to sturgeon. The types of adverse effects are not likely to be temporary and limited to periods of sturgeon absence, and they are likely to be implemented in lower parts of the units where sturgeon can be expected to be present year-round. Thus, adverse effects of navigation maintenance dredging activities are likely to involve coextensive formal consultations to address impacts to both the species and the essential features. These actions are not likely to result in informal consultations with solely critical habitat impacts.

Adverse effects of dredging on essential habitat features would also result in injury or death to individual sturgeon, and thus constitute take. Removal or covering of spawning substrate could interfere with the services this feature is designed to provide – settlement of fertilized eggs and refuge, growth and development of early life stages. These effects to the feature would also be adverse effects to sturgeon eggs, larvae and early life stages that were not able to settle, grow, develop or seek refuge. Project modifications to address both these impacts to the feature and the sturgeon could involve limiting the amount or location of substrate removed, or turbidity controls to prevent sediment deposition on hard substrate. Similarly, adverse effects of dredging in removing the soft substrate feature that would interfere with provision of juvenile foraging services, could also injure or kill juveniles seeking to use that foraging habitat. Coextensive project modifications might be similar to those mentioned for impacts to the hard substrate feature. Changing the salinity regime by deepening harbors and parts of rivers would remove portions of the transitional salinity zone feature that is being designated to provide foraging and developmental habitat services to juveniles; loss of portions of this habitat could impede development of juveniles using the remaining habitat, or prevent the habitat from supporting some juveniles. Coextensive project modifications that might be required to prevent or lessen these impacts could involve changes in the depth of deepening. The deepening of harbors and ports may also create hypoxic zones which would impact the water quality feature that is designed to ensure survival of sturgeon. Coextensive project modifications that might be required to prevent hypoxic zones could include limiting the amount of deepening or requiring the use of aeration systems.

3.1.1.1.2 WRDA flood control, ecosystem restoration activities

Watershed restoration is one of the primary missions of the USACE Civil Works program. The purpose of restoration is to restore lost or degraded ecosystem function, structure, and processes. Restoration projects occur in a variety of ecosystems, including estuaries, marshes, rivers, and waterways. USACE responsibilities under the Water Resources Development Act (WRDA) include flood control and related ecosystem repair projects, such as construction of levees and non-structural flood control measures, to major dams. Erosion control and bank stabilization activities are typically associated with dredging and marsh creation. Shoreline protection efforts may involve construction of jetties, seawalls, and other hard structures, as well as beach nourishment. We estimate that 6 WRDA flood control or ecosystem restoration projects may require consultation over the next 10 years.

We have concluded that effects of WRDA flood control/ecosystem restoration projects on critical habitat will be fully-coextensive with impacts to the species, and that any project modifications required to address adverse impacts to critical habitat will be the same as those required to address adverse impacts to sturgeon. The types of adverse effects are not likely to be temporary and limited to periods of sturgeon absence, and they are likely to be implemented or have effects in parts of the units where sturgeon can be expected to be present year-round. Thus, adverse effects of WRDA flood control/ecosystem restoration activities are likely to involve coextensive formal consultations to address impacts to both the species and the essential features. These actions are not likely to result in informal consultations with solely critical habitat impacts.

Depending on type, size, and scope, flood control or ecosystem restoration projects have the potential to negatively impact suitable substrate for spawning by removing or covering gravel, cobble, etc., or soft substrate needed by juveniles for foraging. This could interfere with the services the substrate features are designed to provide – settlement of fertilized eggs and refuge, growth and development of early life

stages, and juvenile foraging. These effects to the features would also be adverse effects to sturgeon eggs, larvae and juveniles that were not able to settle, grow, develop or seek refuge, or forage. Project modifications to address both these impacts to the features and the sturgeon could involve limiting the amount or location of substrate removed, or turbidity controls to prevent sediment deposition on hard substrate.

Potential changes in flow regime associated with these types of projects could impact salinity and water depth, which could in turn affect water temperature and dissolved oxygen. Changes in water depth that adversely affect the conservation services this feature is intended to provide could impede movement of adults to and from spawning sites or interfere with spawning behavior, and could impede juveniles from seeking age-appropriate salinity zones. These same impacts could also adversely affect Atlantic sturgeon by preventing spawning or injuring or killing juveniles. Coextensive project modifications for these types of effects may involve requiring minimum flow levels to ensure appropriate depths and dissolved oxygen concentrations are maintained or, conversely, maximum flow levels if extremely cold water is being released to ensure proper temperatures are maintained.

These types of activities also have the potential to adversely affect the unimpeded movement function of the water depth/passage essential feature, which would also directly obstruct Atlantic sturgeon migration. Modifications to address these impacts would be coextensive, and might involve requiring the project to be completed in phases so that some portion of the channels remain unimpeded or requiring some type of passage be built around the project area to allow for unimpeded movement.

If these activities adversely affect the water quality essential feature by affecting the ranges of temperature or dissolved oxygen, the impacts would impede one or more of the services this feature is designed to provide: spawning; annual and interannual adult, larval and juvenile survival; and larval and juvenile growth, development, and recruitment. Impeding these functions would also adversely affect sturgeon by reducing spawning behavior, reducing survival or development of eggs and larvae, or impeding juvenile growth and development. Coextensive project modifications of flood control/ecosystem restoration activities that might be required to address these impacts include similar modifications as deepening of channel or ports, changes in flow regime, and activities that impede movement. The use of aeration systems, limiting deepening, maximum or minimum flow levels, phasing of the project, or additional passage measures may be required to prevent impacts to the water quality essential feature.

3.1.1.1.3 WRDA dam operations/repair, fishway construction

Under their WRDA authorities USACE has constructed a wide variety of dams to serve navigation, flood control, and other purposes. These structures frequently develop popular recreational opportunities including fishing and boating. Constructing these facilities is a major federal action, requiring specific congressional appropriations, and are implemented over several years. Once constructed, USACE activities may involve operating navigation locks, managing water levels for flood control, fishing, habitat and other purposes, and operation of fish passage facilities, and repairs to maintain the structures. We project that USACE WRDA dam-related activities will result in 3 consultations over the next 10 years on operation, maintenance and repair of these facilities.

To be conservative, we will assume these future actions will involve effects in the river, as may result from changes in timing or amount of water releases, or operation of locks. In an occupied critical habitat unit, these activities could affect both sturgeon and their critical habitat. Changes in water releases could affect water depth, temperature and dissolved oxygen, and cause sedimentation on spawning habitat. If these were temporary or one-time activities, they might be timed to avoid direct effects to sturgeon and involve only incremental informal consultations on critical habitat effects and would likely not require project modifications. Long-term impacts from these types of activities would cause coextensive adverse effects to both sturgeon and critical habitat features, with the same project modifications needed to address impacts to both. To be conservative in estimating impacts of this designation, we assume that all

projected future WRDA dam operation/repair activities will be incremental impacts of this designation, involving informal consultation.

If future dam repair actions did involve non-temporary adverse effects to essential features of critical habitat, they would also result in adverse effects to sturgeon and the formal consultations will be coextensive. If changes in water releases adversely affect the water depth, or water quality features, it would impede those features from providing appropriate habitat for spawning, migration or juvenile development, and could also impede annual and interannual adult, larval and juvenile survival. Coextensive project modifications to address these impacts of WRDA dam projects on both the feature and the sturgeon might include requiring minimum flow levels to ensure appropriate depths and dissolved oxygen concentrations are maintained or, conversely, maximum flow levels if extremely cold water is being released to ensure proper temperatures are maintained.

Similarly, sedimentation on spawning habitat would interfere with the services this feature is designed to provide – settlement of fertilized eggs and refuge, growth and development of early life stages. These effects to the feature would also be adverse effects to sturgeon eggs, larvae and early life stages that were not able to settle, grow, develop or seek refuge. Project modifications to address both these impacts to the feature and the sturgeon could involve requiring the use of turbidity structures or placing project time windows to allow the benthos to recover from sedimentation if water flow levels were high enough to eventually remove the sediments.

3.1.1.1.4 Section 404/RHA permits; dredge/fill, construction

Under the authority of the CWA and the Rivers and Harbors Act, the USACE maintains permitting authority over activities such as dock and pier construction. Each year, numerous private landowners seek permits from USACE to construct docks, boat launches, and other structures in and adjacent to rivers and bays. Private parties may request permits to undertake small localized shoreline stabilization, beach nourishment, and restoration projects. Most of these projects are very small-scale and are regulated under Nationwide and Regional general permits, which generally do not require individual Section 7 consultation. However, large-scale marine construction projects may require individual permits. For example, private entities interested in developing a marina, or similar in-water project, would need to apply to the USACE for an individual permit. The USACE issued one permit for private mining activity in the last 10 years, for phosphate mining. Finally, USACE has issued a few CWA Section 404 permits for state, county, and municipal water supply projects in the proposed critical habitat area over the last 10 years. We project the USACE will enter into consultation for 20 section 404/RHA permitting of construction or dredge and fill projects in proposed Atlantic sturgeon critical habitat over the next 10 years.

Projects of this type have the potential to impact most essential features of Atlantic sturgeon critical habitat. In-water construction could negatively impact substrate suitable for spawning and foraging, and could potentially obstruct passage. Mining could negatively impact spawning or foraging by removing or covering suitable substrate for spawning or foraging. Depending on the location and scale of a mining project, negative impacts to water depth and water quality could also result. Equipment used during mining and the operations themselves have the potential to obstruct passage for Atlantic sturgeon. Water supply structures and activities could negatively affect the water quality, and salinity features.

Mining projects and municipal water supply projects would be long-term and would likely involve coextensive impacts to sturgeon and the critical habitat features. Small scale construction and dredging projects generally do not adversely affect Atlantic sturgeon, and could be implemented during sturgeon absence from project areas. Thus, USACE-permitted in-water construction and dredging projects in proposed critical habitat could result in incremental informal consultations solely due to temporary critical habitat effects. Therefore, to be conservative, we will assume that all projected future section 404/RHA permitting activities will be incremental impacts of this designation, involving informal consultation. We would not expect project modifications to be required for temporary impacts to critical

habitat, where the features are expected to return to pre-project conditions when sturgeon return to the habitat and need to use the features.

If future section 404/RHA permitting actions involve non-temporary adverse effects to essential features of critical habitat, they will also result in adverse effects to sturgeon and the formal consultations will be coextensive. Project modifications to address the adverse impacts to critical habitat will be the same as those required to address adverse impacts to sturgeon. If these actions result in covering or removal of the soft and hard substrate features, it would impede settlement of fertilized eggs and refuge, growth and development of early life stages, and juvenile foraging. Project modifications to address both these impacts to the feature and the sturgeon could involve limiting the amount or location of substrate removed, or turbidity controls to prevent sediment deposition on hard substrate, and restoration or mitigation of temporary or permanent impacts to riparian or instream habitat. Impacts to the migration feature and obstruction of sturgeon migration could require modifications that limit the amount of the river channel obstructed by structures and operations, or restricting the time of operations to avoid migration periods. Impacts to the salinity and water quality features that adversely affect sturgeon behavior or survival could require modifications that treat or limit discharges to sturgeon habitats.

3.2.1.2 Federal Highway Administration

3.2.1.2.1 Bridge repair/replacement

The Federal Highway Administration (FHWA) consults with NMFS when it provides funding to state Departments of Transportation (DOTs) for bridge replacement or expansion projects, or road construction projects in or over critical habitat. The FHWA permitted the majority of projects (67) that required consultation in the past across all the areas now being proposed as critical habitat.

Bridge repair or replacement projects have the potential to impact a few of the essential feature of Atlantic sturgeon critical habitat. Bridge projects have the potential to negatively impact spawning substrate by removing or covering suitable substrate for spawning. Similarly, these projects could negatively impact juvenile foraging substrate. These impacts would likely be permanent, and thus would also adversely affect the species. Equipment used during construction and the new structures themselves have the potential to obstruct passage for Atlantic sturgeon, however this effect to the species and to the critical habitat feature can be avoided by timing in-water construction to avoid migratory periods. Thus, we project that these projects in the future will require coextensive formal consultations due to impacts to both the species and critical habitat substrate features.

We have also concluded that project modifications to address adverse impacts to the hard substrate or soft substrate critical habitat features will be the same as those required to address adverse impacts to sturgeon, and could involve the modifications to reduce the amount of substrate impacted by, for example, changing the type or location of structures.

3.2.1.3 United States Coast Guard

Over the past 10 years, the U.S. Coast Guard has requested consultation for 3 projects in the areas being considered for critical habitat designation, involving issuing permits for bridge replacement or repair. Any individual, partnership, corporation, or local, state, or federal legislative body, agency, or authority planning to construct or modify a bridge or causeway across a navigable waterway of the United States must apply for a Coast Guard bridge permit. The projected effects to critical habitat and Atlantic sturgeon would be the same as FHWA bridge projects and thus we project future projects will require coextensive formal consultations. Coextensive project modifications would be the same as those for FHWA projects discussed above.

3.2.1.4 Federal Energy Regulatory Commission

3.2.1.4.1 Hydropower facility licensing

FERC is responsible for issuing licenses for the construction of new hydropower projects, relicensing the continuance of an existing project, and oversight on all ongoing project operations, including environmental monitoring. FERC has initiated or completed consulted on relicensing of 5 hydropower projects under the Federal Power Act over the last 10 years. Some of the completed consultations may require reinitiation of consultation if a critical habitat designation is finalized for Atlantic sturgeon; however, if these consultations considered impacts to Atlantic sturgeon they should have already evaluated impacts to sturgeon habitat that is now being proposed to be designated as critical habitat, and any adverse effects should have been evaluated as take of the species. To be conservative in estimating impacts, we assume that future formal consultations will be required.

Dams and water diversions for the purposes of hydropower have the potential to affect each of the essential features of Atlantic sturgeon critical habitat. Dam maintenance activities, such as dredging and minor excavations along the shore can result in the release of silts and fine sediments that may cover suitable spawning substrate. Dams can have a negative impact on water depth and continuous flow, and water quality, particularly temperature and dissolved oxygen. Both these effects would also adversely impact the species' spawning and development. Dams can lead to the upstream migration of the salt wedge due to decreased freshwater discharge, which could adversely affect the species' juvenile development. Higher salinity would adversely affect the species through increased larval mortality. Dams could also adversely affect the water depth feature through limiting water releases to habitats below the dam, which could also prevent sturgeon migration and spawning, or render spawning ineffective. Conversely, peak power flow releases from dams could wash spawning projects out of spawning habitat. Limitations on water releases could adversely affect the temperature and dissolved oxygen aspects of the water quality feature, and kill or injure all life stages of sturgeon.

These projects are long-term and affect large areas of watersheds, and are not likely to be implemented to have temporary impacts on habitat that don't affect the species. This would be the case even for projects in unoccupied units where no sturgeon are present, because these projects always have downstream impacts on amount, timing, and quality of water in the rivershed. We project these activities will result in coextensive formal consultations due to impacts to both the species and its critical habitat. The effects to critical habitat are likely to also comprise take of the species. Hypothetically, a new dam constructed in an unoccupied unit could adversely affect the migratory pathway feature without having downstream effects on sturgeon in the occupied critical habitat. However, based on our review of the consultation database and coordination with FERC, we do not project any new project construction licensings in proposed critical habitat units, occupied or unoccupied – we are only expecting relicensings of existing structures.

We have also concluded that any project modifications required to address adverse impacts to critical habitat are likely to be the same as those required to address adverse impacts to sturgeon. Project modifications to avoid adverse effects to the spawning substrate essential feature as well as to spawning behavior and growth and development of larvae and juveniles, might require turbidity controls or dredging of sediments above a dam, or flow regulation that ensures that waters of appropriate depth, salinity, temperature and dissolved oxygen are released and present in the applicable habitats when sturgeon need to use them for spawning, migration, foraging, growth and development. Technology to ensure that waters released from a dam are of appropriate temperature and dissolved oxygen for sturgeon might also be required.

3.2.1.4.2 Natural gas (LNG) facilities, pipelines authorization

FERC is responsible for regulating the interstate movement of oil and gas, including the transmission of natural gas, the transportation of oil by pipeline, the siting and abandonment of interstate natural gas

pipelines and storage facilities, and the operation of proposed and operating liquefied natural gas terminals. Over the past 10 years, FERC has consulted on 5 liquefied natural gas facility or pipeline projects in the areas being proposed as critical habitat.

LNG facility and pipeline projects have the potential to impact some of the essential features of Atlantic sturgeon critical habitat. Pipeline projects have the potential to negatively impact the spawning substrate essential feature by removing or covering suitable substrate for spawning. Equipment used during construction and any new structures constructed have the potential to obstruct passage for Atlantic sturgeon; if this occurred, it would always be a coextensive impact with effects to the species. LNG facilities could also impact water quality, especially temperature, through withdrawals for cooling systems; adverse effects to temperature would not likely be temporary and thus would adversely affect fish as well. We project that future consultations on these projects will be coextensive formal consultations due to impacts to sturgeon and its critical habitat features.

We have also concluded that any project modifications required to address adverse impacts to critical habitat will be the same as those required to address adverse impacts to sturgeon. Impacts of pipelines or other structures on substrate features or unobstructed migratory pathways might involve relocating the pipeline, elevating the pipeline above the river, or burying the pipeline beneath the river bed. Impacts of water withdrawals on water quality features that impact sturgeon behavior, development or survival, might require limiting the amount or timing of water withdrawn or changing the location of intake structures. Similarly, discharge from cooling water intake structures may impact sturgeon behavior and development and survival and may require measures to reduce temperatures, oxygenate the water, or control flow volumes.

3.2.1.5 Nuclear Regulatory Commission

3.2.1.5.1 Nuclear power plant construction/operation licensing

The Nuclear Regulatory Commission (NRC) is responsible for the issuance and renewal of licenses for nuclear power plant construction and operation, and the NRC consulted with us on 8 projects over the past 10 years that could affect the essential features of proposed critical habitat. These projects typically involve construction of cooling water intake structures and some effluent structures, and dredging to maintain operation of the structures. These activities could alter the sediment feature of spawning habitat or the soft substrate feature downstream of spawning habitat. Additionally, discharge from the cooling water intake structures may affect the water quality features. The effects of operating these plants are long-term and relatively large-scale, and likely to be of a nature that results in coextensive adverse effects to both sturgeon and their critical habitat essential features. Project modifications to address these impacts might be the same type as those applicable to dredging, section 404 permitted water projects, dams, and natural gas facilities and pipelines, discussed above.

3.2.1.6 National Marine Fisheries Service/US Fish and Wildlife Service

3.2.1.6.1 Endangered Species Act research and incidental take permitting

NMFS issues ESA section 10 permits for scientific research on or enhancement of listed species, and for incidental take of listed species associated with other activities such as fishery research. The majority of the 46 research and incidental take permits issued by NMFS in the proposed critical habitat areas over the last 10 years have involved the shortnose sturgeon. This research has the potential to impact suitable substrate and fish migration through the use of various types of fishing gear, but is unlikely to impact other essential features of Atlantic sturgeon critical habitat. Any adverse impacts on the fish migration essential feature would be a coextensive impact with the listing of the species and would require the same project modifications to address impacts, such as prohibiting gear use during periods when sturgeon are migrating through an area, or reducing the amount of time gear is in the water to only portions of migratory periods. Modifications to address adverse impacts to substrate features might involve

prohibiting certain gear types or gear placement on spawning substrate or limiting the amount of substrate covered, or timing the work to avoid periods when sturgeon need to use the substrate at issue.

3.2.1.7 U.S. Fish and Wildlife Service

3.2.1.7.1 Fishery management grants

The U.S. Fish and Wildlife Service (USFWS) issues a number of grants through statutes promoting sportfishing, recreation, and habitat conservation. USFWS consulted on 11 such grants over the last 10 years in areas being proposed as Atlantic sturgeon critical habitat. Any effects of these activities on proposed critical habitat features and potential project modifications would be similar to those discussed for NMFS's ESA permitting above, and would be coextensive impacts with the species' listing.

3.2.1.8 Environmental Protection Agency

3.2.1.8.1 Pesticide authorization

Under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), before a pesticide product may be sold or distributed in the U.S. it must be registered with a label identifying approved uses by EPA's Office of Pesticide Programs (OPP). Once registered, a pesticide may not legally be used unless the use is consistent with directions on its approved label(s) (http:www.epa.gov/pesticides/regulating/registering/index.htm). EPA authorization of pesticide uses are categorized as FIFRA sections 3 (new product registrations), 4 (re-registrations and special review), 18 (emergency use), or 24(c) Special Local Needs (SLN).

We project there will be 9 nationwide, formal consultations with EPA over the next 10 years. The scope of these nationwide consultations will include all listed species and designated critical habitat under NMFS's jurisdiction. The first of these consultations will address diazinon, malathion, and chlorpyrifos, and must be completed in December 2017. A draft Biological Evaluation for this consultation was submitted by EPA and concluded there will likely be adverse effects on Atlantic sturgeon. (Effects on the proposed Atlantic sturgeon critical habitat have not yet been considered but will be evaluated in the Biological Opinion issued by NMFS.) The second consultation will address methomyl, and carbaryl, and is due in December 2018. The remaining 7 consultations will address various chemicals and have uncertain completion dates. These consultations will involve coextensive impacts due to listings of several species and critical habitat designations other than that for Atlantic sturgeon. We lack sufficient information to project any other incremental that would be attributable solely to the proposed designation.

3.2.1.9 Federal Emergency Management Agency

3.2.1.9.1 Disaster assistance/preparation grants

Disaster assistance from FEMA is financial or direct assistance to individuals and families whose property has been damaged or destroyed as a result of a federally-declared disaster, and whose losses are not covered by insurance. It is meant to help with critical expenses that cannot be covered in other ways. FEMA also awards preparedness funding to state, local, territorial, and Tribal governments in the form of non-disaster grants. Preparedness grants support governments, citizens and first responders in building capability to prepare for, protect against, respond to, recover from, and mitigate all hazards. FEMA consulted on 5 such activities in the areas being proposed for critical habitat over the last 10 years, involving projects such as docks, piers, and shoreline structures damaged by hurricanes, and construction or upgrading of municipal stormwater facilities.

Depending on the nature of the project supported by FEMA funding, critical habitat could be affected through alteration of the sediment and depth of the water body, or changes to water quality. Projects such as docks and piers may alter sediment types if the existing substrate is removed or buried or altered by construction activities. Similarly, shoreline structure projects can alter the sediment type through removal or burial of existing substrate. Upgrading municipal stormwater facilities or constructing flood protection

structures may alter water quality depending on the design and capabilities of the system. FEMA grant projects that we have consulted on in the past have tended to be large in scale, with permanent changes to environmental features, and hence would not in our judgment be projects that could be implemented with temporary effects to habitat features, or timed to avoid impacts to sturgeon. Thus, we project these consultations in the future will be coextensive formal consultations on effects to both the species and its critical habitat.

We have also concluded that project modifications to address adverse impacts to critical habitat will be the same as those required to address adverse impacts to sturgeon. Coextensive project modifications could be the same as those discussed under other action categories above, depending on the project that FEMA is funding.

3.2.1.10 Department of Energy

3.2.1.10.1 Nuclear fuel management

The Department of Energy consulted with NMFS 3 times over the last 10 years concerning facility construction and operations at the Savannah River Site for Used Nuclear Fuel Management. Effects to critical habitat could include alterations to substrate type and water quality issues. Effects to substrate type will depend on the location of the facility under consultation. Facilities found in upstream reaches of rivers where substrate type is suitable for spawning may affect the suitable substrate feature through removal or burial of substrate. All facilities have the potential to alter the water quality features. These facilities utilize cooling structures which discharge large volumes of water. While the effluent is supposed to be treated for any chemical contamination and held in sumps or holding areas until it reaches the appropriate temperatures, these systems sometimes fail. Discharge of unusually warm water or water with contaminants would affect the water quality feature. Adverse impacts of these projects would likely impact both sturgeon and its critical habitat, and we project the consultations would be coextensive. Project modifications to avoid adverse effects to both the essential water quality feature and sturgeon might include relocating discharge points, limiting or relocating water withdrawal structures, treatment or cooling of discharges.

3.3 Estimated Section 7 Costs

The costs associated with ESA section 7 include two main components, administrative and project modification. Administrative costs arise due to consultations between agencies from the designation of critical habitat. Project modification costs include potential material, labor, and opportunity costs borne by agencies or third parties to modify certain physical structures or processes within the designated critical habitat area.

Certain assumptions were made in considering the economic impact of section 7 consultation and project modification implementation. Table 3-18 presents the key assumptions applied to this analysis.

Table 3-18: Key Assumptions of Cost Analysis for Projected Section 7 Consideration in the Next 10 Years

Key Assumption	Effect on Cost
The presence of listed species other than Atlantic or shortnose sturgeon, or designated critical habitat has no influence on consultation.	+
Section 7 consultation history from the previous 10 years is indicative of consultations likely in the next 10 years.	?

3.3.1 Administrative Costs[4]

Costs associated with consultations include administrative costs, such as the cost of time spent in meetings, preparing letters, and in some cases, developing a biological assessment and biological opinion, identifying and designing RPMs, and so forth. For this impacts report, we estimated per-project administrative costs based on IEc 2014. That impacts report estimates administrative costs for different categories of consultations as follows: 1) new consultations resulting entirely from critical habitat designation; 2) new consultations considering only adverse modification (unoccupied habitat); 3) re-initiation of consultation to address adverse modification; and 4) additional consultation effort to address adverse modification in a new consultation. Most of the projected future consultations in Atlantic sturgeon critical habitat are projected to be coextensive formal consultations on new actions that would be evaluating impacts to sturgeon as well as impacts to critical habitat, and the administrative costs for these 182 consultations would be in category 4 above. The remaining 23 actions are projected to involve incremental informal consultation due to impacts to critical habitat alone.

Table 3-19: Estimated Per Consultation Administrative Costs of Section 7 Consultations (2013 Nominal U.S. Dollars).

Consultation Type	Costs to				
	NMFS	**Action Agency**	**Third Party**	**Biological Assessment**	**Total Cost**
Coextensive formal consultations, added costs of critical habitat analyses (180 consultations)	$1,400	$1,600	$880	$1,200	$5,080
Incremental informal consultations, critical habitat only (23 consultations)	$1,900	$2,300	$1,500	$1,500	$7,200

As discussed, we have projected consultations to be required for fourteen categories of activities and concluded that there would be incremental administrative costs associated with those consultations. Twenty-two actions are projected to result in incremental informal consultation costs due to impacts solely to critical habitat. Costs estimates per consultation are provided in Table 3-19. Table 3-20 reports estimated administrative costs for those consultations we can reasonably project to occur over the next 10 years.

[4] This section was adapted in part from Industrial Economics (IEc) "Economic Analysis of Critical Habitat Designation of Marine Habitat for the Northwest Atlantic Ocean Distinct Population Segment of the Loggerhead Sea Turtle Final Report" June 2014.

Table 3-20. Projected 10 year and average annual section 7 consultations and related administrative costs per critical habitat unit.

DPS	Unit	Numbers of Section 7 Consultations Over Ten Years[1]	Annual Average	Annual Section 7 Costs	Total Administrative Costs over 10 Years
Carolina	Roanoke C1	13	1.3	$2,179.48	$21,794.84
	Tar-Pamlico C2[2]	20	2.0	$5,947.48	$59,474.84
	Neuse C3	14	1.4	$3,195.48	$31,954.84
	Cape Fear C4[2]	29	2.9	$10,731.48	$107,314.84
	Unoccupied Cape Fear CU1	9	0.9	$147.48	$1,474.84
	Pee Dee River C5[2]	35	3.5	$13,713.94	$137,794.84
	Black C6	10	1.0	$655.48	$6,554.84
	Santee-Cooper C7[2]	29	2.9	$11,579.48	$115,794.84
	Unoccupied Santee-Cooper system CU2	13	1.3	$2,113.94	$21,794.84
	DPS Total	**101[1]**	**10.1**	**$50,395[3]**	**$503,954[3]**
South Atlantic	Edisto SA1	13	1.3	$2,179.48	$21,794.84
	Combahee SA2	12	1.2	$1,671.48	$16,714.84
	Savannah SA3[2]	52	5.2	$23,051.48	$230,514.84
	Unoccupied Savannah SAU1	10	1.0	$655.48	$6,554.84
	Ogeechee SA4	23	2.3	$7,259.48	$72,594.84
	Altamaha SA5[2]	39	3.9	$18,691.48	$186,914.84
	Satilla SA6	18	1.8	$4,719.48	$47,194.84
	St. Marys SA7	10	1.0	$655.48	$6,554.84
	DPS Total	**114[1]**	**11.4**	**$58,884[3]**	**$588,839[3]**

[1] Given the nationwide nature of the EPA pesticide authorization consultations, 9 consultations are included in the total number of consultations for this report, 9 are included in the total for each unit, and 9 are included in each DPS's total. The costs of these consultations are $819.35 per unit. These costs were derived by spreading the costs of adding critical habitat analyses to 9 coextensive formal consultations across the 17 units of this proposed rule plus the 14 units of the companion rule proposing critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. This is a conservative overestimate of per-unit costs, given these consultations are considering impacts to all listed species and designated critical habitat under NMFS's jurisdiction.

[2] These units include incremental informal consultations

[3] Rounded to nearest dollar

All projected types of future federal actions that have routes of effects to one or more of the critical habitat essential features also have routes of effects to Atlantic sturgeon or shortnose sturgeon. The administrative cost estimates above are based on our best judgments that the vast majority of incremental impacts will consist of the administrative costs of adding critical habitat analyses to formal consultations. A small subset (23) of the projected future federal actions could have wholly incremental impacts resulting from the critical habitat designation (i.e., those categories of actions we assumed could be conducted when sturgeon are out of project areas). These potential incremental consultations would all be informal.

However, we acknowledge that there is a great deal of inherent uncertainty in predicting the impacts of future federal actions, due to the lack of information on the scope, methods, exact locations, timing, and other facets of future activities. Thus, for illustration purposes, we also calculated what the future administrative costs might be if 50 percent of all future federal actions involve wholly incremental impacts due to the designation, and the other 50 percent consist of coextensive consultations as described above – i.e., the only incremental impacts are additional administrative costs of adding critical habitat analyses to a consultation required to address impacts to the species. We then estimated costs for a hypothetical circumstance that all of the incremental consultations are informal consultations, and for a hypothetical circumstance that all of the incremental consultations are formal (see Table 3-12). Given the EPA pesticide authorization consultations are nationwide, we did not alter the costs estimates from above. As with Table 3-20, for these hypothetical cases, we again applied the administrative costs estimates reported in Exhibit 2-1 of IEc 2014. Based on these estimates, administrative costs of wholly incremental consultations would total $7,200 per informal consultation and $15,000 per formal consultation. In the case where 50 percent of future incremental consultations per unit are informal, the costs over 10 years would increase by approximately 17 percent to $589,814 for the Carolina DPS and $688,475 for the South Atlantic DPS (Table 3-21). If 50 percent of future incremental consultations per unit are formal, the costs over 10 years in the table above would increase by approximately 88 and 90 percent, respectively, to $948,614 for the Carolina DPS and $1,117,819 for the South Atlantic DPS (Table 3-21).

Table 3-21. Hypothetical 10 year administrative costs per critical habitat unit for different assumptions regarding incremental consultations

DPS	Unit	Total Administrative Costs over 10 Years where 50% of consultations are Incremental Informal Consultations	Total Administrative Costs over 10 Years where 50% of consultations are Incremental Formal Consultations
Carolina	Roanoke C1	$24,560	$40,160
	Tar-Pamlico C2*	$68,600	$111,500
	Neuse C3	$36,840	$60,240
	Cape Fear C4*	$124,920	$202,920
	Unoccupied Cape Fear CU1	0	0
	Pee Dee River C5*	$161,760	$263,160
	Black C6	$6,140	$10,040
	Santee-Cooper C7*	$129,160	$207,160

	Unoccupied Santee-Cooper system CU2	$24,560	$40,160
	EPA consultations	$13,274	$13,274
	DPS Total	**$589,814**	**$948,614**
South Atlantic	Edisto SA1	$25,560	$40,160
	Combahee SA2	$18,420	$30,120
	Savannah SA3*	$269,320	$437,020
	Unoccupied Savannah SAU1	$6,140	$10,040
	Ogeechee SA4	$85,960	$140,560
	Altamaha SA5*	$215,120	$347,720
	Satilla SA6	$55,260	$90,360
	St. Marys SA7	$6,140	$10,040
	EPA consultations	$11,799	$11,799
	DPS Total	**$693,719**	**$1,117,819**

3.3.1.1 Sensitivity of Section 7 Cost Projections to Discounting

Ten-year total cost estimates presented in Table 3-20 assume the average annual number of consultations will be constant throughout the 10-year period and that consultation costs will be constant throughout the period. Discounting future costs using the OMB recommended nominal discount rates of 3% and 7% would reduce average annual and 10-year costs presented in Table 3-20 by about 15% and 30%, respectively.

3.3.2 Project Modification Costs

The sections above describe the types of coextensive project modifications that might be required to address adverse impacts to both the critical habitat and sturgeon. Based on the analyses above, we do not project any incremental project modification costs to result from this designation. Atlantic sturgeon have not been listed very long, and we do not have cost estimates for project modifications that might have addressed impacts to sturgeon habitat. The only estimates of project modification costs produced for section 4(b)(2) impacts analyses are from critical habitat designations for west coast salmon species. To the extent those estimates provide any relevant information about what project modifications associated with the same categories of federal actions evaluated in this report might cost, they are listed in Table 3-22 below. It must be noted that salmon and sturgeon likely would not require the exact same modifications, and the agency actions evaluated on the west coast were likely not of the same scale as those evaluated in this report.

Table 3-22. Estimates of project modification costs for activities similar to those evaluated in this report

	Project Modification Cost Estimate		
Activity Type	**Low**	**Medium**	**High**
In-water construction	$29,835	$65,040	$100,245
Dredging[1]	$396,205	$979,773	$1,551,407
Bridges and culverts[1]	$48,929	$87,117	$125,306
Roads[1]	$42,962	$79,360	$115,759
Hydropower (unknown capacity)	$1,670,746	$8,986,224	$16,230,099

Utility lines	$119,339	$120,532	$121,726
Sand and gravel mining[2]	$1,208,307	$1,611,076	$2,013,845
NPDES - Major projects	$568,053	$751,835	$935,617
NPDES - Minor projects[2]	$64,443	$85,924	$107,405

[1] NOAA (2005) provided only low and high cost estimates for this activity; medium cost estimate presented here is the average of the two.
[2] NOAA (2005) provided only one cost estimate for this activity which is presented here as the medium estimate; low and high cost estimates presented here are 25% lower and 25% higher than the medium cost estimate.
Source: NOAA, 2005; CPI used to adjust all cost estimates from 2005 to 2013 dollars

4 NATIONAL SECURITY IMPACTS

As noted, section 4(b)(2) of the ESA requires NMFS to take into consideration the impact on national security of specifying any particular area as critical habitat. Previous critical habitat designations have recognized that impacts to national security may result if a designation would trigger future Section 7 consultations because a proposed military activity may affect the physical or biological features essential to the listed species' conservation. Anticipated interference with mission-essential training, testing, or unit readiness, either through delays caused by the consultation process or through expected requirements to modify the action to prevent adverse modification of critical habitat, has been identified as a negative impact of critical habitat designations (See, e.g., *Proposed Designation of Critical Habitat for the Pacific Coast Population of the Western Snowy Plover*, 71 FR 34571 at 34583, June 15, 2006, and *Proposed Designation of Critical Habitat for Southern Resident Killer Whales*, 69 FR 75608 at 75633, Dec. 17, 2004). These past designations also recognized that national security impacts resulting from the designation depend on whether future consultations would be required under the jeopardy standard, regardless of the critical habitat designation, and whether the designation would add new burdens beyond those related to the jeopardy consultation.

DOD operates 14 military installations in and near proposed Atlantic sturgeon critical habitat areas. In the past ten years, the USCG, U.S. Navy, U.S. Army and the U.S. Air Force have participated in section 7 consultations within the ranges of the Carolina and South Atlantic DPSs of Atlantic sturgeon. Many of these activities were in the marine environment and would have no routes of effects to the essential features of proposed critical habitat. Past consultations and each Branch's information on future activities are described and evaluated below.

On February 14, 2014, and again on October 7, 2015, NMFS sent letters to DOD and the Department of Homeland Security requesting information on national security impacts of the proposed critical habitat designation, and we received responses from the Navy, Air Force, Army, and Coast Guard.

The Navy's first submission provided information on its facilities and operations. However, the Navy was not able to make a full assessment whether there would be any national security impacts. The Navy indicated that as we define our essential features and areas more precisely, they would be able to provide a more detailed response to our requests and would update their INRMPs as necessary for the protection of Atlantic sturgeon and its critical habitat. The Navy's second submission noted that Naval Submarine Base Kings Bay is adjacent to the South Atlantic DPS critical habitat unit in the St. Marys River. The Navy stated it did not own or control any land or waters within the St. Marys channel, but that the TRIDENT-class submarines used 4.9 km of the waterway transiting to and from the Atlantic Ocean. The Navy stated that any operational or dredging restrictions that would impede maintenance of the channel from the Intracoastal Waterway and St. Marys channel intersection, downstream, could pose a national security risk. Based on the Navy's input, we included a future maintenance dredging action in the St.

Marys unit table above, but it is attributed to the USACE, as the USACE is typically the lead action agency with us for dredging actions that also involve another branch of the military.

The Navy and Air Force expressed concern that designating the Cooper River, including the area of the river on the west side adjacent to the Joint Base Charleston Naval Weapons Station, could have significant impacts on the Navy's ability to adequately support mission-essential military operations, thereby impacting national security. The Navy and Air Force were concerned designation of critical habitat could affect land-based training facilities and the maintenance of these facilities. Additional concerns were expressed regarding shipping and receiving operations from two waterfront facilities.

Over the last 10 years, the Navy consulted with us three times, and the Air Force once, on activities involving land-based facility maintenance, repairs, construction, or waterway dredging in areas that are being proposed for designation. We have determined that of the potential future Navy and Air Force activities, only dredging has the potential to affect the proposed critical habitat. As discussed above, we have concluded that adverse effects of dredging on the proposed critical habitat will be fully-coextensive with impacts to sturgeon. Adverse effects of dredging on essential features would also result in injury or death to individual sturgeon, and thus constitute take. Removal or covering of spawning substrate could prevent effective spawning or result in death of eggs or larvae that are spawned. Changing the salinity regime by deepening harbors and parts of rivers could result in permanent decreases if available foraging and developmental habitat for juveniles. These types of adverse effects are not likely to be temporary and limited to periods of sturgeon absence. Thus, adverse effects of dredging activities are likely to be coextensive formal consultation impacts to both the species and the essential features. The only potential incremental impacts from this designation would be the added administrative costs of adding critical habitat analyses to dredging consultations required due to impacts to sturgeon.

Coextensive project modifications to address both impacts to the essential features and sturgeon could involve limiting the amount or location of substrate removed, or turbidity controls to prevent sediment deposition on hard substrate. Similarly, adverse effects of dredging in removing the soft substrate feature that would interfere with provision of juvenile foraging services could also injure or kill juveniles seeking to use that foraging habitat. Coextensive project modifications might be similar to those mentioned for impacts to the hard substrate feature. Changing the salinity regime by deepening harbors and parts of rivers would remove portions of the transitional salinity zone feature that is being designated to provide foraging and developmental habitat services to juveniles; loss of portions of this habitat could impede development of juveniles using the remaining habitat, or prevent the habitat from supporting some juveniles. Coextensive project modifications that might be required to prevent or lessen these impacts could involve changes in the depth of deepening. The deepening of harbors and ports may also create hypoxic zones which would impact the water quality feature that is designed to ensure survival of sturgeon. Coextensive project modifications that might be required to prevent hypoxic zones could include limiting the amount of deepening or requiring the use of aeration systems.

The Army consulted with us 4 times over the past 10 years, on facility construction, repairs and maintenance. In its input for this rulemaking, the Army noted that Military Ocean Terminal-Sunny Point, NC is located on the Cape Fear River and Fort Stewart, Georgia is located on the Ogeechee River. However, the Army was not able to make a full assessment whether there would be any national security impacts and concluded that technical assessments between the installations and regional levels of NMFS would identify any specific impacts. Based on our consultation database and on input from the Army, we have concluded that the types of actions the Army may engage in do not present routes of effects to essential features of critical habitat and this designation will have no impact on the Army's activities.

The USCG provided information on its facilities and operations. However, the USCG was not able to make a full assessment whether there would be any national security impacts. The USCG indicated that as we define our essential features and areas more precisely, they would be able to provide a more detailed response to our requests. Over the past 10 years, the USCG consulted with us 3 times on authorizations

for bridge repairs or replacements. As discussed above, these activities may affect proposed critical habitat features, but the effects would be fully coextensive with effects to listed sturgeon. Based on this information regarding potential future USCG action in proposed Atlantic sturgeon critical habitat, we do not expect any incremental impacts due to critical habitat designation, other than additional administrative costs of adding critical habitat to consultations that would be required to address impacts to sturgeon.

Based on a review of our consultation database, and the information provided by the Navy, Air Force, Army, and USCG on their activities conducted within the specific areas proposed for designation as Atlantic sturgeon critical habitat, we determined that the only incremental impact of this designation will be added administrative costs of designation. Only one military action identified as a potential area of national security impact has routes of potential effects to proposed critical habitat – river channel dredging. As discussed, this activity will require consultation due to potential impacts to Atlantic and shortnose sturgeon, and any project modifications needed to address impacts to these species would also address impacts to critical habitat. Thus, no incremental project modification impacts are expected due to this designation. On this basis, we conclude there will be no national security impacts associated with the proposed critical habitat for the Carolina and South Atlantic DPSs of Atlantic sturgeon.

5 OTHER RELEVANT IMPACTS

5.1 Introduction

The impacts described in the previous section involved costs and potential effects of Section 7 consultation and related project modifications that could result from the critical habitat designation. This section describes other potentially relevant impacts of the designation. These impacts fall into three general categories: conservation benefits; educational and awareness benefits; and impacts on natural resources agencies that implement management plans in areas covered by the designation.

Ideally, all relevant benefits of the critical habitat designation would be monetized or quantified and be described for each separate habitat unit in order to provide policy-makers with a basis for comparing benefits and costs when finalizing critical habitat designations. Quantified estimates of unit-specific benefits, for example, would be useful for considering whether the benefits of excluding one (or more) critical habitat unit outweigh the costs of including them. Quantifying these unit-specific benefits would require two types of information: (1) data and models that can be used to trace and measure how the designation of specific habitat units generate conservation, public awareness, and resource management impacts; and (2) data and models that can be used to quantify and monetize the values of those impacts.

The subsections below describe how the designation can be expected to generate other relevant impacts in each of the three categories identified above. For reasons described in these subsections, it is not possible at this time to quantify or monetize these other relevant benefits of the designation. As a result, the subsections below describe other relevant impacts of the critical habitat designation in each impact category qualitatively for all critical habitat units combined. Differences in baseline conditions in each critical habitat unit, described in *Section 2*, indicate how these other relevant benefits are likely to differ from one critical habitat area to another. No attempt is made here to differentiate between potential other relevant impacts that may accrue in different critical habitat unit based on differences in baseline economic, environmental, or regulatory conditions described in *Section 2*.

5.2 Conservation Benefits

Benefits, including economic benefits, that may result from conserving critical habitat can be placed into two broad categories: those associated with the primary goal of species conservation and those benefits that result from the conservation efforts, but are not the purpose of the designation (e.g., improved water quality and improved habitat for other species).

For purposes of analysis, each of these two categories of conservation benefits can be classified further as being associated with "use values" (the economic value of commercial and recreational activities associated with species that are protected as a result of the critical habitat designation) or with "non-use" values (values that are classified in the economics literature as existence, bequest, altruistic, and option values). These "non-use" values are values that people place on conserving individual species or biodiversity in general or various ecosystem services even though they do not actually use them.

Although not always measurable in monetary terms, the published economics literature documents that real social welfare benefits result from the conservation and recovery of endangered and threatened species, and from the preservation of water quality, open space, and biodiversity which typically result from species conservation efforts (e.g., Innes and Frisvold 2009, National Research Council 2004). Related conservation benefits have also been shown to be associated with improvements in regional tourism industries and real estate markets that may rely in various ways on the preservation of healthy populations of endangered and threatened species, and the habitat on which they depend.

5.2.1 Types of Conservation Benefits

The primary goal of listing Atlantic sturgeon as endangered and protecting its critical habitat is to preserve the species from extinction and bring about its recovery; this is the most important conservation benefit of the designation. However, the critical habitat designation for Atlantic sturgeon can also generate beneficial impacts related to other species that either rely on the same essential habitat features as sturgeon or rely on forage species that do. Protecting critical habitat for sturgeon can also be expected to generate conservation benefits by protecting ecosystem services that result from, or are enhanced by, those same habitat features.

The quantification and monetization of these conservation benefits would require data and models that can be used to first estimate the incremental improvements in Atlantic sturgeon populations and populations of other species that are expected to result from the designation, and then to estimate the public's willingness to pay for those improvements. Data and models to perform these tasks are not available, so it is not possible to quantify or monetize the overall conservation benefits of this proposed designation in absolute terms. Even determining the relative benefits of designating various critical habitat areas to prioritize among them would be extremely difficult at this time because it would require the ability to isolate and quantify the effect of a particular designated critical habitat area separately, not only apart from one another, but apart from all the other ongoing or planned conservation efforts, such as the protections afforded the species due to other federal and state laws and regulations described in *Section 2.2*.

It is possible, however, to describe the logical pathway of conservation benefits that will result from this designation. For example, benefits from Section 7 consultation that results in project modifications to protect water quantity or quality, substrate, and other essential habitat features for Atlantic sturgeon can be expected to result in conservation benefits associated with other fish and water-dependent species, and related ecosystem services that rely on those same protected features. More specifically, fish species, such as river herring, provide forage for important commercial fish species and benefit from protecting habitat essential to sturgeon; shad, white perch, and catfish are important recreational fish that rely on the same hard substrate that is an essential feature of sturgeon habitat; and shortnose sturgeon, another endangered sturgeon species for which critical habitat has not been designated, relies on the same substrate characteristics as Atlantic sturgeon. Protection of the water depth feature would benefit river users such as fishermen and boaters. Similarly, water quality that is protected for sturgeon can be expected to positively influence all riverine species. Sturgeon habitat protection that results in higher dissolved oxygen and less turbidity in river water can benefit many other fish species directly, and also generate indirect benefits associated with fish, bird and terrestrial species that forage on them.

While non-use conservation benefits can be significant, tracing and measuring them in the case of protected sturgeon habitat would require applications of riverine food web models and the use of surveys that are not available to measure specific links between the protection of habitat features and non-use values. In this situation, non-use conservation values may extend to species of reptiles, amphibians, and water-dependent terrestrial species and birds that rely on forage fish that benefit from the habitat features that are being protected.

There are other potential use and non-use values that may result from the designation that extend beyond those associated with protecting essential habitat features. Project modifications resulting from Section 7 consultation, for example, could involve the installation of silt fences or wetland buffers at construction sites to protect sturgeon habitat by reducing sediment runoff; these project modifications may also result in shoreline protection, improved habitat for terrestrial species, reduced dredging needs, and the preservation of open space that enhances adjacent and nearby property values.

These potential indirect and induced conservation benefits, although recognized as being potentially significant impacts of the designation, cannot be predicted because they will be based on particular project modifications resulting from future Section 7 consultation that cannot be forecast at this time.

5.2.2 Measuring Conservation Benefits

Economists apply a variety of methods to estimate use and non-use values for species and for habitat improvements. These are usually classified as being either revealed preference methods or stated preference methods. These two general categories of non-use valuation methods are described below. Table 5-1 lists the most common methods of estimating conservation benefits and provides web links to sites that describe and illustrate them.

Revealed preference techniques focus on how much people actually pay for goods and services, or how much they spend to take advantage of recreational or aesthetic opportunities, or how they modify their behavior in response to changes in the quality or quantity of environmental or other amenities. For example, travel cost models are frequently applied to value access to recreational opportunities, as well as to value changes in the quality and characteristics of these opportunities. Another revealed preference technique is hedonic analysis, which estimates the effect of proximity or access to particular environmental amenities on property values.

Stated preference techniques include tools such as the contingent valuation method, conjoint analysis, or contingent ranking methods, all of which typically employ survey techniques such as asking respondents to state what they would be willing to pay for a resource or for programs designed to protect a resource. A substantial body of literature has been developed that describes the application of these techniques to the valuation of natural resource assets, including threatened and endangered species.

Table 5-1. Methods to monetize other relevant impacts[1]

Method	Description
Market Price Method	Estimates economic values for ecosystem products or services that are bought and sold in commercial markets.
Productivity Method	Estimates economic values for ecosystem products or services that contribute to the production of commercially marketed goods.
Hedonic Pricing Method	Estimates economic values for ecosystem or environmental services that directly affect market prices of some other good. Most commonly applied to variations in housing prices that reflect the value of local environmental attributes.
Travel Cost Method	Estimates economic values associated with ecosystems or sites that are used for recreation. Assumes that the value of a site is reflected in how much people are willing to pay to travel to visit the site.

Damage Cost Avoided, Replacement Cost, and Substitute Cost Methods	Estimates economic values based on costs of avoided damages resulting from lost ecosystem services, costs of replacing ecosystem services, or costs of providing substitute services.
Contingent Valuation Method	Estimates economic values for virtually any ecosystem or environmental service. The most widely used method for estimating non-use, or "passive use" values. Asks people to directly state their willingness to pay for specific environmental services, based on a hypothetical scenario.
Contingent Choice Method	Estimates economic values for virtually any ecosystem or environmental service. Based on asking people to make tradeoffs among sets of ecosystem or environmental services or characteristics. Does not directly ask for willingness to pay—this is inferred from tradeoffs that include cost as an attribute.
Benefit Transfer Method	Estimates economic values by transferring existing benefit estimates from studies already completed for another location or issue.

[1] Non-technical descriptions and illustrations of each of these valuation methods are presented at: www.ecosystemvaluation.org; technical descriptions and case studies are available in Champ et al. (2003), Freeman (2003), and Haab and McConnell (2002).

5.2.3 Studies of Conservation Benefits

The economics literature includes many published studies that attempt to estimate individual and collective willingness to pay to protect endangered species and/or conserve various use and non-use values associated with ecosystem features and functions that are derived from their critical habitat. In the absence of any primary research related to the benefits of conserving critical habitat for Atlantic sturgeon, or of the necessary data and models to undertake such research, a benefit transfer was considered for putting the conservation benefits of this designation in perspective.

The OMB prepared guidelines for conducting credible benefit transfer studies that included two important steps: (1) clearly specify the value that is associated with a proposed action (e.g., improved conservation and recovery prospects for Atlantic sturgeon that are expected to result from the critical habitat designation); and (2) identify appropriate studies to form the basis for using benefit transfer analysis to estimate these values based on the following criteria:

- The selected studies should be based on adequate data and sound and defensible empirical methods and techniques;
- The selected studies should document parameter estimates of the valuation function;
- The study and policy contexts should have similar populations (e.g., demographic characteristics). The market size (e.g., target population) between the study site and the policy site should be similar;
- The good, and the magnitude of change in that good, should be similar in the study and policy contexts;
- The relevant characteristics of the study and policy contexts should be similar;
- The distribution of property rights should be similar so that the analysis uses the same welfare measure (i.e., if the property rights in the study context support the use of willingness-to-accept measures while the rights in the rulemaking context support the use of willingness-to-pay measures) benefits transfer is not appropriate); and,
- The availability of substitutes across study and policy contexts should be similar.

A review of literature to identify relevant research that could be used in a benefit transfer application related to conserving Atlantic sturgeon habitat in the U.S. identified two studies that involved stated

preference surveys related to other sturgeon species (Kotchen and Reiling 2000; Syring 2003) and one related more generally to anadromous fish (Richardson and Loomis 2009). The review also identified two more general studies with results that are useful for putting the non-use values associated with Atlantic sturgeon and its habitat in perspective (Richardson and Loomis 2009; Wallmo and Lew 2012). The results of these studies are summarized below and in Table 5-2.

- The 2000 study by Kotchen and Reiling used contingent valuation/willingness to pay (WTP) surveys to estimate the value that Maine residents with various environmental attitudes and motivations place on shortnose sturgeon. The study concluded that in 1999, Maine residents' WTP in the form of a "onetime payment to increase populations to a level that ensures continued survival of the species in Maine" was approximately $23, or about $32 in 2013 dollars. The study addressed only the WTP of Maine residents to protect habitat for this species of sturgeon in Maine. The study did not address how much Maine residents or residents outside of Maine would pay to ensure the continued survival of the species.
- The 2003 study by Syring used three separate contingent valuation surveys to estimate the value that wildlife viewers in Wisconsin place on the opportunity to view Lake sturgeon. The results "indicated a mean, annual individual WTP of $101.44 for a sturgeon population stabilized at its current level," which was aggregated across the entire sturgeon viewing population to show an aggregated mean annual WTP of $322,173. This is equivalent to a mean individual value and aggregate value of $128 and $408,000, respectively, in 2013 dollars. While these numbers do not provide a basis for estimating the public's WTP to protect Atlantic sturgeon habitat, they do reflect a monetized value associated with one pathway of conservation benefits, wildlife viewing, associated with another sturgeon species.
- The 2009 study by Richardson and Loomis estimates a model (i.e., a WTP function) to value threatened or endangered species based on estimates from multiple studies, which is referred to as a "meta-analysis." In this case, the meta-analysis of WTP estimates is based on 31 studies with 67 separate WTP observations published from 1985 to 2005 that addressed economic values of endangered, threatened, or rare species. Nearly all of the studies involved contingent valuation surveys where the primary focus was on recreational use and non-use values, but some of the studies focused solely on non-use values. The species addressed in these studies were primarily marine and riverine species (whales, dolphins, seals, otters, sea lions, salmon, and other listed fish species), but included some avian and other species. Results were grouped based on whether the study estimated annual or one-time lump sum payments. Based on the 67 separate willingness to pay surveys that were reviewed in this meta-analysis, the average value of threatened or endangered species in 2006 dollars ranged in annual WTP from $10 to $130 for individual species and from $147 to $311 for "Washington State anadromous fish populations"; and in WTP lump sum payments from about $20 (wolf) and around $240 (humpback whale) to the highest estimated one time WTP of $350 (bald eagle).
- Wallmo and Lew (2012) evaluated people's preferences to downlist eight threatened and endangered marine species. The focus of the study was to determine if some marine taxa are more valuable than others to the public in the United States. Respondents to the stated preference choice experiment were asked about their WTP for different additional protection actions for a variety of species with the understanding that the protection actions would achieve specified downlisting objectives (i.e., downlisting from endangered to threatened or recovered). The analysts found a positive WTP to improve the status of all species, and identified significant differences in the relative WTP estimates. Values range from mean WTP for recovery of $40.49 to $71.62 (2011 dollars) per household every year for 10 years.

Monetary values of threatened and endangered species from Richardson and Loomis (2009) are presented in Table 5-2 along with the two valuation estimates for sturgeon species described above. These are

useful for putting non-use benefits of protecting sturgeon habitat in perspective. However, there are at least 3 reasons why it is not possible at this time to follow OMB guidelines for using these study results to conduct a benefit transfer analysis that will generate credible estimates of the benefits of this proposed designation. First, information about the effects of critical habitat protection on the size or survivability of Atlantic sturgeon populations is insufficient to identify what improvements should be the focus of a benefit transfer application. Second, appropriately assigning transferred benefits to the designation, as opposed to the listing or other baseline conservation efforts, would require projecting incremental changes in the probability or timing of sturgeon recovery that will result specifically from the critical habitat designation. However, the timing and extent to which the Carolina and South Atlantic DPSs of Atlantic sturgeon can be expected to recover, and the extent to which this recovery would be associated with the critical habitat-related conservation efforts, are unknown. Third, the valuation studies related to other sturgeon were specific to their existence in particular regions, not their overall survival. WTP estimates related to the survival or downlisting of other species provide only the most general indications of what might be expected if similar studies were focused on Atlantic sturgeon.

Table 5-2. Monetary value of threatened and endangered species: results from a 2009 meta-analysis of willingness to pay studies (2006 dollars, except as noted)

Type of Study	Species	Low Value	High Value	Average of All Studies
Studies reporting annual WTP	Bald eagle	$21	$45	$39
	Bighorn sheep			$17
	Dolphin			$36
	Gray whale	$24	$46	$35
	Lake sturgeon[1]			$128
	Owl	$39	$130	$65
	Salmon/Steelhead	$10	$139	$81
	Sea lion			$71
	Sea otter			$40
	Sea turtle			$19
	Seal			$35
	Silvery Minnow			$38
	Squawfish			$12
	Striped Shiner			$8
	Turkey	$11	$15	$13
	Washington State anadromous fish populations	$147	$311	$241
	Whooping crane	$44	$69	$56
	Woodpecker	$13	$20	$16
Studies reporting lump sum WTP	Arctic grayling	$20	$26	$23
	Bald eagle	$245	$350	$297
	Falcon			$32
	Humpback whale			$240
	Monk seal			$166
	Shortnose sturgeon[2]			$32
	Wolf	$22	$162	$61

Source: All values derived from Richardson and Loomis (2009), except as noted

[1] Derived from Syring (2003); adjusted to 2013 dollars using CPI
[2] Derived from Kotchen and Reiling (2000); adjusted to 2013 dollars using CPI

5.2.4 Ecosystem Health Benefits Resulting from the Designation

Atlantic sturgeon are an integral part of the ecosystems in which they live. Protecting the essential features of Atlantic sturgeon critical habitat, including preserving water quality and natural flow regimes, will benefit other organisms that cohabit these areas. Each one of these organisms and the health of the ecosystems they are part of may in turn provide some level of direct or secondary benefit to the public and help support local economies.

Understanding the change in aquatic ecosystem health resulting from this designation would require significant effort to model the likely changes in water quantity and quality and substrate conditions, as well as the ecosystem functions and services of protected and modified water flow regimes. While these benefits can be described qualitatively, existing data are not available to quantify the scale of these changes or to monetize their value. For example, it is widely understood that reduced sedimentation in a river system can benefit many species of fish, shellfish, and aquatic plant communities. In addition, reductions in sedimentation may provide direct economic benefit (e.g., reducing the need for, or scale of, dredging operations). Quantifying these changes would, however, require a great deal of information about the make-up of these aquatic communities and the baseline state of environmental quality. More importantly, such quantification would require detailed information on the nature and scope of project modifications resulting from Section 7 consultation, including the locations of the activities requiring modification. Such information is not currently available due to the uncertainty about the modifications potentially needed for future projects.

5.2.5 Ecosystem Service Benefits

Measures undertaken to protect Atlantic sturgeon habitat could lead to other benefits including: (1) protection of human and livestock drinking water supplies; (2) reduced cost of drinking water treatment and/or future stream restoration/maintenance; and, (3) protection and enhancement of property values. For example, preserving natural environments may reduce FEMA insurance premiums and county expenditures on bank stabilization and other flood control programs, and may also reduce the threats and impacts of floods that do occur.

Modeling expected bio-physical change and associated reductions in costs and risks that might result from this critical habitat designation would require detailed understanding of the location and effects of expected project modifications, as well as detailed hydrological models of the affected river systems. Quantification of these benefits is not possible at this time because of the same modelling and data constraints described above.

5.2.6 Use Benefits Associated with Species Recovery

5.2.6.1 Commercial Fishing Benefits

Atlantic sturgeon populations supported a commercial fishery in the early twentieth century, providing eggs for caviar, flesh for smoked fish, and swim bladders for isinglass, a gelatin used in food products and glues. Combined with the protections afforded under the ESA due to the endangered listing of the Carolina and South Atlantic DPSs of Atlantic sturgeon, protecting their designated critical habitat could result in the full recovery and eventual delisting the species, which could eventually yield economic benefits derived from an allowable commercial sturgeon harvest. However, the sturgeon is a long-lived, late-maturing animal that may require numerous generations to achieve long-term population stability at levels that could support a commercial fishery. Therefore, the likelihood of the sturgeon population being sufficiently large to yield significant commercial fishing benefits within a 10-year period is extremely low. Because of uncertainties regarding how much the critical habitat designation might contribute to the

possibility of an allowable commercial sturgeon harvest, and because this is only likely to take place in the relatively distant future, any potential commercial fishing benefits derived from the critical habitat designation cannot be assessed at this time.

5.2.6.2 Recreational Fishing Benefits

Full recovery of the sturgeon population may lead to an allowable recreational sturgeon harvest and the development of a recreational sport fishing industry centered on sturgeon. Associated benefits could include an increase in tourism and fishing-related jobs, incomes, and business activity across the area where fishing for Atlantic sturgeon is allowed. However, the sturgeon is a long-lived, late-maturing animal that may require numerous generations to achieve long-term population stability at levels that could support a recreational fishery. As with commercial fishing, the likelihood of the sturgeon population being sufficiently large to support a recreational fishery within a 10-year period is extremely low.

5.2.6.3 Use Benefits Associated with Habitat Protection

Although the near-term potential for the recovery of Atlantic sturgeon to support commercial or recreational fishing is very low, protecting critical habitat for this species may help protect other fish species that can and do support fisheries, and therefore may result in indirect fishery-related benefits. Habitat protection to support the recovery of sturgeon may also help maintain riverine, estuarine, and marine habitats that are better suited for other recreational uses, such as boating, snorkeling, skin-diving, and swimming. In turn, this may lead to increased tourism and contribute to the expansion of tourist-based economies in communities near critical habitat areas. The quantification of these benefits is not possible at this time because of the same modelling and data constraints described above.

5.3 Education, Awareness, and Other General Benefits of the Protected Habitat That May Result from the Designation

Extensive research into the value that people place on the existence of species beyond their commercial and recreational uses indicates that education and awareness benefits could potentially arise from the critical habitat designation (e.g., Kotchen and Reiling 2000; Loomis and White 1996; Richardson and Loomis 2009). These potential benefits stem from two sources: (1) entities that engage in Section 7 consultation become more aware of sturgeon, and (2) publicity about these consultations results in members of the general public becoming interested in Atlantic sturgeon. The potential exists, therefore, for individuals and business entities who are involved in Section 7 consultation to alter their activities to benefit the species or essential features because they are made aware of the critical habitat designation. Others may engage in similar efforts because they learn of the critical habitat designation through outreach materials. Increases in voluntary reporting of sturgeon encounters or observations by members of the public, and reporting of data such as environmental features associated with the encounters, is evidence of benefits resulting from increased awareness of Atlantic sturgeon and their endangered status.

NOAA has observed that public awareness of critical habitat designations results in the general public giving special consideration to areas with a critical habitat designation, and in voluntary efforts by the general public to alter their activities to reduce the impact and/or engage in more non-consumptive recreational activities to view the habitat and learn about the species. Similarly, the final critical habitat designation may prompt state and local governments to enact laws or rules to complement the critical habitat designation and benefit the listed species and essential habitat features. Although potentially significant, quantifying the beneficial effects of the awareness and educational experiences gained and secondary impacts resulting from state and local regulations that are “triggered” by critical habitat designations is not possible with available data.

5.4 Impact on Natural Resource Agencies with Existing Management Plans

Many previous critical habitat impact analyses have evaluated the impacts of the designation on relationships with, or the efforts of, private and public entities that are involved in management or conservation efforts benefiting listed species. These analyses found that the additional regulatory layer of a designation could negatively impact the conservation benefits provided to the listed species by existing or proposed management or conservation plans. For example, NMFS previously considered the impacts of designation on Indian Tribal sovereignty and participation in conservation activities (69 FR 74572, 74622, December 14, 2004, Proposed Designation of Critical Habitat for 13 Evolutionarily Significant Units of Pacific Salmon [*Oncorhynchus* spp.] and Steelhead [*O. mykiss*] in Washington, Oregon, and Idaho).

Impacts on entities responsible for natural resource management, conservation plans, or the functioning of those plans depend on the type and number of Section 7 consultations that may result from the designation in the areas covered by those plans, as well as any potential project modifications recommended by these consultations. There were no past consultations on management plans in any of the proposed critical habitat units in our consultation database, and we have no information from federal agencies indicating potential future consultations on natural resource management activities that might affect Atlantic sturgeon. Therefore, we do not expect the critical habitat designation to impact natural resource agencies implementing management plans.

6 SYNTHESIS OF IMPACTS OF INCLUDING EACH UNIT IN THE CRITICAL HABITAT DESIGNATION

As discussed, the ESA requires that in proposing to designate or revise critical habitat we take into consideration the economic, national security, and other relevant impacts of designating any particular area as critical habitat. Because the ESA does not specify methods or criteria for the consideration of impacts, the agency has considerable discretion in evaluating the various impacts and in deciding whether to exclude any particular area.

6.1 Economic Impacts

6.1.1 Carolina DPS

Economic Impacts in Unit C1, Roanoke River

There are 3 categories of federal actions expected to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA section 10 research permits, USFWS's award of fishery management research grants, and EPA nationwide pesticide authorizations. The NMFS and FWS actions are expected to result in coextensive impacts to Atlantic or shortnose sturgeon and either or both the migratory passage essential feature and the substrate essential feature of critical habitat. EPA's nationwide actions will have coextensive impacts to a large number of listed species and designated critical habitats. The 13 consultations projected to occur over the next 10 years are projected to result in $21,794.84 in administrative costs of consultation, or about $2,179 per year. Non-federal permittees could be involved in these consultations, consisting of either state agencies, academic researchers or chemical companies. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605[5]. Third parties involved in the other consultations could incur roughly between 17 and 41% of the $5,080 costs of each consultation, depending upon

[5] The maximum third party costs for a single, local incremental critical habitat consultation are projected to be $2,080, or 41% of the $5,080 total incremental costs of these consultations. Total incremental costs of each EPA pesticide authorization consultations that we attribute to each unit over 10 years are $1,474.84, and 41% of these costs is about $605.

whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features.

Based on the nature of the future activities requiring consultation and the third parties that might be involved, there will be no impact on the business and employment sectors of some importance in the counties bordering the unit (see section 2.1.1.1).

Economic Impacts in Unit C2, Tar-Pamlico Rivers

There are 7 categories of federal actions expected to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA section 10 research or incidental take permits; USFWS's award of fishery management research grants; USACE maintenance dredging; USACE issuance of section 404/RHA permits for construction/dredge and fill; FHWA authorization of bridge repair or replacement; and EPA nationwide pesticide authorizations. USACE is projected to issue one 404/RHA permit in this unit in the future, and we projected this type of activity could result in a fully incremental informal consultation due to impacts to any of the essential features. This incremental consultation would cost $7,200, or $720 averaged over 10 years. This project could involve a non-federal permittee, which could be a private landowner, a contractor, or a local agency or municipality. Such a third party's costs would be either $1,500 or $3,000, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No project modifications associated with these incremental informal consultations are projected.

The other 19 consultations predicted to occur over the next 10 years in this unit are projected to result in $52,275 in administrative costs of consultation, or about $5,226 per year. Non-federal permittees could be involved in the 8 NMFS and USFWS consultations, consisting of either state agencies or academic researchers. A local government agency or private contractor could also be involved in the single FHWA action requiring consultation. Chemical companies are likely to be involved in the 9 EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 cost of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features for these actions. The single USACE maintenance dredging action is not projected to result in costs to non-federal entities.

Based on the nature of the future activities and the third parties that might be involved, there will be no impact on the business and employment sectors of some importance in the counties bordering the unit (see section 2.1.1.2).

Economic Impacts in Unit C3, Neuse River

There are 5 categories of federal actions predicted to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA research permits; USACE WRDA flood control/ecosystem restoration implementation; EPA nationwide pesticide authorizations; FEMA issuance of disaster assistance funds; and FHWA authorization of bridge repair/replacement. These actions are expected to result in coextensive impacts to Atlantic or shortnose sturgeon and any of the essential features of critical habitat, depending on the action. The 14 consultations predicted to occur over the next 10 years are projected to result in $ 31,955 in administrative costs of consultation, or about $3,196 per year. Non-federal permittees could be involved in all of these consultations except the USACE WRDA flood control/ecosystem restoration action, consisting of either state agencies, academic researchers, local governments, private landowners or chemical companies. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 costs of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the

assessment. No modifications to these projects are projected to be required solely to protect critical habitat features.

In terms of economic impacts on local economies, the professional/scientific/technical services sector is the only relevant business sector of some importance to local economies in this unit that could be impacted by the critical habitat designation (see section 2.1.1.3). The professional/scientific/technical services sector was a substantial employer in Wake Co., NC in 2013, with 47,005 employees and was the business sector with the highest annual payroll in the county in 2013. However, Wake Co. is at the most upstream extent of this Unit, and NMFS research permits have typically involved activities lower in the watershed. Moreover, only 2 consultations on ESA research permits are projected, which would result in maximum costs of $4,160 to third parties over the next 10 years.

Economic Impacts in Unit C4, Cape Fear-Northeast Cape Fear Rivers

There are 8 categories of federal actions expected to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA research permits; NRC authorization of nuclear power plant operation/modification; USACE maintenance dredging; USACE WRDA dam maintenance/construction; USACE issuance of section 404/RHA permits for construction/dredge and fill; FHWA authorization of bridge repair or replacement; FEMA issuance of disaster assistance grants; and EPA nationwide pesticide authorizations. USACE is predicted to issue two 404/RHA permit in this unit in the future and implement one WRDA dam maintenance/construction project, and we projected these types of activities could result in fully incremental informal consultations due to impacts to any of the essential features. These incremental consultations would cost $21,600, or $2,160 averaged over 10 years. The 404/RHA project could involve a non-federal permittee, which could be a private landowner, a contractor, or a local agency or municipality. Such a third party's costs would be either $1,500 or $3,000 per consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No project modifications associated with these incremental informal consultations are projected.

The other 26 consultations predicted to occur over the next 10 years in this unit are projected to result in $85,715 in administrative costs of consultation, or about $8,572 per year. The costs of the 4 USACE maintenance dredging actions are expected to be borne solely by federal agencies. A private corporate permittee could be involved in the 2 NRC actions. Non-federal permittees could be involved in the 6 NMFS consultations, consisting of either state agencies or academic researchers. A local government agency or private contractor could also be involved in the 5 FHWA actions requiring consultation. A private landowner or contractor, or local government could be involved in the single FEMA action requiring consultation. Chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 cost of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features for these actions.

In terms of economic impacts on local economies, the construction and professional/scientific/technical services sectors are the only relevant business sectors of some importance to local economies in this unit that could be impacted by the critical habitat designation (see section 2.1.1.4). The construction sector was the business sector with the second highest annual payroll in 2013 in Pender Co., NC (over $35 million), and the third highest annual payroll in 2013 in Brunswick Co., NC (over $56 million). The professional/scientific/technical services sector had the second highest payroll in 2013 in New Hanover Co., NC (over $24 million). If a private construction contractor were involved in the 8 combined NRC, FWHA and FEMA consultations in the future, they could incur a maximum of $16,640 over the next 10 years, or $1,640 per year in consultation costs. Six entities in the professional/scientific/technical services sector could conceivably incur a maximum of $12,480 over the next 10 years, or $1,248 per year, for

involvement in consultations on NMFS's issuance of ESA research permits. If all the predicted future actions did occur in these relevant counties, the projected costs would be very minimal relative to the value of the potentially affected business sectors. However, all but two of the predicted activities that could involve third parties might be implemented in the other counties in the unit, and would have no impact on relevant business sectors.

Economic Impacts in Unit CU1, Unoccupied Cape Fear River

Nine EPA nationwide pesticide authorizations are the only consultations expected to occur involving this unit in the future which "may affect" the water quality feature of critical habitat. These incremental consultations would cost $1,475, or $148 averaged over 10 years. These projects would likely involve chemical companies which could incur a maximum total cost of $605 over 10 years. No project modifications associated with these consultations are projected to be attributable solely to the proposed critical habitat.

Economic Impacts in Unit C5, Pee Dee River System

There are 8 categories of federal actions expected to occur in the future in this unit which "may affect" any of the essential features of critical habitat, depending on the action: NMFS's issuance of ESA section 10 research or incidental take permits; USFWS's award of fishery management research grants; USACE issuance of section 404/RHA permits for construction/dredge and fill; USCG and FHWA authorization of bridge repair or replacement; FEMA issuance of disaster assistance grants; FERC issuance of hydropower licenses/modifications; and EPA nationwide pesticide authorizations. USACE is projected to issue two 404/RHA permits in this unit in the future, and we projected this type of activity could result in fully incremental informal consultations due to impacts to any of the essential features. These incremental consultations would cost $14,400, or $1,440 averaged over 10 years. These projects could involve a non-federal permittee, which could be a private landowner, a contractor, or a local agency or municipality. Such a third party's costs would be either $1,500 or $3,000, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No project modifications associated with these incremental informal consultations are projected.

The other 33 consultations projected to occur over the next 10 years in this unit are projected to result in $123,395 in administrative costs of consultation, or about $12,340 per year. Non-federal permittees could be involved in the 6 NMFS and USFWS consultations, consisting of either state agencies or academic researchers. A local government agency or private contractor could also be involved in the combined 16 USCG and FHWA actions requiring consultation. A private landowner or contractor, or local government could be involved in the single FEMA action requiring consultation. Private corporations and contractors could also be involved in the single projected FERC action. Chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 cost of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features for these actions.

In terms of economic impacts on local economies, the construction sector is the only relevant business sector of some importance to local economies in this unit that might be affected by the critical habitat designation (see section 2.1.1.6). The construction sector had the third highest annual payroll in 2013 in Brunswick Co., NC (over $56 million). If private construction contractors were involved in the 20 combined USCG, FWHA, FEMA, FERC and USACE consultations in the future, they could incur a maximum of $41,600 over the next 10 years, or $4,160 per year in consultation costs. If all the 19 predicted future actions that could involve the construction sector did occur in Brunswick Co., the projected costs would be very minimal relative to the value of the potentially affected business sector, even taking into account that Brunswick Co. also borders the Cape Fear River unit which also may impact

the construction sector. However, other than the possible future FERC action associated with a specific location, all the other activities that could involve this sector might be implemented in the other counties in the unit, and would have no impact on relevant business sectors.

Economic Impacts in Unit C6, Black River

One FHWA authorized bridge repair/replacement action and 9 EPA nationwide pesticide authorizations are projected to occur in this unit over the next 10 years. These actions are projected to be fully coextensive and incremental costs of consultation will total $6,555. A local government agency or private contractor could be involved in the FHWA action and chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 cost of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment.

In terms of impacts on local economies, the construction sector is the only relevant business sector of some importance to local economies in this unit that could be affected by critical habitat designation (see section 2.1.1.7). The construction sector had the second highest annual payroll in 2013 in Sumter Co., SC (over $1 billion). If a private construction contractor were involved in the FWHA consultation in the future, it could incur a maximum of $2,080 in consultation costs. If this action does occur in Sumter Co., the costs would be minimal compared to the value of the construction sector. However, this action could also occur in any of the other counties in the unit.

Economic Impacts in Unit C7, Santee-Cooper Rivers

There are 9 categories of federal actions predicted to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA research permits; USACE maintenance dredging; USACE WRDA dam maintenance/construction; USACE issuance of section 404/RHA permits for construction/dredge and fill; USACE WRDA flood control/watershed ecosystem restoration; FHWA authorization of bridge repair or replacement; USCG authorization of bridge repair or replacement; and EPA nationwide pesticide authorizations. USACE is projected to issue five 404/RHA permit in this unit in the future and implement one WRDA dam maintenance/construction project, and we projected these types of activities could result in fully incremental informal consultations due to impacts to any of the essential features. These incremental consultations would cost $43,200, or $4,320 per year averaged over 10 years. The 404/RHA projects could involve non-federal permittees, which could be private landowners, contractors, or local agencies or municipalities. Such third parties' costs would be either $1,500 or $3,000 per consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No project modifications associated with these incremental informal consultations are projected.

The other 23 consultations predicted to occur over the next 10 years in this unit are projected to result in $72,595 in administrative costs of consultation, or about $7,260 per year. The costs of the two USACE maintenance dredging actions and one flood control/ecosystem restoration action are expected to be borne solely by federal agencies. Non-federal permittees could be involved in the seven NMFS consultations, consisting of either state agencies or academic researchers. A local government agency or private contractor could also be involved in the three combined USCG and FHWA actions requiring consultation. Private corporations and contractors could also be involved in the single projected FERC action. Chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 cost of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features for these actions.

In terms of impacts on local economies, the professional/scientific/technical services sector is the only relevant business sector of some importance to local economies in this unit that could be affected by the critical habitat designation (see section 2.1.1.8). This sector had the second highest annual payroll in 2013 in Berkeley and Charleston counties, SC (over $36 million and $1 billion, respectively). Entities in the professional/scientific/technical services sector could conceivably be affected by the 7 consultations on NMFS's issuance of ESA research permits, and incur a maximum of $14,560 over the next 10 years, or $1,456 per year on average. If the predicted future activities that might involve this sector do occur in either Berkeley or Charleston counties, the costs would be minimal compared to the value of the professional/scientific/technical services sector. However, the actions that could involve this sector could be implemented in any of the other counties in the unit.

Economic Impacts in Unit CU2, Unoccupied Santee-Cooper River System

There are 4 categories of federal actions predicted to occur in the future in this unit which "may affect" the essential features of critical habitat: FERC issuance of hydropower licenses/modifications; USACE maintenance dredging; NRC authorization of nuclear power plant operation/maintenance; and EPA pesticide authorizations. These actions are expected to result in coextensive impacts to Atlantic or shortnose sturgeon and any of the essential features of critical habitat, depending on the action. The 13 consultations predicted to occur over the next 10 years are projected to result in $21,795 in administrative costs of consultation, or about $2,180 per year. Non-federal permittees could be involved in the 2 FERC consultations and 1 NRC consultation, consisting of private corporations or contractors. Chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 costs of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features.

In terms of economic impacts on local economies, the construction and professional/scientific/technical services sectors are the only relevant business sectors of some importance to local economies in this unit that could be impacted by the critical habitat designation (see section 2.1.1.9). The construction sector was the business sector with the second highest annual payroll in 2013 in Calhoun Co., SC (over $14 million). The professional/scientific/technical services sector had the second highest annual payroll in 2013 in Berkeley Co., SC (over $180 million) and the third highest annual payroll in 2013 in Richland Co., SC (over $690 million). If a private construction or professional/scientific/technical services contractor were involved in the 3 combined NRC and FERC consultations in the future, they could incur a maximum of $6,240 over the next 10 years, or $624 per year in consultation costs, which would be extremely minimal relative to the values of these sectors.

Conclusions on Economic Impacts due to the Designation for the Carolina DPS

Incremental economic impacts due to the designation proposed for the Carolina DPS will be minimal overall, estimated at $503,954 over the next 10 years, or $50,396 per year (See Table 3-20). These costs will result from 92 local section 7 consultations and 9 nationwide consultations, and will be spread over 7 river systems totaling over 1,400 river miles in 2 states. The total per unit estimated costs range from $1,474.84 (Unoccupied Cape Fear River unit) to $137,794.84 (Pee Dee River unit) over 10 years. Federal agencies will bear the majority of the costs (59% to 83%), which will be limited to administrative costs of consultation for all parties involved. There are no apparent concentrations of costs and the costs to the business sectors that could be impacted are very minimal.

6.1.2 South Atlantic DPS

Economic Impacts in Unit SA1, Edisto River

There are 3 categories of federal actions predicted to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA section 10 research permits, FHWA's

authorization of bridge repair or replacement; and EPA pesticide authorizations. These actions are expected to result in coextensive impacts to Atlantic or shortnose sturgeon and any of the essential features, depending on the action. The 13 consultations predicted to occur over the next 10 years are projected to result in $ 21,795 in administrative costs of consultation, or about $2,180 per year. Non-federal permittees could be involved in these consultations, consisting of either state agencies, academic researchers, local governments, private contractors, or chemical companies. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 costs of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features.

In terms of economic impacts on local economies, the construction sector is the only relevant business sectors of some importance to local economies in this unit that could be impacted by the critical habitat designation (see section 2.1.2.1). The construction sector was the business sector with the second highest annual payroll in 2013 in Calhoun Co., SC (over $14 million). If a private construction contractor were involved in the 3 FHWA consultations in the future, they could incur a maximum of $6,240 over the next 10 years, or $624 per year in consultation costs, which would be extremely minimal relative to the values of these sectors. Moreover, these future FHWA activities could occur in any of the nine other counties in this unit where the construction sector is not as important to local economies.

Economic Impacts in Unit SA2, Combahee River

There are 4 categories of federal actions predicted to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA section 10 research permits; FHWA's authorization of bridge repair or replacement; USACE maintenance dredging; and EPA pesticide authorizations. These actions are expected to result in coextensive impacts to Atlantic or shortnose sturgeon and any of the essential features, depending on the action. The 12 consultations projected to occur over the next 10 years are projected to result in $ 16,715 in administrative costs of consultation, or about $1,672 per year. Non-federal permittees could be involved in the NMFS and FHWA consultations (1 each), consisting of either state agencies, academic researchers, local governments or private contractors. Chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 costs of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features.

Based on the nature of the future activities and the third parties that might be involved, there will be no impact on the business and employment sectors of some importance in the counties bordering the unit (see section 2.1.2.2).

Economic Impacts in Unit SA3, Savannah River

There are 14 categories of federal actions predicted to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA research permits; USFWS's award of fishery management grants; USACE maintenance dredging; USACE WRDA dam maintenance/construction; USACE issuance of section 404/RHA permits for construction/dredge and fill; USACE WRDA flood control/watershed ecosystem restoration; FHWA authorization of bridge repair or replacement; FERC authorization of LNG terminal construction and LNG pipelines; DOE construction at spent nuclear fuel site; FEMA disaster assistance/planning awards; NRC authorization of nuclear power plant construction or repair; and EPA pesticide authorizations. USACE is projected to issue four 404/RHA permit in this unit in the future and implement one WRDA dam maintenance/construction project, and we projected these types of activities could result in fully incremental informal consultations

due to impacts to any of the essential features. These incremental consultations would cost $36,000, or $3,600 per year averaged over 10 years. The 404/RHA projects could involve non-federal permittees, which could be private landowners, contractors, or local agencies or municipalities. Such third parties' costs would be either $1,500 or $3,000 per consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No project modifications associated with these incremental informal consultations are projected.

The other 47 consultations predicted to occur over the next 10 years in this unit are projected to result in $194,515 in administrative costs of consultation, or about $19,452 per year. The costs of the three USACE maintenance dredging actions and four flood control/ecosystem restoration action, and the costs of the 3 DOE actions, are expected to be borne solely by federal agencies. Non-federal permittees could be involved in the six NMFS and USFWS consultations, consisting of either state agencies or academic researchers. A local government agency or private contractor could also be involved in the 13 FHWA actions and the 2 FEMA actions requiring consultation. Private corporations and contractors could also be involved in the 3 projected FERC actions and the 4 predicted NRC actions. Chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 cost of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features for these actions.

In terms of impacts on local economies, the construction sector is the only relevant business sectors of some importance to local economies in this unit that could be impacted by the critical habitat designation (see section 2.1.2.1). The construction sector was the business sector with the third highest annual payroll in 2013 in Aiken Co., SC (over $158 million) and Jasper Co., SC (over $27 million). If a private construction contractor were involved in the 26 combined USACE, FHWA, FEMA, FERC and NRC consultations that could involve third parties in the future, they could incur a maximum of $57,760 over the next 10 years, or $5,776 per year in consultation costs, which would be extremely minimal relative to the values of these sectors in the potentially affected counties. Moreover, other than the 4 predicted future NRC actions, the future activities that may impact third parties could occur in any of the other counties in this unit where the construction sector is not as important to local economies.

Economic Impacts in Unit SAU1, Unoccupied Savannah River

One FERC hydropower licensing/license modification action and 9 EPA nationwide pesticide authorizations are predicted to occur in this unit over the next 10 years. These actions are projected to be fully coextensive and incremental costs of consultation for the unit will total $6,555. A local government agency or private contractor could be involved in the FERC action and chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. Third parties involved with the FERC action could incur roughly between 17 and 41% of the $5,080 cost of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment.

Based on the nature of the future activity, the type of third parties that might be involved, and that the action would occur at an existing hydropower facility in Richmond Co., GA, there will be no impact on the business and employment sectors of some importance in the counties bordering the unit (see section 2.1.2.4).

Economic Impacts in Unit SA4, Ogeechee River

There are 5 categories of federal actions predicted to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA section 10 research permits; USFWS's award of fishery management grants; FHWA's authorization of bridge repair or replacement; USACE

maintenance dredging; and EPA pesticide authorizations. These actions are expected to result in coextensive impacts to Atlantic or shortnose sturgeon and any of the essential features, depending on the action. The 23 consultations predicted to occur over the next 10 years are projected to result in $72,595 in administrative costs of consultation, or about $7,260 per year. Non-federal permittees could be involved in the 5 NMFS and 1 USFWS consultations, consisting of either state agencies or academic researchers. A local government agency or private contractor could also be involved in the 7 FHWA actions. Chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 costs of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features.

Based on the nature of the future activities and the third parties that might be involved, there will be no impact on the business and employment sectors of some importance in the counties bordering the unit (see section 2.1.2.5).

Economic Impacts in Unit SA5, Altamaha River

There are 8 categories of federal actions predicted to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA research permits; USFWS's award of fishery management grants; USACE issuance of section 404/RHA permits for construction/dredge and fill;; NRC authorization of nuclear power plant operation or modification; FHWA authorization of bridge repair or replacement; FERC authorization of LNG pipeline construction; and EPA pesticide authorizations. USACE is projected to issue six 404/RHA permit in this unit in the future, and we projected these types of activities could result in fully incremental informal consultations due to impacts to any of the essential features. These incremental consultations would cost $43,200, or $4,320 per year averaged over 10 years. The 404/RHA projects could involve non-federal permittees, which could be private landowners, contractors, or local agencies or municipalities. Such third parties' costs would be either $1,500 or $3,000 per consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No project modifications associated with these incremental informal consultations are projected.

The other 33 consultations predicted to occur over the next 10 years in this unit are projected to result in $143,715 in administrative costs of consultation, or about $14,372 per year. Non-federal permittees could be involved in the 7 NMFS or USFWS consultations, consisting of either state agencies or academic researchers. A local government agency or private contractor could also be involved in the 15 FHWA actions requiring consultation. Private corporations and contractors could also be involved in the predicted FERC and NRC actions (1 each). Chemical companies are likely to be involved in the 5 EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 cost of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features for these actions.

In terms of impacts on local economies, the construction and professional/scientific/technical services sectors are the only relevant business sectors of some importance to local economies in this unit that could be impacted by the critical habitat designation (see section 2.1.2.6). The construction sector was the business sector with the second highest annual payroll in 2013 in Wayne Co., GA, on the Altamaha River (over $26 million), and was the business sector with the highest annual payroll in 2013 in Jones Co., GA, along the Ocmulgee River (also over $26 million). The professional/scientific/technical services sector was the business sector with the highest annual payroll in 2013 in Houston Co., GA, along the Ocmulgee River (over $238 million). If a private construction contractor were involved in the 5

combined FHWA and FERC consultations that could involve third parties in the future, they could incur a maximum of $10,400 over the next 10 years, or $1,040 per year in consultation costs, which would be minimal relative to the value of the construction sector in the potentially affected counties. Similarly, if a private scientific or technical company was involved in the 3 NMFS consultations predicted to occur, they could incur a maximum of $6,240 over the next 10 years, or $626 per year. These costs are extremely minimal relative to the value of the professional/scientific/technical services sector in the potentially affected county. Moreover, all of the future activities that may impact third parties could occur in any of the other counties in this unit where the construction and professional/scientific/technical services sectors are not as important to local economies.

Economic Impacts in Unit SA6, Satilla River

There are 5 categories of federal actions predicted to occur in the future in this unit which "may affect" the essential features of critical habitat: NMFS's issuance of ESA section 10 research permits; FHWA's authorization of bridge repair or replacement; USACE maintenance dredging; FERC authorization of LNG pipeline construction; and EPA pesticide authorizations. These actions are expected to result in coextensive impacts to Atlantic or shortnose sturgeon and any of the essential features, depending on the action. The 18 consultations predicted to occur over the next 10 years are projected to result in $47,195 in administrative costs of consultation, or about $4,720 per year. Non-federal permittees could be involved in the 3 NMFS consultations, consisting of either state agencies or academic researchers. A local government agency or private contractor could also be involved in the 4 FHWA actions. A private contractor could be involved in the single FERC consultation. Chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. The other third parties could incur roughly between 17 and 41% of the $5,080 costs of each consultation, depending upon whether a biological assessment is required and the permittee bears the costs of producing the assessment. No modifications to these projects are projected to be required solely to protect critical habitat features.

In terms of impacts on local economies, the professional/scientific/technical services sector is the only relevant business sectors of some importance to local economies in this unit that could be impacted by the critical habitat designation (see section 2.1.2.7). This sector was the business sector with the third highest annual payroll in 2013 in Camden Co., GA (over $27 million). If a private contractor in this sector is involved in the 3 NMFS consultations that could involve third parties in the future, they could incur a maximum of $6,240 over the next 10 years, or an average of $6,24 per year in consultation costs, which would be extremely minimal relative to the value of the professional/scientific/technical services sector in the potentially affected county. Moreover, the future activities that may impact third parties could occur in any of the other counties in this unit where the professional/scientific/technical services sector is not as important to local economies.

Economic Impacts in Unit SA7, St. Marys River

One USACE maintenance dredging action and 9 EPA nationwide pesticide authorizations are predicted to occur in this unit over the next 10 years. These actions are projected to be fully coextensive and incremental costs of consultation will total $6,555. Federal agencies are expected to bear all the costs of the USACE consultation. Chemical companies are likely to be involved in the EPA consultations. Third party costs attributable to the proposed designation for the EPA consultations would be a maximum of about $605. No impacts on local economies are projected.

Conclusions on Economic Impacts due to the Designation for the South Atlantic DPS

Incremental economic impacts due to the designation proposed for the South Atlantic DPS will be minimal overall, estimated at $588,839 over the next 10 years, or $58,840 per year (See Table 3-20). These costs will result from 118 section 7 consultations, and will be spread over 7 river systems totaling over 1,800 river miles in 3 states. The total per unit estimated costs range from $6,555 (St. Marys unit) to

$230,515 (Savannah River unit) over 10 years. Federal agencies will bear the majority of the costs (59% to 83%), which will be limited to administrative costs of consultation for all parties involved. There are no apparent concentrations of costs and the costs to the business sectors that could be impacted are very minimal.

6.2 National Security Impacts

As discussed above in section 4, we concluded there will be no impacts to national security from designating critical habitat for the Carolina and South Atlantic DPSs of Atlantic sturgeon.

6.3 Other Relevant Impacts

We identified several types of positive conservation benefits expected to result from the designation of critical habitat for the Carolina and South Atlantic DPSs. As described in section 5 above, we are unable to monetize these benefits based on existing information, and in most cases we can only characterize benefits to the DPSs as a whole, not to individual critical habitat units. For the spawning populations that use each of the units proposed to be designated, the units as a whole have high conservation value, given they are encompass the only spawning habitats for the Atlantic sturgeon riverine populations that inhabit those rivers or river systems. Because the physical and biological features underpinning the critical habitat are by definition "essential to the conservation" of the species, conservation benefits to the listed DPSs would be expected to result when the section 7 consultation process avoids destruction or adverse modification of critical habitat, or avoids lesser adverse effects to critical habitat that may not rise to the level of adverse modification. The proposed critical habitat designation for the Carolina and South Atlantic DPSs of Atlantic sturgeon is focused on the species' recovery so that the protections of the ESA are no longer necessary. Designation and protection of critical habitat could result in project modifications that avoid adverse impacts to critical habitat and would benefit other components of the ecosystem, notably the endangered shortnose sturgeon and other important fish species that use the same habitat as Atlantic sturgeon. Users of aquatic habitats covered by the designation, including boaters and fishermen, would also benefit from conservation of the essential features such as water quality and water depth.

As discussed, there is the potential for education and awareness benefits arising from the designation of Atlantic sturgeon critical habitat. These benefits result when states or local governments, or members of the public, change their behavior or activities when they become aware of the designation and the importance of the critical habitat areas and features.

7 DISCRETIONARY EXCLUSION ANALYSIS

Based on the above consideration of positive and negative impacts of including all proposed occupied and unoccupied units in the critical habitat designations for the Carolina and South Atlantic DPSs of Atlantic sturgeon, we do not exercise our discretion to exclude all or any part of these units from the designation on the basis of these impacts.

Section 4(b)(2) of the ESA provides the Secretary with broad discretion to exclude any area from critical habitat if she determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless it is determined, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species concerned. The agency has considerable discretion in evaluating the various impacts and determining how the impacts will be considered and weighed in deciding whether to exclude any particular area. Based on our consideration of impacts above, we are not excluding any particular areas from the critical habitat designation based on economic, national security or other relevant impacts.

We have analyzed the economic, national security, and other relevant impacts of designating critical habitat. While we have utilized the best available information and an approach designed to avoid

underestimating impacts, many of the potential impacts are speculative and may not occur in the future. Our conservative identification of potential incremental economic impacts indicates that any such impacts would be very small, resulting from very few (about 20) federal section 7 consultations annually. These consultations will be spread over 4 states and over 3,300 river miles. Incremental economic impacts will consist solely of the administrative costs of consultation; no project modifications are projected to be required to address impacts solely to the proposed critical habitat. Further, the analysis indicates that there is no particular area within the units designated as critical habitat where economic impacts would be particularly high or concentrated. No impacts to national security are expected. Other relevant impacts include conservation benefits of the designation, both to the species and to society. Because the features that form the basis of the critical habitat designation are essential to the conservation of the Carolina and South Atlantic DPSs of Atlantic sturgeon, the protection of critical habitat from destruction or adverse modification may at minimum prevent loss of the benefits currently provided by the species and may contribute to an increase in the benefits of these species to society in the future. For the spawning populations that use each of the units proposed to be designated, the units as a whole have high conservation value, given they are encompass the only spawning habitats for the Atlantic sturgeon riverine populations that inhabit those rivers or river systems. While we cannot quantify nor monetize the benefits, we believe they are not negligible and would be an incremental benefit of this designation. Therefore, we have concluded that there is no basis to exclude any particular area from the proposed critical habitat units.

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APPENDIX A: **INITIAL REGULATORY FLEXIBILITY ANALYSIS**

Introduction

The Regulatory Flexibility Act (RFA) establishes a principle that agencies shall endeavor, consistent with the objectives of the rule and applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions that are subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals, and to explain the rationale for their actions to ensure that such proposals are given serious consideration. An RFA analysis does not contain any decision criteria; instead, the purpose of the RFA analysis is to inform the agency, as well as the public, of the expected economic impacts of the proposed action, and to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the proposed action and applicable statutes.

This section contains an Initial Regulatory Flexibility Analysis (IRFA) that was prepared pursuant to Section 603 of the RFA to provide information to the public about the impacts of the proposed action and significant alternatives to the proposed action. The RFA applies to three types of small entities: small businesses, defined by section 3 of the Small Business Act according to relevant business sectors; small nonprofits, any nonprofit enterprise that is independently owned and operated and not dominant in its field; and small governmental jurisdictions, governments of cities, counties, towns, townships, villages, school districts, or special districts with a population of less than 50,000.

According to the RFA, an IRFA must contain the following information: (1) a description of the reasons why action by the agency is being considered; (2) a succinct statement of the objectives of, and legal basis for, the proposed rule; (3) a description, and, where feasible, an estimate of the number of small entities affected by the proposed rule; (4) a description of the projected reporting, record keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirements of the Report or record; and, (5) identification, to the extent practicable, of all relevant federal rules that may duplicate, overlap, or conflict with the proposed rule. An IRFA must also describe significant alternatives to the final rule that accomplish the stated objectives of applicable statutes and that minimize any significant economic impact of the final rule on small entities. The following sections address each of these Section 603 requirements.

Reasons Why the Agency Action is Being Considered

The purpose of the proposed rule is described in *Section 1* of this report. In summary, the purpose of critical habitat designation as required by the ESA, is to designate, to the maximum extent prudent and determinable, the specific areas that contain the physical or biological features essential to the conservation of the species and that may require special management considerations or protections. NMFS has determined 4 physical features to be essential to the conservation of the species because they provide reproduction and recruitment habitat, which facilitates adult reproduction by allowing adult Atlantic sturgeon to reach spawning habitat and allows newly spawned Atlantic sturgeon to recruit to the population by providing safe downstream passage and developmental habitat. The essential features for each type of critical habitat are described in *Section 1.5* and are related to suitable substrate, salinity, water quality, water depth, and the absence of barriers to migration. Specific areas in 16 critical habitat units in 4 states have been identified that contain the physical features essential to Atlantic sturgeon conservation.

Objectives of and Legal Basis for the Proposed Rule

The objective of this proposed rule is to identify Atlantic sturgeon habitat areas and features, the protection of which would support the survival and recovery of these endangered DPSs. The ESA states

that the Secretary shall, to the maximum extent prudent and determinable, designate critical habitat concurrently with making a determination that a species is endangered or threatened, and that the Secretary may from time to time revise critical habitat that already exists for threatened and endangered species (Section 4(a)(3)(A)(i) and (ii)). NMFS published a final rule listing the Carolina and South Atlantic DPSs of Atlantic sturgeon as endangered on February 6, 2012 (77 FR 5914). In response to a lawsuit regarding the timing of issuing proposed and final rules designating critical habitat for Atlantic sturgeon, NMFS entered to a settlement agreement, subsequently modified, requiring that proposed rules regarding critical habitat be submitted to the *Federal Register* for publication by May 30, 2016.

Description and estimate of the number of small entities to which the rule may apply

The Small Business Administration (SBA) has established size standards for all for-profit economic activities or industries in the North American Industry Classification System (13 C.F.R. §121.201). The SBA size standards define whether a business entity is small and, thus, eligible for Government programs and preferences reserved for "small business" concerns. In 2007, the SBA, in recognition that changes in industry structure and the federal marketplace since its last overall review had rendered the size standards for some industries in need of revision, began a comprehensive review of its size standards. The SBA has subsequently been reviewing the size standards for groups of related industries on a sector by sector basis and revising the standards as appropriate (78 Fed. Reg. 37398, June 20, 2013; 78 Fed. Reg. 77343, December 23, 2013; 79 Fed. Reg. 33467, June 12, 2014).

The proposed critical habitat rule does not directly apply to any particular entity, small or large. The rule would operate in conjunction with ESA Section 7(a)(2), which requires that federal agencies ensure, in consultation with NMFS, that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species or destroy or adversely modify critical habitat. Consultations may result in economic impacts to federal agencies and proponents of proposed actions (e.g., permittees, applicants, grantees). Those economic impacts may be in the form of administrative costs of participating in a Section 7 consultation and, if the consultation results in required measures to protect critical habitat, project modification costs. As discussed in *Section 3.2* of this report, designation of critical habitat for the Atlantic sturgeon could potentially trigger consultation costs in three circumstances:

(1) A new consultation is necessary to address both the listed species and the designated critical habitat;
(2) A new consultation is required solely because of the critical habitat designation; or
(3) An existing consultation must be re-initiated to include the designated critical habitat.

We evaluated whether predicted future federal actions would affect Atlantic sturgeon, the essential features of the proposed critical habitat, or both, or whether there were other identifiable baseline impacts that might be coextensive with impacts to habitat features, such as impacts to shortnose sturgeon. If a proposed action affects only listed sturgeon or affects both listed sturgeon and essential features, the administrative and project modification costs are not attributable solely to critical habitat designation. In these circumstances, the added administrative costs associated with addressing critical habitat were considered incremental impacts of the proposed designation. There could also be incremental project modification costs for consultations with coextensive impacts, if an action is considered likely to require unique project modifications to specifically address impacts to the features. If a proposed action would only affect the essential features, the administrative and project modification costs would be attributable to the critical habitat designation and thus treated as incremental impacts of the designation.

For most if not all of the federal activities predicted to occur in the next 10 years, if the effects to critical habitat will be adverse and require formal consultation, those effects would also constitute adverse effects to Atlantic sturgeon or shortnose sturgeon, either directly when they are in the project area, or indirectly

due to the effects on their habitat. This is due to the conservation functions that the features are being designated to provide. For example, hard substrate is being designated to facilitate successful spawning that will lead to juvenile recruitment into the adult population, and subsequently population growth. Effects to the hard substrate feature that impede that conservation objective could injure or kill individual Atlantic sturgeon, for example by preventing adult reproduction, or rendering reproduction ineffective or resulting in mortality of larvae. In these circumstances, the same project modifications would be required to address effects to both the species and effects to the critical habitat. Thus, projects that adversely affect the proposed essential features are likely to always also adversely affect the species and the project impacts would not be incremental. The only costs of this class of actions that are attributable to this rule are the administrative costs of adding critical habitat analyses to a consultation that would occur anyway, due to impacts to sturgeon species.

For some of the predicted future federal activities, it may be feasible to conduct the action when sturgeon are out of the action area. If effects to critical habitat are temporary such that the essential features return to their pre-project condition by the time the sturgeon return and need to use the features, there might not be any adverse effects to either the species or the critical habitat. In these circumstances, consultations would be fully incremental consultations only on critical habitat, and the consultations would be informal. This would likely only apply to actions that affect just spawning habitat in the upper parts of the rivers, as sturgeon of various ages are present year-round in the lower reaches of the rivers and the estuaries. Because the costs of fully incremental informal consultations are higher than the marginal costs of adding critical habitat analyses to coextensive formal consultations, we conservatively assumed future actions will be incremental informal consultations, where applicable. Thus, the costs of these future activities that are attributable to the rule would consist of the full costs of informal consultation, to NMFS, to the action agency, and to any third party proponent of the action (e.g., applicant, permittee).

Costs associated with consultations include administrative costs, such as the cost of time spent in meetings, preparing letters, and in some cases, developing a biological assessment and biological opinion, identifying and designing RPMs, and so forth. For this impacts report, we estimated per-project administrative costs based on IEc 2014. That impacts report estimates administrative costs for different categories of consultations as follows: 1) new consultations resulting entirely from critical habitat designation; 2) new consultations considering only adverse modification (unoccupied habitat); 3) re-initiation of consultation to address adverse modification; and 4) additional consultation effort to address adverse modification in a new consultation. Most of the projected future consultations in Atlantic sturgeon critical habitat are projected to be coextensive formal consultations on new actions that would be evaluating impacts to sturgeon as well as impacts to critical habitat, and the administrative costs for these 179 consultations would be in category 4 above. The remaining 23 actions are projected to involve incremental informal consultation due to impacts to critical habitat alone.

The costs involved to all parties in these 2 classes of actions are included in the table below.

Estimated Per Consultation Administrative Costs of Section 7 Consultations (2013 Nominal US Dollars) (from IEc 2014).

Consultation Type	**Costs to**				
	NMFS	Action Agency	Third Party	Biological Assessment	Total Cost
Coextensive formal consultations, added costs of critical habitat analyses (180 consultations)	$1,400	$1,600	**$880**	$1,200	$5,080

Incremental informal consultations, critical habitat only (21 consultations)	$1,900	$2,300	$1,500	$1,500	$7,200

Ten different federal entities implemented or approved 14 different categories of activities in the areas covered by the proposed critical habitat units that required consultations in the past. All categories of activities implemented by these federal entities were identified as having the potential to affect the essential features. The total number of projected consultations over 10 years is indicated in parentheses below.

1. USACE -- Navigation maintenance dredging, harbor expansion (14)
2. USACE -- WRDA flood control, ecosystem restoration studies (6)
3. USACE -- WRDA dam operations, repair, fishway construction (3)
4. USACE -- Section 404/RHA section 10 permitting – dredge, fill, construction (20)
5. FHWA -- Bridge repair, replacement (67)
6. USCG -- Bridge repair, replacement permitting (3)
7. FERC -- Hydropower licensing (5)
8. FERC -- LNG facilities, pipelines authorization (5)
9. NRC -- Nuclear power plant construction/operation licensing (8)
10. NMFS -- ESA research or incidental take permitting (section 10) (46)
11. USFWS -- Fishery management grants (11)
12. EPA -- Nationwide pesticide authorizations (9)
13. FEMA -- Disaster assistance/ preparation grants (5)
14. DOE -- Nuclear fuel management (3)

Based on our past consultations, actions 1-3, and 14 will not involve third parties incurring costs and thus will have no impacts on small businesses. All of the other types of federal actions that may occur in the areas being proposed as critical habitat typically do involve third parties.

In our Draft Impacts Analysis Report, we projected that actions 3 and 4 could be fully incremental informal consultations, and the $7,200 total costs of each such consultation would be incremental impacts of this rulemaking. Thus, the 20 projected future actions in category 4 that could involve third parties could result in either $1,500 or $3,000 in costs to such third parties, depending upon whether they bear the costs of completing a biological assessment.

The 159 projected future actions in categories 5-11, 12 and 13 that could involve third parties will consist of coextensive formal consultations considering impacts to both sturgeon and critical habitat. The administrative costs of consultation to third parties from these actions will either be $880 or $2,080, depending upon whether they bear the costs of completing a biological assessment. Given the EPA consultations will be national in scope and involve all of NMFS's listed species and designated critical habitats, costs to third parties involved in the these consultations that are attributable to this rulemaking are conservatively estimated to be $25,072 for all units over 10 years.

Businesses in North American Industry Classification System (NAICS) Subsector 325320, Pesticide and Other Agricultural Chemical Manufacturing, could be involved in the 5 nationwide EPA pesticide authorization consultations. A small business in this subsector is defined by the SBA as having 1,000 employees. (https://www.sba.gov/sites/default/files/files/Size_Standards_Table.pdf)

Businesses in NAICS Sector 22 (Utilities) could be involved in the 18 actions projected to occur in federal action categories 7-9. For hydropower power generation and natural gas distribution enterprises, a

small business is defined by the SBA as one having a total of 500 employees. For nuclear power generation, a small business is defined by the SBA as one having a total of 750 employees.

Businesses in NAICS Sector 54 could be involved as contractors assisting with the ESA consultation in any of the 179 projected future federal actions that could involve third parties. Relevant subsectors could include 541370, Surveying and Mapping, 541620, Environmental Consulting Services, or 541690, Other Scientific and Technical Consulting Services. A small business in any of these subsectors is defined by the SBA as one having average annual receipts of $15 million.

Businesses in NAICS Sector 23, Construction, could be involved in a number of categories of projected future actions, where they could incur administrative costs of construction. Some potentially affected subsectors and the SBA's definition of small businesses for those subsectors are discussed below.

Businesses in subsector 237120, Oil and Gas Pipeline and Related Structures Construction, could be involved in the 3 FERC LNG pipeline consultations. A small business in this subsector has average annual receipts of $36.5 million.

Businesses in subsector 237310, Highway, Street, and Bridge Construction, could be involved in the 70 FHWA and USCG bridge repair, replacement consultations. A small business in this subsector has average annual receipts of $36.5 million.

Businesses in subsector 238, Other Specialty Trade Contractors, could be involved as construction contractors in the 20 future USACE section 404/RHA permitting actions and the 5 FEMA disaster assistance actions. Small businesses in this subsector have average annual receipts of $15 million.

Cities could be involved in many of the 70 FHWA and USCG bridge repair, replacement projects, and some proportion of the 20 USACE section 404/RHA permitting actions. The SBA defines a small governmental jurisdiction as cities, counties, towns, townships, villages, school districts, or special districts with a population of less than 50,000.

Our consultation database does not track the identity of past third parties involved in consultations, or whether the third parties were small entities; therefore we have no basis to determine the percentage of the 179 third parties that may potentially be involved in future consultations due to impacts to proposed critical habitat that may be small businesses, small nonprofits or small government jurisdictions.

There is no indication in the data evaluated in the draft Impacts Analysis Report, which serves as the basis for this IRFA, that the designation would place small entities at a competitive disadvantage compared to large entities. Incremental economic impacts due to the designation proposed for the Carolina and South Atlantic DPSs will be minimal overall. These costs will result from participation in the Section 7 consultation process, and will be spread over 17 critical habitat units totaling over 3,300 river miles in 4 states. Federal agencies will bear the majority of the costs (59% to 83%), which will be limited to administrative costs of consultation for all parties involved. There are no apparent concentrations of costs. Assuming a third party would be involved and incur costs for each of the 179 projects in all of the categories of federal activity that involved third parties in the past, the costs to third parties that could be involved in the projected future consultations other than those with EPA would be between $880 and $2,080 for each action for coextensive formal consultations, and between $1,500 and $3,000 for each fully incremental informal consultation. The total costs over the next 10 years to all third parties for these 2 classes of actions would be between $30,000 and $60,000 for the incremental informal consultations and between $136,400 and $322,400 for the coextensive consultations. The total costs over the next 10 years to third parties involved in the EPA consultations are conservatively estimated to be $25,072 across all units.

Determination

Even though we cannot determine relative numbers of small and large entities that may be affected by the designation of critical habitat, there is no indication that affected project applicants would be limited to, nor disproportionately comprised of, small entities. It is unclear whether small entities would be placed at a competitive disadvantage compared to large entities. However, as described in the draft Impacts Analysis Report, consultations and project modifications will be required based on the type of permitted action and its associated impacts on the essential critical habitat features.

It is unlikely that the proposed rule will significantly reduce profits or revenue for small businesses, if they are involved in future consultations required by this rulemaking, given costs will be limited to administrative costs of participating in the consultation process and the maximum cost of a single consultation to a third party is projected to be $3,000.

We encourage all small businesses, small nonprofits and small governmental jurisdictions that may be affected by this rule to provide comment on the potential economic impacts of the proposed designation, to improve the above analysis.

Description of projected reporting, record-keeping, and other compliance requirements of the rule, and professional skills necessary for the preparation of any report or record

There are no record-keeping or reporting requirements associated with the proposed rule. Similarly, there are no other compliance requirements in the rule. There are no professional skills necessary for preparation of any report or record, although consultants are frequently involved on behalf of project proponents, for example in preparing biological assessments of the impacts of a proposed action on listed species and critical habitat.

Identification of all relevant federal rules which may duplicate, overlap, or conflict with the proposed rule

Federal laws and regulations that directly and indirectly protect the Carolina and South Atlantic DPSs of Atlantic sturgeon are listed and discussed in the draft Impacts Analysis Report. No federal laws or regulations duplicate or conflict with the proposed rule. Existing federal laws and regulations overlap with the proposed rule only to the extent that they provide protection to marine natural resources. However, no existing laws or regulations specifically address negative impacts to, or require the avoidance of the destruction or adverse modification of, the essential features of critical habitat for the Carolina and South Atlantic DPSs of Atlantic sturgeon.

Significant Alternatives Considered

Alternative 1: No Action Alternative

No action (status quo): NMFS would not propose critical habitat for the Carolina and South Atlantic DPSs of Atlantic sturgeon. Under this alternative, conservation and recovery of the listed species would depend upon the protection provided under the “jeopardy” provisions of Section 7 of the ESA. Under the status quo, there would be no increase in the number of ESA consultations or project modifications in the future that would not otherwise be required due to the listing of the Carolina and South Atlantic DPSs of Atlantic sturgeon. However, we have determined that the physical features forming the basis for our proposed critical habitat designation are essential to the conservation of the Carolina and South Atlantic DPSs of Atlantic sturgeon. Thus, the lack of protection of the essential features from adverse modification and/or destruction could result in decline in abundance of the Carolina and South Atlantic DPSs of Atlantic sturgeon, and loss of associated economic and other values this species provides to society. Thus, the no action alternative is not necessarily a “no cost” alternative for small entities.

Alternative 2: Preferred Alternative

Under this alternative, 16 critical habitat units totaling over 3,300 river miles in 4 states that provide reproduction and recruitment functions for the Carolina and South Atlantic DPSs of Atlantic sturgeon are proposed for designation as critical habitat. These areas are located in the watersheds from the Roanoke River southward along North Carolina, South Carolina, Georgia, and Florida coastal areas to the St Marys River. These areas contain the physical and biological features essential to the conservation of the Carolina and South Atlantic DPSs of Atlantic sturgeon. The essential features for successful reproduction and recruitment are:

- Suitable hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 ppt range) for settlement of fertilized eggs and refuge, growth, and development of early life stages;
- Transitional salinity zones inclusive of waters with a gradual downstream gradient of 0.5-30 ppt and soft substrate (e.g., sand, mud) downstream of spawning sites for juvenile foraging and physiological development;
- Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: (1) unimpeded movement of adults to and from spawning sites; (2) seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary; and (3) staging, resting, or holding of spawning condition adults. Water depths in main river channels must be deep enough to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river. Water depths of at least 1.2 m are generally deep enough to facilitate effective adult migration and spawning behavior.
- Water quality conditions, especially in the bottom meter of the water column, with temperature and oxygen values that support: (1) spawning; (2) annual and interannual adult, larval, and juvenile survival; and (3) larval and juvenile growth, development, and recruitment. Appropriate temperature and oxygen values will vary interdependently, and depending on salinity in a particular habitat. For example, 6 mg/L D.O. for juvenile rearing habitat is considered optimal, whereas D.O. less than 5.0 mg/L for longer than 30 days is considered suboptimal when water temperature is greater than 25°C. In temperatures greater than 26°C, D.O. greater than 4.3 mg/L is needed to protect survival and growth. Temperatures of 13° C to 26° C for spawning habitat are considered optimal.

An analysis of the costs and benefits of the preferred alternative designation is presented in the draft Impacts Analysis Report. Relative to the no action alternative, this alternative will likely involve an increase in the complexity of some Section 7 consultations and potentially an increase in project modifications required to avoid adverse impacts to critical habitat. We have determined based on the review of past consultation history that no future consultations would be required solely to prevent adverse modification of critical habitat.

The preferred alternative was selected because it reflects the best available scientific information on Atlantic sturgeon habitat, best implements the critical habitat provisions of the ESA by defining the specific features that are essential to the conservation of the species, and offers greater conservation benefits relative to the no action alternative.

Alternative 3: Expanded Areas of Proposed Critical Habitat

Under this alternative we would include all large coastal rivers from the North Carolina/Virginia border southward to the St Johns River, Florida. Several large coastal rivers within the geographic area occupied by the Carolina and South Atlantic DPSs of Atlantic sturgeon do not appear to support spawning and

juvenile recruitment or to contain suitable habitat features to support spawning. These rivers are the Chowan and New Rivers in North Carolina; the Waccamaw (above its confluence with Bull Creek which links it to the Pee Dee River), Sampit, Ashley, Ashepoo, and Broad-Coosawhatchie Rivers in South Carolina; and the St. Johns River, Florida. We have no information, current or historic, of Atlantic sturgeon utilizing the Chowan and New Rivers in North Carolina. Recent telemetry work by Post *et al*. (2014) indicates that Atlantic sturgeon do not utilize the Sampit, Ashley, Ashepoo, and Broad-Coosawhatchie Rivers in South Carolina. These rivers are short, coastal plains rivers that most likely do not contain suitable habitat for Atlantic sturgeon. Post *et al*. (2014) also found Atlantic sturgeon only utilized the portion of the Waccamaw River downstream of Bull Creek. Due to man-made structures and alterations, spawning areas in the St. Johns are not accessible and therefore do not support a reproducing population. For these reasons, we are not designating these coastal rivers, or portions of the rivers, as critical habitat.