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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 224

RIN 0648–XN50

[Docket No. 090219208–9210–01]

Endangered and Threatened Wildlife and Plants; Proposed Listings for Two Distinct Population Segments of Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus) in the Southeast

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: In 2007, a Status Review Team (SRT) consisting of Federal biologists from NMFS, U.S. Geological Survey (USGS), and U.S. Fish and Wildlife Service (USFWS) completed a status review report on Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) in the United States. We, NMFS, have reviewed this status review report and all other best available information to determine if listing Atlantic sturgeon under the Endangered Species Act (ESA) as either threatened or endangered is warranted. The SRT recommended that Atlantic sturgeon in the United States be divided into the following five distinct population segments (DPSs): Gulf of Maine; New York Bight; Chesapeake Bay; Carolina; and South Atlantic, and we agree with this DPS structure. After reviewing the available information on the Carolina and South Atlantic DPSs, the two DPSs located within the NMFS Southeast Region, we have determined that listing these two DPSs as endangered is warranted. Therefore, we propose to list these two DPSs as endangered under the ESA. We have published a separate listing determination for the DPSs within the NMFS Northeast Region in today's **Federal Register.**

DATES: Comments on this proposed rule must be received by January 4, 2011. At least one public hearing will be held in a central location for each DPS; notice of the location(s) and time(s) of the hearing(s) will be subsequently published in the **Federal Register** not less than 15 days before the hearing is held.

ADDRESSES: You may submit comments, identified by the XRIN 0648–XN50, by any of the following methods:

- *Electronic Submissions:* Submit all electronic public comments via the Federal eRulemaking Portal *http//www.regulations.gov.* Follow the instructions for submitting comments.
- *Mail or hand-delivery:* Assistant Regional Administrator for Protected Resources, NMFS, Southeast Regional Office, 263 13th Avenue South, St. Petersburg, FL 33701.
- *Facsimile (fax) to:* 727–824–5309.

Instructions: All comments received are considered part of the public record and will generally be posted to *http://www.regulations.gov.* All Personal Identifying Information (*i.e.,* name, address, etc.) voluntarily submitted may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information. We will accept anonymous comments (enter "n/a" in the required fields if you wish to remain anonymous). Please provide electronic attachments using Microsoft Word, Excel, WordPerfect, or Adobe PDF file formats only. This proposed rule, the list of references, and the status review report are also available electronically at the NMFS Web site at *http://sero.nmfs.noaa.gov/pr/sturgeon.htm.*

FOR FURTHER INFORMATION CONTACT: Kelly Shotts, NMFS, Southeast Regional Office (727) 824–5312 or Marta Nammack, NMFS, Office of Protected Resources (301) 713–1401.

SUPPLEMENTARY INFORMATION:

Public Comments Solicited

We intend that any final action resulting from this proposal will be as accurate as possible and informed by the best available scientific and commercial information. Therefore, we request comments or information from the public, other concerned governmental agencies, the scientific community, industry, or any other interested party concerning this proposed rule. We particularly seek comments concerning:

(1) The abundance of Atlantic sturgeon in the various river systems in the Carolina and South Atlantic DPSs;

(2) The mixing of fish from different DPSs in parts of their ranges, particularly in the marine environment;

(3) Information concerning the viability of and/or threats to Atlantic sturgeon in the Carolina and South Atlantic DPSs; and

(4) Efforts being made to protect Atlantic sturgeon in the Carolina and South Atlantic DPSs.

Public Hearings

One public hearing will be held in a central location for each DPS. We will schedule the public hearings on this proposal and announce the dates, times, and locations of those hearings, as well as how to obtain reasonable accommodations for disabilities, in the **Federal Register** and local newspapers at least 15 days before the first hearing.

Background

Initiation of the Status Review

We first identified Atlantic sturgeon as a candidate species in 1991. On June 2, 1997, NMFS and USFWS (collectively, the Services) received a petition from the Biodiversity Legal Foundation requesting that we list Atlantic sturgeon in the United States, where it continues to exist, as threatened or endangered and designate critical habitat within a reasonable period of time following the listing. A notice was published in the **Federal Register** on October 17, 1997, stating that the Services had determined substantial information existed indicating the petitioned action may be warranted (62 FR 54018). In 1998, after completing a comprehensive status review, the Services published a 12-month determination in the **Federal Register** announcing that listing was not warranted at that time (63 FR 50187; September 21, 1998). We retained Atlantic sturgeon on the candidate species list (and subsequently transferred it to the Species of Concern List (69 FR 19975; April 15, 2004)). Concurrently, the Atlantic States Marine Fisheries Commission (ASMFC) completed Amendment 1 to the 1990 Atlantic Sturgeon Fishery Management Plan (FMP) that imposed a 20- to 40-year moratorium on all Atlantic sturgeon fisheries until the Atlantic Coast spawning stocks could be restored to a level where 20 subsequent year classes of adult females were protected (ASMFC, 1998). In 1999, pursuant to section 804(b) of the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA) (16 U.S.C. 5101 *et seq.*), we followed this action by closing the Exclusive Economic Zone (EEZ) to Atlantic sturgeon retention. In 2003, we sponsored a workshop in Raleigh, North Carolina, with USFWS and ASMFC entitled, "The Status and Management of Atlantic Sturgeon," to discuss the status of sturgeon along the Atlantic Coast and determine what obstacles, if any, were impeding their recovery (Kahnle *et al.,* 2005). The workshop revealed mixed results in regards to the status of Atlantic sturgeon populations, despite the coastwide fishing moratorium. Some populations seemed to be recovering while others were declining. Bycatch and habitat degradation were noted as possible causes for continued population declines.

Based on the information gathered from the 2003 workshop on Atlantic sturgeon, we decided that a new review of Atlantic sturgeon status was needed to determine if listing as threatened or endangered under the ESA was warranted. The SRT, consisting of four NMFS, four USFWS, and three USGS biologists prepared a draft status review report. The draft report was then reviewed and supplemented by eight state and regional experts who provided their individual expert opinions on the scientific facts contained in the report and provided additional information to ensure the report provided the best available data. Lastly, the report was peer reviewed by six experts from academia. A Notice of Availability of the final status review report was published in the **Federal Register** on April 3, 2007 (72 FR 15865). On October 6, 2009, we received a petition from the Natural Resources Defense Council to list Atlantic sturgeon as endangered under the ESA. As an alternative, the petitioner requested that the species be delineated and listed as the five DPSs described in the 2007 Atlantic sturgeon status review report (ASSRT, 2007): Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs, with the Gulf of Maine and South Atlantic DPSs listed as threatened, and the remaining three DPSs listed as endangered. The petitioner also requested that critical habitat be designated for Atlantic sturgeon under the ESA. We published a Notice of 90-Day Finding on January 6, 2010 (75 FR 838), stating that the petition presented substantial scientific or commercial information indicating that the petitioned actions may be warranted.

Listing Species Under the Endangered Species Act

We are responsible for determining whether Atlantic sturgeon are threatened or endangered under the ESA (16 U.S.C. 1531 *et seq.*) To be considered for listing under the ESA, a group of organisms must constitute a "species," which is defined in section 3 of the ESA to include "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." On February 7, 1996, the Services adopted a policy describing what constitutes a DPS of a taxonomic species (61 FR 4722). The joint DPS policy identified two elements that must be considered when identifying a DPS: (1) The discreteness of the population segment in relation to the remainder of the species (or subspecies) to which it belongs; and (2) the significance of the population segment to the remainder of the species (or subspecies) to which it belongs. As stated in the joint DPS policy, Congress expressed its expectation that the Services would exercise authority with regard to DPSs sparingly and only when the biological evidence indicates such action is warranted.

Section 3 of the ESA defines an endangered species as "any species which is in danger of extinction throughout all or a significant portion of its range" and a threatened species as one "which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The statute requires us to determine whether any species is endangered or threatened as a result of any one or a combination of the following five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence (section 4(a)(1)(A)(E)). Section 4(b)(1)(A) of the ESA requires us to make listing determinations based solely on the best scientific and commercial data available after conducting a review of the status of the species and after taking into account efforts being made to protect the species. Accordingly, we have followed a stepwise approach in making our listing determination for Atlantic sturgeon. Considering biological evidence, such as the separation between river populations during spawning and the possibility of multiple distinct interbreeding Atlantic sturgeon populations, we evaluated whether Atlantic sturgeon population segments met the DPS Policy criteria. We then determined the status of each DPS (each "species") and identified the factors and threats contributing to their status per section 4(a)(1) of the ESA. Finally, we assessed efforts being made to protect the species, determining if these efforts are adequate to mitigate impacts and threats to the species' status. We evaluated ongoing conservation efforts using the criteria outlined in the Policy for Evaluating Conservation Efforts (PECE; 68 FR 15100; March 28, 2003) to determine their certainties of implementation and effectiveness.

We reviewed the status review report, its cited references and peer review comments, and information that has become available since the status review report was finalized in 2007. Thus, we believe this proposed rule is based on the best available scientific and commercial information. Much of the information discussed below on Atlantic sturgeon biology, distribution, historical abundance and threats is attributable to the status review report. However, we have independently applied the statutory provisions of the ESA, our regulations regarding listing determinations, and our policy on identification of distinct population segments, in making the proposed listing determinations.

Taxonomy and Life History

There are two subspecies of Atlantic sturgeon—the Gulf sturgeon (*Acipenser oxyrinchus desotoi*) and the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Historically, the Gulf sturgeon occurred from the Mississippi River east to Tampa Bay. Its present range extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi east to the Suwannee River in Florida. The Gulf sturgeon was listed as threatened under the ESA in 1991. The finding in this proposed rule addresses the subspecies *Acipenser oxyrinchus oxyrinchus* (referred to as Atlantic sturgeon), which is distributed along the eastern coast of North America. Historically, sightings have been reported from Hamilton Inlet, Labrador, south to the St. Johns River, Florida. Occurrences south of the St. Johns River, Florida, and in Labrador may have always been rare.

Atlantic sturgeon is a long-lived, late-maturing, estuarine-dependent, anadromous species. Atlantic sturgeon may live up to 60 years, reach lengths up to 14 feet (ft; 4.27 meters (m)), and weigh over 800 pounds (lbs; 363 kilograms (kg)). They are distinguished by armor-like plates and a long protruding snout that is ventrally located, with four barbels crossing in front. Sturgeon are omnivorous benthic (bottom) feeders and filter quantities of mud along with their food. Adult sturgeon diets include mollusks, gastropods, amphipods, isopods, and fish. Juvenile sturgeon feed on aquatic insects and other invertebrates (ASSRT, 2007).

Vital parameters of Atlantic sturgeon populations show clinal variation with faster growth and earlier age at maturation in more southern systems, though not all data sets conform to this trend. Atlantic sturgeon mature between the ages of 5 and 19 years in South Carolina (Smith *et al.,* 1982), between 11 and 21 years in the Hudson River (Young *et al.,* 1988), and between 22 and 34 years in the St. Lawrence River (Scott and Crossman, 1973). Atlantic sturgeon likely do not spawn every year. Multiple studies have shown that spawning intervals range from 1 to 5 years for males (Smith, 1985; Collins *et al.,* 2000; Caron *et al.,* 2002) and 2 to 5 years for females (Vladykov and Greeley, 1963; Van Eenennaam *et al.,* 1996; Stevenson and Secor, 1999). Fecundity of Atlantic sturgeon has been correlated with age and body size, with egg production ranging from 400,000 to 8 million eggs per year (Smith *et al.,* 1982; Van Eenennaam and Doroshov, 1998; Dadswell, 2006). The average age at which 50 percent of maximum lifetime egg production is achieved is estimated to be 29 years, approximately 3 to 10 times longer than for other bony fish species examined (Boreman, 1997).

Spawning adults migrate upriver in the spring, which occurs during February and March in southern systems, April and May in mid-Atlantic systems, and May and July in Canadian systems (Murawski and Pacheco, 1977; Smith, 1985; Bain, 1997; Smith and Clugston, 1997; Caron *et al.,* 2002). In some southern rivers, a fall spawning migration may also occur (Rogers and Weber, 1995; Weber and Jennings, 1996; Moser *et al.,* 1998). Spawning is believed to occur in flowing water between the salt front and fall line of large rivers, where optimal flows are 18 to 30 inches (in) per second (46 to 76 centimeters (cm) per second) and depths are 36 to 89 ft (11 to 27 m) (Borodin, 1925; Leland, 1968; Scott and Crossman, 1973; Crance, 1987; Bain *et al.,* 2000). The fall line is the boundary between an upland region of continental bedrock and an alluvial coastal plain, sometimes characterized by waterfalls or rapids. Sturgeon eggs are highly adhesive and are deposited on the bottom substrate, usually on hard surfaces (*e.g.,* cobble) (Gilbert, 1989; Smith and Clugston, 1997). Hatching occurs approximately 94 to 140 hours after egg deposition at corresponding temperatures of 68.0 to 64.4 degrees Fahrenheit (20 to 18 degrees Celsius). The newly emerged larvae assume a demersal existence (Smith *et al.,* 1980). The yolksac larval stage is completed in about 8 to 12 days, during which time the larvae move downstream to rearing grounds (Kynard and Horgan, 2002). During the first half of their migration downstream, movement is limited to night. During the day, larvae use benthic structure (*e.g.,* gravel matrix) as refugia (Kynard and Horgan, 2002). During the latter half of migration, when larvae are more fully developed, movement to rearing grounds occurs both day and night. Juvenile sturgeon continue to move further downstream into brackish waters and eventually become residents in estuarine waters for months to years.

Recovery of depleted populations is an inherently slow process for a late-maturing species such as Atlantic sturgeon. Their late age at maturity provides more opportunities for individuals to be removed from the population before reproducing. However, a long life-span also allows multiple opportunities to contribute to future generations provided the appropriate spawning habitat and conditions are available.

Distribution and Abundance

Historically, Atlantic sturgeon were present in approximately 38 rivers throughout their range, of which 35 rivers have been confirmed to have had a historical spawning population. More recently, presence has been documented in 36 rivers with spawning taking place in at least 18 rivers. Spawning has been confirmed in the St. Lawrence, Annapolis, St. John, Kennebec, Hudson, Delaware, James, Roanoke, Tar-Pamlico, Cape Fear, Waccamaw, Great Pee Dee, Combahee, Edisto, Savannah, Ogeechee, Altamaha, and Satilla rivers. Rivers with possible, but unconfirmed, spawning populations include the St. Croix, Penobscot, Androscoggin, Sheepscot, York, Neuse, Santee and Cooper Rivers; spawning may occur in the Santee and/or the Cooper Rivers, but it may not result in successful recruitment.

Historical records from the 1700s and 1800s document large numbers of sturgeon in many rivers along the Atlantic Coast. Atlantic sturgeon underwent significant range-wide declines from historical abundance levels due to overfishing in the late 1800s, as discussed more fully below. Sturgeon stocks were further impacted through environmental degradation, especially due to habitat loss and reduced water quality from the construction of dams in the early to mid-1900s. The species persisted in many rivers, though at greatly reduced levels (1 to 5 percent of their earliest recorded numbers), and commercial fisheries were active in many rivers during all or some of the years 1962 to 1997. Many of these contemporary fisheries resulted in continued overfishing, which prompted ASMFC to impose the Atlantic sturgeon fishing moratorium in 1998 and NMFS to close the EEZ to Atlantic sturgeon retention in 1999.

Abundance estimates of Atlantic sturgeon are currently only available for the Hudson (NY) and Altamaha (GA) rivers, where adult spawning populations are estimated to be approximately 870 and 343 fish per year, respectively (Kahnle *et al.,* 2007; Schueller and Peterson, 2006). Surveys from other rivers in the species' U.S. range are more qualitative, primarily focusing on documentation of multiple year classes and reproduction, as well as the presence of very large adults and gravid females, in the river systems. In the Southeast Region, spawning has been confirmed in 11 rivers (Roanoke, Tar-Pamlico, Cape Fear, Waccamaw, Great Pee Dee, Combahee, Edisto, Savannah, Ogeechee, Altamaha, and Satilla rivers), with possible spawning occurring in 3 additional river (the Neuse, Santee and Cooper Rivers). Based on a comprehensive review of the available data, the literature, and information provided by local, state, and Federal fishery management personnel, the Altamaha River is believed to have the largest population in the Southeast (ASSRT, 2007). The larger size of this population relative to the other river populations in the Southeast is likely due to the absence of dams, the lack of heavy development in the watershed, and relatively good water quality, as Atlantic sturgeon populations in the other rivers in the Southeast have been affected by one or more of these factors. Trammel net surveys, as well as independent monitoring of incidental take in the American shad fishery, suggest that the Altamaha population is neither increasing nor decreasing. Though abundance estimates are not available for the other river populations, because the Altamaha spawning population is the largest, we believe a conservative estimate of the other spawning populations in the Southeast Region is no more than 300 adults spawning per year.

Historically, Atlantic sturgeon were abundant in most North Carolina coastal rivers and estuaries, with the largest fisheries occurring in the Roanoke River/Albemarle Sound system and in the Cape Fear River (Kahnle *et al.,* 1998). Historical landings records from the late 1800s indicated that Atlantic sturgeon were very abundant within Albemarle Sound (approximately 135,600 lbs or 61,500 kg landed per year). Abundance estimates derived from these historical landings records indicated that between 7,200 and 10,500 adult females were present within North Carolina prior to 1890 (Armstrong and

Hightower, 2002; Secor, 2002). The North Carolina Division of Marine Fisheries (NCDMF) has conducted the Albemarle Sound Independent Gill Net Survey (IGNS), initially designed to target striped bass, since 1990. During that time, 842 young-of-the-year (YOY) and subadult sturgeon have been captured. Incidental take of Atlantic sturgeon in the IGNS, as well as multiple observations of YOY from the Albemarle Sound and Roanoke River, provide evidence that spawning continues, and catch records indicate that this population seemed to be increasing until 2000, when recruitment began to decline. Catch records and observations from other river systems in North Carolina exist (*e.g.,* Hoff, 1980, Oakley, 2003, in the Tar and Neuse rivers; Moser *et al.,* 1998, and Williams and Lankford, 2003, in the Cape Fear River) and provide evidence for spawning, but based on the relatively low numbers of fish caught, it is difficult to determine whether the populations in those systems are declining, rebounding, or remaining static. Also, large survey captures during a single year are difficult to interpret. For instance, abundance of Atlantic sturgeon below Lock and Dam #1 in the Cape Fear River seemed to have increased dramatically during the 1990–1997 surveys (Moser *et al.,* 1998) as the catch per unit effort (CPUE) of Atlantic sturgeon was up to eight times greater during 1997 than in the earlier survey years. Since 1997, Atlantic sturgeon CPUE doubled between the years of 1997 and 2003 (Williams and Lankford, 2003). However, it is unknown whether this is an actual population increase reflecting the effects of North Carolina's ban on Atlantic sturgeon fishing that began in 1991, or whether the results were skewed by one outlier year. There was a large increase observed in 2002, though the estimates were similar among all other years of the 1997 to 2003 study.

Atlantic sturgeon were likely present in many South Carolina river/estuary systems historically, but it is not known where spawning occurred. Secor (2002) estimated that 8,000 spawning females were likely present prior to 1890, based on U.S. Fish Commission landing records. Since the 1800s, however, populations have declined dramatically (Collins and Smith, 1997). Recorded landings of Atlantic sturgeon in South Carolina peaked at 481,050 lbs (218,200 kg) in 1897, but 5 years later, only 93,920 lbs (42,600 kg) were reported landed (Smith *et al.,* 1984). Landings remained depressed throughout the 1900s, with between 4,410 and 99,210 lbs (2,000 and 45,000 kg) of Atlantic sturgeon reported annually between 1958 and 1982 (Smith *et al.,* 1984). During the last two decades, Atlantic sturgeon have been observed in most South Carolina coastal rivers, although it is not known if all rivers support a spawning population (Collins and Smith, 1997). Recent sampling for shortnose sturgeon (*Acipenser brevirostrum*) conducted in Winyah Bay captured two subadult Atlantic sturgeon in 2004. Captures of age-1 juveniles from the Waccamaw River during the early 1980s suggest that a reproducing population of Atlantic sturgeon may persist in that river, although the fish could have been from the nearby Great Pee Dee River (Collins and Smith, 1997). Until recently, there was no evidence that Atlantic sturgeon spawned in the Great Pee Dee River, although subadults were frequently captured and large adults were often observed by fishers. However, a fishery survey conducted by Progress Energy Carolinas Incorporated captured a running ripe male in October 2003 and observed other large sturgeon, perhaps revealing a fall spawning run (ASSRT, 2007). There are no data available regarding the presence of YOY or spawning adult Atlantic sturgeon in the Sampit River, although it did historically support a population and is thought to serve as a nursery ground for local stocks (ASMFC, 2009).

The Santee-Cooper system had some of the highest historical landings of Atlantic sturgeon in the Southeast. Data from the U.S. Fish Commission shows that greater than 220,460 lbs (100,000 kg) of Atlantic sturgeon were landed in 1890 (Secor, 2002). The capture of 151 subadults, including age-1 juveniles, in the Santee River in 1997 suggests that an Atlantic sturgeon population still exists in this river (Collins and Smith, 1997). The status review report documents that three adult Atlantic sturgeon carcasses were found above the Wilson and Pinopolis dams in Lake Moultrie (a Santee-Cooper reservoir) during the 1990s, and also states that there is little information regarding a land-locked population existing above the dams. There is no effective fish passage for sturgeon on the Santee and Cooper Rivers, and the lowest dams on these rivers are well below the fall line, thus limiting the amount of freshwater spawning and developmental habitat for fish below the dams. In 2007, an Atlantic sturgeon entered the lock at the St. Stephens dam; it was physically removed and translocated downstream into the Santee River (A. Crosby, SCDNR, pers. comm.) In 2004, 15 subadult Atlantic sturgeon were captured in shortnose sturgeon surveys in the Santee River estuary. The previous winter, four juvenile (YOY and subadults) Atlantic sturgeon were captured from the Santee (one fish) and Cooper (three fish) rivers. These data support previous hypotheses that a fall spawning run occurs within this system, similar to that observed in other southern river systems. However, the status review report notes that SCDNR biologists have some doubt whether smaller sturgeon from the Santee-Cooper are resident YOY, as flood waters from the Pee-Dee or Waccamaw Rivers could have transported these YOY to the Santee-Cooper system via Winyah Bay and the Intracoastal Waterway (McCord, 2004). Resident YOY could, however, be evidence of a spawning population above the dams, as is the case with shortnose sturgeon (S. Bolden, pers. comm.).

From 1994 to 2001, over 3,000 juveniles have been collected in the Ashepoo-Combahee-Edisto Rivers (ACE) Basin, including 1,331 YOY sturgeon (Collins and Smith, 1997; ASSRT, 2007). Sampling for adults began in 1997, with two adult sturgeon captured in the first year of the survey, including one gravid female captured in the Edisto River and one running ripe male captured in the Combahee River. The running ripe male in the Combahee River was recaptured one week later in the Edisto River, which suggests that the three rivers that make up the ACE Basin may support a single population that spawns in at least two of the rivers. In 1998, an additional 39 spawning adults were captured (ASSRT, 2007). These captures show that a current spawning population exists in the ACE Basin, as both YOY and spawning adults are regularly captured.

The Ashley River, along with the Cooper River, drains into Charleston Bay; only shortnose sturgeon have been sampled in these rivers. While the Ashley River historically supported an Atlantic sturgeon spawning population, it is unknown whether the population still exists. There has been little or no scientific sampling for Atlantic sturgeon in the Broad/Coosawatchie River. One fish of unknown size was reported from a small directed fishery during 1981 to 1982 (Smith and Dingley, 1984).

Prior to the collapse of the fishery in the late 1800s, the sturgeon fishery was the third largest fishery in Georgia. Secor (2002) estimated from U.S. Fish Commission landing reports that approximately 11,000 spawning females were likely present prior to 1890. The sturgeon fishery was mainly centered on the Altamaha River, and in more recent years, peak landings were recorded in

1982 (13,000 lbs, 5,900 kg). Based on juvenile presence and abundance, the Altamaha River currently supports one of the healthier Atlantic sturgeon populations in the southeast (ASSRT, 2007). Atlantic sturgeon are also present in the Ogeechee River; however, the absence of age-1 fish during some years and the unbalanced age structure suggests that the population is highly stressed (Rogers and Weber, 1995). Sampling results indicate that the Atlantic sturgeon population in the Satilla River is also highly stressed (Rogers and Weber, 1995). Only four spawning adults or YOY, which were used for genetic analysis (Ong *et al.,* 1996), have been collected from this river since 1995. In Georgia, Atlantic sturgeon are believed to spawn in the Savannah, Ogeechee, Altamaha, and Satilla rivers. The Savannah River supports a reproducing population of Atlantic sturgeon (Collins and Smith, 1997). According to NOAA's National Ocean Service, 70 Atlantic sturgeon have been captured since 1999 (ASSRT, 2007). Twenty-two of these fish have been YOY. A running ripe male was captured at the base of the dam at Augusta during the late summer of 1997, which supports the hypothesis that spawning occurs there in the fall.

Reproducing Atlantic sturgeon populations are no longer believed to exist south of the Satilla River in Georgia. Recent sampling of the St. Marys River failed to locate any sturgeon, which suggests that the spawning population may be extirpated (Rogers *et al.,* 1994; NMFS 2009). In January 2010, 12 sturgeon, believed to be Atlantics, were captured at the mouth of the St. Marys during relocation trawling associated with a dredging project (J. Wilcox, Florida Fish and Wildlife Conservation Commission, Pers. Comm.), the first capture of Atlantics in the St. Marys in decades. However, because they were not YOY or adults captured upstream, these trawl-captured sturgeon do not provide new evidence of a spawning population in the St. Marys. There have been reports of Atlantic sturgeon tagged in the Edisto River (South Carolina) being recaptured in the St. Johns River, indicating this river may serve as a nursery ground; however, there are no data to support the existence of a current spawning population (*i.e.,* YOY or running ripe adults) in the St. Johns (Rogers and Weber, 1995; Kahnle *et al.,* 1998).

Identification of Distinct Population Segments

The ESA's definition of "species" includes "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." The high degree of reproductive isolation of Atlantic sturgeon (*i.e.,* homing to their natal rivers for spawning) (ASSRT, 2007; Wirgin *et al.,* 2000; King *et al.,* 2001; Waldman *et al.,* 2002), as well as the ecological uniqueness of those riverine spawning habitats, the genetic diversity amongst subpopulations, and the differences in life history characteristics, provide evidence that discrete reproducing populations of Atlantic sturgeon exist, which led the Services to evaluate application of the DPS policy in its 2007 status review. To determine whether any populations qualify as DPSs, we evaluated populations pursuant to the joint DPS policy, and considered: (1) The discreteness of any Atlantic sturgeon population segment in relation to the remainder of the subspecies to which it belongs; and (2) the significance of any Atlantic sturgeon population segment to the remainder of the subspecies to which it belongs.

Discreteness

The joint DPS policy states that a population of a vertebrate species may be considered discrete if it satisfies either one of the following conditions: (1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors (quantitative measures of genetic or morphological discontinuity may provide evidence of this separation) or (2) it is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of Section 4(a)(1)(D) of the ESA.

Atlantic sturgeon throughout their range exhibit ecological separation during spawning that has resulted in multiple genetically distinct interbreeding population segments. Tagging studies and genetic analyses provide the evidence of this ecological separation (Wirgin *et al.,* 2000; King *et al.,* 2001; Waldman *et al.,* 2002; ASSRT, 2007; Grunwald *et al.,* 2008). As previously discussed, though adult and subadult Atlantic sturgeon originating from different rivers mix in the marine environment (Stein *et al.,* 2004a), the vast majority of Atlantic sturgeon return to their natal rivers to spawn, with some studies showing one or two individuals per generation spawning outside their natal river system (Wirgin *et al.,* 2000; King *et al.,* 2001; Waldman *et al.,* 2002). In addition, spawning in the various river systems occurs at different times, with spawning occurring earliest in southern systems and occurring as much as 5 months later in the northernmost river systems (Murawski and Pacheco, 1977; Smith, 1985; Rogers and Weber, 1995; Weber and Jennings, 1996; Bain, 1997; Smith and Clugston, 1997; Moser *et al.,* 1998; Caron *et al.,* 2002). Therefore, the ecological separation of the interbreeding units of Atlantic sturgeon results primarily from spatial separation (*i.e.,* very few fish spawning outside their natal river systems), as well as temporal separation (spawning populations becoming active at different times along a continuum from north to south).

Genetic analyses of mitochondrial DNA (mtDNA), which is maternally inherited, and nuclear DNA (nDNA), which reflects the genetics of both parents, provides evidence of the separation amongst Atlantic sturgeon populations in different rivers (Bowen and Avise, 1990; Ong *et al.,* 1996; Waldman *et al.,* 1996a; Waldman *et al.,* 1996b; Waldman and Wirgin, 1998; Waldman *et al.,* 2002; King *et al.,* 2001; Wirgin *et al.,* 2002; Wirgin *et al.,* 2005; Wirgin and King, 2006; Grunwald *et al.,* 2008). Overall, these studies consistently found Atlantic sturgeon to be genetically diverse, and offered that between seven and ten Atlantic sturgeon population groupings can be statistically differentiated range-wide (King *et al.,* 2001; Waldman *et al.,* 2002; Wirgin *et al.,* 2002; Wirgin *et al.,* 2005; ASSRT, 2007 (Tables 4 and 5); Grunwald *et al.,* 2008).

Given a number of key differences amongst the studies (*e.g.,* the analytical and/or statistical methods used, the number of rivers sampled, and whether samples from subadults were included), it is not unexpected that each reached a different conclusion as to the number of Atlantic sturgeon population groupings. Wirgin and King (2006) refined the genetic analyses for Atlantic sturgeon to address such differences in prior studies. Most notably, they increased sample sizes from multiple rivers and limited the samples analyzed to those collected from YOY and mature adults (greater than 130 cm total length) to ensure that the fish originated from the river in which it was sampled. The results of the refined analysis by Wirgin and King (2006) are presented in the status review report (ASSRT, 2007; *e.g.,* Table 6 and Figure 17); both the mtDNA haplotype and nDNA allelic frequencies analyzed by Wirgin and King (2006) indicated that Atlantic sturgeon river populations are genetically differentiated. The results of the mtDNA analysis used for the status review report were also subsequently published by Grunwald *et al.* (2008). In comparison to the mtDNA analyses of the status review report, Grunwald *et al.* (2008) used additional samples, some from fish in the size range (less than 130 cm) excluded by Wirgin and King because they were smaller than those considered to be mature adults. Nevertheless, the results were qualitatively the same and demonstrated that each of the 12 sampled Atlantic sturgeon populations could be genetically differentiated (Grunwald *et al.,* 2008).

Genetic distances and statistical analyses (bootstrap values and assignment test values) were used to investigate significant relationships among, and differences between, Atlantic sturgeon river populations (ASSRT, 2007; Table 6 and Figures 16–18). Overall, the genetic markers used in this analysis resulted in an average accuracy of only 88 percent for determining a sturgeon's natal river origin, but an average accuracy of 94 percent for correctly classifying it to one of five groups of populations (Kennebec River, Hudson River, James River, Albemarle Sound, and Savannah/Ogeechee/Altamaha Rivers) when using microsatellite data collected only from YOY and adults (ASSRT, 2007; Table 6). A phylogenetic tree (a neighbor joining tree) was produced from only YOY and adult samples (to reduce the likelihood of including strays from other populations) using the microsatellite analysis (ASSRT, 2007; Figure 17). Bootstrap values (which measure how consistently the data support the tree structure) for this tree were high (equal to or greater than 87 percent, and all but one over 90 percent) (ASSRT, 2007). Regarding sturgeon from southeast rivers, this analysis resulted in a range of 60 to 92 percent accuracy in determining a sturgeon's natal river origin, but 92 and 96 percent accuracy in correctly classifying a sturgeon from four sampled river populations (the Albemarle Sound, Savannah, Ogeechee, and Altamaha River populations) to two groupings of river populations (Albemarle Sound and Savannah/Ogeechee/Altamaha Rivers). These two groupings exhibited clear separation from northern populations and from each other.

Genetic samples for YOY and spawning adults were not available for river populations originating between the Albemarle Sound and the other three rivers. However, nDNA from an expanded dataset that included juvenile Atlantic sturgeon was used to produce a neighbor-joining tree with bootstrap values (ASSRT, 2007; Figure 18). This dataset included additional samples from the Santee-Cooper, Waccamaw, and Edisto populations in the Southeast. Atlantic sturgeon river populations also grouped into five population segments in this analysis. Atlantic sturgeon from the Santee-Cooper system grouped with the Albemarle Sound population, while the other two river populations grouped with the Savannah/Ogeechee/Altamaha River population segment. With the exception of the Waccamaw River population, all river populations sampled within each population segment along the entire East Coast were geographically adjacent. The Waccamaw River population grouped with the Edisto/Savannah/Ogeechee/Altamaha River population segment, even though it is geographically located between Albemarle Sound and the Santee and Cooper Rivers. However, we attributed this to the small sample size (21 fish) from the Waccamaw River. From the seven Southeast river populations included in the analysis, we determined that river populations from the ACE Basin southward grouped together and that river populations between the Santee-Cooper system and Albemarle Sound (Roanoke River) grouped together.

The higher accuracy in identifying Atlantic sturgeon to one of two population groupings (Albemarle Sound/Santee-Cooper Rivers and Ogeechee/Savannah/Altamaha/Edisto Rivers) compared to their natal rivers supports the fact that these multiple-river population segments are discrete from each other.

We have considered the information on Atlantic sturgeon population structuring provided in the status review report and Grunwald *et al.* (2008). The nDNA analyses described in the status review report provide additional genetics information, and include chord distances and bootstrap values to support the findings for population structuring of Atlantic sturgeon within the United States. Therefore, based on genetic differences observed between certain river populations and the assumption that adjacent river populations are more likely to breed with one another than river populations from rivers that are not adjacent to each other, five discrete Atlantic sturgeon population segments in the United States meet the DPS Policy's Discreteness criterion, with two located in the Southeast: (1) The "Carolina" population segment, which includes Atlantic sturgeon originating from the Roanoke, Tar/Pamlico, Cape Fear, Waccamaw, Pee Dee, and Santee-Cooper Rivers, and (2) the "South Atlantic" population segment, which includes Atlantic sturgeon originating from the ACE Basin (Ashepoo, Combahee, and Edisto rivers), Savannah, Ogeechee, Altamaha, and Satilla Rivers.

Significance

When the discreteness criterion is met for a potential DPS, as it is for the Carolina and South Atlantic population segments in the Southeast identified above, the second element that must be considered under the DPS policy is significance of each DPS to the taxon as a whole. The DPS policy cites examples of potential considerations indicating significance, including: (1) Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon; (2) evidence that loss of the discrete population segment would result in a significant gap in the range of the taxon; (3) evidence that the DPS represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or, (4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

We believe that the Carolina and South Atlantic population segments persist in ecological settings unique for the taxon. This is evidenced by the fact that spawning habitat of each population grouping is found in separate and distinct ecoregions that were identified by The Nature Conservancy (TNC) based on the habitat, climate, geology, and physiographic differences for both terrestrial and marine ecosystems throughout the range of the Atlantic sturgeon along the Atlantic coast (Figure 1). TNC descriptions do not include detailed information on the chemical properties of the rivers within each ecoregion, but include an analysis of bedrock and surficial geology type because it relates to water chemistry, hydrologic regime, and substrate. It is well established that waters have different chemical properties (*i.e.,* identities) depending on the geology of where the waters originate.

Riverine spawning habitat of the Carolina population segment occurs within the Mid-Atlantic Coastal Plain ecoregion, which is described as consisting of bottomland hardwood forests, swamps, and some of the world's most active coastal dunes, sounds, and estuaries. Natural fires, floods, and storms are so dominant in this region that the landscape changes very quickly. Rivers routinely change their courses and emerge from their banks. The TNC lists the most significant threats (sources of biological and ecological stress) in the region as: global climate change and rising sea-level; altered surface hydrology and landform alteration (*e.g.,* flood-control and hydroelectric dams, inter-basin transfers of water, drainage ditches, breached levees, artificial levees, dredged inlets and river channels, beach renourishment, and spoil deposition banks and piles); a regionally receding water table, probably resulting from both over-use and inadequate recharge; fire suppression; land fragmentation, mainly by highway development; land-use conversion (*e.g.,* from forests to timber plantations, farms, golf courses, housing developments, and resorts); the invasion of exotic plants and animals; air and water pollution, mainly from agricultural activities including concentrated animal feed operations; and over-harvesting and poaching of species. Many of the Carolina population segment's spawning rivers, located in the Mid-Coastal Plain, originate in areas of marl. Waters draining calcareous, impervious surface materials such as marl are likely to be alkaline, dominated by surface run-off, have little groundwater connection, and be seasonally ephemeral.

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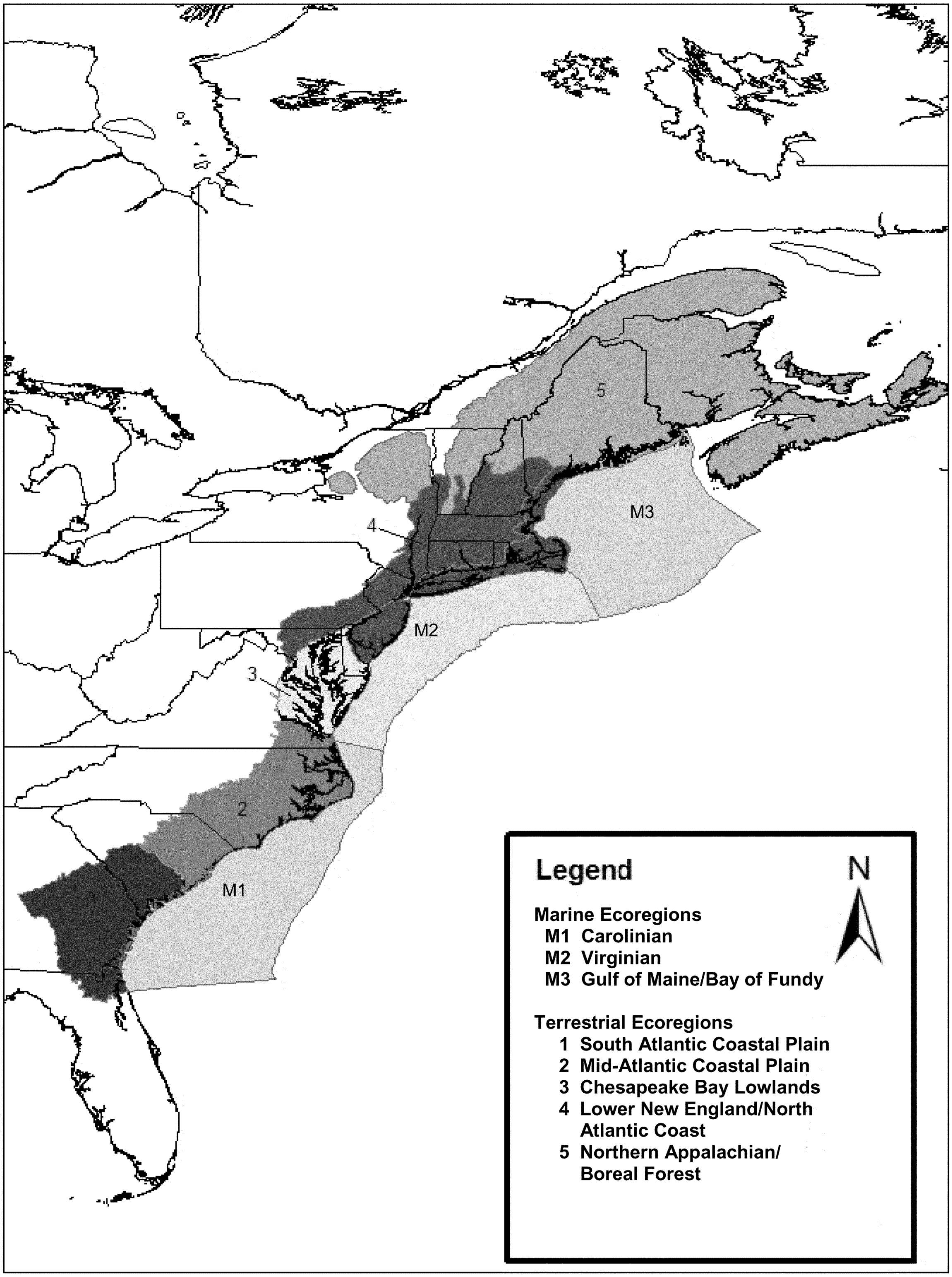

Figure 1: Map of TNC Marine and Terrestrial Ecoregions

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

Therefore, the ecoregion delineations support that the physical and chemical properties of the Atlantic sturgeon spawning rivers utilized by the Carolina and South Atlantic DPSs are unique to each population segment. Since reproductive isolation accounts for the discreteness of each population segment, the Carolina and South Atlantic population segments of Atlantic sturgeon are "significant" as defined in the DPS policy given that the spawning rivers for each population segment occur in a unique ecological setting.

The loss of either the Carolina or the South Atlantic population segments of Atlantic sturgeon would create a significant gap in the range of the taxon. The loss of the Carolina population segment would result in a 475-mile (764-kilometer (km)) gap between the northern population segments and the South Atlantic population segment. The loss of the South Atlantic population segment would truncate the southern range of Atlantic sturgeon by greater than 150 miles (241 km). Though Atlantic sturgeon travel great distances in the marine environment and may use multiple river systems for foraging and nursery habitat, the range occupied by the Carolina and South Atlantic population segments would likely not be recolonized by a new, viable spawning population if either population segment was lost. Based on genetic analyses showing that fewer than two individuals per generation spawn outside their natal rivers (Secor and Waldman, 1999), we do not expect Atlantic sturgeon that originate from other population segments to re-colonize extirpated systems and establish new spawning populations, except perhaps over a long time frame (*i.e.,* many Atlantic sturgeon generations). Therefore, the loss of either the Carolina or South Atlantic population segments would result in a significant gap in the range of Atlantic sturgeon over a long time frame, and negatively impact the species as a whole because the loss of either population segment would constitute an important loss of genetic diversity for the Atlantic sturgeon.

The information presented above describes: (1) Persistence of the Carolina and South Atlantic population segments in ecological settings that are unique for the Atlantic sturgeon as a whole; and (2) evidence that loss of either population segment would result in a significant gap in the range of the taxon. Based on this information, we concur with the SRT's conclusion that the Carolina and South Atlantic population segments meet the discreteness and significance criteria outlined in the DPS policy. We hereafter refer to these DPSs as the Carolina and South Atlantic DPSs. Figure 2 shows the riverine and U.S. marine ranges of the Carolina and South Atlantic DPSs.

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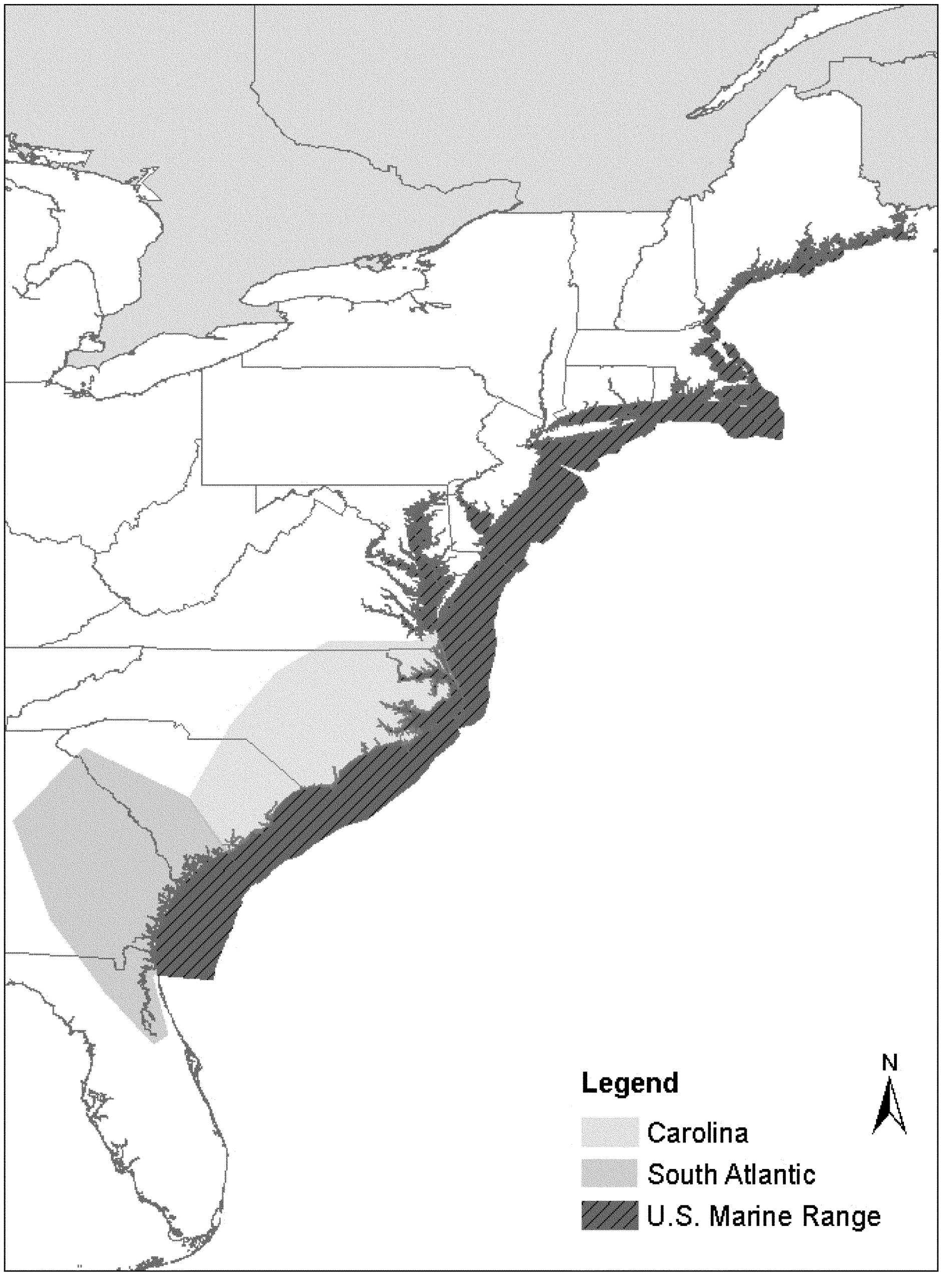

Figure 2: Depiction of the U.S. Atlantic sturgeon DPSs showing rivers in which the species are known to occur. Shading denotes the general area for each DPS in which other rivers used by Atlantic sturgeon belonging to that DPS may occur.

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Conservation Status

We will now consider the conservation status of the two DPSs in the Southeast Region's jurisdiction, the Carolina and South Atlantic DPSs, in relation to the ESA's standards for listing. We will determine whether each DPS meets the definition of "endangered" or "threatened" as defined in section 3 of the ESA, and whether that status is a result of one or a combination of the factors listed under section 4(a)(1) of the ESA. An endangered species is "any species which is in danger of extinction throughout all or a significant portion of its range" and a threatened species is one "which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

The abundance of Atlantic sturgeon has decreased dramatically within the last 150 years. A major fishery for Atlantic sturgeon developed in 1870 when a caviar market was established (Smith and Clugston, 1997). Record landings in the U.S. were reported in 1890, with over 7,385,000 lbs (3,350,000 kg) of Atlantic sturgeon landed from coastal rivers along the entire Atlantic Coast (Smith and Clugston, 1997; Secor and Waldman, 1999). Ten years after peak landings, the fishery collapsed in 1901, when less than 10 percent (650,365 lbs, 295,000 kg) of the U.S. 1890 peak landings were reported. The landings continued to decline coastwide, reaching about 5 percent of the peak in 1920. During the 1950s, the remaining U.S. fishery switched to targeting sturgeon for flesh, rather than caviar, and coastwide landings remained between 1 and 5 percent of the 1890 peak levels until the Atlantic sturgeon fishery was closed by ASMFC in 1998.

The Carolina DPS includes all Atlantic sturgeon that spawn in the watersheds from the Roanoke River, Virginia, southward along the southern Virginia, North Carolina, and South Carolina coastal areas to the Cooper River. The marine range of Atlantic sturgeon from the Carolina DPS extends from the Bay of Fundy, Canada, to the Saint Johns River, Florida. While Atlantic sturgeon exhibit a high degree of spawning fidelity to their natal rivers, multiple riverine, estuarine, and marine habitats may serve various life (*e.g.,* nursery, foraging, and migration) functions. Rivers known to have current spawning populations within the range of this DPS include the Roanoke, Tar-Pamlico, Cape Fear, Waccamaw, and Pee Dee Rivers. There may also be spawning populations in the Neuse, Santee and Cooper Rivers, though it is uncertain at this time. Historically, both the Sampit and Ashley Rivers were documented to have spawning populations at one time. However, the spawning population in the Sampit River is believed to be extirpated and the current status of the spawning population in the Ashley River is unknown. Both rivers may be used as nursery habitat by young Atlantic sturgeon originating from other spawning populations. This represents our current knowledge of the river systems utilized by the Carolina DPS for specific life functions, such as spawning, nursery habitat, and foraging. However, fish from the Carolina DPS likely use other river systems than those listed here for their specific life functions. The Carolina DPS also includes Atlantic sturgeon held in captivity (*e.g.,* aquaria, hatcheries, and scientific institutions) and which are identified as fish belonging to the Carolina DPS based on genetics analyses, previously applied tags, previously applied marks, or documentation to verify that the fish originated from (hatched in) a river within the range of the Carolina DPS, or is the progeny of any fish that originated from a river within the range of the Carolina DPS. NMFS has no records of Atlantic sturgeon from the Carolina DPS being held in captivity.

Historical landings data indicate that between 7,000 and 10,500 adult female Atlantic sturgeon were present in North Carolina prior to 1890 (Armstrong and Hightower, 2002; Secor, 2002). Secor (2002) estimates that 8,000 adult females were present in South Carolina during that same timeframe. Prior reductions from the commercial fishery and ongoing threats have drastically reduced the numbers of Atlantic sturgeon within the Carolina DPS. Currently, the Atlantic sturgeon spawning population in at least one river system within the Carolina DPS has been extirpated, with a potential extirpation in an additional system. The abundance of the remaining river populations within the DPS, each estimated to have fewer than 300 spawning adults, is estimated to be less than 3 percent of what it was historically (ASSRT, 2007). Though directed fishing and possession of Atlantic sturgeon is no longer legal, the Carolina DPS continues to face threats such as habitat alteration and bycatch. The presence of dams has resulted in the loss of over 60 percent of the historical sturgeon habitat on the Cape Fear River and in the Santee-Cooper system. This has resulted in the loss of important spawning and juvenile developmental habitat and has reduced the quality of the remaining habitat by affecting water quality parameters (such as depth, temperature, velocity, and dissolved oxygen) that are important to sturgeon.

The South Atlantic DPS includes all Atlantic sturgeon that spawn in the watersheds of the ACE Basin in South Carolina to the St. Johns River, Florida. The marine range of Atlantic sturgeon from the South Atlantic DPS extends from the Bay of Fundy, Canada, to the Saint Johns River, Florida. While Atlantic sturgeon exhibit a high degree of spawning fidelity to their natal rivers, multiple riverine, estuarine, and marine habitats may serve various life (*e.g.,* nursery, foraging, and migration) functions. Rivers known to have current spawning populations within this DPS include the Combahee, Edisto, Savannah, Ogeechee, Altamaha, and Satilla Rivers. Historically, both the Broad-Coosawatchie and St. Marys Rivers were documented to have spawning populations at one time; there is also evidence that spawning may have occurred in the St. Johns River or one of its tributaries. However, the spawning population in the St. Marys River, as well as any historical spawning population present in the St. Johns, is believed to be extirpated, and the status of the spawning population in the Broad-Coosawatchie is unknown. Both the St. Marys and St. Johns Rivers are used as nursery habitat by young Atlantic sturgeon originating from other spawning populations. The use of the Broad-Coosawatchie by sturgeon from other spawning populations is unknown at this time. The presence of historical and current spawning populations in the Ashepoo River has not been documented; however, this river may currently be used for nursery habitat by young Atlantic sturgeon originating from other spawning populations. This represents our current knowledge of the river systems utilized by the South Atlantic DPS for specific life functions, such as spawning, nursery habitat, and foraging. However, fish from the South Atlantic DPS likely use other river systems than those listed here for their specific life functions. The South Atlantic DPS also includes Atlantic sturgeon held in captivity (*e.g.,* aquaria, hatcheries, and scientific institutions) and which are identified as fish belonging to the South Atlantic DPS based on genetics analyses, previously applied tags, previously applied marks, or documentation to verify that the fish originated from (hatched in) a river within the range of the South Atlantic DPS, or is the progeny of any fish that originated from a river within the range of the South Atlantic DPS. Ten Atlantic sturgeon taken from the Altamaha River are currently being held at the Bears Bluff National Fish Hatchery in Warm Springs, Georgia, though it is not certain whether those fish were spawned in the Altamaha or were migrants from another river system. NMFS has no other records of Atlantic sturgeon from the South Atlantic DPS being held in captivity.

Secor (2002) estimated that 8,000 spawning female Atlantic sturgeon were present in South Carolina. Historically, the population of spawning female Atlantic sturgeon in Georgia was estimated at 11,000 fish per year prior to 1890 (Secor, 2002). Prior reductions from the commercial fishery and ongoing threats have drastically reduced the numbers of Atlantic sturgeon within the South Atlantic DPS. Currently, the Atlantic sturgeon spawning population in one (possibly two) river systems within the South Atlantic DPS have been extirpated. The Altamaha River, with an estimated 343 spawning adults per year, is suspected to be less than 6 percent of its historical abundance, extrapolated from the 1890s commercial landings; the abundance of the remaining river populations within the DPS, each estimated to have fewer than 300 spawning adults, is estimated to be less than 1 percent of what it was historically (ASSRT, 2007). While the directed fishery that originally drastically reduced the numbers of Atlantic sturgeon has been closed, other impacts have contributed to their low population numbers, may have contributed to the extirpation of some spawning populations, and are likely inhibiting recovery of extant river populations. Historically, Atlantic sturgeon likely accessed all parts of the St. Johns River, as American shad were reported as far upstream as Lake Poinsett (reviewed in McBride, 2000). However, the construction of Kirkpatrick Dam (originally Rodman Dam) at river mile (RM) 95 (river km (RKM) 153) restricted migration to potential spawning and juvenile developmental habitat upstream. Approximately 63 percent of historical sturgeon habitat is believed to be blocked due to the dam (ASSRT, 2007), and there is no longer a spawning population in the St. Johns River.

Small numbers of individuals resulting from drastic reductions in populations, such as occurred with Atlantic sturgeon due to the commercial fishery, can remove the buffer against natural demographic and environmental variability provided by large populations (Berry, 1971; Shaffer, 1981; Soule, 1980). Though the Carolina and South Atlantic DPSs, made up of multiple river populations of Atlantic sturgeon, were determined to be genetically discrete, interbreeding population units, the vast majority of Atlantic sturgeon return to their natal rivers to spawn, with fewer than two migrants per generation spawning outside their natal system (Wirgin *et al.,* 2000; King *et al.,* 2001; Waldman *et al.,* 2002). Therefore, it is important to look at each riverine spawning population within each DPS when considering the effects of a small population size on the extinction risk for the DPS. Though there is no absolute population size above which populations are "safe" and below which they face an unacceptable risk of extinction (Gilpin and Soule, 1986; Soule and Simberloff, 1986; Ewens *et al.,* 1987; Goodman, 1987; Simberloff, 1988; Thomas, 1990), some have argued that "rules of thumb" can and should be applied (Soule, 1987; Thompson, 1991). Salwasser *et al.* (1984) prescribe a minimum viable population size of at least 1,000 adults. Belovsky (1987) indicates that a minimum viable population in the range of 1,000 to 10,000 adults should be sufficient for a mid-sized vertebrate species. Soule (1987) suggests that minimum viable population sizes for vertebrate species should be in the "low thousands" or higher. Thomas (1990) offers a population size of 5,500 as "a useful goal," but suggests that where uncertainty is extreme "we should usually aim for population sizes from several thousand to ten thousand." In a NOAA Technical Memorandum "Determining Minimum Viable Populations under the ESA," Thompson (1991) states the "50/500" rule of thumb initially advanced by Franklin (1980) and Soule (1980) comes the closest of any to attaining "magic number" status. Franklin (1980) has suggested that, simply to maintain short-term fitness (*i.e.,* prevent serious in-breeding and its deleterious effects), the minimum effective population size should be around 50. He further recommended that, to maintain sufficient genetic variability for adaptation to changing environmental conditions, the minimum effective population size should be around 500. Soule (1980) has pointed out that, above and beyond preserving short-term fitness and genetic adaptability, long-term evolutionary potential (at the species level) may well require a number of substantially larger populations. It is important to note that the 50/500 rule is cast in terms of effective population size, a concept introduced by Wright (1931). The effective population size refers to an ideal population of breeding individuals produced each generation by random union of an equal number of male and female gametes randomly drawn from the previous generation. To the extent that this ideal is violated in nature, the effective population size is generally smaller than the overall number of mature individuals in the population. It is not possible to calculate the effective population sizes of the riverine spawning populations in the Carolina or the South Atlantic DPS. However, even under ideal circumstances where the effective population size is equal to the overall numbers of adults, the spawning populations are all believed to be smaller than the 500 recommended by Thompson (1991) to maintain sufficient genetic variability for adaptation to changing environmental conditions, and certainly smaller than the 1,000 to 10,000 recommended by other authors. It is not known if certain riverine populations are at an abundance smaller than the minimum effective population size of 50 that would prevent serious in-breeding (Thompson, 1991). Moreover, in some rivers, spawning by Atlantic sturgeon may not be contributing to population growth because of lack of suitable habitat and other stressors on juvenile survival and development.

The concept of a viable population able to adapt to changing environmental conditions is critical to Atlantic sturgeon, and the low population numbers of every river population in the Carolina and South Atlantic DPSs put them in danger of extinction throughout their ranges; none of the populations are large or stable enough to provide with any level of certainty for continued existence of Atlantic sturgeon in this part of its range. While the directed fishery that originally drastically reduced the numbers of Atlantic sturgeon has been closed, recovery of depleted populations is an inherently slow process for a late-maturing species such as Atlantic sturgeon, and they continue to face a variety of other threats that contribute to their risk of extinction. Their late age at maturity provides more opportunities for individual Atlantic sturgeon to be removed from the population before reproducing. While a long life-span also allows multiple opportunities to contribute to future generations, it also increases the timeframe over which exposure to the multitude of threats facing the Carolina and South Atlantic DPS can occur. These threats include the loss, reduction, and degradation of habitat resulting from dams, dredging, and changes in water quality parameters (such as depth, temperature, velocity, and dissolved oxygen). Even with a moratorium on directed fisheries, bycatch is a threat to both the Carolina and South Atlantic DPSs. Fisheries known to incidentally catch Atlantic sturgeon occur throughout the marine range of the species and in some riverine waters as well. Because Atlantic sturgeon mix extensively in marine waters and may use multiple river systems for spawning, foraging, and other life functions, they are subject to being caught in multiple fisheries throughout their range. In addition to direct mortality, stress or injury to Atlantic sturgeon taken as bycatch but released alive may result in increased susceptibility to other threats, such as poor water quality (*e.g.,* exposure to toxins). This may result in reduced ability to perform major life functions, such as foraging and spawning, or even post-capture mortality. While some of the threats to the Carolina and South Atlantic DPS have been ameliorated or reduced due to the existing regulatory mechanisms, such as the moratorium on directed fisheries for Atlantic sturgeon, bycatch is currently not being addressed through existing mechanisms. Further, water quality continues to be a problem even with existing controls on some pollution sources and water withdrawal, and dams continue to curtail and modify habitat, even with the Federal Power Act.

We have reviewed the status review report, as well as other available literature and information, and have consulted with scientists and fishery resource managers familiar with Atlantic sturgeon in the Carolina and South Atlantic DPSs. After reviewing the best scientific and commercial information available, we find that both the Carolina and South Atlantic DPSs are in danger of extinction throughout their ranges and thus meet the ESA's definition of an endangered species. Atlantic sturgeon populations declined precipitously decades ago due to directed commercial fishing. The failure of Atlantic sturgeon numbers within the Carolina and South Atlantic DPSs to rebound even after the moratorium on directed fishing was established in 1998 indicates that impacts and threats from limits on habitat for spawning and development, habitat alteration, and bycatch are responsible for the risk of extinction faced by both DPSs. In addition, the persistence of these impacts and threats points to the inadequacy of existing regulatory mechanisms to address and reduce habitat alterations and bycatch. We will address the threats of habitat alteration, bycatch, and the inadequacy of regulatory mechanisms and their contributions to the endangered statuses of the Carolina and South Atlantic DPSs in detail in the following sections of this proposed rule.

Analysis of Section 4(a)(1) Factors' Effects on the Species

The ESA requires us to determine whether any species is endangered or threatened because of any of the following factors: (A) Present or threatened destruction, modification, or curtailment of habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. Listing determinations are made solely on the best scientific and commercial data available and after taking into account any efforts being made by any state or foreign nation to protect the species. The SRT examined each of the aforementioned five factors for their impacts on the Atlantic sturgeon DPSs. The following is a summary of its relevant findings, any additional information that has become available since the status review report was published, and the conclusions that we have made based on the available information.

A. Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range

Habitat alterations considered by the SRT that affect the status of sturgeon populations include: dam and tidal turbine construction and operation; dredging, disposal, and blasting; and water quality modifications, such as changes in levels of DO, water temperature, and contaminants. Atlantic sturgeon, like all anadromous fish, are vulnerable to a host of habitat impacts because they use rivers, estuaries, bays, and the ocean at various points of their life. In addition to the habitat alterations considered by the SRT, other emerging threats to habitat considered in this section are drought, intra- and inter-state water allocation issues, and climate change. These threats have the potential to further exacerbate habitat modifications evaluated by the SRT. Because they were not evaluated in the status review report, they are considered in more detail in this section. In this section, we summarize the threats for each DPS that we believe represent a present or threatened destruction, modification or curtailment of the DPS's habitat or range and are contributing to the endangered status of both DPSs.

Dams

Dams are a threat to the Carolina and South Atlantic DPS that contributes to their endangered status by curtailing the extent of available habitat, as well as modifying sturgeon habitat downstream through a reduction in water quality. As noted in the status review report, dams for hydropower generation, flood control, and navigation adversely affect Atlantic sturgeon habitat by impeding access to spawning, developmental and foraging habitat, modifying free-flowing rivers to reservoirs, physically damaging fish on upstream and downstream migrations, and altering water quality in the remaining downstream portions of spawning and nursery habitat. Attempts to minimize the impacts of dams using measures such as fish passage have not proven beneficial to Atlantic sturgeon, as they do not regularly use existing fish passage devices, which are generally designed to pass pelagic fish. To date, only four Atlantic sturgeon have been documented to have passed via a fish lift (three at the St. Stephens fish lift in South Carolina and one at the Holyoke Dam in Massachusetts), as these passage facilities are not designed to accommodate adult-sized sturgeon. While there has not been a large loss of Atlantic sturgeon habitat throughout the entire species' range due to the presence of dams, individual riverine systems have been severely impacted by dams, as access to large portions of historical sturgeon spawning and juvenile developmental habitat has been eliminated or restricted. The SRT used GIS tools and dam location data collected by Oakley (2003) as reference points for river kilometer measurements to map historical rivers in which Atlantic sturgeon spawned. This information was then used to determine the number of kilometers of available habitat. Within the Carolina and South Atlantic DPSs, the Cape Fear, Santee-Cooper, and St. Johns River systems have lost greater than 60 percent of the habitat historically used for spawning and juvenile development.

The Cape Fear River has three locks and dams (constructed from 1915 to 1935) between Wilmington and Fayetteville that are located below the fall line; two additional dams, Buckhorn and B. Everette Jordan, are located above the fall line. Atlantic sturgeon movement is blocked at the first lock and dam located in Riegelwood, North Carolina, which was constructed in 1915. Pelagic species can pass over the three locks and dams during high water, but the benthic Atlantic sturgeon is not known to pass over these three locks/dams. No Atlantic sturgeon have been captured upstream of Lock and Dam #1 despite extensive sampling efforts (Moser *et al.,* 1998). Exact historical spawning locations are unknown in the Cape Fear River, but Atlantic sturgeon spawning is generally believed to occur in flowing water between the salt front and fall line of large rivers (Borodin, 1925; Leland, 1968; Scott and Crossman, 1973; Crance, 1987; Bain *et al.,* 2000). Therefore, sturgeon researchers judge the fall line to be the likely upper limit of spawning habitat. Using the fall line as a guide, only 36 percent of the historical habitat is available to Atlantic sturgeon. 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.

The Santee-Cooper Hydroelectric Project is located in the coastal plain of the Santee Basin on the Santee and Cooper Rivers, South Carolina. The project was finished in 1942 and includes Lake Marion, which is impounded by the Santee Dam (Wilson Dam) on the Santee River at RM 87 (RKM 140), and Lake Moultrie, which is impounded by the Pinopolis Dam on the Cooper River at RM 48 (RKM 77). 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 today. Although fish lifts operate at the Pinopolis and St. Stephens Dams during the spring, observations of sturgeon in the lifts are extremely rare (traditional fish passage designs are not typically successful for sturgeon). There is no record of an adult Atlantic sturgeon being lifted, although three dead Atlantic sturgeon were observed in Lake Marion between 1995 and 1997, and in 2007, an Atlantic sturgeon entered the St. Stephens fishway and was physically removed and translocated downstream into the Santee River (A. Crosby, SCDNR, Pers. Comm.)

In addition to blocking access to habitat, dams can degrade spawning, nursery, and foraging habitat downstream by reducing water quality. Flow, water temperature, and oxygen levels in the Roanoke River are affected by the Kerr Dam and the Gaston Dam/ Roanoke Rapids facilities, which engage in peaking operations. Riverine water flow has already been modified by the dam operators during the striped bass spawning season to simulate natural flow patterns; these modifications undoubtedly benefit Atlantic sturgeon. Regardless of the temporary modifications, lower water temperatures resulting from the hypolimnetic discharge from Kerr Dam have caused temporal shifts in the spawning peaks for both American shad and striped bass and likely have had the same impact for other diadromous species, including Atlantic sturgeon (ASSRT, 2007). High flows from Kerr Dam during the summer are coupled with high ambient temperatures and an influx of swamp water with low DO, creating a large, hypoxic plume within the river. Fish kills have been documented to occur during this time (ASSRT, 2007), and sturgeon are more highly sensitive to low DO (less than 5 milligrams per liter (mg/L)) than other fish species (Niklitschek and Secor, 2009a, 2009b). Low DO in combination with high temperature is particularly problematic for Atlantic sturgeon, and studies have shown that juvenile Atlantic sturgeon experience lethal and sublethal (metabolic, growth, feeding) effects as DO drops and temperatures rise (Niklitschek and Secor, 2009a, 2009b; Niklitschek and Secor, 2005; Secor and Gunderson, 1998). Therefore, it is likely that dam operations are negatively affecting Atlantic sturgeon nursery habitat in the lower Roanoke River.

Dredging

Dredging is a present threat to both the Carolina and South Atlantic DPSs and is contributing to their endangered status by modifying the quality and availability of Atlantic sturgeon habitat. Riverine, nearshore, and offshore areas are often dredged to support commercial shipping and recreational boating, construction of infrastructure, and marine mining. Environmental impacts of dredging include the direct removal/ burial of organisms; turbidity/siltation effects; contaminant resuspension; noise/disturbance; alterations to hydrodynamic regime and physical habitat; and actual loss of riparian habitat (Chytalo, 1996; Winger *et al.,* 2000). According to Smith and Clugston (1997), dredging and filling impact important habitat features of Atlantic sturgeon as they disturb benthic fauna, eliminate deep holes, and alter rock substrates. To reduce the impacts of dredging on anadromous fish species, most of the Atlantic states impose work restrictions during sensitive time periods (spawning, migration, feeding) when anadromous fish are present. NMFS also imposes seasonal restrictions to protect shortnose sturgeon populations (where present) through Section 7 consultations that may have the added benefit of protecting Atlantic sturgeon where the two species co-occur. Within the Carolina DPS, dredging operations (including the blasting of rock) on the lower Cape Fear River, Brunswick River, and port facilities at the U.S. Army's Sunny Point Military Ocean Terminal and Port of Wilmington are extensive. To protect diadromous fish, restrictions are placed on dredging to avoid sensitive seasons and locations, such as potential spawning habitat (February 1 through June 30) and suspected nursery grounds (April 1 through September 30). However, while the restrictions prevent dredging from occurring when Atlantic sturgeon are expected to be present, the effects of dredging on Atlantic sturgeon habitat remain long after the dredging has been completed. Moser and Ross (1995) found that some of the winter holding sites favored by sturgeon in the lower Cape Fear River estuary also support very high levels of benthic infauna and may be important feeding stations. Repeated dredging in the Cape Fear River can modify sturgeon habitat through the removal or burial of benthic infauna in feeding grounds and creation of unsuitable substrate in spawning grounds (ASSRT, 2007). Similar habitat modifications are occurring in the Cooper River, which flows into Charleston Harbor, one of the busiest ports on the Atlantic Coast, and is dredged regularly. The river channel is maintained by dredging all the way to the Pinopolis Dam. No seasonal restrictions are placed on dredging in the Cooper River, potentially interrupting spawning activities (ASSRT, 2007).

In the South Atlantic DPS, maintenance dredging in Atlantic sturgeon nursery habitat in the Savannah River is frequent, and substantial channel deepening took place in 1994. The Georgia Ports Authority is seeking to expand its port facility on the Savannah River. Within the 1999 Water Resources Development Act, Congress authorized the deepening of the Savannah Navigation Channel from the current depth of –42 to –48 ft (–12.8 to –14.6 m) mean low water. Hydrodynamic and water quality models have been developed to predict changes in water quality across depth and throughout the channel. The channel deepening is predicted to alter overall water quality (*e.g.,* salinity and DO), creating inhospitable foraging/ resting habitat in the lower Savannah River for sturgeon. The lower Savannah River is heavily industrialized and serves as a major shipping port. Nursery habitat in the lower river has been heavily impacted by diminished water quality and channelization. Reduced DO levels and upriver movement of the salt wedge are predicted to result from channel deepening. Sturgeon are highly sensitive to low DO, more so than other fish species (Niklitschek and Secor, 2009a, 2009b). Because Atlantic sturgeon spawn above the interface between fresh water and salt water, the upriver movement of the salt wedge will curtail the extent of Atlantic sturgeon habitat in the Savannah River. Dredging also commonly occurs within the St. Johns River and has been linked to the reduction in submerged aquatic vegetation where Atlantic sturgeon likely forage (Jordan, 2002). Though there is currently no resident spawning population in the St. Johns, it still provides nursery habitat for juvenile Atlantic sturgeon in the South Atlantic DPS (NMFS and USFWS, 1998). Over 60 percent of the historical sturgeon habitat in the St. Johns River has already been curtailed by the presence of a dam, and dredging modifies the quality of the remaining nursery habitat in the river.

Water Quality

Degraded water quality is a present threat to the Carolina and South Atlantic DPSs and is contributing to their endangered status by modifying and curtailing the extent of available habitat for spawning and nursery areas. Atlantic sturgeon rely on a variety of water quality parameters to successfully carry out their life functions. Low DO and the presence of contaminants modify the quality of Atlantic sturgeon habitat and in some cases, curtail the extent of suitable habitat for life functions. Secor (1995) noted a correlation between low abundances of sturgeon during this century and decreasing water quality caused by increased nutrient loading and increased spatial and temporal frequency of hypoxic conditions. Of particular concern is the high occurrence of low DO coupled with high temperatures in the river systems throughout the range of the Carolina and South Atlantic DPSs. Sturgeon are more highly sensitive to low DO than other fish species (Niklitschek and Secor, 2009a, 2009b) and low DO in combination with high temperature is particularly problematic for Atlantic sturgeon. Studies have shown that juvenile Atlantic sturgeon experience lethal and sublethal (metabolic, growth, feeding) effects as DO drops and temperatures rise (Niklitschek and Secor, 2009a, 2009b; Niklitschek and Secor, 2005; Secor and Gunderson, 1998). Water quality within the river systems in the range of the Carolina and South Atlantic DPSs is also negatively impacted by contaminants and large water withdrawals.

For the Carolina DPS, water quality in the Pamlico system, especially in the lower Neuse River, is highly degraded (Paerl *et al.,* 1998; Qian *et al.,* 2000; Glasgow *et al.,* 2001). The entire basin has been designated as nutrient-sensitive, and additional regulatory controls are being implemented to improve water quality. Both the Neuse and Pamlico portions of the estuary have been subject to seasonal episodes of anoxia that significantly affect the quality of Atlantic sturgeon nursery habitat. Concentrated animal feeding operations (CAFOs) cause at least some portion of the current water quality problems in the Pamlico watershed (Mallin and Cahoon, 2003). Farms that produce hogs, turkeys, and chickens have proliferated throughout the coastal portion of the basin in the last decade, with increases in both aquatic and atmospheric deposition of nitrogenous waste products. North Carolina passed a moratorium in 1997 limiting additional hog operations and is conducting a study of measures to address the problem; the moratorium was renewed in 1999 and 2003. Water quality in the Cape Fear River is poor for aquatic life, due largely to industrial development and use, including the Port of Wilmington and numerous industrial point-source discharges. Development of CAFOs in the coastal portion of the Cape Fear River basin has been especially heavy (most concentrated operations of CAFOs occur in the Cape Fear River drainage within North Carolina) and contributes to both atmospheric and aquatic inputs of nitrogenous contamination, possibly causing DO levels to regularly fall below the 5 mg/L state standard (Mallin and Cahoon, 2003). In recent years, fish kills have been observed, usually as a result of blackwater swamps (with low DO) being flushed after heavy rainfall.

Industrialization also threatens the habitat of the Carolina DPS. Paper and steel mills in the Winyah Bay system, which includes the Waccamaw, Pee Dee, and Sampit rivers, have impacted water quality. Riverine sediment samples contain high levels of various toxins including dioxins (NMFS and USFWS, 1998). Though the effects of these contaminants on Atlantic sturgeon are unknown, Atlantic sturgeon are particularly susceptible to impacts from contaminated sediments due to their benthic foraging behavior and long-life span, and effects from these compounds on fish include production of acute lesions, growth retardation, and reproductive impairment (Cooper, 1989; Sinderman, 1994). It should be noted that the effect of multiple contaminants or mixtures of compounds at sublethal levels on fish has not been adequately studied. Atlantic sturgeon use marine, estuarine, and freshwater habitats and are in direct contact through water, diet, or dermal exposure with multiple contaminants throughout their range.

Habitat utilized by the South Atlantic DPS in the Savannah River has also been modified by mercury contamination (ASSRT, 2007). While water quality in the Altamaha River is good at this time, the drainage basin is dominated by silviculture and agriculture, with two paper mills and over two dozen other industries or municipalities discharging effluent into the river. Nitrogen and phosphorus concentrations are increasing, and eutrophication and loss of thermal refugia are growing concerns for the South Atlantic DPS. In the Ogeechee River, the primary source of pollution results from non-point sources, which results in nutrient-loading and decreases in DO. These problems result from the cumulative effect of activities of many individual landowners or managers. The Ogeechee River Basin Watershed Protection Plan developed by the Georgia Environmental Protection Division (GAEPD, 2001b) states that because there are so many small sources of non-point loading spread throughout the watershed, non-point sources of pollution cannot effectively be controlled by state agency permitting and enforcement, even where regulatory authority exists. The increases in nutrients and resulting decreases in DO are coupled with increases in water temperature resulting from clearing of the riparian canopy and increased paved surface areas. Downstream sturgeon nursery habitat is compromised during hot, dry summers when water flow is minimal, and non-point sources of hypoxic waters have a greater impact on the system as potential thermal refugia are lost when the aquifer is lowered. Since 1986, average summer DO levels in the Ogeechee have dropped to approximately 4 mg/L (GAEPD, 2001b). Low DO (less than 5 mg/L), most likely due to non-point sources, was a common occurrence observed during 1998 and 1999 water quality surveys (GAEPD, 2002) in the Satilla River, which serves as both spawning and nursery habitat for sturgeon in the South Atlantic DPS. The extirpation of the Atlantic sturgeon spawning population in the St. Marys River is believed to have been caused by reduced DO levels during the summer in the nursery habitat, probably due to eutrophication from non-point source pollution (ASSRT, 2007). Both the St. Marys and St. Johns Rivers continue to be used as nursery habitat by Atlantic sturgeon in the South Atlantic DPS; however, low DO is a common occurrence during the summer months when water temperatures rise. At times, it is so severe in the St. Marys that it completely eliminates juvenile nursery habitat during the summer (D. Peterson, UGA, Pers. Comm.).

Water allocation issues are a growing threat in the Southeast and exacerbate existing water quality problems. Taking water from one basin and transferring it to another fundamentally and irreversibly alters natural water flows in both the originating and receiving basins, which can affect DO levels, temperature, and the ability of the basin of origin to assimilate pollutants

(Georgia Water Coalition, 2006). Water allocation issues increasingly threaten to exacerbate the present threat of degraded water quality on the endangered status of the Carolina DPS. Even with its generous natural supply of water, North Carolina is experiencing problems where somewhat limited natural availability of water is coupled with high demand or competition among water users. Some of these emerging pressure points are the Central Coastal Plain, where the Cretaceous aquifers have a relatively slow recharge rate; the headwater areas of the Piedmont river basins, where streamflows are greatly reduced during dry weather; and some areas near the coast and on the Outer Banks, where the natural availability of fresh water is limited (NCDENR, 2001a). Interbasin water transfers are increasingly being looked at to deal with the inadequate water availability. In 1993, the North Carolina Legislature adopted the Regulation of Surface Water Transfers Act (G.S. § 143–215.22I). This law regulates large surface water transfers between river basins by requiring a certificate from the North Carolina Environmental Management Commission. The act has been modified several times since it was first adopted, most recently in 2007 when G.S. § 143–215.22I was repealed and replaced with G.S. § 143–215.22L. A transfer certificate is required for a new transfer of 2 million gallons per day (mgd) (7,600 m^3pd) or more and for an increase in an existing transfer by 25 percent or more (if the total including the increase is more than 2 mgd). Certificates are not required for facilities that existed or were under construction prior to July 1, 1993, up to the full capacity of that facility to transfer water, regardless of the transfer amount.

The North Carolina Department of Environment and Natural Resources reports that 20 facilities, with a combined average (not maximum) daily transfer of 66.5 mgd (252,000 m^3pd), were grandfathered in when G.S. § 143–215.22I was enacted (NCDENR, 2009). Since then, five additional facilities have received certificates to withdraw up to a combined maximum total of 167.5 mgd (634,000 m^3pd). The most significant certified interbasin transfer in this group is the withdrawal of 60 mgd (227,000 m^3pd) of water from Lake Gaston (part of the Roanoke River Basin) by Virginia Beach, Virginia. Virginia Beach began pumping in 1998 following a very lengthy and contested Federal Energy Regulatory Commission (FERC) approval process, during which North Carolina opposed the withdrawals (NCDENR, 2001b). Certificates are pending for three facilities, totaling almost 60 mgd (227,000 m^3pd). This includes the Kerr Lake Regional Water System (KLRWS), a regional provider of drinking water. The KLRWS has an existing, grandfathered, surface water transfer capacity of 10 mgd (38,000 m^3pd). The grandfathered capacity allows the system to move water from the Roanoke River Basin (Kerr Lake) to sub-basins of the Tar-Pamlico River Basin. On February 18, 2009, KLRWS submitted a Notice of Intent to Request an Interbasin Transfer Certificate to the Environmental Management Commission. In that notice, KLRWS requested to increase the authorized transfer from 10 mgd to 24 mgd (38,000 m^3pd to 91,000 m^3pd), and to transfer 2.4 mgd (9,100 m^3pd) from the Roanoke River Basin to the Neuse River Basin. These transfer amounts are based on water use projections to the year 2040.

Water allocation issues also increasingly threaten to exacerbate the present threat of degraded water quality on the endangered status of the South Atlantic DPS. Water allocation issues are occurring on the Atlantic Coast of South Carolina and Georgia (Ruhl, 2003). This area is served by five major rivers—the Savannah, Altamaha (including its two major tributaries, the Oconee and Ocmulgee rivers), Ogeechee, Satilla, and St. Marys Rivers. A 2006 study by the Congressional Budget Office (CBO) reported that Georgia had the sixth highest population growth (26.4 percent) in the nation, followed by Florida (23.5 percent) (CBO, 2006). The University of Georgia (UGA) reports that the per capita water use in Georgia has been estimated to be 8 to 10 percent greater than the national average, and 17 percent higher than per capita use in neighboring states (UGA, 2002). Water shortages have already occurred and are expected to continue due to increasing periods of drought coupled with the rapid population growth expected in the region over the next 50 years (Cummings *et al.,* 2003). Two of the largest and most rapidly expanding urban areas in the Savannah River basin, Augusta-Richmond County and Savannah, currently utilize both ground water and surface water for drinking water uses (GAEPD, 2001a). Surface water use in the Savannah River basin is expected to increase in the near future, due to a population increase in the basin. Predictions for 2050 estimate the population will increase to nearly 900,000 (GAEPD, 2001a). It is important to note that the two water supply sources are not independent, because ground water discharge to streams is important in maintaining dry-weather flow. Thus, withdrawal of ground water also results in reduction in surface water flow.

The Vogtle Electric Generating Plant consists of two nuclear reactors and currently uses up to 64 mgd of water from the Savannah River to generate power. In March 2008, the Southern Nuclear Operating Company applied to the Nuclear Regulatory Commission for a license to build two additional nuclear reactors at the plant, increasing the potential water usage to 80 mgd. Up to 100 mgd (379,000 m^3pd) of Savannah River water may be withdrawn to support the growth of South Carolina communities located outside of the Savannah River basin, such as Greenville and Beaufort County (Spencer and Muzekari, 2002). While Georgia has laws restricting interbasin transfers of water, South Carolina has yet to adopt stream flow protections and does not regulate surface water withdrawals (Rusert and Cummings, 2004). Savannah has been withdrawing water from its coastal aquifer since the city became established. However, Savannah has grown to the point that the aquifer has been depleted over 100 ft (31 m) beneath the city due to growth and increased water usage. This decrease in aquifer storage water has resulted in salt water intrusion into the water wells used by Hilton Head, just north of Savannah. Currently, 5 of Hilton Head's 12 wells are unusable and the problem is expected to escalate if no action is taken to prevent further salt water intrusion. The South Carolina team on the Savannah River Basin Advisory Group has begun looking at withdrawing surface water from the Savannah River to ease the aquifer problem (State of South Carolina, 2007; Spencer and Muzekari, 2002).

New surface water withdrawal permits in the Savannah, Ogeechee, and Altamaha Rivers pose potential threats to water quality in those rivers (Alber and Smith, 2001). Approximately 126,500 people depend on the Altamaha basin for water. The Ocmulgee River, a tributary of the Altamaha, is located in North Georgia and passes through Atlanta and Macon before joining the Altamaha River. Of the seven river basins in Georgia, the Ocmulgee River Basin has the highest population of 1,714,722 people. The Ocmulgee River Basin is home to a diverse industrial and attraction base, from agriculture to defense. It has the highest agriculture production and the most agricultural water withdrawal permits in Georgia (Fisher *et al.,* 2003).

It is not known how much water is already being removed from rivers utilized by the South Atlantic DPS for spawning and nursery habitat because there is little information concerning actual withdrawals and virtually no information concerning water discharges. This is particularly the case for municipal and industrial uses because water use permits are not required for withdrawals less than 100,000 gpd (379 m^3pd) (Cummings *et al.,* 2003) and discharge permits are not required unless discharge contains selected toxic materials. Agricultural water use permits are not quantified in any meaningful way, thus neither water withdrawals nor return flows are measured (Fisher *et al.,* 2003). Large withdrawals of water (such as those for municipal use) result in reduced water quality (altered flows, higher temperatures, and lowered DO), and reduced water quality is already contributing to the endangered status of the South Atlantic DPS. Therefore, water withdrawals from the rivers in the range of the South Atlantic DPS, which are highly likely to occur based on current water shortages and increasing demand, threaten to exacerbate water quality problems that are currently modifying and curtailing Atlantic sturgeon habitat in the South Atlantic DPS.

Climate Change

Climate change threatens to exacerbate the effects of modification and curtailment of Atlantic sturgeon habitat caused by dams, dredging, and reduced water quality on the endangered status of the Carolina and South Atlantic DPSs. A major advance in climate change projections is the large number of simulations available from a broader range of climate models, run for various emissions scenarios. The Intergovernmental Panel on Climate Change (IPCC) reports in its technical paper "Climate Change and Water" that best-estimate projections from models indicate that decadal average warming over each inhabited continent by 2030 (*i.e.,* over the next 20-year period) is insensitive to the choice of emissions scenarios and is "very likely" to be at least twice as large (around 0.36 degrees Fahrenheit or 0.2 degrees Celsius per decade) as the corresponding model-estimated natural variability during the 20th century (IPCC, 2008). Continued greenhouse gas emissions at or above current rates under non-mitigation emissions scenarios would cause further warming and induce many changes in the global climate system during the 21st century, with these changes "very likely" to be larger than those observed during the 20th century. In addition, the IPCC expects the rate of warming to accelerate in the coming decades. Because 20 years is equal to at least one generation of Atlantic sturgeon (ASSRT, 2007), and possibly multiple generations in the Southeast where Atlantic sturgeon may mature as early as 5 years (Smith *et al.,* 1982), the modifying effects of climate change over the next 20 years on vital parameters of the Carolina and South Atlantic DPS' habitat will occur on a scale relevant to their endangered status. Researchers anticipate that the frequency and intensity of droughts and floods will change across the nation (CBO, 2006). The IPCC report states that the most important societal and ecological impacts of climate change in North America stem from changes in surface and groundwater hydrology (IPCC, 2008).

Both the Carolina and South Atlantic DPSs are within a region the IPCC predicts will experience decreases in precipitation. Since the status review report was completed, the Southeast experienced approximately 3 years of drought. During this time, South Carolina experienced drought conditions that ranged from moderate to extreme (South Carolina State Climatology Office, 2008). From 2006 until mid-2009, Georgia experienced the worst drought in its history. In September 2007, many of Georgia's rivers and streams were at their lowest levels ever recorded for the month, and new record low daily streamflows were recorded at 15 rivers with 20 or more years of data in Georgia (USGS, 2007). The drought worsened in September 2008. All streams in Georgia except those originating in the extreme southern counties were extremely low. While Georgia has periodically undergone periods of drought—there have been 6 periods of drought lasting from 2 to 7 years since 1903 (USGS, 2000)—drought frequency appears to be increasing (Ruhl, 2003). Abnormally low stream flows restrict access to habitat areas, reduce thermal refugia, and exacerbate water quality issues, such as water temperature, reduced DO, nutrient levels, and contaminants.

The Carolina and South Atlantic DPSs are already threatened by reduced water quality resulting from dams, inputs of nutrients, contaminants from CAFOs, industrial activities, and non-point sources, and interbasin transfers of water. The IPCC report projects with high confidence that higher water temperatures and changes in extremes in this region, including floods and droughts, will affect water quality and exacerbate many forms of water pollution—from sediments, nutrients, dissolved organic carbon, pathogens, pesticides, and salt, as well as thermal pollution, with possible negative impacts on ecosystems. In addition, sea-level rise is projected to extend areas of salinization of groundwater and estuaries, resulting in a decrease of freshwater availability for humans and ecosystems in coastal areas. Some of the most populated areas of this region are low-lying, and the threat of salt water entering into its aquifers with projected sea-level rise is a concern (U.S. Global Research Group, 2004). Existing water allocation issues would be exacerbated, leading to an increase in reliance on interbasin water transfers to meet municipal water needs, further stressing water quality. Dams, dredging, and poor water quality have already modified and curtailed the extent of suitable habitat for Atlantic sturgeon spawning and nursery habitat. Changes in water availability (depth and velocities) and water quality (temperature, salinity, DO, contaminants, etc.) in rivers and coastal waters inhabited by Atlantic sturgeon resulting from climate change will further modify and curtail the extent of suitable habitat for the Carolina DPS. Effects could be especially harmful since these populations have already been reduced to low numbers. The spawning populations within the Carolina DPS are all estimated to number fewer than the 500 recommended by Thompson (1991) to maintain sufficient genetic variability for adaptation to changing environmental conditions, and certainly smaller than the 1,000 to 10,000 recommended by other authors (Salwasser *et al.,* 1984; Belovsky, 1987; Soule, 1987; Thomas, 1990).

The SRT concluded that habitat modifications due to the placement of dams, dredging, and degraded water quality present a moderate to moderately high threat to all river populations within the Carolina DPS, with the exception of the Roanoke River. For the South Atlantic DPS, the SRT concluded that dredging and water quality issues are having a moderately low to moderate impact on the river populations. We believe that the modification and curtailment of Atlantic sturgeon habitat resulting from dams, dredging, and degraded water quality is contributing to the endangered status of both the Carolina and South Atlantic DPSs. Further, additional threats arising from water allocation and climate change threaten to exacerbate water quality problems already present throughout the range of both DPSs. Existing water allocation issues will likely be compounded by population growth and potentially climate change. Climate change is also predicted to elevate water temperatures and exacerbate nutrient-loading, pollution inputs, and lower DO, all of which are current threats to the Carolina and South Atlantic DPSs.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial purposes is a factor that contributed to the historical drastic decline in Atlantic sturgeon populations throughout the species' range. Data on the total weight of Atlantic and shortnose sturgeon harvested were collected by each state starting in 1880, and in the late 1800s commercial fisheries were landing upwards of 6,800,000 lbs (3,084 kg) of sturgeon annually (Murawski and Pacheco, 1977). By 1905, only 15 years later, this number had dropped to 20,000 lbs (9,071 kg). The population sizes were then further reduced by overfishing in the 1900s, when the landings drastically fell to a total of 215 lbs (98 kg) in 1990 (Stein *et al.,* 2004b). The total landings recorded include shortnose sturgeon as well as Atlantic sturgeon; however, the harvest is thought to have been primarily Atlantic sturgeon due to the large mesh-size nets commonly used at that time. A complete moratorium on possession of Atlantic sturgeon has been implemented in both state and Federal waters since 1998 to eliminate the threat of directed catch and incentives to retain Atlantic sturgeon bycatch. However, Atlantic sturgeon are taken as bycatch in various commercial fisheries along the entire U.S. Atlantic Coast within inland, coastal, and Federal waters. While Atlantic sturgeon caught incidentally can no longer be legally landed, bycatch may still be a threat if fish are injured or killed in the act of being caught.

Based on their life history, Atlantic sturgeon are more sensitive to fishing mortality than other coastal fish species. They are a long-lived species, have an older age at full maturity, have lower maximum fecundity values, with 50 percent of the lifetime egg production for Atlantic sturgeon occurring later in life (Boreman, 1997). Boreman (1997) looked at the relationship between fishing mortality (F) and the corresponding percentage of the maximum lifetime egg production of an age 1 female. The F_{50} is the fishing rate at which a cohort produces 50 percent of the eggs that it would produce with no fishing effort. Boreman calculated a sustainable fishing (bycatch) mortality rate of 5 percent per year for adult Atlantic sturgeon based on the F_{50}. While many fishery models use a less conservative target fishing level of F_{30} or F_{20}, the more conservative choice of F_{50} for Atlantic sturgeon is justified by their late age at maturity and because they are periodic spawners (Boreman, 1997).

We currently do not have all the data necessary to determine whether the percentage of Atlantic sturgeon populations lost annually due to bycatch mortality exceeds a sustainable rate of 5 percent per year suggested by Boreman (1997) as we do not have abundance estimates for the Carolina and South Atlantic DPSs and bycatch remains highly underreported. However, bycatch is occurring throughout the range of the Carolina and South Atlantic DPSs of Atlantic sturgeon, and the bycatch mortality associated with the dominant fishing gear in the Southeast is relatively high. All the spawning populations in the Southeast Region are quite small, which means that the loss of a small number of fish to bycatch mortality could exceed the sustainable rate of 5 percent per year. Overutilization of Atlantic sturgeon through commercial bycatch is presently a threat to the Carolina and South Atlantic DPSs, and we believe it is contributing to their endangered status.

Mortality rates of Atlantic sturgeon taken as bycatch in various types of fishing gear range between 0 and 51 percent, with the greatest mortality occurring in sturgeon caught by sink gillnets (Stein *et al.,* 2004b; ASMFC, 2007). The ASMFC Sturgeon Technical Committee (TC) determined that bycatch losses principally occur in sink gillnet fisheries, though there may be losses in the trawl fisheries, as well. Atlantic sturgeon are particularly vulnerable to sink gillnets due to their demersal nature (tendency to be at the bottom of the water column). If the nets are not tended often enough, it can be detrimental to the sturgeon, resulting in suffocation because their operculum or gills can be held closed by the net. Using the NMFS ocean observer dataset, the NEFSC estimated that bycatch mortality of sturgeon captured in sink gillnets between 2001 and 2006 was 13.8 percent (ASMFC, 2007). The ASMFC Sturgeon TC notes that any estimate of bycatch from the NMFS ocean observer dataset will be an underestimate because bycatch is under-reported in state waters and no observer coverage exists in the South Atlantic (North Carolina to Florida) Federal waters. In addition, bycatch mortality estimates do not account for post-capture mortality. The 13.8 percent mortality rate for sink gillnets estimated by the NEFSC may further underestimate the mortality rate in sink gillnets in the Carolina and South Atlantic DPSs because bycatch survival is greater in colder water temperatures of the north compared to warmer southern waters occupied by these DPSs (ASSRT, 2007). Mortality of Atlantic sturgeon captured by trawls seems to be low, with most surveys reporting 0 percent mortality. However, these studies do not include post-capture mortality, and studies of mortality from trawl fisheries conducted in the south, where tow times are longer and water temperatures are higher, are very limited.

Sink gillnets and trawls are used throughout riverine, estuarine, and marine waters in the range of the Carolina DPS to target a wide array of finfish and shellfish. Data on Atlantic sturgeon bycatch in Albemarle and Pamlico Sound commercial fisheries come from three sources: (1) NCDMF independent gillnet surveys (IGNS) that were initially designed to monitor striped bass; (2) the NCDMF Observer Program; and (3) the NC Sea Grant Fishery Resource Grant project that examined sturgeon bycatch in the flounder fishery (White and Armstrong, 2000). The Albemarle and Pamlico IGNS used sink and drift gillnets, similar to those used by the shad/herring and the flounder fisheries. Only a few fish have been captured in the Pamlico Sound gillnet survey since 2000, although 842 Atlantic sturgeon were captured in the Albemarle Sound between 1990 and 2005. The NCDMF Observer Program sampled both the Albemarle and Pamlico Sound monthly from April 2004 to December 2005. Thirty Atlantic sturgeon were observed in Albemarle Sound, and 12 Atlantic sturgeon were observed in Pamlico Sound. Overall, five observed mortalities (12 percent of captures) occurred in June 2004 and April, August, January, and March 2005. No overall bycatch estimates have been extrapolated from these observer data. Commercial fishermen in Albemarle and Pamlico Sound and Cape Fear River reported catches of zero to two sturgeon per fishery per year. However, White and Armstrong (2000) reported that sturgeon bycatch in flounder gillnets fished from 1998 to 2000 by a single fishermen in the Albemarle Sound flounder fishery included the capture of 131 Atlantic sturgeon. Of the 131 Atlantic sturgeon captured, no mortalities were reported, although four individuals were noted as having minor injuries. These data indicate that underreporting of sturgeon bycatch is occurring in this area.

A sink gillnet survey conducted in the Cape Fear River by UNCW personnel noted that 25 percent of sturgeon intercepted (22 of 88 caught) were killed. The gillnets were set one day, checked the second, and retrieved on the third. The greatest mortality occurred during periods of highest water temperature (Moser *et al.,* 1998). This survey was continued by the NCDMF, and it has reported mortality rates of 37 percent overall. Similar to earlier findings, mortality was greatest during the summer months (June through August), averaging 49 percent (34 of 69 sturgeon died) (ASSRT, 2007). This study has been discontinued due to lack of funding. There are no estimates of bycatch in fishery dependent surveys.

Winyah Bay is currently fished for American shad (*Alosa sapidissima*) using both sink and drift gillnets. This fishery has an estimated bycatch of 158 Atlantic sturgeon per year, of which 16 percent (25 fish) die and another 20 percent are injured to some degree, although this estimate is dated (Collins *et al.,* 1996). Shad fishers also operate within the rivers, but neither fishing effort nor average numbers of Atlantic sturgeon encountered are known. Poaching of adult Atlantic sturgeon has been reported from the Winyah Bay area in recent years. Carcasses of large females have been found with the ovaries (caviar) removed.

The mouth of the Santee River, just south of Winyah Bay, has the largest shad landings in the Southeast (ASSRT, 2007), likely resulting in mortality and injury of sturgeon similar to that in the Winyah Bay shad fishery. Upriver bycatch levels are unknown. The Cooper River also has an active hook and line shad fishery because gillnets are restricted (ASSRT, 2007).

The two largest commercial fisheries likely to capture Atlantic sturgeon from the South Atlantic DPS in the state waters of South Carolina and Georgia are the American shad gillnet and shrimp trawl fisheries. Studies in Georgia on commercial gillnet fisheries for American shad showed that they accounted for 52 percent of Atlantic sturgeon bycatch and the shrimp trawl fisheries accounted for 39 percent (Collins *et al.,* 1996). The American shad fisheries use sink gillnets and drift gillnets. Collins *et al.* (1996) documented a 16 percent capture-induced mortality rate for sturgeon in the American shad fishery.

There was a directed commercial fishery for Atlantic sturgeon in the ACE Basin prior to the 1985 fishery closure. The commercial sturgeon fishery operated in the lower and middle portions of both the Combahee and Edisto rivers. Commercial shad fisheries captured some juvenile Atlantic sturgeon, but most fishermen operate upriver from the areas of greatest abundance during that time of year. The shrimp trawl fishery in St. Helena Sound also captures juveniles, as evident from tag returns (ASSRT, 2007).

Although a few commercial sturgeon fishers apparently operated in the Port Royal river system prior to 1985, the landing of only one Atlantic sturgeon has been recorded (Smith and Dingley, 1984). Little, if any, shad fishing takes place in this system. It is not known whether there is any significant bycatch in the shrimp trawl fishery in this area.

During 1989 to 1991, the commercial shad gillnet fishery's bycatch in the Savannah River included more endangered shortnose sturgeon than juvenile Atlantic sturgeon. Collins *et al.* (1996) reported that two commercial fishermen collected 14 Atlantic and 189 shortnose sturgeon over the period of 1990 to 1992. It appears that abundance within the Savannah River is extremely low, as evidenced from low bycatch and reported captures over the last 15 years. Thus, bycatch may be a more serious impact if abundance is low and fishing effort is high.

Bycatch in the shad fishery in the Ogeechee River is a heightened concern because evidence suggests that this Atlantic sturgeon population is stressed and that complete recruitment failure has occurred in some years (ASSRT, 2007). Bycatch mortality in the estuarine and lower river shad fishery is suspected to be high, but no estimates of take are available (ASSRT, 2007).

Estimated annual total bycatch of Atlantic and shortnose sturgeon in the shad gillnet fishery in the tidal portion of the Altamaha River during 1982 and 1983 averaged 372 sturgeon (Collins *et al.,* 1996). Percent mortality was not determined. During a study conducted between 1986 and 1992 in the Altamaha River, 97 of 1,534 tagged juvenile Atlantic sturgeon were recaptured primarily by shad gillnets (52 percent) and shrimp trawls (39 percent) (Collins *et al.,* 1996). Juvenile Atlantic sturgeon from the Altamaha are relatively abundant in comparison to other rivers in the region, so a large percentage of the individuals in winter mixed-stock aggregations on the shelf are likely from this river. Most sturgeon occurring as shrimp trawl bycatch are from mixed-stock aggregations. Using the percentages of Atlantic and shortnose sturgeon from the 1986 to 1992 Altamaha catch data and applying them to the 1982 and 1983 total estimated sturgeon bycatch, it is expected that 89 percent (331 fish) of the catch consisted of Atlantic sturgeon (ASSRT, 2007). Also, assuming a 10 percent bycatch mortality rate for Atlantic sturgeon from drift nets (Stein *et al.,* 2004b), the dominant gear used in the shad gillnet fishery, it is estimated that 33 Atlantic sturgeon would die each year from the fishery.

Shad fishing effort is low in the Satilla River due to an apparently depleted shad population. However, because the Atlantic sturgeon population is depleted and highly stressed, any bycatch mortality could have an impact on the population (ASSRT, 2007).

The SRT concluded that bycatch presents a moderate threat to the Carolina DPS, while the threat of bycatch to the South Atlantic DPS was characterized as moderately low in each of the populations, with the exception of the Altamaha, where bycatch was deemed to pose a moderate threat. Overutilization of Atlantic sturgeon from directed fishing caused initial severe declines in Atlantic sturgeon populations in the southeast, from which they have never rebounded. Further, we believe continued overutilization of Atlantic sturgeon from bycatch in commercial fisheries is an ongoing impact to the Carolina and South Atlantic DPSs that is contributing to their endangered status. Atlantic sturgeon are particularly vulnerable to being caught in sink gillnets; therefore, fisheries using this type of gear account for a high percentage of Atlantic sturgeon bycatch. Little data exist on bycatch in the Southeast, and high levels of bycatch underreporting are suspected. Further, total population abundances for the Carolina and South Atlantic DPSs are not available; therefore, it is not possible to calculate the percentages of the Carolina and South Atlantic DPSs subject to bycatch mortality based on the available bycatch mortality rates for individual fisheries. However, fisheries known to incidentally catch Atlantic sturgeon occur throughout the marine range of the species and in some riverine waters as well. Because Atlantic sturgeon mix extensively in marine waters and may access multiple river systems, they are subject to being caught in multiple fisheries throughout their range. Atlantic sturgeon taken as bycatch may suffer immediate mortality. In addition, stress or injury to Atlantic sturgeon taken as bycatch but released alive may result in increased susceptibility to other threats, such as poor water quality (*e.g.,* exposure to toxins and low DO). This may result in reduced ability to perform major life functions, such as foraging and spawning, or even post-capture mortality. Several of the systems in the South Atlantic DPS (*e.g.,* the Ogeechee and the Satilla) are stressed to the degree that any level of bycatch could have an adverse impact on the status of the DPS (ASSRT, 2007).

C. Disease or Predation

Very little is known about natural predators of Atlantic sturgeon. The presence of bony scutes is likely an effective adaptation for minimizing predation of sturgeon greater than 25 mm (Gadomski and Parsley, 2005). Gadomski and Parsley (2005) have shown that catfish and other species do prey on juvenile sturgeon, and concerns have been raised regarding the potential for increased predation on juvenile Atlantic sturgeon by introduced flathead catfish (Brown *et al.,* 2005). Atlantic sturgeon populations are persisting in the Cape Fear River, North Carolina, and Altamaha River, Georgia, where flatheads have been present for many years, at least in the absence of any directed fisheries for Atlantic sturgeon. Thus, further research is warranted to determine at what level, if any, flatheads and other exotic species prey upon juvenile Atlantic sturgeon and to what extent such predation is affecting the sturgeon populations.

While some disease organisms have been identified from wild Atlantic sturgeon, they are unlikely to threaten the survival of the wild populations. Disease organisms commonly occur among wild fish populations, but under favorable environmental conditions, these organisms are not expected to cause population-threatening epidemics. There is concern that non-indigenous sturgeon pathogens could be introduced, most likely through aquaculture operations. Fungal infections and various types of bacteria have been noted to have various effects on hatchery Atlantic sturgeon. Due to this threat of impacts to wild populations, the ASMFC recommends requiring any sturgeon aquaculture operation to be certified as disease-free, thereby reducing the risk of the spread of disease from hatchery origin fish. The aquarium industry is another possible source for transfer of non-indigenous pathogens or non-indigenous species from one geographic area to another, primarily through release of aquaria fish into public waters. With millions of aquaria fish sold to individuals annually, it is unlikely that such activity could ever be effectively regulated. Definitive evidence that aquaria fish could be blamed for transmitting a non-indigenous pathogen to wild fish (sturgeon) populations would be very difficult to collect (ASSRT, 2007).

In their extinction risk analysis, the SRT ranked the threat from disease and predation as a low risk. While information on the impacts of disease and predation on Atlantic sturgeon is limited, there is nothing to indicate that either of these factors is currently having any measurable adverse impact on Atlantic sturgeon. Therefore, we concur with the SRT, and we conclude that disease and predation are not contributing to the endangered status of either the Carolina or the South Atlantic DPS.

D. Inadequacy of Existing Regulatory Mechanisms

As a wide-ranging anadromous species, Atlantic sturgeon are subject to numerous Federal (U.S. and Canadian), state and provincial, and inter-jurisdictional laws, regulations, and agency activities. These regulatory mechanisms are described in detail in the status review report (*see* Section 3.4). We believe that the inadequacy of regulatory mechanisms to control bycatch and the modification and curtailment of Atlantic sturgeon habitat is contributing to the endangered status of the Carolina and South Atlantic DPSs.

Current regulatory mechanisms have effectively removed threats from legal, directed harvest in the United States, as well as incentives for retention of bycatch. The ASMFC was given management authority in 1993 under the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA) (16 U.S.C. 5101–5108), and it manages Atlantic sturgeon through an interstate fisheries management plan (IFMP). The moratorium prohibiting directed catch of Atlantic sturgeon was developed as an Amendment to the IFMP. The ACFCMA, authorized under the terms of the ASMFC Compact, as amended (Pub. L. 103–206), provides the Secretary of Commerce with the authority to implement regulations that are compatible to ASMFC FMPs in the Exclusive Economic Zone (EEZ) in the absence of an approved Magnuson-Stevens FMP. In 1999, it was under this authority that a similar moratorium was implemented for Atlantic sturgeon in Federal waters. The Amendment includes a stock rebuilding target of at least 20 protected mature age classes in each spawning stock, which is to be achieved by imposing a harvest moratorium. The Amendment requires states to monitor, assess, and annually report Atlantic sturgeon bycatch and mortality in other fisheries. The Amendment also requires that states annually report habitat protection and enhancement efforts. Finally, the Amendment states that each jurisdiction with a reproducing population should conduct juvenile assessment surveys (including CPUE estimates, tag and release programs, and age analysis), and states with rivers that lack a reproducing sturgeon population(s) but support nursery habitat for migrating juveniles should also conduct sampling.

While the ASMFC and NMFS have made significant strides in reducing the threats from direct harvest and retention of bycatch, those threats have not been eliminated, and continued bycatch of Atlantic sturgeon is contributing to the endangered status of the Carolina and South Atlantic DPSs. Although the FMP contains requirements for reporting bycatch, fishery managers, such as the ASMFC Atlantic Sturgeon Management Board, widely accept that Atlantic sturgeon bycatch is underreported or not reported at all based on research and anecdotal evidence (ASMFC, 2005; ASSRT, 2007; White and Armstrong, 2000). Abundance estimates are available only for two river systems (the Hudson and the Altamaha) even though the FMP states that each jurisdiction with a reproducing population should conduct juvenile assessment surveys (including CPUE estimates, tag and release programs, and age analysis). While the aforementioned mechanisms have addressed impacts to Atlantic sturgeon through directed fisheries, there are currently no mechanisms in place to address the significant impacts and risks posed to Atlantic sturgeon from commercial bycatch.

State and Federal agencies are actively employing a variety of legal authorities to implement proactive restoration activities for this species, and coordination of these efforts is being furnished through the ASMFC. Due to existing state and Federal laws, water quality and other habitat conditions have improved in many riverine habitats, although many systems still have DO and toxic contaminants issues, and habitat quality and quantity continue to be affected by dams, dredging, and/or altering natural flow conditions.

Though statutory and regulatory mechanisms exist that authorize reducing the impact of dams on riverine and anadromous species, such as Atlantic sturgeon, and their habitat, these mechanisms have proven inadequate for preventing dams from blocking access to habitat upstream and degrading habitat downstream. Hydropower dams are regulated by the FERC. The Federal Power Act (FPA), originally enacted in 1920, provides for cooperation between FERC and other Federal agencies, including resource agencies, in licensing and relicensing power projects. The FPA authorizes NMFS to recommend hydropower license conditions to protect, mitigate damages to, and enhance anadromous fish, including related habitat. The FPA also provides authority for NMFS to issue mandatory fishway prescriptions. FERC licenses have a term of 30 to 50 years, so NMFS' involvement in the licensing process to ensure the protection and accessibility of upstream habitat, and to improve habitat degraded by changes in water flow and quality from dam operations, only occurs twice or thrice a century. The FPA does not apply to non-hydropower dams, such as those operated by the Army Corps of Engineers for navigation purposes. Even where fish passage currently exists, evidence is rare that they effectively pass sturgeon, including Atlantic sturgeon. As mentioned in previous sections, dams in the Southeast are currently blocking over 60 percent of the habitat in three rivers with historical and/or current spawning Atlantic sturgeon populations (the Cape Fear River and Santee-Cooper System in the Carolina DPS and the St. Johns River in the South Atlantic DPS). In addition to the loss of important spawning and juvenile developmental habitat upstream, dam operations reduce the quality of the remaining habitat downstream by affecting water quality parameters (such as depth, temperature, velocity, and DO) that are important to Atlantic sturgeon. Therefore, the inadequacy of regulatory mechanisms to ensure safe and effective upstream and downstream passage to Atlantic sturgeon and prevent degradation of habitat downstream from dam operations in riverine habitat is contributing to the endangered status of the Carolina and South Atlantic DPSs.

Inadequacies in the regulation of water allocation also impact the South Atlantic DPS. Data concerning consumptive water use in this region are, at best, very limited. While extensive data exist concerning permitted water withdrawals, there is little information concerning actual withdrawals and virtually no information concerning water discharges. This is particularly the case for municipal and industrial uses because water use permits are not required for withdrawals less than 100,000 gpd (379 m^3pd) (Cummings *et al.,* 2003) and discharge permits are not required unless discharge contains selected toxic materials. Agricultural water use permits are not quantified in any meaningful way, thus neither water withdrawals nor return flows are measured (Fisher *et al.,* 2003). While several other states have similar permitting thresholds, the majority require permits for water withdrawals less than 100,000 gpd (379 m^3pd) and some require a permit for any water withdrawal. The State of Georgia allows access to water in amounts required to satisfy the household needs of more than 300 households without a permit (Cummings *et al.,* 2003).

Even the most fundamental requisites for basin water planning—data for historical, unimpaired flows in the coastal regions' rivers—simply do not exist (Fisher *et al.,* 2003). There are 125 river gauges in the region's 7 river basins. However, 72 of these gauges are inactive, and 28 of the remaining 53 gauges do not provide consistent flow information. Moreover, historical data from many gauges have gaps, reflecting periods (sometimes extending over months) during which the gauge was inoperative. Also, there are extensive discharge areas between the last gauge in each river system and the point at which the river discharges into the ocean—thus, there are potentially large water supplies about which absolutely nothing is known (Fisher *et al.,* 2003).

Water quality continues to be a problem, even with existing controls on some pollution sources. Data required to evaluate water allocation issues are either very weak, in terms of determining the precise amounts of water currently being used, or non-existent, in terms of our knowledge of water supplies available for use under historical hydrologic conditions in the region. Current regulatory regimes are not necessarily effective in controlling water allocation (*e.g.,* no permit requirements for water withdrawals under 100,000 gpd (379 m^3pd) in Georgia and no restrictions on interbasin water transfers in South Carolina).

In their extinction risk analysis, the SRT ranked the threat from the inadequacy of regulatory mechanisms as moderately low to moderate. While some of the threats to the Carolina and South Atlantic DPSs have been ameliorated or reduced through the existing regulatory mechanisms, such as the moratorium on directed fisheries for Atlantic sturgeon, bycatch is currently not being addressed through existing mechanisms. Further, water quality continues to be a problem even with existing controls on some pollution sources and water withdrawal, and dams continue to curtail and modify habitat, even with the Federal Power Act.

E. Other Natural or Manmade Factors Affecting the Species' Continued Existence

The SRT considered several manmade factors that may affect Atlantic sturgeon, including impingement and entrainment, ship strikes, and artificial propagation. The vast withdrawal of water from rivers that support Atlantic sturgeon populations was considered to pose a threat of impingement and entrainment; however, data are lacking to determine the overall impact of this threat on sturgeon populations, as impacts are dependent on a variety of factors (*e.g.,* the species, time of year, location of the intake structure, and strength of the intake current). Multiple suspected boat/ship strikes have been reported in several rivers. A large number of the mortalities observed in these rivers from potential ship strikes have been of large adult Atlantic sturgeon. Lastly, potential artificial propagation of Atlantic sturgeon was also a concern to SRT members, as both stock enhancement programs and commercial aquaculture can have negative impacts on a recovering population (*e.g.,* fish disease, escapement, outbreeding depression). In order to circumvent these potential threats, stock enhancement programs follow culture and stocking protocols approved by the ASMFC. Commercial aquaculture facilities are expected to maintain disease-free facilities and have safeguards in place to prevent escapement of sturgeon into the wild. While in at least one instance cultured Atlantic sturgeon have gone unaccounted for from a commercial aquaculture facility in Florida, this is not considered to be a significant threat, as this was a rare event. Mechanisms are in place at all facilities to prevent escapement of sturgeon; facilities are all land based, and most are not located in close proximity to any Atlantic sturgeon rivers.

Along the range of Atlantic sturgeon from the Carolina and South Atlantic DPSs, most, if not all, populations are at risk of possible entrainment or impingement in water withdrawal intakes for commercial uses, municipal water supply facilities, and agricultural irrigation intakes. In North Carolina, over two billion gallons of water per day were withdrawn from the Cape Fear, Neuse, Tar, and Roanoke rivers in 1999 by agriculture and non-agricultural industries (NCDENR, 2006). Currently, there are only three surveys that have shown the direct impacts of water withdrawal on Atlantic sturgeon: (1) Hudson River Utility Surveys, (2) Delaware River Salem Power Plant survey, and (3) Edwin I. Hatch Nuclear Power Plant (HNP) survey. The Edwin I. Hatch Nuclear power plant is located 11 miles north of Baxley, Georgia. The HNP uses a closed-loop system for main condenser cooling that withdraws from, and discharges to, the Altamaha River. Pre-operational drift surveys were conducted and only two *Acipenser* sp. larvae were collected. Entrainment samples at HNP were collected for the years 1975, 1976, and 1980, and no *Acipenser* sp. were observed in the samples (Sumner, 2004). Though most rivers have multiple intake structures which remove millions of gallons a day during the spring and summer months, it is believed that the migratory behavior of larval sturgeon allows them to avoid intake structures, since migration is active and occurs in deep water (Kynard and Horgan, 2002). Effluent from these facilities can also affect populations, as some facilities release heated water that acts as a thermal refuge during the winter months, but drastic changes in water temperature have the potential to cause mortality.

Locations that support large ports and have relatively narrow waterways are more prone to ship strikes (*e.g.,* Delaware, James, and Cape Fear rivers). One ship strike per 5 years is reported for the Cape Fear River within the Carolina DPS. Ship strikes have not been documented in any of the rivers within the South Atlantic DPS. While it is possible that ship strikes may have occurred that have gone unreported or unobserved, the lack of large ship traffic on narrow waterways within the range of the DPS may limit potential interactions.

Artificial propagation of Atlantic sturgeon for use in restoration of extirpated populations or recovery of severely depleted wild populations has the potential to be both a threat to the species and a tool for recovery. Within the range of the Carolina DPS, several attempts were made by Smith *et al.* (1980 and 1981) to hormonally-induce spawning and culture Atlantic sturgeon captured in the Atlantic Ocean off the Winyah Bay jetties. Fry were hatched in each instance, but lived less than a year. As a result of successful spawning of Hudson River Atlantic sturgeon from 1993 to 1998, USFWS' Northeast Fisheries Center (NEFC) is currently rearing five year-classes of domestic fish. These fish could potentially be used as broodstock for aquaculture operations and stock enhancement, provided that there is no risk to wild fish. Aquaculturists along the East Coast, including some in North Carolina and South Carolina, have contacted the NEFC and expressed interest in initiating commercial production of Atlantic sturgeon. In 2006, La Paz Aquaculture Group was approved by North Carolina state resource agencies and ASMFC to produce Atlantic sturgeon for flesh and caviar sales. However, their first year of production was halted because remnant storms from Hurricane Katrina destroyed their fry stock. In August 2006, ASMFC reevaluated the La Paz permit, and voted to draft an addendum to allow La Paz to acquire Atlantic sturgeon from multiple Canadian aquaculture companies (previously restricted to one company), allowing them to resume Atlantic sturgeon culture. Resource managers who reviewed the permit found the La Paz facility to pose little threat to Atlantic sturgeon or shortnose populations due to the facility location (far inland), use of a recirculating system, and land application of any discharge (ASSRT, 2007).

In the range of the South Atlantic DPS, artificial propagation has been attempted for the purposes of both restoration and commercial profit. The St. Marys Fish Restoration Committee (SMFRC) is working with Florida and Georgia to reestablish Atlantic sturgeon in the St. Marys River. Efforts are currently underway to refine restoration approaches within the system. Phase 1 of the restoration plan includes a population and habitat assessment. Field investigations are being funded through ESA Section 6 and coordinated through Georgia DNR. The State of Florida has been involved in fish sampling and will continue to explore and refine sturgeon sampling strategies. Aquatic habitat and water quality surveillance work will continue to be accomplished by the St. Johns River Water Management District, the Environmental Protection Agency, Florida Department of Environmental Protection, USFWS, TNC, and the St. Marys River Management Committee. Phase 2 of the plan would include experimental transplanting of Atlantic sturgeon to assess environmental factors, habitat use at different life-stages, contaminants, migration-homing, etc. Upon approval from the ASMFC, the SMFRC transferred 12 Atlantic sturgeon from the Altamaha River in Georgia to the Bears Bluff National Fish Hatchery in South Carolina. The SMFRC hopes to develop and refine captive propagation techniques for predictable spawning and provide fish to approved researchers.

Aquaculturists in South Carolina and Florida have also contacted the NEFC and expressed interest in initiating commercial production of Atlantic sturgeon through use of the Hudson River broodstock. In 2001, the Canadian Caviar Company shipped 18,000 Atlantic sturgeon sac fry to the University of Florida. These fry were used to conduct early larval and feeding trials. Survivors of these experiments were transferred to four aquacultural businesses: (1) Evan's Fish Farm in Pierson, Florida; (2) Watts Aquatics in Tampa, Florida; (3) Hi-Tech Fisheries of Florida in Lakeland, Florida; and (4) Rokaviar in Homestead, Florida. Evan's Fish Farm experienced a catastrophic systems failure in 2004 and currently has five Atlantic sturgeon on its premises. The farm intends to use these remaining sturgeon as broodstock and would like to acquire more Atlantic sturgeon. Watts Aquatics went out of business, and the status of the Atlantic sturgeon this farm received is unknown. Hi-Tech Fisheries of Florida currently has around 300 Atlantic sturgeon which have been transferred to a quarry, and the company is in the process of evaluating stock size and health condition. Rokaviar originally received 100 sturgeon, but due to a malfunction with the life support systems, the company now holds only 20 Atlantic sturgeon. All of these facilities are periodically screened for disease by a University of Florida Institute for Food and Agricultural Science (IFAS) veterinarian. None have reported diseases. All facilities are above the 100-year flood plain and have zero discharge, where tank culture or quarry culture is utilized (Roberts and Huff, 2004). These facilities may sell meat, fingerlings, and caviar in accordance with state, Federal, and international laws.

The SRT ranked the threats from impingement/entrainment, ship strikes, and artificial propagation as low for both DPSs, with the exception of the threat from ship strikes as moderately low for the Carolina DPS. We concur with these rankings and conclude that none of these threats are contributing to the endangered status of the DPS.

Current Protective Efforts

Section 4(b)(1)(A) of the ESA requires the Secretary, when making a listing determination for a species, to take into account those efforts, if any, being made by any State or foreign nation to protect the species. In judging the efficacy of existing protective efforts, we rely on the Services' joint "Policy for Evaluation of Conservation Efforts When Making Listing Decisions" ("PECE;" 68 FR 15100; March 28, 2003). The PECE is designed to guide determinations on whether any conservation efforts that have been recently adopted or implemented, but not yet proven to be successful, will result in recovering the species to the point at which listing is not warranted or contribute to forming a basis for listing a species as threatened rather than endangered. The purpose of the PECE is to ensure consistent and adequate evaluation of future or recently implemented conservation efforts identified in conservation agreements, conservation plans, management plans, and similar documents when making listing decisions. The PECE provides direction for the consideration of such conservation efforts that have not yet been implemented, or have been implemented but have not yet demonstrated effectiveness. The policy is expected to facilitate the development by states and other entities of conservation efforts that sufficiently improve a species' status so as to make listing the species as threatened or endangered unnecessary.

The PECE established two basic criteria: (1) The certainty that the conservation efforts will be implemented, and (2) the certainty that the efforts will be effective. Satisfaction of the criteria for implementation and effectiveness establishes a given protective effort as a candidate for consideration, but does not mean that an effort will ultimately change the risk assessment for the species. Overall, the PECE analysis ascertains whether the formalized conservation effort improves the status of the species at the time a listing determination is made.

We evaluated the current conservation efforts underway to protect and recover Atlantic sturgeon in making our listing determination. We determined that only the following conservation efforts warrant consideration under the PECE for the Carolina and South Atlantic DPSs: the 1998 ASMFC FMP and the proposal by the SMFRC to restore Atlantic sturgeon to the St. Marys River.

The 1998 Amendment to the ASMFC Atlantic Sturgeon FMP strengthens conservation efforts by formalizing the closure of the directed fishery, and by banning possession of bycatch, eliminating any legal incentive to retain Atlantic sturgeon. However, bycatch is known to occur in several fisheries (ASMFC, 2007) and it is widely accepted that bycatch is underreported. With respect to its effectiveness, contrary to information available in 1998 when the Amendment was approved, Atlantic sturgeon bycatch mortality is a major stressor affecting the recovery of Atlantic sturgeon, despite actions taken by the states and NMFS to prohibit directed fishing and retention of Atlantic sturgeon. Therefore, there is considerable uncertainty that the Atlantic Sturgeon FMP will be effective in meeting its conservation goals. In addition, though the 1998 Amendment contains requirements for population surveys, it is highly uncertain these will be implemented, as there are limited resources for assessing current abundance of spawning females for each of the DPSs and to date, abundance estimates have only been completed for one river within the range of the two DPSs considered here. For these reasons, there is no certainty of implementation and effectiveness of the intended ASMFC FMP conservation effort for the Carolina and South Atlantic DPSs of Atlantic sturgeon.

The SMFRC is working with Florida and Georgia with the intention of reestablishing Atlantic sturgeon in the St. Marys River. Efforts are currently underway to refine restoration approaches within the system. As discussed in Section E, Phase 1 of the restoration plan includes a population and habitat assessment, and Phase 2 includes experimental transplanting of Atlantic sturgeon to assess environmental factors, habitat use at different life-stages, contaminants, migration-homing, etc. Atlantic sturgeon are believed to be extirpated in the St. Marys River. This conservation effort may increase our knowledge and understanding of Atlantic sturgeon status and habitat conditions in the St. Marys River, as well as provide methods for restoring a population there in the future. As previously discussed, artificial propagation of Atlantic sturgeon for use in restoration of extirpated populations or recovery of severely depleted wild populations has the potential to be both a threat to the species and a tool for recovery. Because it is in the earliest stages of planning, development, and authorization, the feasibility of any project or the potential degree of success for this effort is unknown. Therefore, the SMRFC efforts do not satisfy the PECE policy's standards for certainty of implementation or effectiveness.

Conclusion

Finding for the Carolina DPS

The Carolina DPS is estimated to number less than 3 percent of its historical population size (ASSRT, 2007). Prior to 1890, Secor (2002) estimated there were between 7,000 and 10,000 adult females in North Carolina and 8,000 adult females in South Carolina. Currently, there are estimated to be less than 300 spawning adults (total of both sexes) in each of the major river systems occupied by the DPS, whose freshwater range occurs in the watersheds from the Roanoke River southward along the southern Virginia, North Carolina, and South Carolina coastal areas to the Cooper River. We have reviewed the status review report, as well as other available literature and information, and have consulted with scientists and fishery resource managers familiar with the Atlantic sturgeon in the Carolina DPS. After reviewing the best scientific and commercial information available, we find that the Atlantic sturgeon Carolina DPS is in danger of extinction throughout its range as a result of a combination of habitat curtailment and alteration, overutilization in commercial fisheries, and inadequacy of regulatory mechanisms in ameliorating these impacts and threats, and we propose to list it as endangered.

Finding for the South Atlantic DPS

The South Atlantic DPS is estimated to number less than 6 percent of its historical population size (ASSRT, 2007), with all river populations except the Altamaha estimated to be less than 1 percent of historical abundance. Prior to 1890, Secor (2002) estimated there were 8,000 adult spawning females in South Carolina and 11,000 adult spawning females in Georgia. Currently, there are an estimated 343 spawning adults in the Altamaha and less than 300 spawning adults (total of both sexes) in each of the other major river systems occupied by the DPS, whose freshwater range occurs in the watersheds of the ACE Basin in South Carolina to the St. Johns River, Florida. We have reviewed the status review report, as well as other available literature and information, and have consulted with scientists and fishery resource managers familiar with the Atlantic sturgeon in the South Atlantic DPS. After reviewing the best scientific and commercial information available, we find that the Atlantic sturgeon South Atlantic DPS is in danger of extinction throughout its range as a result of a combination of habitat curtailment and alteration, overutilization in commercial fisheries, and inadequacy of regulatory mechanisms in ameliorating these impacts and threats, and we propose to list it as endangered.

Role of Peer Review

In December 2004, the Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review establishing minimum peer review standards, a transparent process for public disclosure of peer review planning, and opportunities for public participation. The OMB Bulletin, implemented under the Information

Quality Act (Pub. L. 106–554), is intended to enhance the quality and credibility of the Federal government's scientific information, and applies to influential or highly influential scientific information disseminated on or after June 16, 2005. To satisfy our requirements under the OMB Bulletin, the Atlantic sturgeon status review report was peer reviewed by six experts in the field, with their substantive comments incorporated in the final status review report.

On July 1, 1994, the NMFS and USFWS published a series of policies regarding listings under the ESA, including a policy for peer review of scientific data (59 FR 34270). The intent of the peer review policy is to ensure that listings are based on the best scientific and commercial data available. Prior to a final listing, NMFS will solicit the expert opinions of three qualified specialists selected from the academic and scientific community, Federal and State agencies, and the private sector on listing recommendations to ensure the best biological and commercial information is being used in the decisionmaking process, as well as to ensure that reviews by recognized experts are incorporated into the review process of rulemakings developed in accordance with the requirements of the ESA.

Effects of Listing

Conservation measures provided for species listed as endangered or threatened under the ESA include recovery actions (16 U.S.C. 1533(f)), critical habitat designations, Federal agency consultation requirements (16 U.S.C. 1536), and prohibitions on taking (16 U.S.C. 1538). Recognition of the species' plight through listing promotes conservation actions by Federal and state agencies, private groups, and individuals. Should the proposed listings be made final, a recovery program would be implemented, and critical habitat may be designated. Federal, state, and the private sectors will need to cooperate to conserve listed Atlantic sturgeon and the ecosystems upon which they depend.

Critical habitat is defined in section 3 of the ESA (16 U.S.C. 1532(3)) as: (1) The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the ESA, on which are found those physical or biological features (a) essential to the conservation of the species and (b) that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by a species at the time it is listed upon a determination that such areas are essential for the conservation of the species. "Conservation" means the use of all methods and procedures needed to bring the species to the point at which listing under the ESA is no longer necessary. Section 4(a)(3)(a) of the ESA (16 U.S.C. 1533(a)(3)(A)) requires that, to the extent prudent and determinable, critical habitat be designated concurrently with the listing of a species. If we determine that it is prudent and determinable, we will publish a proposed designation of critical habitat for Atlantic sturgeon in a separate rule. Public input on features and areas that may meet the definition of critical habitat for the Carolina and South Atlantic DPSs is invited.

Identifying the DPS(s) Potentially Affected by an Action During Section 7 Consultation

The Carolina and South Atlantic DPSs are distinguished based on genetic data and spawning locations. However, extensive mixing of the populations occurs in coastal waters. Therefore, the distributions of the DPSs outside of natal waters generally overlap with one another, and with fish from Northeast river populations. This presents a challenge in conducting ESA section 7 consultations because fish from any DPS could potentially be affected by a proposed project. Project location alone will likely not inform the section 7 biologist as to which populations to consider in the analysis of a project's potential direct and indirect effects on Atlantic sturgeon and their habitat. This will be especially problematic for projects where take could occur because it is critical to know which Atlantic sturgeon population(s) to include in the jeopardy analysis. One conservative, but potentially cumbersome, method would be to analyze the total anticipated take from a proposed project as if all Atlantic sturgeon came from a single DPS and repeat the jeopardy analysis for each DPS the taken individuals could have come from. However, recently funded research may shed some light on the composition of mixed stocks of Atlantic sturgeon, relative to their rivers of origin, in locations along the East Coast. The specific purpose of the study is to evaluate the vulnerability to coastal bycatch of Hudson River Atlantic sturgeon, thought to be the largest stock contributing to coastal aggregations from the Bay of Fundy to Georgia. However, the mixed stock analysis will also allow NMFS to better estimate a project's effects on different components of a mixed stock of Atlantic sturgeon in coastal waters or estuaries other than where they were spawned. Results from the study are expected in February 2011. Genetic mixed stock analysis, such as proposed in this study, requires a high degree of resolution among stocks contributing to mixed aggregations and characterization of most potential contributory stocks. Fortunately, almost all extant populations, at least those with reasonable population sizes, have been characterized in previous genetic studies, though some additional populations will be characterized in this study. Genetic testing of mixed stocks will be conducted in eight coastal locales in both the Northeast and Southeast Regions. Coastal fisheries and sites were selected based on sample availabilities, bycatch concerns, and specific biological questions (*i.e.,* real uncertainty as to stock origins of the coastal aggregation). We are specifically seeking public input on the mixing of fish from different DPSs in parts of their ranges, particularly in the marine environment.

Identification of Those Activities That Would Constitute a Violation of Section 9 of the ESA

On July 1, 1994, we and USFWS published a policy to identify, to the maximum extent possible, those activities that would or would not constitute a violation of section 9 of the ESA (59 FR 34272; July 1, 1994). The intent of this policy is to increase public awareness of the effect of this listing on proposed and ongoing activities within the species' range. We will identify, to the extent known at the time of the final rule, specific activities that will not be considered likely to result in violation of section 9, as well as activities that will be considered likely to result in violation. Activities that we believe could result in violation of section 9 prohibitions against "take" of the Atlantic sturgeon in the Carolina and South Atlantic DPSs include, but are not limited to, the following: (1) Bycatch associated with commercial and recreational fisheries; (2) poaching of individuals for meat or caviar; (3) marine vessel strikes; (4) destruction of riverine, estuarine, and marine habitat through such activities as agricultural and urban development, commercial activities, diversion of water for hydropower and public consumption, and dredge and fill operations; (5) impingement and entrainment in water control structures; (6) unauthorized collecting or handling of the species (permits to conduct these activities are available for purposes of scientific research or to enhance the propagation or survival of the DPSs); (7) releasing a captive Atlantic sturgeon into the wild; and (8) harming captive Atlantic sturgeon by, among other things, injuring or killing them through veterinary care, research, or breeding activities outside the bounds of normal animal husbandry practices. We believe that, based on the best available information, the following actions will not result in a violation of section 9: (1) Possession of Atlantic sturgeon acquired lawfully by permit issued by NMFS pursuant to section 10 of the ESA, or by the terms of an incidental take statement in a biological opinion pursuant to section 7 of the ESA; (2) Federally approved projects that involve activities such as agriculture, managed fisheries, road construction, discharge of fill material, stream channelization, or diversion for which consultation under section 7 of the ESA has been completed, and when such activity is conducted in accordance with any terms and conditions given by NMFS in an incidental take statement in a biological opinion pursuant to section 7 of the ESA; (3) continued possession of live Atlantic sturgeon that were in captivity or in a controlled environment (*e.g.,* in aquaria) at the time of this listing, so long as the prohibitions under an ESA section 9(a)(1) are not violated. If listed, NMFS will provide contact information for facilities to submit information on Atlantic sturgeon in their possession, to establish their claim of possession; and (4) provision of care for live Atlantic sturgeon that were in captivity at the time of this listing.

Section 9(b)(1) of the ESA provides a narrow exemption for animals held in captivity at the time of listing: Those animals are not subject to the import/export prohibition or to protective regulations adopted by the Secretary, so long as the holding of the species in captivity, before and after listing, is not in the course of a commercial activity; however, 180 days after listing, there is a rebuttable presumption that the exemption does not apply. Thus, in order to apply this exemption, the burden of proof for confirming the status of animals held in captivity prior to listing lies with the holder. The section 9(b)(1) exemption for captive wildlife would not apply to any progeny of the captive animals that may be produced post-listing.

References

A complete list of the references used in this proposed rule is available upon request (*see* **ADDRESSES**).

Classification

National Environmental Policy Act

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in *Pacific Legal Foundation* v. *Andrus,* 675 F. 2d 825 (6th Cir. 1981), NMFS has concluded that ESA listing actions are not subject to the environmental assessment requirements of the National Environmental Policy Act (NEPA). (*See* NOAA Administrative Order 216–6.)

Executive Order 12866, Regulatory Flexibility Act and Paperwork Reduction Act

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts cannot be considered when assessing the status of a species. Therefore, the economic analysis requirements of the Regulatory Flexibility Act are not applicable to the listing process. In addition, this proposed rule is exempt from review under Executive Order 12866. This proposed rule does not contain a collection-of-information requirement for the purposes of the Paperwork Reduction Act.

Federalism

E.O. 13132 requires agencies to take into account any federalism impacts of regulations under development. It includes specific consultation directives for situations where a regulation will preempt state law, or impose substantial direct compliance costs on state and local governments (unless required by statute). Pursuant to the Executive Order on Federalism, E.O. 13132, the Assistant Secretary for Legislative and Intergovernmental Affairs will provide notice of the proposed action and request comments from the governors of the states in which the two DPSs proposed to be listed occur.

Environmental Justice

Executive Order 12898 requires that Federal actions address environmental justice in the decision-making process. In particular, the environmental effects of the actions should not have a disproportionate effect on minority and low-income communities. The proposed listing determination is not expected to have a disproportionately high effect on minority populations or low-income populations.

Coastal Zone Management Act (16 U.S.C. 1451 et seq.)

Section 307(c)(1) of the Federal Coastal Zone Management Act of 1972 requires that all Federal activities that affect any land or water use or natural resource of the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. We have determined that this action is consistent to the maximum extent practicable with the enforceable policies of approved Coastal Zone Management Programs of each of the states within the range of the two DPSs. Letters documenting NMFS' determination, along with the proposed rule, will be sent to the coastal zone management program offices in each affected state. A list of the specific state contacts and a copy of the letters are available upon request.

List of Subjects in 50 CFR Part 224

Administrative practice and procedure, Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Dated: September 24, 2010.

Eric C. Schwaab,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 224 is proposed to be amended as follows:

PART 224—ENDANGERED MARINE AND ANADROMOUS SPECIES

1. The authority citation for part 224 continues to read as follows:

Authority: 16 U.S.C. 1531–1543 and 16 U.S.C. 1361 *et seq.*

2. In § 224.101(a), amend the table by adding entries for Atlantic Sturgeon-Carolina DPS and Atlantic Sturgeon-South Atlantic DPS at the end of the table to read as follows:

§ 224.101 Enumeration of endangered marine and anadromous species.

* * * * *

Species[1]		Where listed	Citation(s) for listing determination(s)	Citation(s) for critical habitat designation(s)
Common name	Scientific name			
*	*	* * * * *	*	
Atlantic Sturgeon—Carolina DPS.	*Acipenser oxyrinchus oxyrinchus*.	The Carolina DPS includes all Atlantic sturgeon that spawn in the watersheds from the Roanoke River, Virginia, southward along the southern Virginia, North Carolina, and South Carolina coastal areas to the Cooper River. The marine range of Atlantic sturgeon from the Carolina DPS extends from the Bay of Fundy, Canada, to the Saint Johns River, Florida. The Carolina DPS also includes Atlantic sturgeon held in captivity (*e.g.,* aquaria, hatcheries, and scientific institutions) and which are identified as fish belonging to the Carolina DPS based on genetics analyses, previously applied tags, previously applied marks, or documentation to verify that the fish originated from (hatched in) a river within the range of the Carolina DPS, or is the progeny of any fish that originated from a river within the range of the Carolina DPS.	[INSERT FR CITATION & DATE WHEN PUBLISHED AS A FINAL RULE].	NA.
Atlantic Sturgeon—South Atlantic DPS.	*Acipenser oxyrinchus oxyrinchus*.	The South Atlantic DPS includes all Atlantic sturgeon that spawn in the watersheds of the ACE Basin in South Carolina to the St. Johns River, Florida. The marine range of Atlantic sturgeon from the South Atlantic DPS extends from the Bay of Fundy, Canada, to the Saint Johns River, Florida. The South Atlantic DPS also includes Atlantic sturgeon held in captivity (*e.g.,* aquaria, hatcheries, and scientific institutions) and which are identified as fish belonging to the South Atlantic DPS based on genetics analyses, previously applied tags, previously applied marks, or documentation to verify that the fish originated from (hatched in) a river within the range of the South Atlantic DPS, or is the progeny of any fish that originated from a river within the range of the South Atlantic DPS.	[INSERT FR CITATION & DATE WHEN PUBLISHED AS A FINAL RULE].	NA.

[1] Species includes taxonomic species, subspecies, distinct population segments (DPSs) (for a policy statement, *see* 61 FR 4722, February 7, 1996), and evolutionarily significant units (ESUs) (for a policy statement, *see* 56 FR 58612, November 20, 1991).

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