Designation of Critical Habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic Sturgeon

ESA Section 4(b)(2) Impact Analysis and Biological Source Document with the Economic Analysis and Final Regulatory Flexibility Analysis
Finalized June 3, 2017

NATIONAL MARINE FISHERIES SERVICE
Greater Atlantic Regional Fisheries Office

Table of Contents

EXECUTIVE SUMMARY

We, the National Marine Fisheries Service (NMFS), are designating critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments (DPSs) of Atlantic sturgeon that were listed under the Endangered Species Act (ESA) on February 6, 2012 (77 FR 5880). This report describes our approach, the available information, and the required analyses we used to identify critical habitat areas for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs based on the information available to us at this time. The report includes information on the economic, national security, and other relevant impacts anticipated as a result of designating the identified areas. A separate report will provide information on the economic, national security, and other relevant impacts anticipated as a result of designating the Carolina and South Atlantic DPSs.

All of the critical habitat areas for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs occur in tidally-affected riverine waters of a coastal estuary within the geographic area occupied by each DPS. We are not designating critical habitat within any unoccupied areas.

Critical habitat is the specific area on which are found physical or biological features essential to the conservation of the listed entity (e.g., species, subspecies, or DPS) and which may require special management or protection. Once critical habitat is designated, section 7 of the ESA requires Federal agencies to ensure that any action they fund, authorize or carry out is not likely to destroy or adversely modify that habitat. Federal actions that occur within designated critical habitat but have no effect on those features are not subject to ESA section 7 consultation regarding critical habitat. Citizens engaged in activities on private land where critical habitat may occur and that do not involve a Federal agency are not subject to ESA section 7 consultation.

We determined that a key conservation objective for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs is to increase the abundance of each DPS by facilitating increased successful reproduction and recruitment of the offspring to the marine environment. The physical features for successful reproduction and recruitment are:

- Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand range) for settlement of fertilized eggs, refuge, growth, and development of early life stages;
- Aquatic habitat with a gradual downstream salinity gradient of 0.5 up to as high as 30 parts per thousand and soft substrate (e.g., sand, mud) between the river mouth and spawning sites for juvenile foraging and physiological development;
- Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: (1) unimpeded movements of adults to and from spawning sites; (2) seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary, and; (3) staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (e.g., at least 1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river, and;
- Water, between the river mouth and spawning sites, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support: (1) spawning; (2) annual and interannual adult, subadult, larval, and juvenile survival;

and (3) larval, juvenile, and subadult growth, development, and recruitment (e.g., 13° C to 26° C for spawning habitat and no more than 30° C for juvenile rearing habitat, and 6 mg/L or greater dissolved oxygen for juvenile rearing habitat).

We determined that these features may require special management or protection. We identified the specific areas for each DPS for which we have information that these physical features are present and may require special management or protection.

For the Gulf of Maine DPS, we are designating five critical habitat units as follows: (1) Penobscot River main stem from the Milford Dam downstream for 53 river kilometers (RKMs) to where the main stem river discharges at its mouth into Penobscot Bay; (2) Kennebec River main stem from the Ticonic Falls/Lockwood Dam downstream for 103 RKMs to where the main stem river discharges at its mouth into the Atlantic Ocean; (3) Androscoggin River main stem from the Brunswick Dam downstream for 10 RKMs to where the main stem river discharges at its mouth into Merrymeeting Bay; (4) Piscataqua River from its confluence with the Salmon Falls and Cocheco rivers downstream for 19 RKMs to where the main stem river discharges at its mouth into the Atlantic Ocean as well as the waters of the Cocheco River from its confluence with the Piscataqua River and upstream 5 RKMs to the Cocheco Falls Dam, and waters of the Salmon Falls River from its confluence with the Piscataqua River and upstream 6 RKMs to the Route 4 Dam; and, (5) Merrimack River from the Essex Dam (also known as the Lawrence Dam) downstream for 48 RKMs to where the main stem river discharges at its mouth into the Atlantic Ocean. In total, these designations encompass approximately 244 kilometers (152 miles) of aquatic habitat.

We are designating four critical habitat units for the New York Bight DPS as follows: (1) Connecticut River from the Holyoke Dam downstream for 140 RKMs to where the main stem river discharges at its mouth into Long Island Sound; (2) Housatonic River from the Derby Dam downstream for 24 RKMs to where the main stem discharges at its mouth into Long Island Sound; (3) Hudson River from the Troy Lock and Dam (also known as the Federal Dam) downstream for 246 RKMs to where the main stem river discharges at its mouth into New York City Harbor; and, (4) Delaware River at the crossing of the Trenton-Morrisville Route 1 Toll Bridge, downstream for 137 RKMs to where the main stem river discharges at its mouth into Delaware Bay. In total, these designations encompass approximately 547 kilometers (340 miles) of aquatic habitat.

We are designating five critical habitat units for the Chesapeake Bay DPS as follows: (1) Potomac River from the Little Falls Dam downstream for 189 RKMs to where the main stem river discharges at its mouth into the Chesapeake Bay; (2) Rappahannock River from the U.S. Highway 1 Bridge, downstream for 172 RKMs to where the river discharges at its mouth into the Chesapeake Bay; (3) York River from its confluence with the Mattaponi and Pamunkey rivers downstream to where the main stem river discharges at its mouth into the Chesapeake Bay as well as the waters of the Mattaponi River from its confluence with the York River and upstream to the Virginia State Route 360 Bridge of the Mattaponi River, and waters of the Pamunkey River from its confluence with the York River and upstream to the Nelson's Bridge Road Route 615 crossing of the Pamunkey River for a total of 206 RKMs of aquatic habitat; (4) James River from Boshers Dam downstream for 160 RKMs to where the main stem river discharges at its

mouth into the Chesapeake Bay at Hampton Roads; and, (5) Nanticoke River from the Maryland State Route 313 Bridge crossing near Sharptown, MD to where the main stem discharges at its mouth into the Chesapeake Bay as well as Marshyhope Creek from its confluence with the Nanticoke River and upriver to the Maryland State Route 318 Bridge crossing near Federalsburg, MD, for a total of 60 RKMs of aquatic habitat. In total, these designations encompass approximately 773 kilometers (480 miles) of aquatic habitat.

The substrate information for Marshyhope Creek and the Nanticoke River was not received in time for us to consider it for inclusion in the proposed rule. However, we were aware that a final report was imminent and noted in this document that the presence of adult sturgeon in spawning condition and at the time when the Chesapeake Bay DPS spawns suggests that the features essential to Atlantic sturgeon reproduction and recruitment are present in Marshyhope Creek. The final project report was submitted to us by the Maryland Department of Natural Resources (DNR) during the public comment period. We reviewed the information as well as other available information for the Nanticoke River, including the Maryland DNR final report, Assessment of Critical Habitats for Recovering the Chesapeake Bay Atlantic Sturgeon Distinct Population Segment (Richardson and Secor, 2016), funded by the NOAA Species Recovery Grants to States (Section 6 Program). Based on this best available information, critical habitat for the Chesapeake Bay DPS occurs in the Nanticoke River and its tributary, Marshyhope Creek.

We proposed to designate critical habitat for the Chesapeake Bay DPS in the Susquehanna River from the Conowingo Dam and downstream for 16 RKMs to where the Susquehanna discharges at its mouth into Chesapeake Bay. We received comments requesting removal of the Susquehanna River critical habitat unit, and comments requesting inclusion of the upper Chesapeake Bay. Upon review, we determined that feature 2 (a salinity gradient to support juvenile growth and physiological development) is not present in the Susquehanna River from the Conowingo Dam and downstream to its mouth, and is not likely to be present in the future. The lack of a salinity gradient downstream of Conowingo Dam leads us to conclude that the river cannot support rearing of Atlantic sturgeon because exposure to increasing salinities prior to leaving the natal river is crucial for the physiological development of juveniles. Therefore, the lowermost 16 RKMs of the Susquehanna River are not essential to the reproduction or recruitment of the Chesapeake Bay DPS and we are not designating these as Chesapeake Bay DPS critical habitat.

We received many requests to designate critical habitat for Atlantic sturgeon in marine waters, bays, and sounds. We considered the best available information for whether and how Atlantic sturgeon juveniles, subadults, and adults use the marine environment, bays, and sounds. The best available information includes the public comment that provided information on the presence of Atlantic sturgeon adults and subadults in proximity to sand waves, peer reviewed literature, and reports submitted to us. However, we could not identify what the specific features are of marine waters, and bays and sounds between the ocean and river segment of a coastal estuary that make them important to Atlantic sturgeon belonging to the Gulf of Maine, New York Bight, or Chesapeake Bay DPS. We will continue to consider new information as it becomes available.

1 INTRODUCTION

On February 6, 2012, we, the National Marine Fisheries Service (NMFS), listed the New York Bight and Chesapeake Bay Distinct Population Segments (DPS) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) as endangered species, and the Gulf of Maine DPS of Atlantic sturgeon as a threatened species (77 FR 5880). Section 4(a)(3) of the ESA requires that we designate critical habitat for threatened and endangered species under our jurisdiction, with public notice and an opportunity to comment.

Section 3(5)(A) of the ESA defines critical habitat as: (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the Act, on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protections; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Act, upon a determination by the Secretary that such areas are essential for the conservation of the species (16 U.S.C. § 1532(5)(A)). Conservation is defined in section 3(3) of the ESA as "to use, and the use of, all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary" (16 U.S.C.§ 1532(3)). Therefore, critical habitat is the habitat essential for the species' recovery. However, section 3(5)(C) of the ESA clarifies that except in those circumstances determined by the Secretary, critical habitat shall not include the entire geographical area which can be occupied by the threatened or endangered species.

As described in section 4(b)(2) of the ESA, we are required to designate critical habitat based on the best available scientific data and after taking into consideration the economic impact, impact on national security and any other relevant impacts, of specifying any particular area as critical habitat. Section 4(b)(2) provides us with discretion to exclude particular areas from a designation if the benefits of excluding that area outweigh the benefits of including it in the designation, unless failure to designate such areas as critical habitat will result in the extinction of the species. Finally, Section 4(a)(3)(B) prohibits designating as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense or designated for its use, that are subject to an Integrated Natural Resources Management Plan (INRMP) prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a conservation benefit to the species, and its habitat, for which critical habitat is proposed for designation. Although not expressly stated in section 4(b)(2), NMFS regulations clarify that critical habitat shall not be designated within foreign countries or in other areas outside of United States jurisdiction (50 CFR § 424.12(h)).

Once critical habitat is designated, section 7(a)(2) of the ESA requires Federal agencies to ensure that any action they fund, authorize or carry out is not likely to destroy or adversely modify that habitat. This requirement is in addition to the section 7(a)(2) requirement that Federal agencies ensure that their actions are not likely to jeopardize the continued existence of ESA-listed species. The purpose and benefit of designating critical habitat was described in a NMFS and U.S. Fish and Wildlife Service joint rulemaking (78 FR 53058, August 28, 2013). Briefly, critical habitat represents the habitat essential for the species' recovery and provides for the conservation of listed species in several ways. For example, specifying the geographic location

of critical habitat facilitates implementation of section 7(a)(1) of the ESA by identifying areas where Federal agencies can focus their conservation programs and use their authorities to further the purposes of the ESA. Critical habitat requirements do not apply to citizens engaged in activities on private land that do not involve a Federal agency. However, designating critical habitat can help focus the efforts of other conservation partners (e.g., State and local governments, individuals and nongovernmental organizations).

The remainder of this report describes how we identified critical habitat areas for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs, including the information considered and the analyses conducted. Section 2 describes our approach as well as the statutory and regulatory requirements that informed our approach. Section 3 provides relevant biological information for each DPS. Section 4 describes the areas initially considered, information received from the military, economic impacts, and other relevant impacts. Section 5 provides our decision on whether to conduct an exclusion analysis. Finally, section 6 identifies each area that we are designating as critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs of Atlantic sturgeon.

2 NMFS' APPROACH FOR THE CRITICAL HABITAT DESIGNATIONS

Our approach, based on the statutory and regulatory requirements, was the same for each DPS. We were responsible for:

1. Considering the available biological information;
2. Identifying the geographical area occupied by the DPS at the time of listing;
3. Identifying physical and biological features essential to the conservation of the DPS;
4. Determining whether these features may require special management considerations;
5. Identifying specific areas that contain these features and delineating the area(s) by specific limits using landmarks, reference points or lines;
6. Considering whether any unoccupied habitat is essential to the conservation of the DPS;
7. Considering economic, national security, or any other impacts of designating critical habitat;
8. Determining whether any area that contains essential features is covered under an Integrated Natural Resource Management Plan that has been reviewed by us and determined by us to provide a conservation benefit to the DPS; if so, we would not include this area in our critical habitat proposal; and,
9. Determining whether to exclude any specific areas, but not if this would result in extinction of the DPS.

The criteria for designating critical habitat are provided in regulation at 50 CFR Part 424. Revisions to these joint NMFS and U.S. Fish and Wildlife Service (Services) regulations were published in February 2016. The revised regulations apply to all critical habitat designations proposed after March 14, 2016, including this designation. There are other laws, Executive Orders (EOs), and agency policy that we must follow when designating critical habitat. These include the Regulatory Flexibility Act (5 U.S.C. 601 et seq.) and EO 12866 that direct our impact analyses, and NOAA's Information Quality Guidelines that we use when we disseminate information to the public.

The Regulatory Flexibility Act establishes, "agencies shall endeavor, consistent with the objectives of a proposed rule and applicable statutes, to fit regulatory requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation." In its findings, Congress declared, in part, that, "when adopting regulations to protect the health, safety, and economic welfare of the Nation, Federal agencies should seek to achieve statutory goals as effectively and efficiently as possible without imposing unnecessary burdens on the public" and "the process by which Federal regulations are developed and adopted should be reformed to require agencies to solicit ideas and comments of small businesses, small organizations, and small governmental jurisdictions to examine the impact of proposed and existing rules on such entities, and to review the continued need for existing rules." Federal agencies are required to prepare and make available for public comment an initial regulatory flexibility analysis whenever the Federal agency publishes a proposed rule, and to prepare a final regulatory flexibility analysis for a final rule. Specific criteria describe what the agency needs to provide in the initial and final regulatory flexibility analyses. The final regulatory flexibility analysis for the designation of critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs of Atlantic sturgeon is provided in Appendix A of this document. The initial regulatory flexibility analysis was made available for public comment when the proposed critical habitat designations were published in the *Federal Register*.

EO 12866, Regulatory Planning and Review, provides guidance to Federal agencies on the development and analysis of regulatory actions. The EO directs Federal agencies to: "…assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages, distributive impacts, and equity), unless a statute requires another regulatory approach."

The EO defines the term "significant regulatory action" and requires the issuing agency to provide an assessment of the potential costs and benefits of a significant regulatory action. The Office of Management and Budget (OMB) provided guidance to Federal agencies on how to conduct such assessments (OMB Circular A-4, September 17, 2003). Based on that guidance and our regulations at 50 CFR § 424, we assessed the costs and benefits of the available regulatory alternatives for the critical habitat designations. The assessment of the potential costs and benefits is included in the final economic analysis, included as Appendix B to this document. The draft economic analysis was made available for public comment when the proposed critical habitat designations were published in the *Federal Register*.

Federal agencies must comply with Information Quality Act (IQA, Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554), OMB 515 Guidelines, and the OMB Peer Review Bulletin when disseminating certain scientific information to the public. NMFS policy directive PD 04-108 implements Section 515 and fulfills the OMB and Department of Commerce information quality and peer review guidelines.

This document meets the definition of "influential scientific information" under the IQA; therefore, we sought peer review of this document from Atlantic sturgeon experts, including researchers and state wildlife managers. We also sought peer review from three economists for the draft economic analysis. As appropriate, we incorporated comments from those reviewers prior to dissemination of this report to the public and prior to completion of the proposed rule for the critical habitat designations. Comments from the peer reviewers and our response to those are posted at http://www.cio.noaa.gov/services_programs/prplans/ID294.html.

3 THE BIOLOGICAL INFORMATION

We considered the best available information on the biology and ecology of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs as well as for the subspecies (i.e., Atlantic sturgeon) and sturgeon species, in general. We gathered and reviewed the best available information to inform our decisions for the critical habitat designations.

Atlantic Sturgeon

Although there is considerable variability among species, all sturgeon species (order *Acipenseriformes*) have some common life history traits. They all: (1) occur within the Northern Hemisphere; (2) spawn in freshwater over hard bottom substrates; (3) generally do not spawn annually; (4) are benthic foragers; (5) mature relatively late and are relatively long lived; and, (6) are relatively sensitive to low dissolved oxygen levels (Dees, 1961; Vladykov and Greeley, 1963; Klyashtorin, 1976; Rochard *et al*., 1990; Bemis and Kynard, 1997; Billard and Lecointre, 2001; Secor and Niklitschek, 2002; Sulak and Randall, 2002; Pikitch *et al*., 2005).

Atlantic sturgeon have all of these traits. They occur along the eastern coast of North America from Hamilton Inlet, Labrador, Canada to Cape Canaveral, Florida, USA (Bigelow and Welsh, 1924; Dees, 1961; Vladykov and Greeley, 1963; Scott and Scott, 1988; ASSRT, 2007; T. Savoy, CT DEEP, pers. comm.). An anadromous species[1], Atlantic sturgeon are spawned in freshwater[2] of tidal-affected rivers that are part of a coastal estuary[3]. The offspring remain in the river estuary (i.e., the part of the estuary that is a river) for months to years before emigrating to the marine environment. Atlantic sturgeon reach maturity at about 5-34 years of age, after years of moving between marine waters and coastal estuaries, and spawn every 1-5 years (males) or 2-5 years (females) (Bigelow and Schroeder, 1953; Vladykov and Greeley, 1963; Mangin, 1964; Smith *et al*., 1982; Smith, 1985; Van Eenennaam *et al*., 1996; Van Eenennaam and Doroshov, 1998; Stevenson and Secor, 1999; Collins *et al*., 2000; Caron *et al*., 2002; Pikitch *et al*., 2005; Dadswell, 2006; ASSRT, 2007). Atlantic sturgeon have been aged to live as long as 64 years, although the typical lifespan is probably much shorter (Sulak and Randall, 2002; Balazik *et al*., 2010; Hilton *et al*., 2016). Analysis of stomach contents confirms that Atlantic sturgeon are benthic foragers (Ryder, 1888; Bigelow and Schroeder, 1953; Johnson *et al*., 1997; Secor *et al*.,

[1] Anadromous refers to a fish that is born in freshwater, spends most of its life in the sea, and returns to freshwater to spawn (NEFSC FAQ's, available at http://www.nefsc.noaa.gov/faq/fishfaq1a.html; modified June 16, 2011).
[2] Freshwater is water containing less than 1,000 milligrams per liter of dissolved solids, most often salt (http://water.usgs.gov/edu/watercyclefreshstorage.html).
[3] Estuaries are areas where salt water from the ocean mixes with fresh water from rivers, rainfall, and upland runoff. Within the estuary, salt and fresh water proportions differ daily depending on the season, weather, and tides. From http://www.btnep.org/btnep/about/whatisestuary.aspx.

2000; NMFS and USFWS, 2007; Guilbard *et al*., 2007; Hatin *et al*., 2007; Savoy, 2007; Dzaugis, 2013; McLean *et al*., 2013).

Tagging records and the relatively low rate of gene flow reported in population genetic studies provide evidence that Atlantic sturgeon return to their natal river to spawn (ASSRT, 2007). The spawning locations for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs are informed by tracking data of adults in spawning condition to freshwater areas of known spawning rivers, collection of Atlantic sturgeon larvae, and historical data from the Atlantic sturgeon caviar fisheries. Based on these lines of evidence, spawning sites for the Atlantic sturgeon DPSs are well-oxygenated areas with flowing freshwater at the time of spawning, ranging in temperature from 13°C to 26°C, and hard bottom substrate such as cobble, gravel, and bedrock (Ryder, 1888; Dees, 1961; Vladykov and Greeley, 1963; Scott and Crossman, 1973; Gilbert, 1989; Bain *et al*., 2000; Collins *et al*., 2000; Caron *et al*., 2002; Hatin *et al*., 2002; Mohler, 2003; Greene *et al*., 2009; Balazik *et al*., 2012; Hager *et al*., 2014). Water depth leading to spawning sites is highly variable; reported depths are relatively shallow in some river systems and relatively deep in other systems (Borodin, 1925; Dees, 1961; Scott and Crossman, 1973; Shirey *et al*., 1999; Bain *et al*., 2000; Hatin *et al*., 2002; Balazik *et al*., 2012; Hager *et al*., 2014).

Within minutes of being fertilized, the eggs become sticky and adhere to the substrate for the relatively short and temperature-dependent period of larval development (Ryder, 1888; Vladykov and Greeley, 1963; Murawski and Pacheco, 1977; Smith *et al*., 1980; Van den Avyle, 1984; Mohler, 2003). In hatchery studies, hatching occurred approximately 60 hours after egg deposition at water temperatures of 20 °C to 21 °C and 96 hours after egg deposition with a water temperature of approximately 18°C (Smith *et al*., 1980; J. Fletcher, USFWS pers. comm. in Mohler, 2003).

Upon hatching, Atlantic sturgeon are nourished by a yolk sac, are mostly pelagic (e.g., exhibit a "swim-up and drift-down" behavior), and move away from light (Kynard and Horgan, 2002; Mohler, 2003). Within days, the fish exhibit more benthic behavior which lasts until the yolk sac is absorbed at about 8 to 10 days post-hatching (Kynard and Horgan, 2002; Mohler, 2003). Once the yolk sac is absorbed, the fish occur in the water column but feed at the bottom of the water column and use the substrate's interstitial spaces to shelter from predators (Ryder, 1888; Smith *et al*., 1980; Van Eenennaam *et al*., 1996; Bain *et al*., 2000; Kynard and Horgan, 2002; Mohler, 2003; Richardson *et al*., 2007; Greene *et al*., 2009). At this stage of development, Atlantic sturgeon are generally referred to as juveniles[4]. The juvenile stage lasts months to years in brackish waters of the natal estuary (Holland and Yelverton, 1973; Dovel and Berggen, 1983; Waldman *et al*., 1996; Shirey *et al*., 1997; Collins *et al*., 2000; Secor *et al*., 2000; Dadswell, 2006; Hatin *et al*., 2007; ASSRT, 2007; Greene *et al*., 2009; Calvo *et al*., 2010; Schueller and Peterson, 2010).

[4] Some of the published literature for Atlantic sturgeon uses the term juvenile to refer to all sexually immature Atlantic sturgeon, including sexually immature fish that have emigrated from the natal river estuary. We use "juvenile" in reference to immature fish that have not emigrated from the natal river estuary, and we use the term "subadult" for immature Atlantic sturgeon that have emigrated from the natal river estuary.

The distribution of Atlantic sturgeon juveniles in the natal river estuary is a function of physiological development and habitat selection based on water quality factors of temperature, salinity and dissolved oxygen[5], which are inter-related environmental variables. Laboratory studies have shown that when juveniles less than a year old (also known as young-of-year) are reared in water with specific values of dissolved oxygen, salinity, and water temperature, they experience differences in growth rate. Young-of-year had reduced growth at 40 percent dissolved oxygen saturation with salinity of 8 and 15 parts per thousand (ppt) and temperatures at 12°C, 20°C, and 28°C. For the conditions tested, they grew best (i.e., maximum growth) at 70 percent dissolved oxygen saturation with salinity of 8 to 15 ppt and temperature of 12°C and 20°C (i.e., dissolved oxygen saturations greater than 6.5 mg/L). When given the opportunity to move between rearing habitats of different values of dissolved oxygen, salinity, and temperature, the young-of-year selected for conditions that supported growth (Niklitschek and Secor, 2009; Niklitschek and Secor, 2010). Similar laboratory results were obtained for age-1 Atlantic sturgeon juveniles (i.e., greater than 1 year and less than 2 years old) which have been shown to tolerate salinities of 33 ppt (e.g., a salinity level associated with seawater) but grow faster in lower salinity waters (Niklitschek and Secor, 2009; Allen *et al*., 2014).

In the natural environment, juvenile Atlantic sturgeon move back and forth within the natal estuary to remain in waters most suitable for their growth and development. The larger, presumably older, juveniles occur across a broader salinity range than smaller, presumably younger, juveniles. For example, juveniles occur in oligohaline waters (salinity of 0.5 to 5 parts per thousand) during the first year of life, transitioning to using mesohaline waters (salinity of 5 to 18 parts per thousand) of the natal estuary during growth and development, and eventually moving into polyhaline waters (salinity of 18-30 parts per thousand) of the natal river estuary, if available, before emigrating from the natal river estuary (Bain, 1997; Shirey *et al*., 1997; Haley, 1999; Bain *et al*., 2000; Collins *et al*., 2000; Secor *et al*., 2000; Hatin *et al*., 2007; McCord *et al*., 2007; Munro *et al*., 2007; Sweka *et al*., 2007; Calvo *et al*., 2010; Hale *et al*., 2016). Tracking studies suggest that Gulf of Maine, New York Bight, and Chesapeake Bay DPS juveniles stay within the natal river until suitably developed, and make their first emigration from the natal river by passing through adjoining bays or sounds on their way to the Atlantic Ocean (Secor *et al*., 2000; McCord *et al*., 2007; ASSRT, 2007; Sweka *et al*., 2007; Greene *et al*., 2009; Calvo *et al*., 2010; Schueller and Peterson, 2010; Hale *et al*., 2016). This marks the beginning of the next life stage, referred to here as the subadult stage, but by other authors as, for example, late-stage juveniles or marine migrants.

In the marine environment, subadults mix with adults and subadults from other river systems. Both life stages typically occur within the 50 meter depth contour (Bowen and Avise, 1990; Waldman *et al*., 1996; King *et al*., 2001; Eyler *et al*., 2004; Stein *et al*., 2004; Eyler, 2006; Laney

[5]Dissolved oxygen is measured either in milligrams per liter (mg/L) or "percent saturation." Milligrams per liter is the amount of oxygen in a liter of water. Percent saturation is the amount of oxygen in a liter of water relative to the total amount of oxygen that the water can hold at that temperature. (EPA, Water: Monitoring & Assessment; http://water.epa.gov/type/rsl/monitoring/vms52.cfm). Dissolved oxygen can fluctuate given a number of factors including water temperature (e.g., cold water holds more oxygen than warm water) and salinity (e.g., the amount of oxygen that can dissolve in water decreases as salinity increases).

et al., 2007; Grunwald *et al*., 2008; Dunton *et al*., 2010; Erickson *et al*., 2011; Dunton *et al*., 2012; Wirgin *et al*., 2012; Waldman *et al*., 2013; O'Leary *et al*., 2014, Wirgin *et al*., 2015a; Wirgin *et al*., 2015b). Atlantic sturgeon travel long distances in marine waters, aggregate in both ocean and estuarine areas at certain times of the year, and exhibit seasonal coastal movements in the spring and fall (Vladykov and Greeley, 1963; Holland and Yelverton, 1973; Dovel and Berggren, 1983; Dadswell *et al*., 1984; Gilbert 1989; Johnson *et al*., 1997; Rochard *et al*., 1997; Bain *et al*., 2000; Kynard *et al*., 2000; Savoy and Pacileo, 2003; Eyler *et al*., 2004; Stein *et al*. 2004; Eyler, 2006; Laney *et al*., 2007; Dunton *et al*., 2010; Dunton *et al*., 2012; Erickson *et al*., 2011; Oliver *et al*., 2013; Wippelhauser and Squiers, 2015). Existing and new technologies are providing additional information about the life history and distribution of the Atlantic sturgeon in marine waters (Nelson *et al*., 2013; Breece *et al*., 2016). However, there is still a paucity of data to inform distribution of subadult and adult Atlantic sturgeon within the marine environment and their habitat use.

The locations of spawning for Gulf of Maine, New York Bight and Chesapeake Bay DPS Atlantic sturgeon are informed by the location of freshwater, hard substrate, water depth, tracking of adults to upriver locations and the behavior of adults at those locations, capture of young-of-year and, in limited cases, larvae, and historical accounts of where fishing occurred for the caviar fishery. Based on one or more of these lines of evidence, multiple sites have been identified in some rivers, including the Hudson River (Dovel and Berggren, 1983; Van Eenennaam *et al*., 1996; Kahnle *et al*., 1998; Bain *et al*., 2000), Delaware River (Sommerfield and Madsen, 2003; Simpson, 2008; Breece *et al*., 2013), James River (Hager, 2011; Austin, 2012; Balazik *et al*., 2012; Balazik and Musick, 2015), and the York River system (Bushnoe *et al*., 2005; Hager *et al*., 2014). Spawning sites at different locations within the tidal-affected river help to ensure successful spawning given annual changes in the location of the salt front[6].

Male Atlantic sturgeon in spawning condition have been observed to stage in more saline waters of the coastal estuary before moving upriver once the water temperature reaches approximately 6°C (43°F). They may spend weeks moving upstream and downstream of the presumed spawning area(s) before moving back downriver to the lower estuary and residing there until outmigration in the fall (Smith *et al*., 1982; Dovel and Berggren, 1983; Smith, 1985; Bain, 1997; Bain *et al*., 2000; Collins *et al*., 2000; Hatin *et al*., 2002; Greene *et al*., 2009; Balazik *et al*., 2012; Breece *et al*., 2013). In contrast, spawning females move upriver when temperatures are closer to 12°C to 13°C (54° to 55°F), return downriver relatively quickly, and may leave the estuary and travel to other coastal estuaries until outmigration to marine waters in the fall (Smith *et al*., 1982; Dovel and Berggren, 1983; Smith, 1985; Bain, 1997; Bain *et al*., 2000; Collins *et al*., 2000; Greene *et al*., 2009; Balazik *et al*., 2012; Breece *et al*., 2013). The scientific literature indicates that Atlantic sturgeon spawn in water depths from 3–27 m (9.8–88.6 ft) (Borodin, 1925; Leland, 1968; Scott and Crossman, 1973; Crance, 1987; Bain *et al*., 2000). However, much of this information is derived from studies of Atlantic sturgeon in the northern United

[6] The salt front in an estuary is the line between brackish water and freshwater. The location of the salt front changes with the tide cycle and the season. Daily, as the tide in the ocean rises, it brings saltier ocean water into the estuary and pushing the salt front further up the river estuary. As the tide recedes, the salt front occurs further downriver. Seasonally, higher freshwater flow (e.g., in the spring) pushes the salt front further downriver in the estuary. During times of less freshwater input (e.g., during the summer), the salt front is further upriver in the estuary.

States and Canadian river systems. Atlantic sturgeon in more southern rivers where the fall line is further inland and there is a long, gently sloping coastal plain, are likely spawning in much shallower water depths based on repeated observations by biologists of sturgeon with lacerations on their undersides from moving into extremely shallow water to spawn on hard substrate. For example, in the James and Pamunkey rivers of Virginia, river depth in areas where spawning Atlantic sturgeon were captured ranged from 0.5 to 11 m deep (Balazik et al., 2012; Hager et al., 2014). The authors did not report the river depth at the time the fish were captured, and water depth in the spawning areas is affected by the tide as well as the volume of freshwater flowing into the river. Based on the available information, and the body depth and spawning behavior of Atlantic sturgeon, water depths of at least 1.2 m (4 ft) are deep enough to accommodate Atlantic sturgeon spawning.

There is a growing body of evidence that some Atlantic sturgeon river populations have two spawning seasons comprised of different spawning adults. These are generally referred to as spring spawning and fall spawning even though the actual time of spawning may not occur during the astronomical spring or fall season (Balazik and Musick, 2015). For example, spring spawning occurs approximately April-May for the Chesapeake Bay DPS, whereas fall spawning for the DPS occurs August-October (Balazik *et al*., 2012; Hager *et al*., 2014; Balazik and Musick, 2015; Richardson and Secor, 2016).

Other historical information (e.g., an 1870's report of Atlantic sturgeon spawning during August in the Hudson River; Dovel and Berggren, 1983) suggests spring and fall spawning runs were typical, and may still occur in many areas of the Atlantic sturgeon's range from Virginia and south (Balazik and Musick, 2015). Evidence of fall spawning for the Carolina and South Atlantic DPSs was available when the five Atlantic sturgeon DPSs were listed under the ESA (77 FR 5914; Smith *et al*., 1984; NMFS and USFWS, 1998; Collins *et al*., 2000). Since the listings, additional evidence of fall as well as spring spawning has been obtained for the Chesapeake Bay DPS (Balazik *et al*., 2012; Hager *et al*., 2014; Kahn *et al*., 2014). Spring spawning is the only currently known spawning period for the Gulf of Maine and New York Bight DPSs. Given seasonal changes in the location of the salt front for estuarine systems, it is likely that fall spawning occurs or would have occurred further upstream than the locations for spring spawning in rivers.

In addition to providing access to spawning habitat, river estuaries provide foraging opportunities for subadult and adult Atlantic sturgeon. Stomach content analysis confirms Atlantic sturgeon subadults and adults forage in coastal river estuaries (Hatin *et al*., 2007; Savoy, 2007; Calvo *et al*., 2010; Wippelhauser, 2012; Dzaugis, 2013; McLean *et al*., 2013; McLean *et al*., 2014). The occurrence of subadult and adults in association with the salt front, a biologically-rich area of river estuaries, (Brundage and Meadows, 1982; Savoy and Shake, 1993; Collins *et al*. 2000; Savoy and Pacileo, 2003; Hatin *et al*., 2007; Calvo *et al*., 2010; Hager, 2011; Balazik *et al.,* 2012; Breece *et al.,* 2013) also suggests use of estuarine waters for seasonal foraging. At least some Atlantic sturgeon subadults and adults move between different estuaries in the spring through fall rather than remaining in the same estuary from spring through fall (Savoy and Pacileo, 2003; Simpson, 2008; Collins *et al*., 2000; Balazik *et al*., 2012).

The directed movement of subadult and adult Atlantic sturgeon to coastal river estuaries in the spring is reversed in the fall (Smith *et al*., 1984; Smith, 1985; Collins *et al*., 2000; Savoy and Pacileo, 2003; Laney *et al*., 2007; Greene *et al*., 2009; Hager, 2011; Erickson *et al*., 2011; Balazik *et al*., 2012; Wippelhauser, 2012; Oliver *et al*., 2013). The whereabouts of these fish once they leave coastal estuaries is uncertain although some aggregation areas have been identified. For example, Atlantic sturgeon aggregate off of the Virginia/North Carolina coastline in the winter (Laney *et al*., 2007). Others have been tracked to the southern extent of the range (T. Savoy, CT DEEP, pers. comm.) while at least one was tracked to the more northern area of the subspecies range, the Back River, Maine, (G. Zydlewski, Univ. of Maine, pers. comm.), and two adults originally tagged in the Delaware were detected in the Appomattox River, Virginia during the winter (C. Hager, Chesapeake Scientific, pers. comm.). A study of Atlantic sturgeon found that some of the fish migrating from the Delaware estuary in the fall remained nearby within a plume of water flowing out from the estuary (Oliver *et al*., 2013). Taylor *et al*. (2016) likewise found that Atlantic sturgeon that left the Saint John River, New Brunswick in the fall primarily moved into Bay of Fundy waters for the winter although some fish were detected as far as 1,500 kilometers from the Bay of Fundy. Dunton *et al.* (2010) summarized the incidental capture of Atlantic sturgeon, primarily from Maine through New Jersey, during fall and winter months while Dunton *et al*., 2015 described the fall and winter aggregations of Atlantic sturgeon off of the south shore of Long Island, New York.

Breece *et al.* (2016) suggested Atlantic sturgeon distribution in the marine environment is affected more by the characteristics of the water (e.g., eddies, coastal upwelling, temperature) than characteristics of the landscape (e.g., depth, substrate). The authors used ocean color and sea surface temperature to describe seascapes and associate these with Atlantic sturgeon presence. However, the authors also acknowledged that the variables used to define the seascapes were so dynamic, the results of the study were presented with respect to an 8-day average of ocean color and sea surface temperature for each seascape, and that further work was needed to explain the association between Atlantic sturgeon, a benthic fish species, and ocean color and sea surface temperature.

Atlantic Sturgeon DPSs

The Atlantic Sturgeon Stock Assessment Peer Review Report (ASMFC, 1998) and the 1998 Status Review for Atlantic Sturgeon (NMFS and USFWS, 1998) provided information for some river estuaries based on information that Atlantic sturgeon historically occurred in the estuary and may have spawned in the river. The 2007 Status Review for Atlantic Sturgeon (ASSRT, 2007) updated information for known occurrence of Atlantic sturgeon in the rivers particularly with respect to whether evidence suggested a spawning population in the river. Our knowledge of Atlantic sturgeon spawning populations continues to evolve, including new evidence of spawning populations that were thought extirpated. For example, since the 2007 status review, research has provided evidence of spawning in the Androscoggin River (Gulf of Maine DPS), Connecticut River (New York Bight DPS), Pamunkey River (Chesapeake Bay DPS), and Marshyhope Creek, a tributary of the Nanticoke River (Chesapeake Bay DPS).

Genetic analyses remain the best method for determining the origin of an Atlantic sturgeon once it has left its natal river. Given on-going analyses of samples already collected, and on-going field research, we expect our knowledge of the habitats used by each DPS to continue to evolve.

We do not have the same level of information for all areas. The following summaries are based on our best available information for the habitats used by the Gulf of Maine, New York Bight, or Chesapeake Bay DPS.

To identify habitats used by a particular Atlantic sturgeon DPS, we considered available information that described: (1) capture location and/or tracking locations of a subadult or adult Atlantic sturgeon identified to its DPS by genetic analysis; (2) capture location and/or tracking locations of a subadult or adult Atlantic sturgeon identified to its DPS based on the presence of a tag that was applied when the sturgeon was captured as a juvenile in its natal estuary; (3) capture or detection location of adults in spawning condition (i.e., extruding eggs or milt) or post-spawning condition (e.g., concave abdomen for females); (4) capture or detection of young-of year and other juvenile age classes; and, (5) collection of eggs or larvae. In the case of estuaries of known spawning rivers, we assumed based on the available information that a portion of the subadults and adults present originated from that river and, thus, the habitats used by subadults and adults in a spawning river were indicative of habitats used by the DPS which spawned in the river. Previous studies have demonstrated that a combination of microsatellite and mitochondrial DNA analyses provide the most accurate information to identify an Atlantic sturgeon to its DPS, and using mitochondrial analysis alone provides much lower assignment accuracy given the prevalence of a common Atlantic sturgeon haplotype (ASSRT, 2007; Wirgin *et al.*, 2012; Waldman *et al.*, 2013). Therefore, when reviewing the available information on habitats used by Atlantic sturgeon, we also considered what genetic analyses, if any, were used to assign the sampled sturgeon to its DPS of origin.

Gulf of Maine DPS

The Kennebec River was the only known spawning river for the Gulf of Maine DPS when the DPS was listed as threatened (ASSRT, 2007; 77 FR 5880, February 6, 2012). Spawning has since been confirmed in the Androscoggin River (Wippelhauser, 2012). The Brunswick Dam is the upstream limit of Atlantic sturgeon distribution in the Androscoggin River, and the likely historical upstream limit given the dam is built at the head of tide at Pejepscot Falls, a natural barrier to sturgeon passage. The Brunswick Dam is located approximately 10 RKMs upstream of the confluence of the Kennebec and Androscoggin rivers (ASMFC, 1998; ASSRT, 2007; NMFS, 2013; Wippelhauser and Squiers, 2015). The Lockwood Dam at RKM 103 is the current upstream limit for Atlantic sturgeon in the Kennebec River and is also located at the site of a natural falls; considered the historic upstream limit for Atlantic sturgeon on the River (ASSRT, 2007). From 1837 to 1999, the Edwards Dam was the upstream limit of Atlantic sturgeon in the Kennebec River. Located near the head of tide, approximately 29 RKMs downstream of the Lockwood Dam, the Edwards Dam (formerly at RKM 74) prevented Atlantic sturgeon from accessing historical habitat. Sturgeon were sighted above the former Edwards Dam site after removal of the dam. In June 2005, an Atlantic sturgeon was incidentally captured as far upriver as RKM 102 (ASSRT, 2007; Wippelhauser, 2012).

Substrate type in the Kennebec estuary is largely sand and bedrock (Fenster and Fitzgerald 1996; Moore and Reblin, 2008). Mesohaline waters occur upstream of Doubling Point (approximately RKM 16) during summer low flows, transitioning to oligohaline waters and then essentially tidal freshwater from Chops Point (the outlet of Merrymeeting Bay at approximately RKM 30)

upriver to the head of tide on the Kennebec and Androscoggin rivers (ASMFC, 1998; Kistner and Pettigrew, 2001; Moore and Reblin; 2008; Wippelhauser, 2012).

During the period 1977-2001, Atlantic sturgeon in spawning condition (i.e., ripe males releasing milt) or of size presumed to be sexually mature adults (i.e., > 150 centimeter total length) were caught between RKM 52.8 and RKM 74 of the Kennebec River during the months of June and July, the likely spawning season. From 2009 to 2011, 31 Atlantic sturgeon, including 6 ripe males, were caught in the Kennebec River between RKM 70 and RKM 75 (Wippelhauser, 2012; Wippelhauser and Squiers, 2015). Sturgeon in the Upper Kennebec Estuary (defined as RKM 45 to RKM 74 at head of tide in the cited document) repeatedly moved between RKM 48 and RKM 75 (Wippelhauser, 2012). An additional eight sturgeon, including one ripe male, were caught in the Androscoggin in June and July of 2009-2011 (Wippelhauser, 2012). Three larvae were captured in the Upper Kennebec Estuary, 1 to 1.6 RKMs upstream of the former Edwards Dam site (RKM 74) (Wippelhauser, 2012).

Merrymeeting Bay and the Lower Kennebec Estuary were used by post-spawn adults, juveniles, and other life stages at least as late as November[7]. Tagging detections the following spring suggest that some subadult Atlantic sturgeon may have overwintered in Merrymeeting Bay (Wippelhauser, 2012). Sturgeon captured and tagged in the Saco and Penobscot rivers were also detected in the Kennebec Estuary, typically Merrymeeting Bay and downstream locations, although at least one male, captured in the Saco in 2010, was the single ripe male also captured in the Androscoggin (Wippelhauser, 2012). Genetic information to identify this Atlantic sturgeon to the river of origin is not available.

The Penobscot River estuary is about 51 RKMs long from the head of tide to Searsport, ME. During spring freshets tidal freshwater extends to Winterport (RKM 29), and during low flow months the salt front extends upstream as far as Hamden (RKM 40) (ASMFC, 1998). The two lowermost dams on the Penobscot River, Great Works Dam and Veazie Dam (at RKM 56), were removed in 2012 and 2013, respectively, opening up all known historical Atlantic sturgeon habitat in the Penobscot River, and access to more of the tidal freshwater habitat.

The upper part of the Penobscot River estuary (RKM 34 to RKM 43) is characterized as freshwater, with depths of 2.5 – 9 meters depending on tide and position in the river, and are predominantly cobble and gravel substrate. The middle part (RKM 26 to RKM 31) has an average water depth of 7.5 meters with maximum salinity of 2.5 ppt (i.e., oligohaline waters) in June, and muddy substrate with high levels of organic matter (mostly decaying wood chips and sawdust), whereas the lower part of the estuary (RKM 21 to RKM 24) has salinities of approximately 15 ppt during summer, and a predominance of sand substrate (Dzaugis, 2013).

The Piscataqua River is formed by the confluence of the Salmon Falls and Cocheco Rivers, and is part of the Great Bay Estuary. The Piscataqua River is tidal throughout it length, approximately 21 RKMs, to its mouth at Portsmouth Harbor. Head of tide occurs upriver of the confluence, at the location of the lowermost dams on the Salmon Falls and Cocheco Rivers (Short, 1992; SBCC, 2009). Salinity of the Piscataqua River ranges from polyhaline at the mouth

[7] Receivers for tracking and detecting tagged fish were maintained from April through October or November.

of the river to oligohaline at the head of tide on the Salmon Falls and Cocheco rivers. Overall, the estuary is heavily influenced by the tidal flow. Dissolved oxygen is typically above 6.0 mg/L, and is very consistent throughout the water column in the Piscataqua River. The average depth at mid-tide is approximately 3.2 meters although this varies with both tide and topography. Substrate varies from soft mud to hard sand to gravel. (Short, 1992; ASMFC, 1998; Trowbridge, 2007). The 2007 Atlantic sturgeon status review provided information on directed effort to catch Atlantic sturgeon in the Piscataqua River, and incidental capture of a large, ripe female Atlantic sturgeon near the head of tide in the Salmon Falls River in 1990. Between 2010 and 2016, three Atlantic sturgeon were detected in the Piscataqua River using passive acoustic array (M. Kieffer, USGS, pers. comm.). There are no current directed studies for Atlantic sturgeon in the Piscataqua River or Great Bay Estuary other than the use of the passive acoustic receivers for a part of the year in some areas of the river.

In the 1800s, construction of the Essex Dam on the Merrimack River (at RKM 48) blocked Atlantic sturgeon access to about 58 percent of historical habitat (ASMFC, 1998; Oakley, 2003; ASSRT, 2007). Tidal influence extends to RKM 35. The salt front extends upriver to RKM 16 in summer at the lowest river discharges (Kieffer and Kynard 1993; ASMFC, 1998). The non-tidal section is dominated by sand and gravel and depths less than three meters. Thus, there is approximately 19 RKMs of tidal freshwater and 11 RKMs of freshwater habitat available for the early life stages of Atlantic sturgeon during the summer months. Atlantic sturgeon are regularly present in the Merrimack River. Although there are no recent reports of Atlantic sturgeon spawning in the Merrimack River, the success of shortnose sturgeon spawning in the river suggests Atlantic sturgeon spawning would be successful as well.

While there is no current evidence that Atlantic sturgeon are spawning in Gulf of Maine rivers other than the Kennebec and Androscoggin, captures of sturgeon in the Merrimack, Penobscot and Piscataqua/Salmon Falls/Cocheco rivers indicate that there is the potential for spawning to occur in these rivers.

Gulf of Maine DPS Atlantic sturgeon travel great distances in the marine environment, and their marine range includes waters under Canadian jurisdiction. Genetics information is available for Atlantic sturgeon captured in six specific areas of their marine range: Bay of Fundy, Connecticut River estuary and Long Island Sound, New York and New Jersey coast, Delaware coast, Long Island coast off of Rockaway, New York, and waters off of the Virginia/North Carolina border. The Gulf of Maine DPS comprised 0 to 14.5 percent of Atlantic sturgeon sampled in these areas with the exception of the Bay of Fundy collection where the Gulf of Maine DPS comprised 35 percent of the Atlantic sturgeon sampled (Laney *et al*., 2007; Dunton *et al*., 2012; Wirgin *et al*., 2012; Waldman *et al*., 2013; O'Leary *et al*., 2014; Wirgin *et al*., 2015a). The greater concentration of Gulf of Maine DPS Atlantic sturgeon in some parts of its marine range suggests certain marine habitats are more useful to and perhaps also essential to the Gulf of Maine DPS. As previously noted, we cannot designate critical habitat in areas outside of U.S. jurisdiction.

New York Bight DPS

At the time of listing, the Delaware and Hudson rivers were the only rivers where spawning was known to still occur for the New York Bight DPS of Atlantic sturgeon (Dovel and Berggren, 1983; Bain *et al*., 1998; Kahnle *et al*., 1998; ASSRT, 2007; Calvo *et al*., 2010). In 2014, several

small Atlantic sturgeon were captured in the Connecticut River (T. Savoy, CT DEEP, pers. comm.; Savoy *et al*., 2017). Though it was previously thought that the Atlantic sturgeon population in the Connecticut had been extirpated (Savoy and Pacileo, 2003; ASSRT, 2007), Analysis of tissues collected from the captured sturgeon indicate the Connecticut River sturgeon are genetically different than sturgeon that are spawned in the Delaware and Hudson rivers (Savoy et al., 2017), and strongly suggests that the Connecticut River supports an Atlantic sturgeon spawning population.

The Hudson River is one of the most studied areas for Atlantic sturgeon. The upstream limit for Atlantic sturgeon on the Hudson River is the Federal Dam at the fall line in Troy, NY, approximately RKM 246 (Dovel and Berggren, 1983; Bain *et al*., 1998; Kahnle *et al*., 1998; Everly and Boreman, 1999). Recent tracking data indicate Atlantic sturgeon presence at this upstream limit (D. Fox, DESU, pers. comm.). Sturgeon occurring in the upstream limits of the river are suspected, but not yet confirmed, to belong to the New York Bight DPS.

Spawning may occur in multiple sites within the river (Dovel and Berggren, 1983; Van Eenennaam *et al*., 1996; Kahnle *et al*., 1998; Bain *et al*., 2000). The area around Hyde Park (approximately RKM 134) is considered a likely spawning area based on scientific studies and historical records of the Hudson River sturgeon fishery (Dovel and Berggren, 1983; Van Eenennaam *et al*., 1996; Kahnle *et al*., 1998; Bain *et al*., 2000). Habitat conditions at the Hyde Park site are described as freshwater year round with substrate including bedrock, and water depths of 12 to 24 meters (Bain *et al*., 2000). Similar conditions occur at RKM 112, an area of freshwater and water depths of 21 to 27 meters (Bain *et al*., 2000).

Catches of Atlantic sturgeon less than 63 centimeter fork length suggest that sexually immature fish utilize the Hudson River estuary from the Tappan Zee (RKM 40) through Kingston (RKM 148) (Dovel and Berggren, 1983; Haley, 1999; Bain *et al*., 2000). Seasonal movements of the immature fish are apparent as they primarily occupy waters from RKM 60 to RKM 107 during summer months and then move downstream as water temperatures decline in the fall, primarily occupying waters from RKM 19 to RKM 74 (Dovel and Berggren, 1983; Haley, 1999; Bain *et al*., 2000). In a separate study, Atlantic sturgeon ranging in size from 32 to 101 cm fork length were captured at highest concentrations during spring in soft-deep areas of Haverstraw Bay even though this habitat type comprised only 25 percent of the available habitat in the Bay (Sweka *et al*., 2007).

In the Delaware River, there is evidence of Atlantic sturgeon presence from the mouth of the Delaware Bay to the head of tide at the fall line near Trenton, New Jersey and Morrisville, Pennsylvania, a distance of 220 RKMs (Shirey *et al*., 1997; Brundage and O'Herron, 2009; Simpson, 2008; Calvo *et al*., 2010; Fisher, 2011; Breece *et al*., 2013). There are no dams on the Delaware River and an Atlantic sturgeon carcass was found as far upstream as Easton, PA in 2014 (M. Fisher, DE DNREC, pers. comm.) suggesting that sturgeon can move beyond the fall line.

Hard bottom habitat believed to be appropriate for sturgeon spawning (gravel/coarse grain depositional material and cobble/boulder habitat) occurs between the Marcus Hook Bar (RKM 134) and the mouth of the Schuylkill River (RKM 148) (Sommerfield and Madsen, 2003). Based

on tagging and tracking studies, Simpson (2008) suggested that spawning habitat exists from Tinicum Island (RKM 136) to the fall line in Trenton, NJ (RKM 211). Tracking of 10 male and 2 female sturgeon belonging to the New York Bight DPS and presumed to be adults based on their size (> 150 cm fork length) indicated that each of the 12 sturgeon spent 7 to 70 days upriver of the salt front in April-July, the months of presumed spawning (Breece *et al*., 2013). This indicates residency in low-salinity waters suitable for spawning. Collectively, the 12 Atlantic sturgeon traveled as far upstream as Roebling, NJ (RKM 201), and inhabited areas of the river ± 30 RKM from the estimated salt front for 84 percent of the time with smaller peaks occurring 60 to100 RKM above the salt front for 16 percent of the time (Breece *et al*., 2013).

Results of passive acoustic tracking of juveniles less than 2 years old[8] indicates the area around Marcus Hook is juvenile rearing habitat. Juveniles are repeatedly present and abundant, relative to other areas of the Delaware River where receivers were located. Tracking detections have also shown that areas upriver and downriver of Marcus Hook, from approximately New Castle through Roebling, are frequented by Atlantic sturgeon juveniles, and that juveniles can travel a considerable distance in a short period of time; in excess of 20 RKM within a 24-h period (Calvo *et al*., 2010; Fisher, 2011; Stetzar *et al*., 2015; Hale *et al*., 2016). There are also differences in juvenile movement patterns. For example, some fish remained relatively stationary during winter months while others continued to move upstream and downstream (Calvo *et al*., 2010; Fisher, 2011). Additional study of juvenile Atlantic sturgeon distribution in the Delaware River estuary is in progress.

Subadult Atlantic sturgeon occur in areas of Delaware Bay and the Delaware River that differ from natal juveniles (Brundage and Meadows, 1982; Lazzari *et al*., 1986; Shirey *et al*., 1997; Shirey *et al*., 1999; Simpson, 2008; Brundage and O'Herron, 2009; Calvo *et al*., 2010; Fisher, 2011). In some cases, subadults that originated from the Delaware River returned to the Delaware Bay and River in successive years but, in other years, tracked subadults selected other, non-natal, estuarine areas.

The Connecticut River has long been known as a seasonal aggregation area for subadult Atlantic sturgeon, and both historical and contemporary records document presence of Atlantic sturgeon in the river as far upstream as the Holyoke Dam in Hadley, MA (Savoy and Shake, 1993; Savoy and Pacileo, 2003; ASSRT, 2007). The Enfield Dam located along the fall line at Enfield, CT prevented upstream passage of Atlantic sturgeon from 1827 until it was breached in 1977 (ASSRT, 2007). The maximum upriver extent of the salt front is to RKM 26. In the spring, high freshwater flow can push the salt front downriver, beyond the river mouth, into Long Island Sound. Tidal influence extends upriver to RKM 90 (Hammerson, 2004).

In August 2006, an adult-sized Atlantic sturgeon was observed as far upriver as the Holyoke Dam spillway lift at approximately RKM 143 (ASSRT, 2007). However, Atlantic sturgeon are more commonly known to occur further downstream of the Holyoke Dam (Savoy, 2007). As noted previously, capture of juvenile (based on size) Atlantic sturgeon in the Connecticut River

[8] Per the conditions of the ESA research permit issued in 2012, only juveniles greater than 30 cm total length can receive a surgically implanted acoustic tag.

in 2014, and genetic analysis of tissues collected from the sturgeon strongly suggests spawning is occurring in the river (Savoy *et al*., 2017).

Characteristics of the Housatonic River relative to use by Atlantic sturgeon were described by the ASMFC (1998). The Derby Dam restricts Atlantic sturgeon access to what was likely historical habitat. Nevertheless, the reach of the river from the Derby Dam and downriver to O'Sullivan's Island has strong currents, and a mix of sand, gravel and cobble substrate. The river is tidal from the dam to the mouth of the river, where it discharges into Long Island Sound. The main channel of the river is approximately 5.5 meters deep from the river mouth to RKM 8, and then approximately 2 meters deep as far upriver as the Derby Dam (HVA, 2006; USACE, 2012). Atlantic sturgeon less than 100 cm total length (i.e., subadults), are present in the Housatonic River estuary during the summer months (Hammerson, 2004). Historical records of an Atlantic sturgeon fishery in the Housatonic River supports the presence of successful spawning (ASMFC, 1998; ASSRT, 2007), and a likelihood that spawning could still occur in the Housatonic.

New York Bight DPS Atlantic sturgeon travel great distances, including into Canadian waters, but mostly occur in marine waters in areas off New York and the Mid-Atlantic Bight. We compared the genetic assignment results for Atlantic sturgeon captured in six areas: Bay of Fundy, Long Island Sound, New York and New Jersey coast, Delaware coast, Long Island coast off of Rockaway, New York, and waters off of the Virginia/North Carolina border. The New York Bight DPS was the most represented DPS in each collection, comprising 55 percent to 87 percent of the sturgeon sampled in each area, with the exception of the Bay of Fundy collection where the New York Bight DPS comprised only 1 to 2 percent of the sampled sturgeon (Laney *et al*., 2007; Dunton *et al*., 2012; Wirgin *et al*., 2012; Waldman *et al*., 2013; O'Leary *et al*., 2014; Wirgin *et al*., 2015a). The greater concentration of New York Bight DPS Atlantic sturgeon in some parts of its marine range suggests certain marine habitats are more useful to and perhaps also essential to the New York Bight DPS.

Chesapeake Bay DPS

At the time of listing, the James River was the only known spawning river for the Chesapeake Bay DPS (ASSRT, 2007; Hager, 2011; Balazik *et al*., 2012). Since the listing, evidence has been provided of both spring and fall spawning populations for the James River, as well as fall spawning in the Pamunkey River, a tributary of the York River, and fall spawning in Marshyhope Creek, a tributary of the Nanticoke River (Hager *et al*., 2014; Kahn *et al*., 2014; Balazik and Musick, 2015; Richardson and Secor, 2016). In addition, detections of acoustically-tagged adult Atlantic sturgeon in the Mattaponi and Rappahannock Rivers at the time when spawning occurs in others rivers, and historical evidence for these as well as the Potomac River supports the likelihood of Atlantic sturgeon spawning populations in the Mattaponi, Rappahannock, and Potomac rivers.

Adult Atlantic sturgeon enter the James River in the spring, with at least some eventually moving as far upstream as Richmond (RKM 155), which is also the head of tide and close to the upstream extent of Atlantic sturgeon in the river given the presence of Boshers Dam at the fall line (approximately RKM 160) (Bushnoe *et al*., 2005; Hager, 2011; Balazik *et al*., 2012). Adults disperse through downriver sites and begin to move out of the river in late September to early October, occupy only lower river sites by November, and are undetected on tracking arrays in

the lower river by December suggesting that adult sturgeon leave the river for the winter (Hager, 2011; Balazik *et al*., 2012).

The availability of hard-bottom habitat is relatively limited in the James River and appears to be significantly reduced compared to the amount of available hard-bottom habitat described in historical records (Bushnoe *et al*., 2005; Austin, 2012). In general, tracked adults occurred further upstream during the late summer and early fall residency (e.g., RKM 108 to RKM 132; Balazik *et al*., 2012) than during the spring and early summer residency (e.g., RKM 29 to RKM 108; Hager, 2011) suggesting two different spawning areas, depending on season, for the two James River spawning populations (Balazik and Musick, 2015).

The York River is 55 RKMs from its mouth, tidally-influenced throughout its length, and with clay/silt and sand substrate. Habitat conditions suitable for Atlantic sturgeon spawning (e.g., freshwater and hard substrate) occur within its tributaries, the Mattaponi and Pamunkey Rivers (Bushnoe *et al*., 2005; Friedrichs, 2009; Reay, 2009).

The Pamunkey River is tidal for 73 RKMs upriver of its confluence with the York River. Substrate includes patches of gravel, and monthly averages of dissolved oxygen in the late spring-summer months range from 5 to 8 mg/L (Bushnoe *et al*., 2005). Recent evidence of a spawning population includes capture of adult Atlantic sturgeon in spawning condition within tidal freshwater, at depths of 0.5 to 6.7 meters, 27 to 67 RKMs upriver of the confluence with the York River (Hager *et al*., 2014), and passive acoustic tracking of adult Atlantic sturgeon to the uppermost receiver in freshwater of the Pamunkey River during the spawning season (VIMS, 2016). Genetic analyses demonstrate these adults are part of a genetically unique spawning population, genetically dissimilar, for example, to spawning adults in the James River (Hager *et al*., 2014; Kahn *et al*., 2014).

The Mattaponi River, likewise, has patches of gravel, and late spring through summer dissolved oxygen levels of approximately 5 to 8 mg/L (Bushnoe *et al*., 2005). Atlantic sturgeon occur in the Mattaponi River although the data is currently more limited than for the Pamunkey River. In September 2015, an acoustically-tagged, adult, female Atlantic sturgeon was detected on multiple days in the Mattaponi River at the uppermost receiver located near the Route 360 Bridge crossing on the river. The detections were not on consecutive days but had lapses of one to five days. Based on examination of the time series of detections, Virginia Institute of Marine Science (VIMS) believes the fish moved past the receiver upstream, then back down again. VIMS recommended that we designate critical habitat for Atlantic sturgeon in the Mattaponi River, and extend the upriver boundary by 10 RKMs. We considered the information provided by VIMS. Based on the information provided, we could not conclude that waters of the Mattaponi River upriver of the Route 360 Bridge crossing are part of the geographical area occupied by Atlantic sturgeon. While the tracking data suggests to VIMS that the single fish moved further upriver, we cannot determine whether the movements of this fish are representative of all Atlantic sturgeon that occur in the Mattaponi or are movements of a vagrant fish. Therefore, we are not changing the upriver boundary for the York River critical habitat unit in the Mattaponi River.

The Rappahannock River flows approximately 170 RKMs from the fall line at Fredericksburg, MD, the site of the former Embrey Dam that was removed in 2005. The river is tidal throughout its length from the fall line to the river mouth. Mud substrate is abundant in the channel of the lower estuary, sand/silt/clay are present upriver of Wilmot, and sand and gravel substrate in the freshwater tidal region downriver of Fredericksburg. Monthly dissolved oxygen averages for May and June range from 6.6 to 10.5 mg/L (Bushnoe *et al*., 2005). The 1998 and 2007 status reviews for Atlantic sturgeon described information for presence of Atlantic sturgeon in the Rappahannock River, including commercial landings data from the 1880s and incidental captures reported to the U.S. Fish and Wildlife Service Reward Program in the 1990s (NMFS and USFWS 1998; ASSRT, 2007). VIMS provided additional information during the public comment period including information on the detection of two acoustically-tagged, adult Atlantic sturgeon in the Rappahannock River in the fall (VIMS, unpublished data). VIMS could not confirm if the adults were making spawning runs since there were no receivers to detect the sturgeon in the freshwater habitat near Fredericksburg. However, the presence of the adults as far upriver as RKM 129, and their presence at the time of year when other Chesapeake DPS Atlantic sturgeon spawn supports the likelihood of an Atlantic sturgeon spawning population in the Rappahannock River.

The Potomac River estuary extends approximately 187 RKMs from Chain Bridge to the mouth of the river. The river is tidal freshwater from Chain Bridge to Quantico, VA with bottom topography characterized by a narrow channel, 6 to 21meters deep, and a shallow shelf on either side of the channel. The mixing zone of transitional salinity occurs from Quantico, VA, to the crossing of the U.S. Highway 301 Bridge, MD. The remainder of the river estuary, from the U.S. Highway 301 Bridge crossing to the Chesapeake Bay, has a wide channel with gradually sloping, shallow flats near shore (USGS, 1984). Sand and clay substrates are dominant in many areas, with patches of gravel. A suspected sturgeon spawning site occurs approximately 2 RKMs downriver of the Chain Bridge, in freshwater and hard substrate (e.g., large and small boulders, gravel-pebble, and cobble-rubble) (USGS, 1984; PCC, 2000; SSSRT, 2010). There are no studies currently directed at Atlantic sturgeon in the Potomac River. However, evidence of a historical sturgeon fishery in the Potomac, observations of a large mature female Atlantic sturgeon in the Potomac River in 1970, and the presence of hard substrate in freshwater suggest the likelihood of Atlantic sturgeon spawning in the Potomac River.

The Nanticoke River begins in Delaware and flows approximately 103 RKMs across the Delmarva Peninsula, draining at its mouth into Chesapeake Bay. Salinity ranges from 0.1 ppt near Sharptown, MD and 7 to 15 ppt at the mouth near Roaring Point. The entire Maryland portion of the Nanticoke River is tidal (Maryland DNR, 2016). The Atlantic Sturgeon Status Review Team provided a brief summary of available information for Atlantic sturgeon presence in the Nanticoke River, but did not include the river in its list of historic or current spawning rivers for Atlantic sturgeon (ASSRT, 2007). Subsequently, after receiving fishermen reports of Atlantic sturgeon in the Nanticoke River and Marshyhope Creek, Maryland DNR initiated a study to determine if there was a population of Atlantic sturgeon in these waterways, if the sturgeon simply moving through the system or if the fish were spawning. In 2014 and 2015, Maryland DNR captured a total of 15 Atlantic sturgeon in Marshyhope Creek, including 10 males expressing milt and 2 females with ripe eggs. One of the capture events included a male and female in the same net, both in spawning condition, and the male with abrasions on the

ventral scutes and caudal fin that are characteristic of spawning, male Atlantic sturgeon (Richardson and Secor, 2016). Benthic mapping was also conducted and provided evidence of spawning substrate in freshwater of Marshyhope Creek (Bruce *et al*., 2016). Based on these lines of evidence, we agree with Maryland DNR's conclusion that the Nanticoke River estuary, including Marshyhope Creek, supports an Atlantic sturgeon spawning population.

Genetic assignment of Atlantic sturgeon captured within their marine range revealed that Chesapeake Bay DPS subadults and adults comprised approximately 5 percent to 21 percent of the Atlantic sturgeon sampled in the Connecticut River, Long Island Sound, the Atlantic Ocean off of Rockaway, New York, and the Atlantic Ocean off of Delaware Bay (Waldman *et al*., 2013; O'Leary *et al*., 2014; Wirgin *et al*., 2015a). The DPS was not detected in the relatively small number of samples collected from Atlantic sturgeon captured off of North Carolina in the winter (Laney *et al*., 2007), and comprised no more that 1 percent of Atlantic sturgeon sampled in the Bay of Fundy in the summer (Wirgin *et al*., 2012). The greater concentration of Chesapeake Bay DPS Atlantic sturgeon in some parts of its marine range suggests certain marine habitats are more useful to and perhaps also essential to the New York Bight DPS.

4 IDENTIFYING CRITICAL HABITAT

Geographical Area Occupied

As described in Section 2 above, our second step was to identify the "geographical area occupied" by each DPS. The term "geographical area occupied by the species" is defined as an area that may generally be delineated around a species' occurrences, as determined by the Secretary (i.e., range). Such areas may include those areas used throughout all or part of the species' life cycle, even if not used on a regular basis (e.g., migratory corridors, seasonal habitats, and habitats used periodically, but not solely by vagrant individuals) (50 CFR § 424.02)

The marine range of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs, including coastal bays and estuaries, is Hamilton Inlet, Labrador, Canada to Cape Canaveral, FL (77 FR 5880, February 6, 2012). The listing rule also identified the known spawning rivers for each of these DPSs but did not describe the specific in-river range for any of the DPSs. Therefore, to better describe the range and, thus, the geographical area occupied by the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs at the time of listing, we considered all available information with the exception of information concerning the presence of Atlantic sturgeon within Canadian jurisdiction (e.g., Minas Basin, Bay of Fundy) since we cannot designate critical habitat areas outside of U.S. jurisdiction (50 CFR § 424.12(h)).

Areas were considered to be within the range of a DPS if there was: (1) presence of Atlantic sturgeon belonging to that DPS in that area; (2) presence of Atlantic sturgeon in a similar area within the boundaries of the otherwise established DPSs range; and, (3) for rivers, all areas downstream of the furthest known upstream location of Atlantic sturgeon belonging to that DPS in that river. Areas were identified as unoccupied by a DPS if the area was completely inaccessible to Atlantic sturgeon.

Genetic analyses indicate the presence of Atlantic sturgeon belonging to the Gulf of Maine, New York Bight, and Chesapeake Bay DPS in many parts of the marine range including the Bay of

Fundy, the Connecticut River Estuary, Long Island Sound, the New York Bight, and coastal waters from Delaware to North Carolina (Waldman *et al*., 1996; Laney *et al*., 2007; Dunton *et al*., 2010; Dunton *et al*., 2012; Wirgin *et al*., 2012; Waldman *et al*., 2013; O'Leary *et al*., 2014; Wirgin *et al*., 2015a; Wirgin *et al*., 2015b). In addition, tracking and tagging studies indicate the presence of Atlantic sturgeon throughout the marine range (Vladykov and Greeley, 1963; Holland and Yelverton 1973; Dovel and Berggren, 1983; Gilbert 1989; Savoy and Pacileo, 2003; Stein *et al*., 2004; Eyler, 2006; Laney *et al*., 2007; Dunton *et al*., 2010; Dunton *et al*., 2012; Oliver *et al*., 2013).

Based on our review of the literature and other available data, we concluded that Atlantic sturgeon: (a) typically occur in marine waters within the 50 meter depth contour, but also occur in deeper marine waters; (b) occur in many coastal sounds and bays from the Maine/Canada border to Cape Canaveral, FL, regardless of whether or not the sound or bay is part of an estuary of a known spawning river; and, (c) occur in tidally-affected rivers along the coast.

We do know certain natural features (e.g., large waterfalls) and dams are impassable barriers to sturgeon. Therefore, we consider those parts of the range that are currently inaccessible to Atlantic sturgeon due to dams, other manmade structures or natural features as unoccupied and not part of the geographic area occupied at the time of listing. We recognize these limits may not align with the historic upstream limit of sturgeon presence in some rivers (e.g., historic information indicates that sturgeon in the Hudson River ranged to Mohawk Falls which is upstream of the Federal Dam at Troy). There are no particular areas within the range of the Gulf of Maine, New York Bight or Chesapeake Bay DPS that are accessible to Atlantic sturgeon where sufficient survey effort has been undertaken to determine that they are not occupied by any Atlantic sturgeon. Therefore, based on the literature, and considering where effort to detect Atlantic sturgeon has occurred, we determined "geographic area occupied" for the Gulf of Maine, New York Bight, and Chesapeake Bay DPS is the entirety of each DPSs' range with the exception of areas that are inaccessible to Atlantic sturgeon because of a dam, other manmade structure or natural feature (e.g., falls) that is impassable by Atlantic sturgeon.

Physical or Biological Features

The third step of our process was to consider those physical and biological features that are essential to the conservation of Atlantic sturgeon. The term "physical or biological features" is defined as the features that support the life history needs of the species, including but not limited to, water characteristics, soil type, geological features, sites, prey, vegetation, symbiotic species or other features. A feature may be a single habitat characteristic, or a more complex combination of habitat characteristics. Features may include habitat characteristics that support ephemeral or dynamic habitat conditions. Features may also be expressed in terms of relating to principles of conservation biology, such as patch size, distribution distances, and connectivity (50 CFR § 424.02).

To meet the statutory definition of critical habitat, physical and biological features must be "essential to the conservation of the species" and "may require special management considerations or protections ..." (16 USC 1532). To help identify such features, we considered the information that led us to conclude the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs warranted listing under the ESA (77 FR 5880, February 6, 2012).

We know, for example, that each DPS is at a low level of abundance and successful reproduction and recruitment occurs in a limited number of rivers for each DPS. Since the listing, additional rivers have either been confirmed to support spawning or are suspected of supporting successful spawning for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs (Wippelhauser, 2012; Hager *et al*., 2014; Kahn *et al*., 2014; Richardson and Secor, 2016; Savoy *et al*., 2017). Nevertheless, the number of known spawning rivers for each DPS is still less than the number of rivers for each DPS in which spawning occurred in the past (ASSRT, 2007). Further, we do not know how successful reproduction is in any of the known spawning rivers (e.g., counts are not available of the number of juveniles of each DPS or spawning river that recruit to the marine environment compared to the number of fertilized eggs that hatched).

Atlantic sturgeon are estuarine dependent, diadromous fish that require specific estuarine habitat for successful reproduction and recruitment. Adults require unimpeded access (e.g., suitable water depth to be able to move freely and a lack of obstructions) to and from all spawning sites. In addition, spawning males require unimpeded access to search for spawning females throughout the spawning season. Fertilized eggs require freshwater, hard, clean substrate to adhere to, and flowing water that helps to disperse and aerate the eggs. Larval Atlantic sturgeon (less than 4 weeks old and <30 mm total length), assumed to inhabit the same freshwater areas where they were spawned, require hard substrate with interstitial spaces that provide refuge from predators. The relatively lengthy juvenile phase requires developing Atlantic sturgeon have access to aquatic habitat with a gradual downstream salinity gradient of 0.5 and up to as high as 30 ppt (e.g., inclusive of oligohaline, mesohaline, and polyhaline waters) and areas of soft substrate that provide an environment for benthic prey necessary for juvenile foraging. Last, Atlantic sturgeon juvenile rearing habitat, habitat for spawning adults and subadults, and larval habitat must have sufficient levels of dissolved oxygen[9] both before the fish are present (to enable fish to utilize the habitat when they migrate to it) and when fish arrive since Atlantic sturgeon are particularly sensitive to low oxygen levels and, similar to other fish species, will avoid habitats that are hypoxic (i.e., insufficient oxygen) (Secor and Niklitschek, 2001; Breitburg, 2002; EPA, 2003).

Oxygen concentrations that fish avoid are approximately equal to concentrations that reduce their growth rate but higher than concentrations necessary for their survival (Breitburg 2002; EPA, 2003). Lab studies have shown that a dissolved oxygen concentration of about 6.5 mg/L supports growth and habitat use by juvenile Atlantic sturgeon less than two years old (Niklitschek and Secor, 2009; Niklitschek and Secor, 2010; Allen *et al*., 2014). The complex relationship between dissolved oxygen, temperature, and salinity as well as other factors that can affect dissolved oxygen levels in estuaries (e.g., water depth and mixing) makes it difficult for us to specify water quality parameters necessary to support Atlantic sturgeon use of reproduction and recruitment habitat. The EPA's guidance on ambient water quality criteria for dissolved oxygen for the Chesapeake Bay recommends dissolved oxygen concentrations of greater than 6 mg/L, based on

[9] Dissolved oxygen is measured either in milligrams per liter (mg/L) or "percent saturation." Milligrams per liter is the amount of oxygen in a liter of water. Percent saturation is the amount of oxygen in a liter of water relative to the total amount of oxygen that the water can hold at that temperature. (EPA, Water: Monitoring & Assessment; http://water.epa.gov/type/rsl/monitoring/vms52.cfm).

a 7-day mean, in tidal habitats with salinity of 0-0.5 parts per thousand for the growth of larval and juvenile tidal-fresh resident fish, including Atlantic sturgeon (EPA, 2003). This concentration has been shown to support habitat use by Atlantic sturgeon juveniles less than two years old (Niklitschek and Secor, 2009; Niklitschek and Secor, 2010). Since these early age groups are more sensitive to dissolved oxygen levels than older, larger juveniles, subadults, and adults, a dissolved oxygen concentration of 6 mg/L or greater supports habitat use by all age groups.

Based on the above, the physical features essential to the conservation of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs for reproduction and recruitment are:

- Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand range) for settlement of fertilized eggs, refuge, growth, and development of early life stages;
- Aquatic habitat with a gradual downstream salinity gradient of 0.5 up to as high as 30 ppt and soft substrate (e.g., sand, mud) between the river mouth and spawning sites for juvenile foraging and physiological development;
- Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: (1) unimpeded movements of spawning adults to and from spawning sites; (2) seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary, and; (3) staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (e.g., at least 1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river, and;
- Water, between the river mouth and spawning sites, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support: (1) spawning; (2) annual and interannual adult, subadult, larval, and juvenile survival; and (3) larval, juvenile, and subadult growth, development, and recruitment (e.g., 13°C to 26°C for spawning habitat and no more than 30°C for juvenile rearing habitat and 6 mg/L or greater dissolved oxygen for juvenile rearing habitat)[10].

We determined another conservation objective for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs is to increase the abundance of each DPS by facilitating increased survival of subadults and adults. The ability of subadults to find food is necessary for continued survival, growth, and physiological development to the adult life stage. Likewise, given that Atlantic sturgeon mature late and do not necessarily spawn annually, increased adult survival would improve the chances that adult Atlantic sturgeon spawn more than once.

[10] The specific oxygen concentration and temperature values are provided as examples and guidance to inform the combinations of temperature, salinity, and oxygen that support successful reproduction and recruitment. Temperature, salinity, and oxygen are ephemeral by nature, fluctuating daily and seasonally in estuaries. Specific areas designated as critical habitat based on the four features are not expected to have water with oxygen concentration of 6 mg/L or greater and the specific water temperatures at all times and within all parts of the area.

We considered all studies that have collected Atlantic sturgeon stomach contents. All of the prey species identified are indicative of benthic foraging and all of these prey items are found in soft substrates. However, different types of prey were consumed and different soft substrates were identified for the areas where Atlantic sturgeon were foraging (Bigelow and Schroeder, 1953; Johnson *et al*., 1997; ASSRT, 2007; Guilbard *et al*., 2007; Savoy, 2007; Dzaugis, 2013; McLean *et al*., 2013). No data are available differentiating areas of preferred prey items or higher prey abundance within or across estuaries. Adding to our uncertainty of the essential features that support successful foraging for growth and survival of subadults and adults, Atlantic sturgeon move between estuarine environments in the spring through fall and can occur in estuarine environments during the winter as well (Savoy and Pacileo, 2003; Simpson, 2008; Collins *et al*., 2000; Balazik *et al*., 2012). For example, subadult Atlantic sturgeon spawned in one riverine system may utilize multiple estuaries for foraging and growth, including those not directly connected to their natal river. Due to the paucity of data on their estuarine needs and specific habitat or resource utilization, we could not at this time identify the physical or biological features of estuaries for foraging and growth that are essential to the conservation of the Gulf of Maine, New York Bight or Chesapeake Bay DPSs.

Subadult and adult Atlantic sturgeon use marine waters to traverse between estuarine areas, particularly within the 50 meter depth contour. In addition, several congregations of Atlantic sturgeon in the marine environment are known to occur. However, the exact importance of those areas is not known, nor whether Atlantic sturgeon are drawn to particular areas based on physical or biological features of the habitat. Therefore, while we can identify general movement patterns and behavior in the marine environment (e.g., aggregating behavior) that may contribute to subadult and adult survival, due to the paucity of data on each DPSs' needs and specific habitat utilization in the marine environment, we could not at this time identify physical or biological features in the marine environment essential to conservation of the Gulf of Maine, New York Bight or Chesapeake Bay DPSs.

Special Management Considerations or Protection

We considered whether the physical features essential to the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs require special management considerations or protections. The term "special management considerations or protection" is defined as "methods or procedures useful in protecting the physical or biological features essential to the conservation of the listed species" (50 CFR § 424.02).

The essential physical features of suitable spawning and juvenile foraging substrate, salinity, water depth and passage conditions, and water quality, may require special management considerations or protection. Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand) has been removed or altered in rivers within the range of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs as a result of dredging projects to deepen harbors and channels, maintain navigation channels and facilitate vessel traffic, or to mine construction materials, make other channel alterations, and to remove sediment build-up. Land development and commercial and recreational activities on or adjacent to a river can contribute to the sediment build-up that reduces Atlantic sturgeon egg adherence and the interstitial spaces used as refuge by larvae. Changes in water depth as a result of removing substrate, or controlling water flow (e.g., dam operations) may result in shifts in the

salt front within the estuary or change other characteristics of the water quality (e.g., temperature, dissolved oxygen) necessary for the developing eggs, larvae, and juveniles. Many communities and commercial facilities withdraw water from the rivers containing the features essential to Atlantic sturgeon reproduction. Water withdrawals during drought events can affect the position of the salt front, further impacting the water flow necessary for successful sturgeon reproduction and affect dissolved oxygen levels. Water withdrawals for other purposes (e.g., cooling water) can also alter the: input of freshwater, water depth, dissolved oxygen levels, and position of the salt front affecting the salinity zones of a tidal river. Thermal plumes, often associated with the withdrawal of cooling water at energy generating facilities, can increase water temperature which can also lower dissolved oxygen, damage or destroy bottom habitat needed for spawning and rearing of juveniles. Barriers, including dams can restrict movement of adults to and from spawning grounds, prevent juveniles from accessing the full range of salinity exposure in the natal estuary, damage or destroy bottom habitat. Water availability as a result of global climate change is also expected to have an effect on the features essential to successful Atlantic sturgeon spawning and recruitment. Attempts by communities to control water during high flows (e.g., spilling water from dams upriver of Atlantic sturgeon spawning and rearing habitat) can similarly alter flows and create barriers (e.g., from debris) to upstream and downstream passage of adults or cause scouring that removes sediments necessary, for example, to support Atlantic sturgeon prey species. After considering all of these, we concluded that the physical features for successful reproduction and recruitment of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs may require special management considerations or protections.

Defining the Boundaries of Critical Habitat

Our fifth step was to identify and delineate the specific areas that contain the features that may require special management considerations or protections, and are essential to the conservation of each DPS. We used the best available information, including published literature, reports, and online databases (e.g., information from salinity gauges within the rivers, GIS for identification of barriers, benthic mapping sites for substrate information), to locate areas containing the features. We also sought information that demonstrates the features in any particular area may require special management considerations or protections.

The ESA emphasizes critical habitat is the specific areas of the geographical area occupied by a listed species. We, therefore, considered whether the areas containing the physical features were essential to the conservation of a particular DPS by examining the literature and other available information for evidence of Atlantic sturgeon reproduction in the river or river segment. Atlantic sturgeon have a strong affinity for natal homing (i.e., adults typically spawn in the river in which they were spawned). Recolonization of spawning rivers can occur (i.e., rivers in which the DPS used to spawn but where the original spawning population was extirpated). We, therefore, considered whether Atlantic sturgeon are likely to use the river for spawning or rearing in the future as the population recovers, using the information provided in the Atlantic Sturgeon Status Review (ASSRT, 2007), literature available since the status review (see Section 3, Atlantic Sturgeon DPSs), and information provided to us during the public comment period for the proposed critical habitat designations for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs.

Critical habitat must also be defined by specific limits, and cannot use ephemeral reference points (50 CFR § 424.12(c)). When several habitats, each satisfying the requirements for designation as critical habitat, are located in proximity to one another, an inclusive area may be designated as critical habitat (50 CFR § 424.12(d)).

We initially decided to use the Hydrographic Unit Code (HUC) system as the basis for delineating boundaries of potential critical habitat within estuarine waters of the Atlantic sturgeon geographic range. The United States is divided and sub-divided into successively smaller hydrologic units (Seaber *et al*., 1987). The hydrologic units are arranged or nested within each other, from the largest geographic area (regions) to the smallest geographic area (cataloging units), and each unit is identified by a unique HUC number (www.usgws.gov/GIS/huc.ITML). We chose to use units represented by the 12-digit codes (i.e., HUC 12s) to minimize "over-designating" (e.g., including parts of an area that are not occupied by Atlantic sturgeon or do not contain the features that are essential to the conservation of the DPS). Nevertheless, the HUCs sometimes included waters for which we had no information that the physical features were present (e.g., when the HUC included waters of a main stem river where the physical features were present, and included waters of a tributary to the main stem where the presence of the physical features was unknown). The regulations allow an inclusive area to be designated as critical habitat only if each habitat satisfies the requirements for designation as critical habitat.

We also determined that using the HUCs could be an inconsistent approach since rivers for which we had no information that the physical features were present would either not be included as part of critical habitat or would be included depending on whether the river occurred within a HUC that included a different river which did contain the physical features. To avoid over-designating, we revised our approach and are identifying the critical habitat areas using points, lines or landmarks (e.g., bridges, dams) for the upstream and downstream boundaries of the part of the river where the physical features are present. All waters in between are part of the critical habitat across the full bank width of the designated river area.

For the Gulf of Maine DPS, we propose to designate five critical habitat units as follows: (1) Penobscot River main stem from the Milford Dam downstream for 53 RKMs to where the main stem river drainage discharges at its mouth into Penobscot Bay; (2) Kennebec River main stem from the Ticonic Falls/Lockwood Dam downstream for 103 RKMs to where the main stem river discharges at its mouth into the Atlantic Ocean; (3) Androscoggin River main stem from the Brunswick Dam downstream for 10 RKMs to where the main stem river drainage discharges into Merrymeeting Bay; (4) Piscataqua River from its confluence with the Salmon Falls and Cocheco rivers downstream for 19 RKMs to where the main stem river discharges at its mouth into the Atlantic Ocean as well as the waters of the Cocheco River from its confluence with the Piscataqua River and upstream 5 RKMs to the Cocheco Falls Dam, and waters of the Salmon Falls River from its confluence with the Piscataqua River and upstream 6 RKMs to the Route 4 Dam; and, (5) Merrimack River from the Essex Dam (also known as the Lawrence Dam) downstream for 48 RKMs to where the main stem river discharges at its mouth into the Atlantic Ocean. The physical features essential for reproduction and recruitment may require special management considerations or protections in these specific areas given, for example, the operation of dams, dredging operations, other construction (e.g., bridge construction or repair), and impacts from development along the river including wastewater treatment and water

withdrawals (Ceasar *et al*., 1976; Short, 1992; Kistner and Pettigrew, 2001; Odell *et al*., 2006; ASSRT, 2007; Moore and Reblin, 2008; McFarlane, 2012). In total, these designations encompass approximately 244 kilometers (152 miles) of aquatic habitat.

We propose to designate four critical habitat units for the New York Bight DPS as follows: (1) Connecticut River from the Holyoke Dam downstream for 140 RKMs to where the main stem river discharges at its mouth into Long Island Sound; (2) Housatonic River from the Derby Dam downstream for 24 RKMs to where the main stem discharges at its mouth into Long Island Sound; (3) Hudson River from the Troy Lock and Dam (also known as the Federal Dam) downstream for 246 RKMs to where the main stem river discharges at its mouth into New York City Harbor; and, (4) Delaware River at the crossing of the Trenton-Morrisville Route 1 Toll Bridge, downstream for 137 RKMs to where the main stem river discharges at its mouth into Delaware Bay. The physical features essential for reproduction and recruitment may require special management considerations or protections in these specific areas given; for example, the operation of dams, dredging operations, other construction (e.g., bridge construction or repair), and impacts from development along the river including wastewater treatment and water withdrawals (Hammerson, 2004; ASSRT, 2007; Henshaw, 2011; Breece *et al*., 2013; 78 FR 1145). In total, these designations encompass approximately 547 kilometers (340 miles) of aquatic habitat.

We propose to designate five critical habitat units for the Chesapeake Bay DPS as follows: (1) Potomac River from the Little Falls Dam downstream for 189 RKMs to where the main stem river discharges at its mouth into the Chesapeake Bay; (2) Rappahannock River from the U.S. Highway 1 Bridge, downstream for 172 RKMs to where the river discharges at its mouth into the Chesapeake Bay; (3) York River from its confluence with the Mattaponi and Pamunkey rivers downstream to where the main stem river discharges at its mouth into the Chesapeake Bay as well as the waters of the Mattaponi River from its confluence with the York River and upstream to the Virginia State Route 360 Bridge crossing of the Mattaponi River, and waters of the Pamunkey River from its confluence with the York River and upstream to the Nelson's Bridge Road Route 615 crossing of the Pamunkey River for a total of 206 RKMs of aquatic habitat; (4) James River from Boshers Dam downstream for 160 RKMs to where the main stem river discharges at its mouth into the Chesapeake Bay at Hampton Roads; and (5) the Nanticoke River from the Maryland State Route 313 Bridge crossing near Sharptown, MD to where the main stem discharges at its mouth into the Chesapeake Bay as well as Marshyhope Creek from its confluence with the Nanticoke River and upriver to the Maryland State Route 318 Bridge crossing near Federalsburg, MD for a total of 60 RKMs of aquatic habitat. The physical features of reproduction and recruitment may require special management considerations or protections in these specific areas given, for example, the operation of dams, dredging operations, other construction (e.g., bridge construction or repair), and impacts from development along the river including wastewater treatment and water withdrawals (Eskin *et al*., 1996; Bushnoe *et al*., 2005;Tiner, 2005; ASSRT, 2007; Friedrichs, 2009; NRWG, 2009; Reay, 2009; Austin, 2012; SRBC, 2013; Potomac Conservancy, 2014; CBF, 2015). In total, these designations encompass approximately 773 kilometers (480 miles) of aquatic habitat.

Unoccupied Areas
Our sixth step was to consider whether there were any unoccupied areas that should be designated as critical habitat for the Gulf of Maine, New York Bight or Chesapeake Bay DPSs. As described above, we determined the "geographic area occupied" for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs is the entirety of each DPS's range with the exception of areas that are inaccessible to Atlantic sturgeon because of a dam, other manmade structure or natural feature (e.g., falls) that is impassable by Atlantic sturgeon. We considered whether there were specific areas within these unoccupied areas of each DPS and whether those areas were essential to the conservation of the respective DPS. We concluded that there were no unoccupied geographic areas essential to the conservation of the Gulf of Maine, New York Bight or Chesapeake Bay DPSs since nearly all known historical habitat is accessible to the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs (ASSRT, 2007; 77 FR 5880, February 6, 2012). We have not identified any unoccupied areas for the Gulf of Maine, New York Bight or Chesapeake Bay DPS in the marine environment since there are no dams, other impassable manmade structures or impassable natural features to Atlantic sturgeon in the marine environment.

Economic Impacts
As described in the background of the August 28, 2013, joint NMFS and USFWS rulemaking, an economic analysis is a tool that informs both the required impact analysis and the 4(b)(2) exclusion analysis, and informs the determinations established under other statutes, regulations, EOs, or directives that apply to rulemakings, generally, including critical habitat designations (78 FR 53058). The joint rulemaking also clarified that an incremental analysis (i.e., analysis that identifies and focuses solely on the impacts of the proposed critical habitat designation over and above those resulting from existing protections) applies to the economic analysis, impact analysis, and 4(b)(2) exclusion analysis (78 FR 53058).

The purpose of the economic analysis is to describe the potential economic impact as a result of the critical habitat designation and to inform our required analysis of impacts. It can also be used to inform our decision making if we choose to conduct a 4(b)(2) exclusion analysis. The potential economic impacts as a result of designating critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs are described in the report attached as Appendix B to this document. The report compiles information describing the potential economic effects of designating critical habitat for each of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. Since each DPS is treated as if it is a separate ESA-listed species, the report provides three economic analyses; one for each of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs.

The economic analysis for each DPS was conducted based on the statutory requirements and the revised regulation described above. We have broad discretion in terms of methods used to evaluate impacts of a critical habitat designation, including to determine the appropriate scale at which effects are considered (e.g., based on what is most meaningful or sufficient to inform the decision; 78 FR 53058). Although we are not using HUCs to define the boundaries of the critical habitat areas for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs, the HUCs were helpful for identifying the counties that would most likely be affected by the critical habitat designations. Economics data were obtained for counties that occur within the boundaries of

each HUC of each critical habitat unit (King and Associates, 2014; Appendix B). Since we are proposing to designate critical habitat at the scale of the critical habitat unit, the collected information was then aggregated across the critical habitat unit, not the individual HUCs. Because the HUCs encompass a larger area than the critical habitat unit, the economic analysis may overestimate the number of parties, including small businesses, likely to be affected by the critical habitat designations, the incremental costs, as well as beneficial impacts of the designations.

Consistent with our past analyses, the administrative costs of conducting section 7 consultations were determined to be the primary source of economic impacts as a result of designating critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs (King and Associates, 2014; Appendix B). We used the record of ESA section 7 consultations conducted over the past 10 years to identify the types of Federal activities that may affect proposed Atlantic sturgeon critical habitat if implemented in the future. With the exception of the Housatonic River critical habitat unit for the New York Bight DPS and the Nanticoke River critical habitat unit for the Chesapeake Bay DPS, the past history for ESA section 7 consultations within each unit provides the information needed to quantify the likely number of ESA section 7 consultations that will occur in the future if the unit is designated as Atlantic sturgeon critical habitat.

In addition, the following factors were considered in the economic analysis. First, there are two types of ESA section 7 consultations, informal and formal (50 CFR § 402.02). Formal consultations generally have a greater administrative cost than informal consultations because formal consultations require more personnel time by the action agency and the consulting agency (e.g., to prepare a biological assessment and a biological opinion). The economic analysis also considers that the costs to third parties (e.g., applicants for a federal permit) are greater for formal consultation than for informal consultations, and that the cost of preparing a biological assessment are greater for actions that are consulted on in formal consultation than actions consulted on in informal consultation. Table 3-6 of King and Associates (Appendix B) lists each of these costs. Based on these, the estimated administrative cost of each section 7 informal consultation is $9,600.00, and the administrative cost of each section 7 formal consultation is $20,000.00.

Second, when considering the economic impacts of a critical habitat designation, we are required to compare the economic impacts that arise from the designation to the economic impacts that would exist without the designation, but would still arise from other listings under the ESA (50 CFR § 424.19). The impacts likely to occur as a result of the critical habitat designation (e.g., additional administrative section 7 costs) are called the incremental impacts. In contrast, impacts that would occur even in the absence of the critical habitat designation are called co-extensive impacts. When analyzing the cost of critical habitat designations, we focus on the incremental impacts since these are the costs associated with designating the critical habitat.

We did not specify to King and Associates the number of ESA section 7consultations that we anticipate to be informal and formal, and we did not specify the percentage of co-extensive and incremental consultations. We cannot be certain that the numbers of informal and formal consultations involving Atlantic sturgeon critical habitat in the future will be exactly the same as the number that would have occurred during the past ten years if critical habitat was designated

at the time. We also have no information about the scope, methods, exact location or timing of future actions, which are key factors for determining whether an action may adversely affect critical habitat, which essential features may be affected, and whether the action may also affect Atlantic sturgeon.

Similar to economic analyses for other NMFS critical habitat designations (e.g., for Gulf sturgeon (IEc, 2003), the southern DPS of green sturgeon (IEc, 2009)), King and Associates addressed uncertainty by presenting the costs for ESA section 7 consultations of low, medium, or high complexity. These cost estimate scenarios help to demonstrate how changes in the number of informal and formal consultations and differing percentages of co-extensive and incremental consultations could influence the cost projections. The scenarios are: (1) low administrative section 7 cost estimates are based on the assumption that the numbers of informal and formal consultations in the future will be the same as they were in the past, and that half of the consultations will be co-extensive (i.e., initiated as a result of the listing of Atlantic sturgeon and the critical habitat designation) and half will be incremental (i.e., initiated as a result of the critical habitat designation only); (2) medium administrative section 7 cost estimates are based on the assumption that the numbers of informal and formal consultations in the future will be the same as they were in the past, and that they will all be incremental; and, (3) high administrative section 7 cost estimates are based on the assumption that all consultations in the next ten years will be formal and all will be incremental.

King and Associates concluded that in most instances, the regulatory baseline conditions, including the listing of the Atlantic sturgeon, will greatly affect the number of incremental consultations. Specifically, King and Associates concluded that the number of incremental consultations will likely be relatively small, and will likely "only require informal consultations." We agree. All of the critical habitat areas are within the geographical area occupied by Atlantic sturgeon. In general, Atlantic sturgeon of various life stages occur year round in the particular areas proposed for designation. Therefore, if the identified areas were not designated as critical habitat, ESA section 7 consultation would still likely occur to determine whether an anticipated action may affect the Atlantic sturgeon DPS present in the area. We expect that in instances where an activity may destroy or adversely modify critical habitat, there will also be effects to the species. Therefore, we do not consider the high and medium administrative costs estimates, both of which assume that all projected consultations will be incremental, to be as realistic as the low administrative costs estimates.

There were no section 7 consultations for activities in the Housatonic River over the ten-year period reviewed for the economic analysis because Atlantic sturgeon, although present, were not ESA-listed, and the activities that occurred did not trigger the need for section 7 consultation for the ESA-listed species under NMFS jurisdiction (i.e., shortnose sturgeon). There was also no designated critical habitat in the Housatonic River for any ESA-listed species under our jurisdiction. Based on this information, the contracted economists projected there would be no section 7 consultation administrative costs over the next ten years as a result of designating the Housatonic River critical habitat unit (King and Associates, 2014; Appendix B). However, there is a federal navigation channel within the Housatonic River critical habitat unit as well as a major highway bridge. Channel dredging, bridge maintenance, and bridge replacement are activities likely to require ESA section 7 consultation in the future given the presence of Atlantic sturgeon,

and designated critical habitat for the New York Bight DPS of Atlantic sturgeon. For example, the federal navigation channel will require periodic maintenance dredging; in June 2016, the U.S. Army Corps of Engineers (USACE) announced they were beginning the environmental review process for upcoming needed maintenance dredging. Bridge replacement has recently occurred (78 FR 1145; January 8, 2013), but routine maintenance is likely within the next 10 years. In-water work associated with bridge maintenance could affect critical habitat and require section 7 consultation. Additionally, USACE activities such as issuing permits or authorizing in-water structures and private dredging within the river; are likely to require section 7 consultation. Therefore, the administrative section 7 costs as a result of designating the Housatonic River critical habitat unit are unlikely to be zero. Based on available information discussed above and the likely need for maintenance, we anticipate up to three consultations will occur over the next 10 years for federal agency actions that may affect the features of the Housatonic River critical habitat unit. These consultations could be informal or formal. However, any consultation would also assess whether the proposed actions may affect one of more of the Atlantic sturgeon DPSs. Therefore, no incremental impacts are anticipated as a result of designating critical habitat in the Housatonic River for the New York Bight DPS of Atlantic sturgeon.

For the section 7 consultation history for activities in the Nanticoke River, during the time period used by King and Associates for the economic analysis, we consulted with the U.S. Environmental Protection Agency (EPA) on approval of water quality criteria for Chesapeake Bay and its tributaries, including the Nanticoke River. In addition, there is a federal navigation channel in the Nanticoke River. Dredging of the channel, including the lower part of the Nanticoke River where we are now designating Atlantic sturgeon critical habitat, was conducted in late 2012-early 2013. We did not consult on this activity. At the time, there were only anecdotal reports of Atlantic sturgeon in the river with no evidence that Atlantic sturgeon were likely present year round, and there are no other ESA-listed species under NMFS jurisdiction in the Nanticoke River. Given the new information for Atlantic sturgeon spawning activity in the Nanticoke River and Marshyhope Creek, ESA section 7consultation is likely to occur in the future before dredging of the Nanticoke River channel, and informal or formal consultation may also occur as a result of dock construction or maintenance, or for federal agency actions associated with the lower Nanticoke River oyster sanctuary, and oyster restoration.

The federal navigation channel will likely require periodic dredging, water quality criteria will require periodic approval, and oyster restoration may require federal permitting or use federal funds that could trigger the need for ESA section 7 consultation. Therefore, based on the past history as well as new activities, we anticipate no more than three consultations will occur over the next for 10 years for federal agency actions that affect the features of the critical habitat in the Nanticoke River and Marshyhope Creek. These could be informal or formal consultations. However, given presence of Atlantic sturgeon in the Nanticoke River system, any consultation would also assess whether the proposed action may affect one of more of the Atlantic sturgeon DPSs. Therefore, no incremental impacts are anticipated as a result of designating critical habitat for the Chesapeake Bay DPS of Atlantic sturgeon in the Nanticoke River or Marshyhope Creek.

Nine nationwide ESA section 7 consultations with the EPA are expected to occur within the next 10 years. These consultations will involve all listed species and designated critical habitat under NMFS's jurisdiction, and thus costs attributable solely to this final rule are expected to be very

small. To be conservative, we added nine formal consultations to each Atlantic sturgeon critical habitat unit, and nine to each DPS's total number of consultations. We spread the costs of these consultations ($5,080 each) evenly across all critical habitat units included in the final rule designating critical habitat for the five DPSs of Atlantic sturgeon. This results in a total cost of $1,474.84 per critical habitat unit. The updated ten year cost estimates are provided below for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs, and in the final rule.

Based on our Economic Impacts Analysis, the projected ten-year low administrative costs of designating all of the Gulf of Maine DPS critical habitat units total $816,574.20. The individual ten-year low costs for the five critical habitat units range from $54,274.84 for the Piscataqua River critical habitat unit to $305,874.84 for the Kennebec River critical habitat unit. The ten-year medium and high administrative costs for the Gulf of Maine DPS critical habitat units total $1,625,774.20 and $2,707,374.20, respectively. The projected ten-year low administrative costs for the New York Bight DPS critical habitat units total $1,418,299.36. The individual ten-year low costs for the four critical habitat units range from $31,474.84 for the Housatonic River critical habitat unit, assuming all three consultations would be formal consultation, to $752,674.84 for the Hudson River critical habitat unit. The ten-year medium and high administrative costs for the New York Bight DPS critical habitat units total $2,830,699.36 and $5,565,899.36, respectively. The projected ten-year low administrative costs of designating all of the Chesapeake Bay DPS critical habitat units total $501,774.20. The individual ten-year low costs for the five critical habitat units range from $31,474.84 for the Nanticoke River critical habitat unit, assuming all three consultations would be formal consultation, to $276,274.84 for the Potomac River critical habitat unit. The ten-year medium and high administrative costs for the Chesapeake Bay DPS critical habitat units total $996,174.20 and $1,807,374.20, respectively.

We estimate there will be no incremental cost of project modifications attributable to the designation of critical habitat. Discussions with federal action agencies identified no instances of past project modifications that would have been necessary as a result of Atlantic sturgeon critical habitat having been designated. These discussions and correspondence with federal agencies yielded no suggestions that project modifications are likely to result from this designation in the future. Further, it is extremely unlikely that modifications that would be required to avoid destruction or adverse modification of critical habitat would not also be required because of adverse effects to the species. However, we do not discount the potential that section 7 consultation stemming from these designations may, sometime in the future, result in project modifications and associated costs. We do not have cost estimates for project modifications that might have addressed impacts to sturgeon habitat. The only estimates of project modification costs produced for section 4(b)(2) impacts analyses are from critical habitat designations for west coast salmon species. The economic analysis provides descriptions of potential project modifications and when and why they may be required as a result of incremental Section 7 consultation. These descriptions of potential project modifications were drawn from the economic analysis of the critical habitat designation for seven West Coast salmon and steelhead evolutionary significant units (ESUs) (NOAA 2005) and are provided here for context to the extent those estimates provide any relevant information about what project modifications associated with the same categories of federal actions evaluated in this report might cost. Details of the cost projections and the number of past formal and informal consultations for each critical

habitat unit of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs are provided in the economic analysis (Appendix B).

INRMPs and National Security Impacts

As described in the Introduction, section 4(a)(3)(B) of the ESA prohibits designating as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an INRMP prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a conservation benefit to the species, and its habitat, for which critical habitat is proposed for designation. In addition, section 4(b)(2) of the ESA requires NMFS to take into consideration the impact on national security of specifying any particular area as critical habitat. Previous critical habitat designations have recognized that impacts to national security may result if a designation would trigger future Section 7 consultations because a proposed military activity may affect the physical or biological features essential to the listed species' conservation. Anticipated interference with mission-essential training, testing, or unit readiness, either through delays caused by the consultation process or through expected requirements to modify the action to prevent adverse modification of critical habitat, has been identified as a negative impact of critical habitat designations (See, e.g., *Proposed Designation of Critical Habitat for the Pacific Coast Population of the Western Snowy Plover*, 71 FR 34571 at 34583, June 15, 2006, and *Proposed Designation of Critical Habitat for Southern Resident Killer Whales*, 69 FR 75608 at 75633, Dec. 17, 2004). These past designations also recognized that national security impacts resulting from the designation depend on whether future consultations would be required to consider effects to the listed species, regardless of the critical habitat designation, and whether the designation would add new burdens beyond those related to the consultation on the species.

We requested information from the Department of Defense and the Department of Homeland Security (for the United States Coast Guard) for: (1) a list of facilities that might occur within critical habitat; (2) whether any of those facilities had an INRMP; and, (3) what might be the impact to national security, if any, of designating the potential critical habitat areas. Since we requested the information before our decision to more narrowly define the boundaries of each critical habitat unit (i.e., to not use HUC-12s), some Department of Defense facilities that were initially identified as occurring within a critical habitat unit do not occur within the critical habitat. The information that follows is for only those facilities or training areas that overlap with a critical habitat unit for the Gulf of Maine, New York Bight or Chesapeake Bay DPS.

There are facilities with INRMPs that overlap with the potential critical habitat areas. We have reviewed the INRMPs and concluded that each provides a conservation benefit to the Atlantic sturgeon DPSs and their habitat. Therefore, in accordance with section 4(a)(3)(B) of the ESA, the particular areas of the proposed critical habitat units (in water habitat) that overlap with Department of Defense controlled lands are not part of the critical habitat units. More detailed information of these particular areas follows in the DPS summaries below and in our response to the Navy, Air Force and Army (Appendix C).

The USCG provided information on operations (e.g., maintenance of navigation aids) in the Penobscot, Kennebec, Piscataqua, and Merrimack rivers that overlap with the critical habitat areas for the Gulf of Maine DPS. USCG operations, such as placement of and maintenance of

aids to navigation, in the Connecticut, Housatonic, Hudson, and Delaware rivers overlap with the critical habitat areas for the New York Bight DPS, and operations in the Potomac, Rappahannock, York, and James rivers overlap with the critical habitat areas of the Chesapeake Bay DPS. We have not identified any national security impacts to USCG operations as a result of designating critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. USCG activities such as maintaining existing navigational aids may have no effect on the physical features because the maintenance will not affect the transitional salinity zone, dissolved oxygen levels, or substrate. We also do not anticipate that aids to navigation will block passage of Atlantic sturgeon since these aids occur primarily at the surface, Atlantic sturgeon are benthic fish, and the anchoring structure is generally minimal relative to the waterway. ESA section 7 consultation is not required for federal agency actions that do not effect designated critical habitat. If section 7 consultation were required for a USCG activity (e.g., placement of a structure that may affect Atlantic sturgeon passage, hard substrate in low salinity waters, or soft substrate in the transitional salinity zone), consultation would also be likely for effects of the action to Atlantic sturgeon. Since a single consultation would consider all effects of the proposed action on ESA-listed species and designated critical habitat, there is no additional section 7 consultation burden associated with designating critical habitat for the Gulf of Maine, New York Bight, or Chesapeake Bay DPSs. Accordingly, we do not anticipate there will be any national security impacts associated with the designation of critical habitat in the areas that overlap with USCG operations.

The Department of the Navy expressed concern for impacts to national security as a result of designating critical habitat units for each of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. Our consideration of the information provided by the Navy with respect to national security impacts is presented below.

Gulf of Maine DPS
No Department of Defense facilities with INRMPs were identified as overlapping with the critical habitat areas of the Gulf of Maine DPS. The Navy identified two facilities, Bath Iron Works and Portsmouth Naval Shipyard, for which the Gulf of Maine DPS critical habitat designations may impact national security.

Bath Iron Works is a privately owned, shipbuilding facility located along the Kennebec River with in-water activities occurring in the Kennebec River critical habitat unit. Bath Iron Works provides the design, building, and support of complex Navy warships. Vessels built at Bath Iron Works must travel downstream through the Kennebec River to the ocean. Activities related to the work of this facility include dredging to maintain depth for the transport of Navy vessels to and from Bath Iron Works. This dredging is authorized and permitted by the U.S. Army Corps of Engineers. The Navy expressed concern that designating critical habitat in this area would affect the Navy's ability to build and test current and future classes of surface ships, resulting in a risk to military readiness and national security. The Navy is concerned that the critical habitat will result in national security impacts in the Kennebec River critical habitat unit. Specifically, the area described as the Kennebec River from the south side of the U.S. Route 1 Bridge over the Kennebec River down river to 50 feet below the south side of Bath Iron Works dry dock, but not including any portion of Hanson Bay or the thoroughfare between Hanson Bay and the Kennebec River. The specific area lies within a box between four points with the following coordinates:

Point 1: N43 54′39.8″, W069 48′43.5″; Point 2: N43 54′40″, W069 48′17.8″; Point 3: N43 54′0.0″, W069 48′47; Point 4: N43 54′0.0″, W069 48′28″.

Portsmouth Naval Shipyard is a Navy facility located on Seavey Island at the mouth of the Piscataqua River. The primary mission of Portsmouth Naval Shipyard is the overhaul, repair, and modernization of submarines. In-water activities associated with the work of this facility include flooding and dewatering dry docks, updating and maintaining pier structures (e.g., pile driving), and dredging to maintain proper channel and berthing depths. These activities are authorized and permitted by the U.S. Army Corps of Engineers. The Navy expressed concern that designating critical habitat in the area immediately surrounding Seavey Island would result in delays or work stoppages that directly impact its mission and national security. The Navy is concerned that the designation of critical habitat will result in national security impacts in a polygon area formed by the shoreline of the Piscataqua River and twelve points with the following coordinates:

Point 1: latitude 43' 05.118", longitude -70' 44.580"; Point 2: latitude 43' 04.857", longitude -70' 44.937″; Point 3: latitude 43' 04.773", longitude -70' 44.886"; Point 4: latitude 43' 04.747", longitude -70' 44.553"; Point 5: latitude 43' 04.437", longitude -70' 44.249"; Point 6: latitude 43' 04.475", longitude -70' 43.830"; Point 7: latitude 43' 04.537", longitude -70' 43.424"; Point 8: latitude 43' 04.547", longitude -70' 43.392", Point 9: latitude 43' 04.597", longitude -70' 43.356"; Point 10: latitude 43' 04.833", longitude -70' 43.317"; Point 11: latitude 43' 04.985", longitude -70' 43.493"; Point 12: latitude 43' 05.126", longitude -70' 44.062", thence west along the shore to the point of the beginning.

The Navy described the activities likely to occur in one or both of the particular areas as: flooding and dewatering dry docks, updating and maintaining pier structures including pile driving, and dredging activities to maintain proper channel and berthing depths.

The physical features of critical habitat in the areas the Navy is concerned they may affect are salinity suitable for older juveniles, open passage for juveniles suitably developed to leave the natal river, open passage for adults traveling through the area to and from spawning areas, open passage for subadults traveling through the area, and soft substrate. Maintaining and/or updating the pier structures may affect open passage and substrate (e.g., placing more pier structures in the area, altering the substrate to make it more suitable for the pier structure). Dredging activities to maintain proper channel and berthing depths may affect (e.g., remove) the substrate that supports foraging, and change the depth affecting the salinity (e.g., as a result of changes to mixing in the estuarine river or the extent of saltwater intrusion). However, while the activities described by the Navy may affect the salinity, open passage, and substrate features, they also may affect individual Atlantic sturgeon and consultations will be required to evaluate impacts on the species. For example, construction to maintain or update piers can produce sounds that disrupt normal behaviors such as sturgeon foraging, staging, and spawning. Dredging may injure or kill sturgeon that come into contact with the gear (e.g, as older juveniles passing through as they leave the natal river, adults traveling through the area to and from spawning areas, subadults traveling through the area). Accordingly, we do not anticipate there will be any national security impacts associated solely with the designation of critical habitat in these areas.

New York Bight DPS

The Department of the Army identified the U.S. Military Academy –West Point, NY as a facility that overlapped with the Hudson River critical habitat unit of the New York Bight DPS. We reviewed the INRMP for the U.S. Military Academy at West Point and concluded that the INRMP provides a conservation benefit to New York Bight DPS Atlantic sturgeon and its habitat. The particular area of the Hudson River critical habitat unit (in water habitat) that overlaps with Department of the Army controlled lands at the U.S. Military Academy –West Point, NY will, therefore, not be part of the designated critical habitat unit in accordance with section 4(a)(3)(B) of the ESA.

The Navy identified one facility for which the New York Bight DPS critical habitat designations may impact national security. The Philadelphia Naval Yard Annex is located along the Delaware River and in-water activities occur in the Delaware River critical habitat unit. Activities for this facility include storage of inactive ships, research and development, and foundry. In water activities include updating and maintaining pier structures (e.g., pile driving), dredging to maintain proper channel and berthing depths, barge loading and unloading, preparation of ships for decommission, and fuel unloading. The Navy expressed concern that designating critical habitat in this area would result in delays or work stoppages that directly impact its mission and national security. The Navy is concerned that the designation of critical habitat will have national security impacts in three areas of the Philadelphia Naval Yard Annex from the Delaware River critical habitat unit. These are:

> Area One. The waters of the Delaware River, beginning at a point on the northern shore of the Delaware River, at latitude 39 53.198, longitude -75 10.996; thence in a southerly direction to a point in the Delaware River at latitude 39 53.178, longitude -75 10.993; thence in an easterly direction to the northern shore of the Delaware River at latitude 39 53.191, longitude -75 10.896; and thence, northerly and westerly along the shore to the point of beginning. The area requested for exclusion is equivalent to 0.005952 square kilometers or 1.470806 acres.
>
> Area Two. The waters of the Delaware River, beginning at a point of the northern shore of the Delaware River, at latitude 39 53.213, longitude -75 10.831; thence in a southerly direction to a point in the Delaware River at latitude 39 53.035, longitude -75 10.810; thence in a easterly direction to a point in the Delaware River at latitude 39 53.040, longitude -75 10.748; thence in a southerly direction to a point in the Delaware River at latitude 39 53.016, longitude -75 10.744; thence in an easterly direction to a point in the Delaware River at latitude 39 53.020, longitude -75 10.680; thence in a northerly direction to a point in the Delaware River at latitude 39 53.045, longitude -75 10.683; thence in an easterly direction to a point in the Delaware River at latitude 39 53.049, longitude -75 10.622; thence in a northerly direction to a point on the northern shore of the Delaware River at latitude 39 53.212, longitude -75 10.642; and thence, westerly along the shore to the point of beginning. The area requested for exclusion is equivalent to 0.092209 square kilometers or 22.785261 acres.
>
> Area Three. The waters of the Delaware River, beginning at a point on the northern shore of the Delaware River, at latitude 39 53.231, longitude -75 10.119; thence in a

> southerly direction to a point in the Delaware River at latitude 39 53.073, longitude -75 10.099; thence in an easterly direction to a point in the Delaware River at latitude 39 53.077, longitude -75 9.841; thence in a northerly direction to the northern shore of the Delaware River at latitude 39 53.225, longitude -75 9.858; and thence, westerly along the shore to the point of beginning. The area requested for exclusion is equivalent to 0.111653 square kilometers or 27.590027 acres.

Specifically, there is a concern that if critical habitat is designated for the New York Bight DPS of Atlantic sturgeon in the area surrounding the Philadelphia Naval Yard Annex (three specific areas), the consultations and project modifications required by designation would impact the Navy's ability to dispose of inactive ships in a timely manner and would pose a significant threat to Navy's systems testing capability (Naval representative pers. comm., January 27, 2014). The Navy described the activities likely to occur in the particular areas as: updating and maintaining pier structures including pile driving, dredging activities to maintain proper channel and berthing depths, barge loading and unloading, fuel unloading,

The physical features of critical habitat in the areas the Navy is concerned it may affect are salinity suitable for younger juveniles, open passage for juveniles to access all parts of the estuary needed for development, open passage for adults traveling through the area to and from spawning areas, and soft substrate. We considered the impact the Navy's activities are likely to have on the physical features. The activities described by the Navy may affect the salinity, open passage, and substrate features. Maintaining and/or updating the pier structures may affect open passage, and substrate (e.g., placing more pier structures in the area, altering the substrate to make it more suitable for the pier structure). Dredging activities to maintain proper channel and berthing depths may affect (e.g., remove) the substrate that supports foraging and spawning. Changing the depth could affect salinity (e.g., as a result of changes to mixing in the estuarine river or the extent of saltwater intrusion). Barge loading and unloading, and fuel unloading may affect water quality (e.g., as a result of spills). However, maintaining and/or updating the pier structures, dredging, and barge traffic also may affect the species. For example, maintaining and/or updating pier structures can produce sounds that disrupt normal sturgeon behaviors such as foraging, staging, and spawning. Dredging may injure or kill sturgeon that come into contact with the gear (e.g., as older juveniles pass through as they leave the natal river, adults traveling through the area to and from spawning areas, subadults traveling through the area). Vessels for fuel deliveries and barge traffic can strike sturgeon resulting in injuries and mortality. Since the activities described by the Navy are also likely to impact the species (e.g., juveniles and spawning adults), we expect consultations will be coextensive. Accordingly, we do not anticipate there will be any national security impacts associated with the designation of critical habitat in these areas.

Chesapeake Bay DPS

The Department of the Air Force identified Joint Base Langley-Eustis, VA as a facility that overlapped with the James River critical habitat unit of the Chesapeake Bay DPS. We reviewed the INRMP for Joint Base Langley-Eustis and concluded that the INRMP provides a conservation benefit to Chesapeake Bay DPS Atlantic sturgeon and its habitat. The particular area of the James River critical habitat unit that overlaps the Department of the Defense

controlled lands at Joint Base Langley-Eustis, VA (in-water habitat) will, therefore, not be part of the designated critical habitat unit in accordance with section 4(a)(3)(B) of the ESA. The Navy identified Marine Corps Base Quantico, VA and Naval Support Facility Dahlgren as facilities along the Potomac River that overlapped with the Potomac River critical habitat unit. The Navy also identified Naval Weapons Station Yorktown, a complex of three facilities known as the Weapons Station, Cheatham Annex, and Yorktown Fuel Terminal, as facilities that overlap the York River critical habitat unit (includes the Mattaponi and Pamunkey Rivers). We have reviewed the INRMPs for each facility and concluded that the INRMPs provide a conservation benefit to Chesapeake Bay DPS Atlantic sturgeon and its habitat. The particular areas of the Potomac River critical habitat unit that overlap the Department of the Defense controlled lands at Marine Corps Base Quantico, VA and Naval Support Facility Dahlgren, and the particular areas of the York River critical habitat unit that overlap the Department of the Defense controlled lands of Naval Weapons Station Yorktown, including Cheatham Annex and Yorktown Fuel Terminal, will not be part of the designated critical habitat unit in accordance with section 4(a)(3)(B) of the ESA.

The Navy identified facilities without INRMPs that had in water operations within the Chesapeake Bay DPS critical habitat designations. The Navy's Rappahannock Training area occurs within the Rappahannock River critical habitat unit. Activities for this facility include small boat tactic, amphibious landings, and helicopter suspension techniques. The Navy expressed concern that designating critical habitat in this area would impact Navy training and, thus, national security.

Within the James River critical habitat unit, there are in water training areas that are not addressed as part of an INRMP. The Navy expressed concern that designating critical habitat would impact military readiness and national security. Navy training activities that occur on the lower James River include underwater diving and salvage operations, helicopter rope suspension techniques, small boat launch and recovery, high-speed boat tactics training, small boat defense drills, and visit, board, search and seizure drills. In addition, NAVSEA conducts various test activities in the James River/Lower Chesapeake Bay. NAVSEA test activities include integrated swimmer defense, submarine maintenance and system upgrades, sonar testing, towing of in-water devices, unmanned vehicle testing, and mine countermeasure testing. Some of these test events could include the potential for bottom object placement. The specific areas where the Navy has identified potential impacts to national security as a result of the critical habitat designation are:

> Area One. James River Reserve Fleet. Navy training activities that occur on the lower James River is typically Coastal Riverine Squadron training, which includes underwater diving and salvage operations; helicopter rope suspension techniques; small boat launch and recovery; high-speed boat tactics training; small boat defense drills; and visit, board, search and seizure drills. Area One is a circular area approximately 16 square kilometers with its center at approximately latitude 37.1143, longitude -76.3669.
>
> Area Two. NAVSEA. NAVSEA test activities include integrated swimmer defense, submarine maintenance and system upgrades, sonar testing, towing of in-water devices,

unmanned vehicle testing, and mine countermeasure testing. Some of these test events could include the potential for bottom object placement.

The physical features of critical habitat in the areas the Navy is concerned it may affect are salinity suitable for older juveniles, open passage for juveniles to access all parts of the estuary needed for development, open passage for adults traveling through the area to and from spawning areas, open passage for subadults traveling through the area, and soft substrate. The described training activities are not likely to adversely affect salinity, but may affect open passage and substrate (e.g., placement of structures, activities resulting in increased siltation or erosion of substrate). However, the training activities also may affect the species. For example, sonar testing and various in-water testing can produce sounds that disrupt normal sturgeon behaviors such as foraging and staging. Operation of small and large vessels can injure or kill sturgeon. Since the activities described by the Navy are also likely to impact the species (e.g., juveniles, subadults, and adults), we expect consultations will be coextensive. Accordingly, we do not anticipate there will be any national security impacts associated with the designation of critical habitat in these areas.

Other Relevant Impacts and Synthesis

As noted above, we are required to consider the economic impacts, impacts to national security, and any other relevant impact of designating critical habitat. Section 4 provided the explanation that the cost of section 7 consultations was the primary source of economic impacts as a result of designating critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. As noted above, we agree with King and Associates' conclusion that, in most cases, consultations will be coextensive, and therefore the high end cost estimates are extremely unlikely to occur. The same is true for project modification costs.

Information on national security concerns for designating any particular area as critical habitat is also described for each critical habitat area. We concluded, given species presence, we expect any consultations that are necessary to consider effects of an action on designated critical habitat would have occurred even in the absence of designated critical habitat because of effects of the action on one or more Atlantic sturgeon DPS. Therefore, the impact of the critical habitat designation for the activities described by the Navy is coextensive rather than incremental. As described above, we do not expect any national security impacts from the designation of critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs.

With respect to other relevant impacts, Secretarial Order 3206 recognizes that Indian Tribes have governmental authority and the desire to protect and manage their resources in the manner that is most beneficial to them. Pursuant to the Secretarial Order, and consistent with the Federal government's trust responsibilities, the Services must consult with the affected Tribes when considering the designation of critical habitat in areas that may impact tribal trust resources, tribally-owned fee lands, or the exercise of tribal rights. We determined that there are no tribal lands that fall into any of the four categories defined in Secretarial Order 3206 within the areas being designated as critical habitat for Atlantic sturgeon. We notified the Chief of the Penobscot Nation, and the Chief of the Pamunkey Tribal Nation of our determinations for the Penobscot River critical habitat unit and the York River critical habitat unit, respectively.

There are a number of potential beneficial impacts of designating critical habitat that extend beyond the conservation benefits to Atlantic sturgeon. For example, protecting essential features of sturgeon habitat, including preserving water quality and natural flow regimes, will benefit other organisms that are co-located in these areas. Benefits can result from additional protections in the form of project modifications or conservation measures due to section 7 consultations or, conversely, a benefit of excluding an area from designation could be avoiding the costs associated with those protections (78 FR 53058, August 28, 2013). Because it is often difficult to quantify the benefits of designating critical habitat, EO 12866, Regulatory Planning and Review, provides guidance on assessing costs and benefits. The EO directs Federal agencies to: "…assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages, distributive impacts, and equity), unless a statute requires another regulatory approach."

The designation of critical habitat will provide conservation benefits such as improved education and outreach by informing the public about areas and features important to the conservation of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. As stated in the Introduction, specifying the geographic location of critical habitat facilitates implementation of section 7(a)(1) of the ESA by identifying areas where Federal agencies can focus their conservation programs and use their authorities to further the purposes of the ESA. Designating critical habitat can also help focus the efforts of other conservation partners (e.g., State and local governments, individuals and nongovernmental organizations).

5 DISCRETIONARY EXCLUSION ANALYSIS

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

We analyzed the economic, national security, and other relevant impacts of designating critical habitat. While we have utilized the best available information and an approach designed to avoid underestimating impacts. Many of the potential impacts are speculative and may not occur in the future. Our conservative identification of potential incremental economic impacts indicates that any such impacts, if they were to occur, would be very small. Any incremental economic impacts will consist solely of the administrative costs of consultation; no project modifications are projected to be required to address impacts solely to the designated critical habitat. The Navy requested exclusion of two areas within the Gulf of Maine DPS critical habitat unit, three areas

within the New York Bight DPS critical habitat units and two areas in the Chesapeake Bay DPS critical habitat units described in detail above in the national security impacts section. As noted above, no impacts to national security are expected to result solely from the critical habitat designation and we are not exercising our discretion to do an exclusion analysis of these areas.

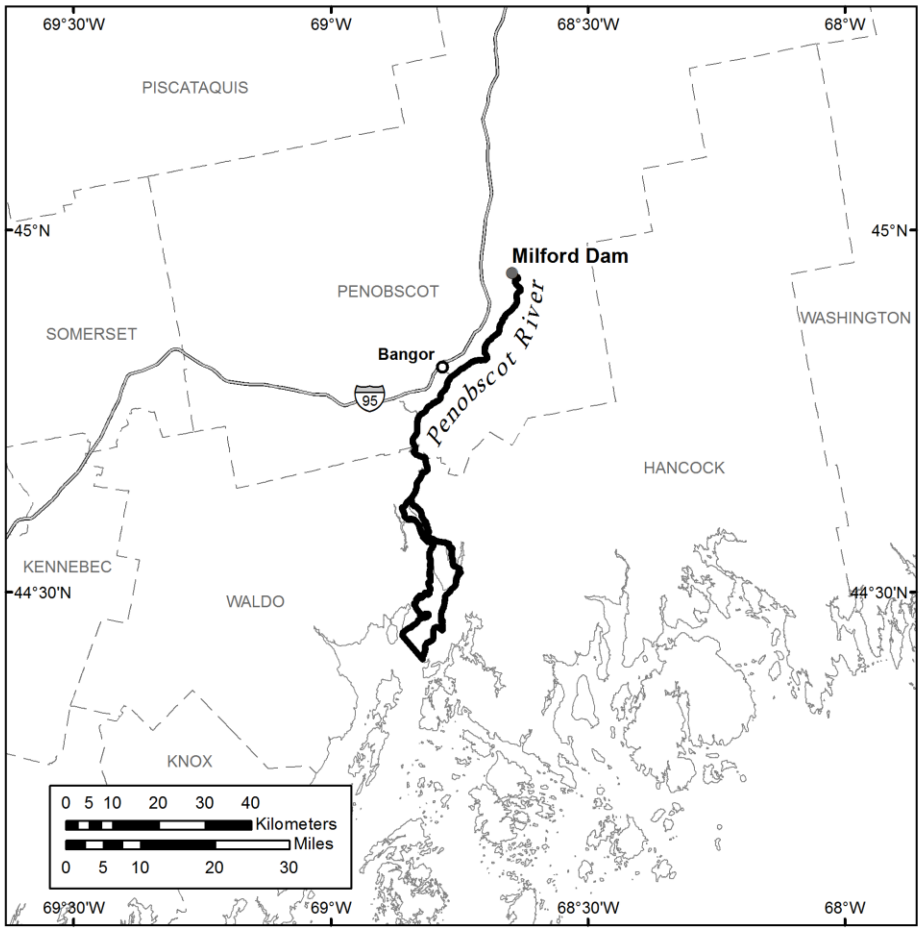
Other relevant impacts include conservation benefits of the designation, both to the species and to society. While we cannot quantify nor monetize these benefits, we believe they are not negligible and are an incremental effect of the designations. Therefore, we have declined to conduct an exclusion analysis for any particular area from the critical habitat units.

6 CRITICAL HABITAT AREAS

Based on the published literature, reports, and other available information cited above as well as information provided by the economic analysis, and information provided by the Department of the Air Force, Department of the Army, Department of the Navy, and USCG, we have identified the critical habitat areas identified below, that meet all regulatory and statutory requirements, for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs of Atlantic sturgeon. We are not exercising our discretion to do an exclusion analysis of any of these areas given the high conservation value of each area. Although not monetized, this conservation value is greater than the projected 10-year costs of section 7 consultation since recovery of each DPS will be facilitated by increased successful reproduction and recruitment.

For the Gulf of Maine DPS, we are designating five critical habitat units as follows: (1) Penobscot River main stem from the Milford Dam downstream for 53 RKMs to where the main stem river drainage discharges at its mouth into Penobscot Bay; (2) Kennebec River main stem from the Ticonic Falls/Lockwood Dam downstream for 103 RKMs to where the main stem river discharges at its mouth into the Atlantic Ocean; (3) Androscoggin River main stem from the Brunswick Dam downstream for 10 RKMs to where the main stem river drainage discharges into Merrymeeting Bay; (4) Piscataqua River from its confluence with the Salmon Falls and Cocheco rivers downstream for 19 RKMs to where the main stem river discharges at its mouth into the Atlantic Ocean as well as the waters of the Cocheco River from its confluence with the Piscataqua River and upstream 5 RKMs to the Cocheco Falls Dam, and waters of the Salmon Falls River from its confluence with the Piscataqua River and upstream 6 RKMs to the Route 4 Dam; and, (5) Merrimack River from the Essex Dam (also known as the Lawrence Dam) downstream for 48 RKMs to where the main stem river discharges at its mouth into the Atlantic Ocean. In total, these designations encompass approximately 244 kilometers (152 miles) of aquatic habitat.

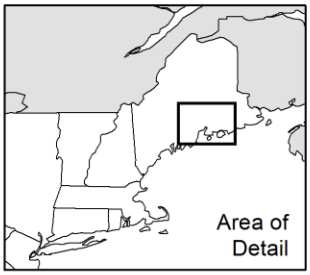
Gulf of Maine Unit 1 **Map 1**
Penobscot River



Legend

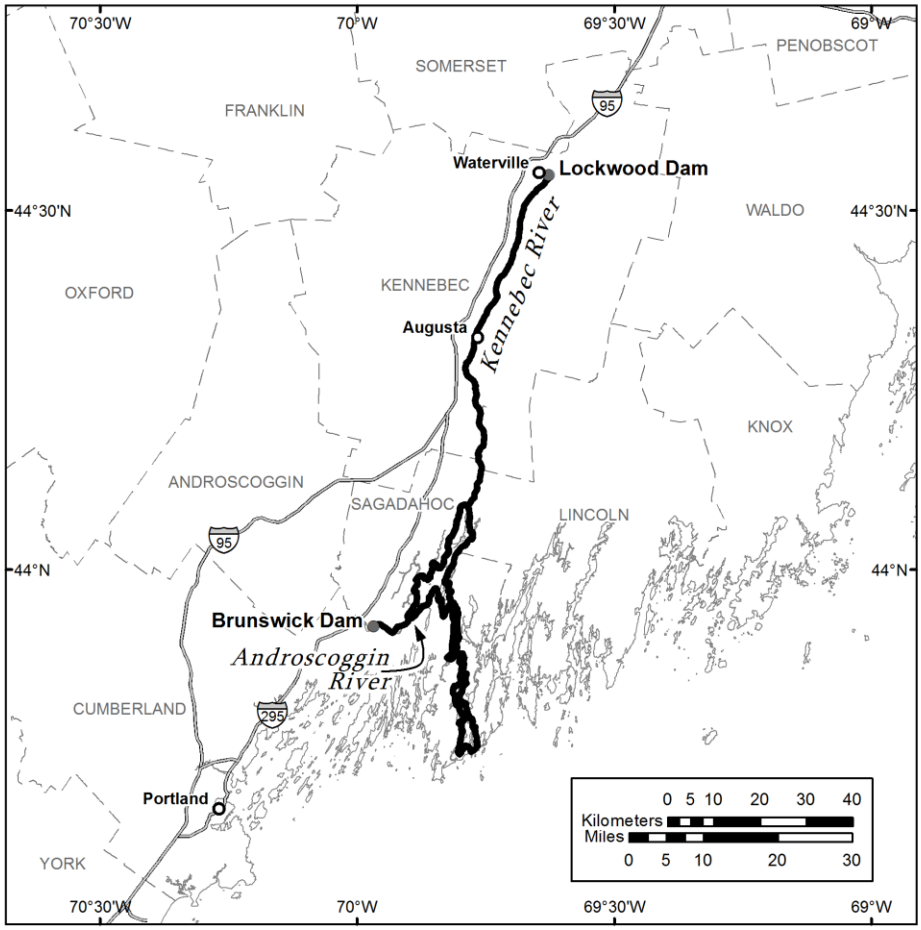
Critical Habitat Area

N
W E
S



This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

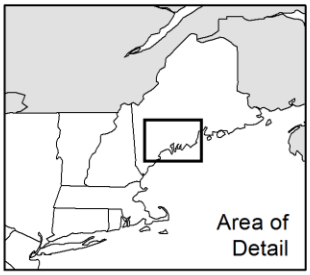
Gulf of Maine Units 2 and 3 **Map 2**
Kennebec River and Androscoggin River



Legend

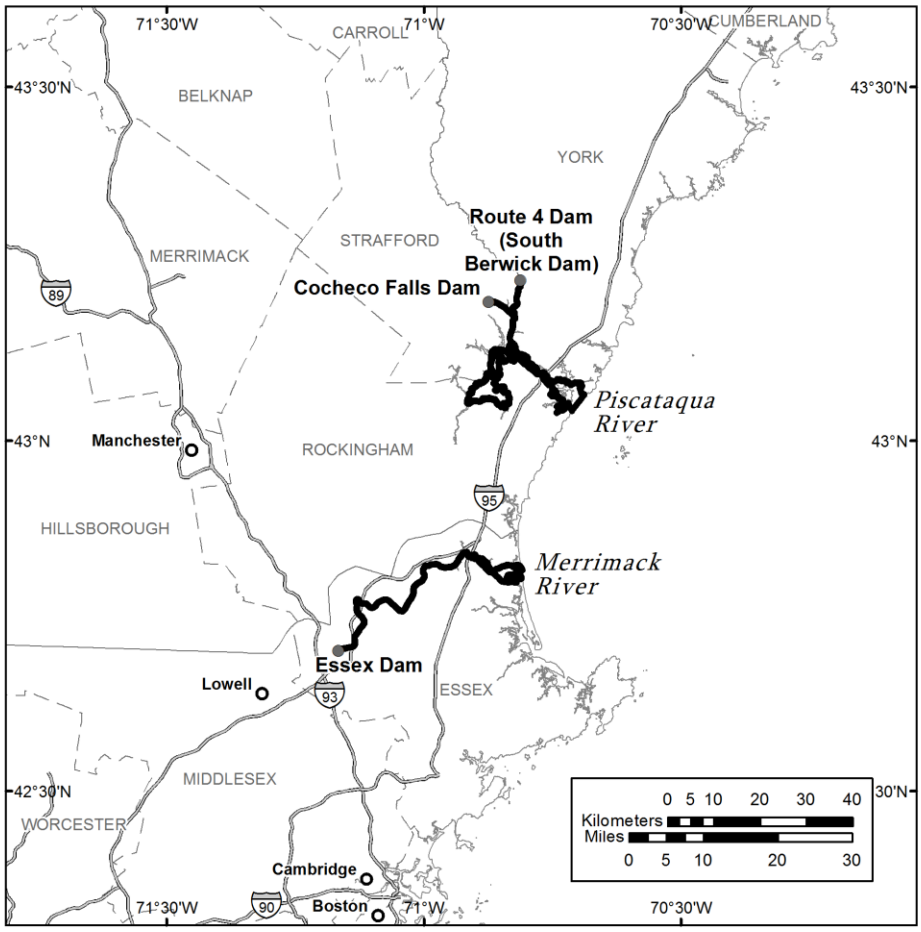
Critical Habitat Area

N
W E
S



This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

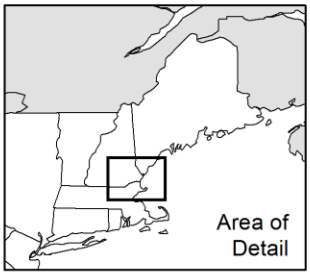
Gulf of Maine Units 4 and 5 **Map 3**
Piscataqua River and Merrimack River



Legend

Critical Habitat Area

N
W E
S

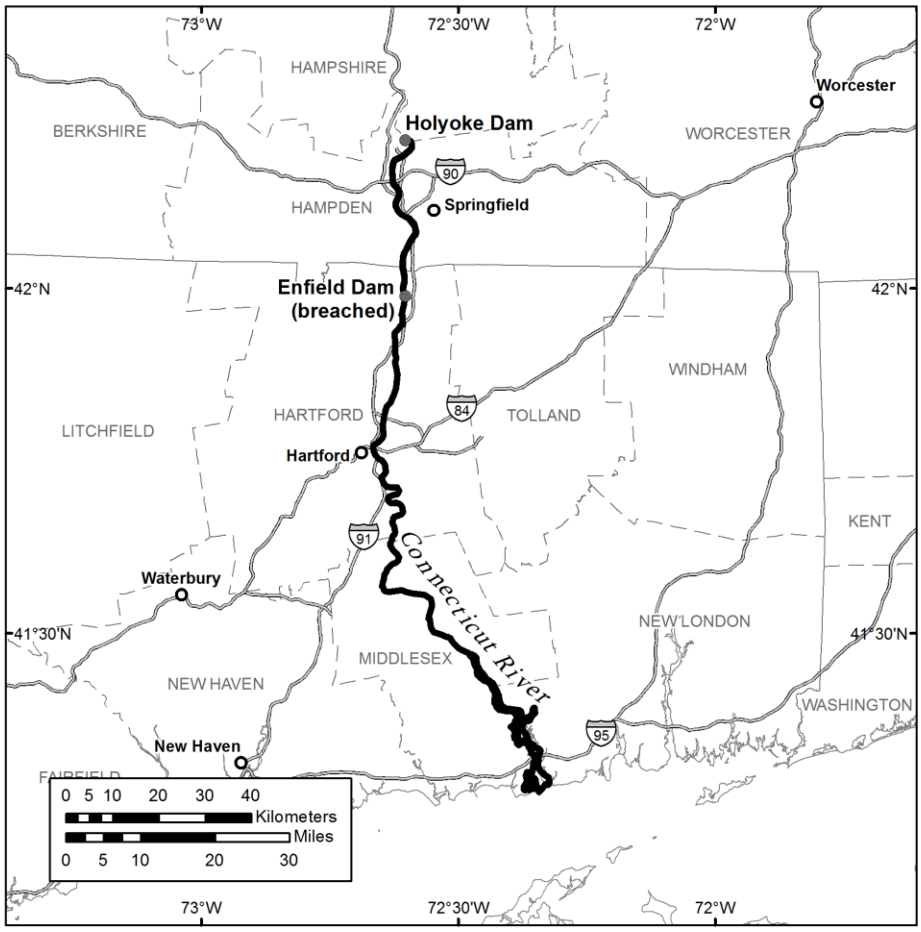


This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

We are designating four critical habitat units for the New York Bight DPS as follows: (1) Connecticut River from the Holyoke Dam downstream for 140 RKMs to where the main stem river discharges at its mouth into Long Island Sound; (2) Housatonic River from the Derby Dam downstream for 24 RKMs to where the main stem discharges at its mouth into Long Island Sound; (3) Hudson River from the Troy Lock and Dam (also known as the Federal Dam) downstream for 246 RKMs to where the main stem river discharges at its mouth into New York City Harbor; and, (4) Delaware River from the crossing of the Trenton-Morrisville Route 1 Toll Bridge, downstream for 137 RKMs to where the main stem river discharges at its mouth into Delaware Bay. In total, these designations encompass approximately 547 kilometers (340 miles) of aquatic habitat.

New York Bight Unit 1
Connecticut River

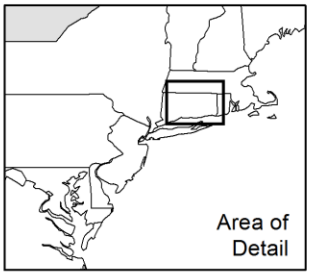
Map 4



Legend

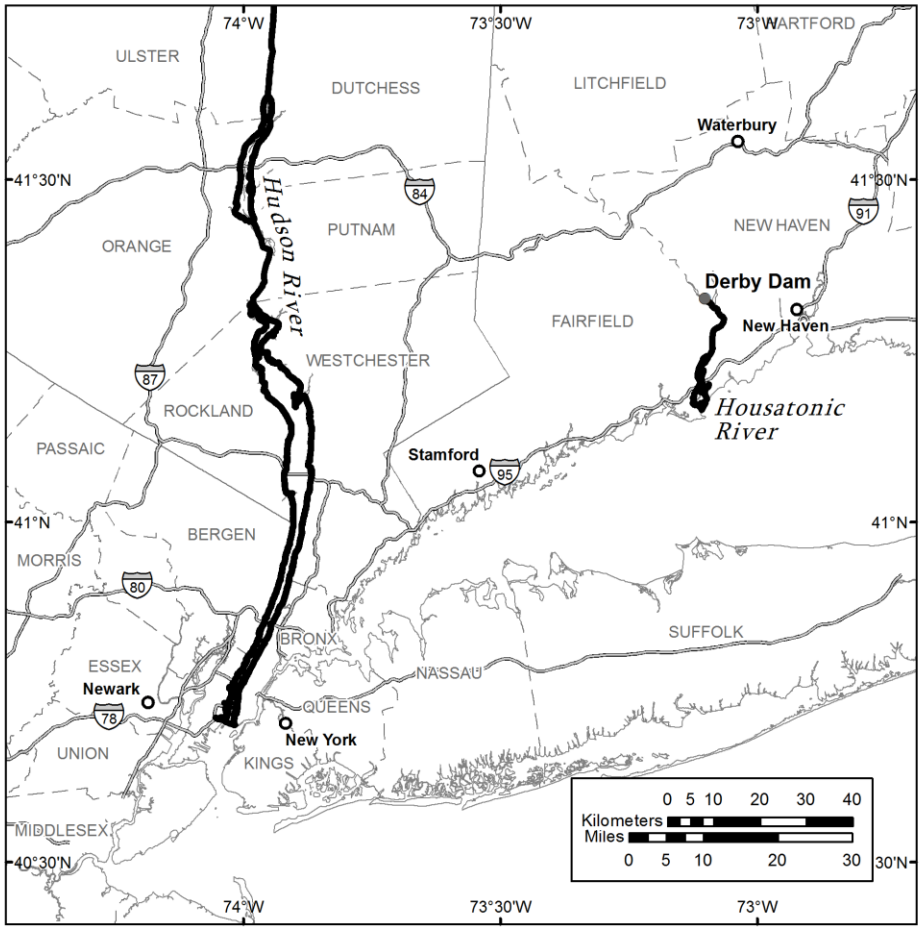
Critical Habitat Area

N
W E
S



This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

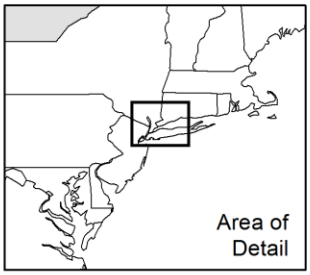
New York Bight Units 2 and 3 **Map 5**
Housatonic River and Hudson River (Part A)



Legend

Critical Habitat Area

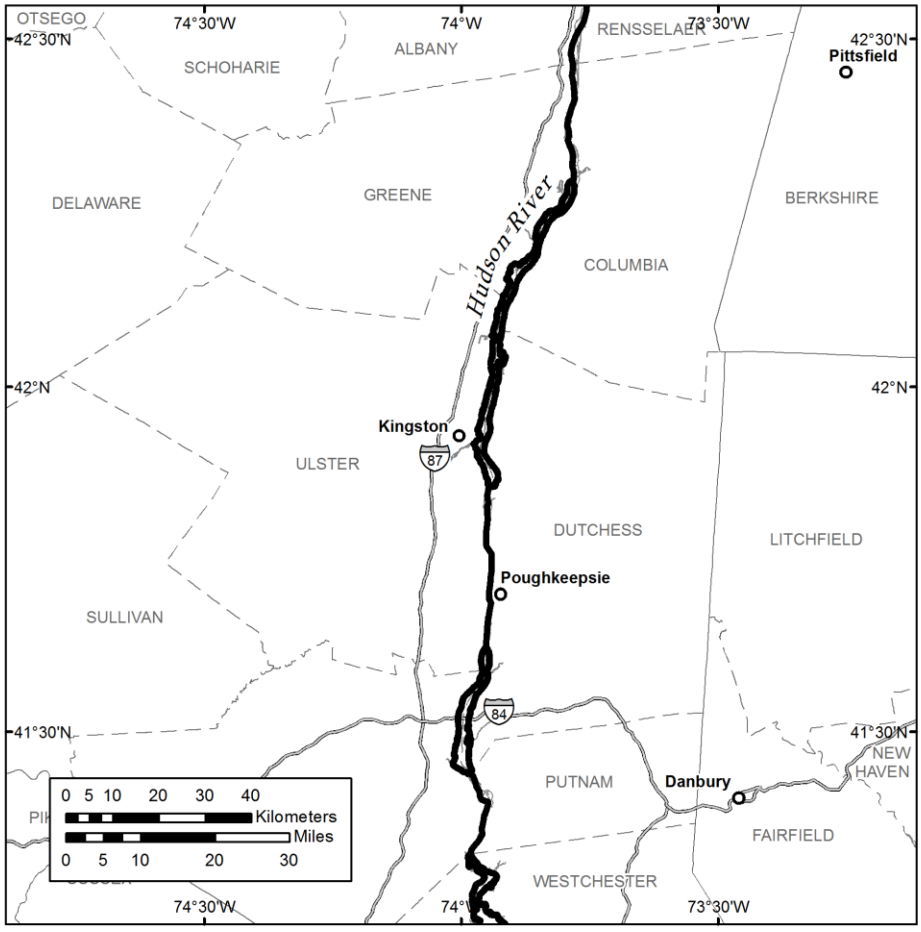
N
W E
S



This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

New York Bight Unit 3
Hudson River (Part B)

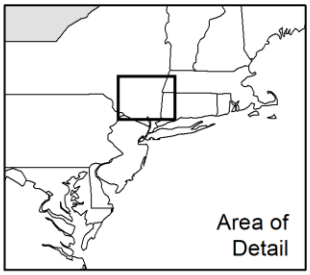
Map 6



Legend

Critical Habitat Area

N
W E
S



This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

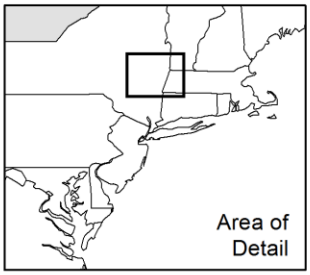
New York Bight Unit 3
Hudson River (Part C)

Map 7

Legend

Critical Habitat Area

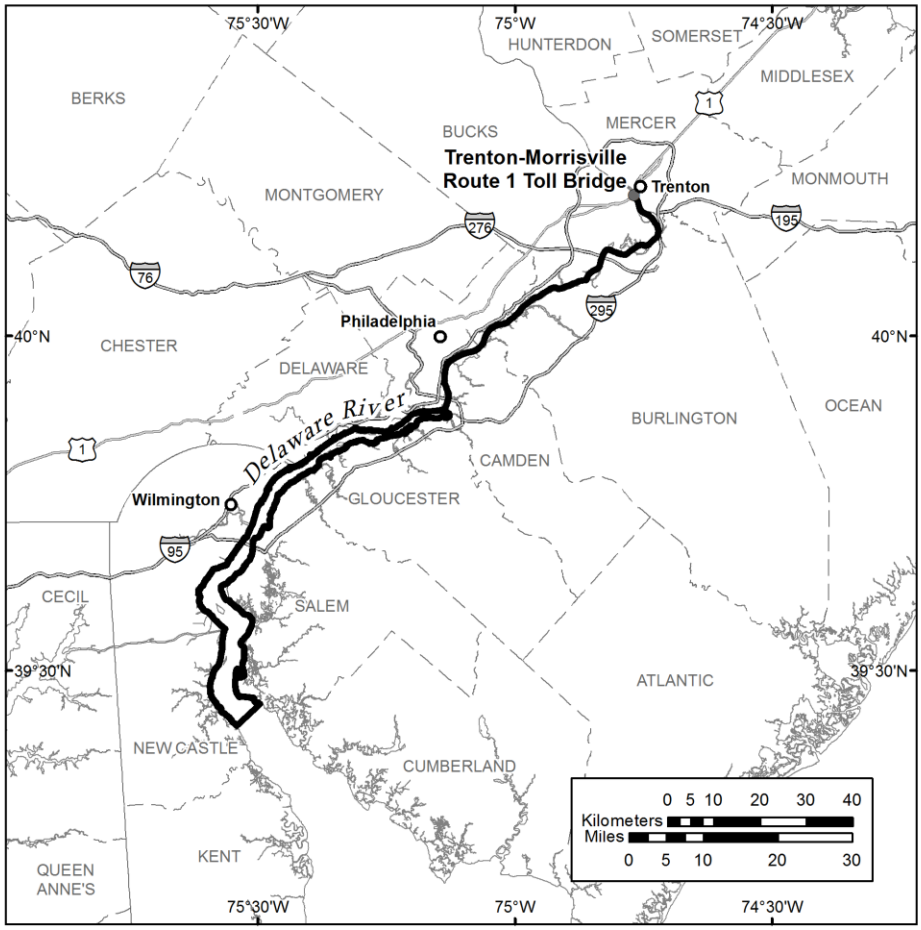
N
W E
S



This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

New York Bight Unit 4
Delaware River

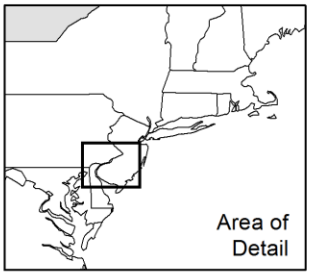
Map 8



Legend

Critical Habitat Area

N
W E
S



This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

We are designating five critical habitat units for the Chesapeake Bay DPS as follows: (1) Potomac River from the Little Falls Dam downstream for 189 RKMs to where the main stem river discharges at its mouth into the Chesapeake Bay; (2) Rappahannock River from the U.S. Highway 1 Bridge, downstream for 172 RKMs to where the river discharges at its mouth into the Chesapeake Bay; (3) York River from its confluence with the Mattaponi and Pamunkey rivers downstream to where the main stem river discharges at its mouth into the Chesapeake Bay as well as the waters of the Mattaponi River from its confluence with the York River and upstream to the Virginia State Route 360 Bridge crossing of the Mattaponi River, and waters of the Pamunkey River from its confluence with the York River and upstream to the Nelson's Bridge Road Route 615 crossing of the Pamunkey River for a total of 206 RKMs of aquatic habitat; (4) James River from Boshers Dam downstream for 160 RKMs to where the main stem river discharges at its mouth into the Chesapeake Bay at Hampton Roads; (5) Nanticoke River from the Maryland State Route 313 Bridge crossing near Sharptown, MD to where the main stem discharges at its mouth into the Chesapeake Bay as well as Marshyhope Creek from its confluence with the Nanticoke River and and upriver to the Maryland State Route 318 Bridge crossing near Federalsburg, MD for a total of 60 RKMs of aquatic habitat. In total, these designations encompass approximately 773 kilometers (480 miles) of aquatic habitat.

Chesapeake Bay Unit 1 **Map 9**

Nanticoke River and Marshyhope Creek

Legend

Critical Habitat Area

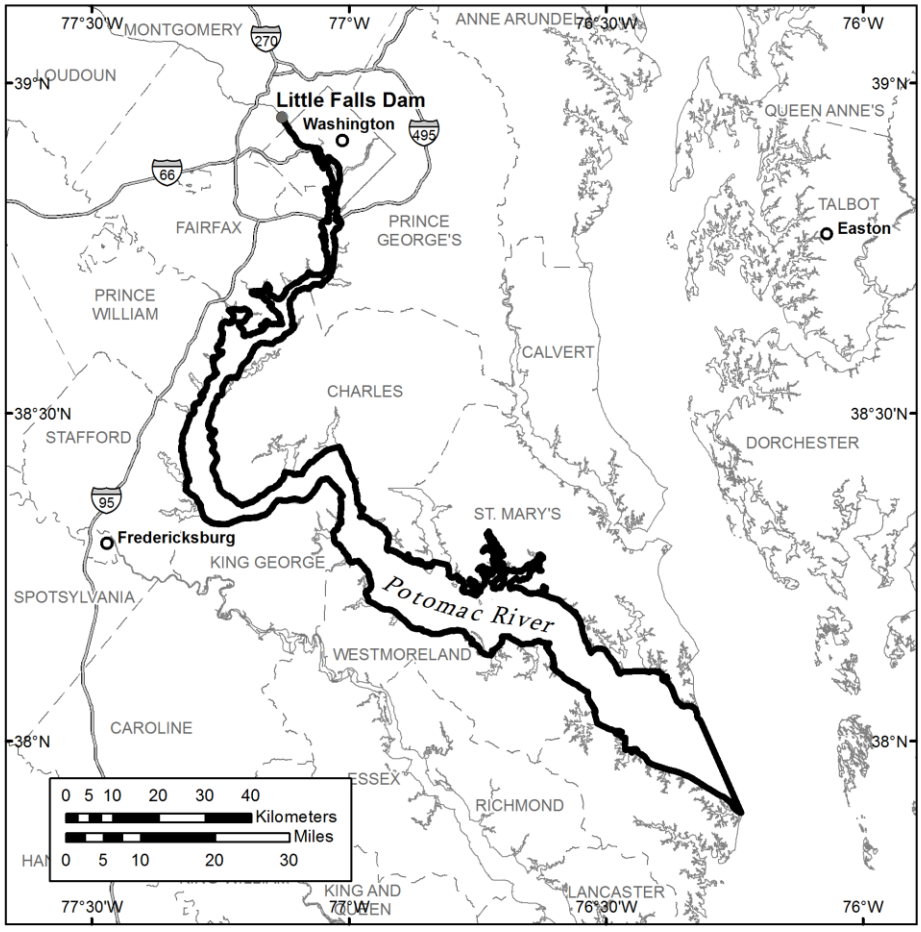
N
W E
S

Area of Detail

This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

Chesapeake Bay Unit 2
Potomac River

Map 10



Legend

Critical Habitat Area

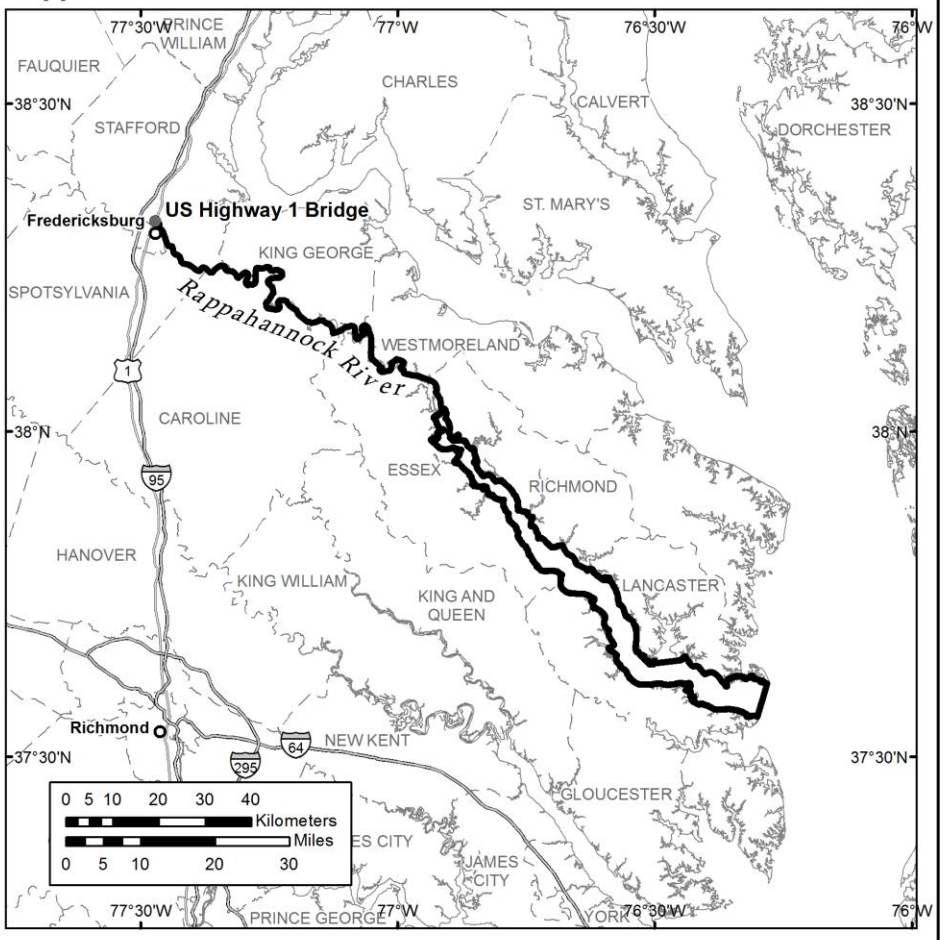
N
W E
S

Area of Detail

This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

Chesapeake Bay Unit 3
Rappahannock River

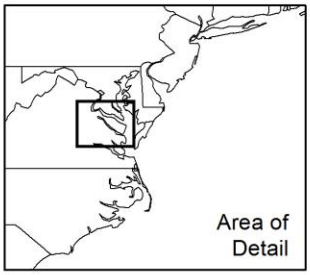
Map 11



Legend

Critical Habitat Area

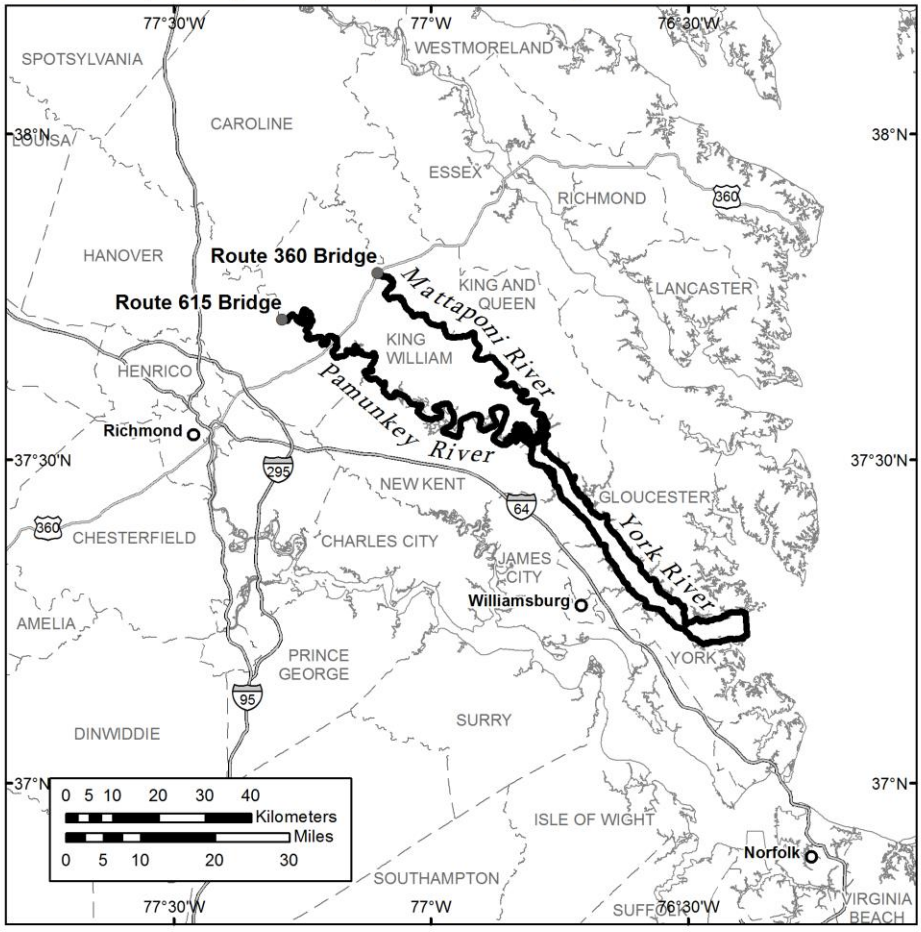
N
W E
S



This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

Chesapeake Bay Unit 4 **Map 12**

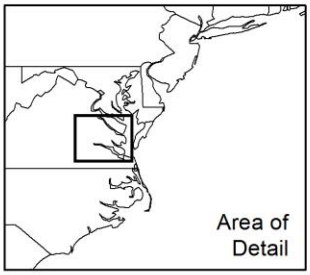
York River, Mattaponi River, and Pamunkey River



Legend

Critical Habitat Area

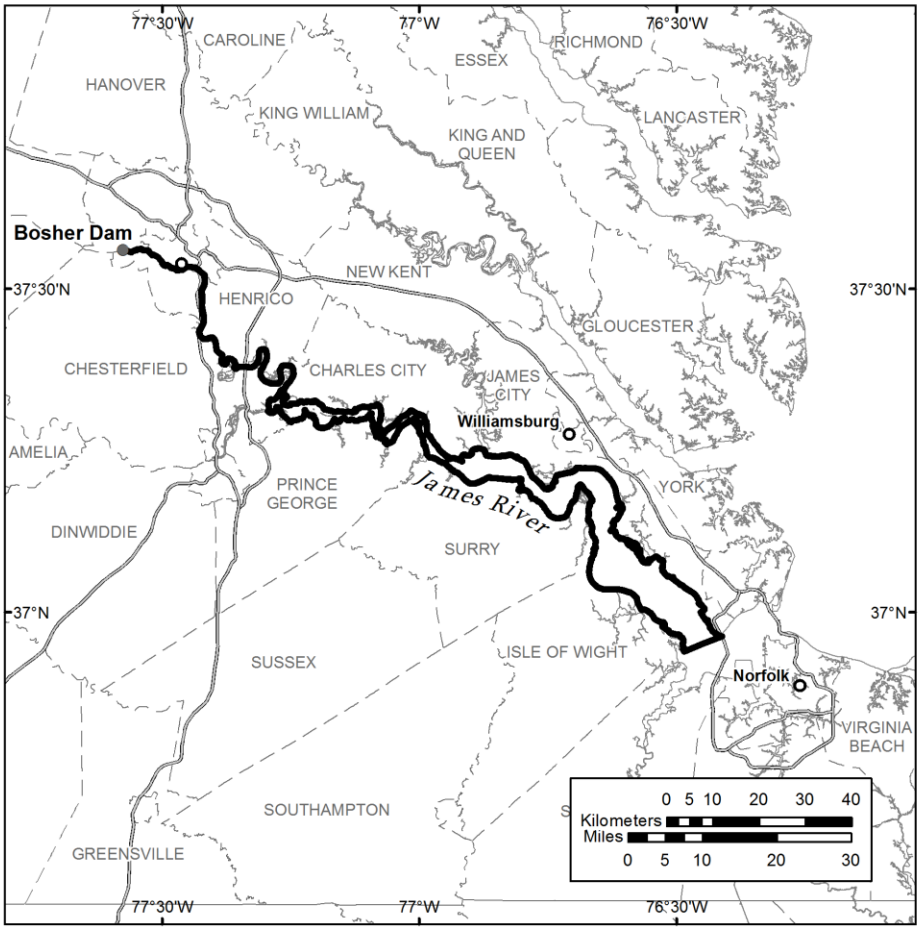
N
W E
S



This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

Chesapeake Bay Unit 5
James River

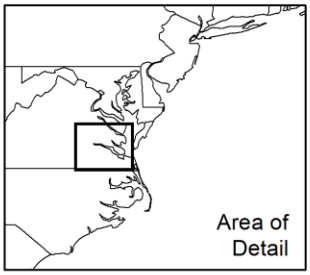
Map 13



Legend

Critical Habitat Area

N
W E
S



This map illustrates Atlantic sturgeon critical habitat. Critical habitat is all of the river within the illustrated Critical Habitat Area; from the ordinary high water mark of one riverbank to the ordinary high water mark of the opposing riverbank. For clarification of the critical habitat definition, please refer to the narrative description.

REFERENCES

Allen, P.J., Z. A. Mitchell, R. J. DeVries, D. L. Aboagye, M. A. Ciaramella, S. W. Ramee, H. A. Stewart and R. B. Shartau. 2014. Salinity effects on Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus* Mitchill, 1815) growth and osmoregulation. Journal of Applied Ichthyology 30: 1229–1236. doi: 10.1111/jai.12542.

ASMFC (Atlantic States Marine Fisheries Commission). 1998. Amendment 1 to the interstate fishery management plan for Atlantic sturgeon. Management Report No. 31, 43 pp.

Atlantic Sturgeon Status Review Team (ASSRT). 2007. Status review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). National Marine Fisheries Service. February 23, 2007. 188 pp.

Austin, G. 2012. Essential spawning habitat for Atlantic sturgeon in the James River, Virginia. Master of Science Thesis. Virginia Commonwealth University, Richmond, Virginia.

Bain, M.B. 1997. Atlantic and shortnose sturgeons of the Hudson River: Common and divergent life history attributes. Environmental Biology of Fishes 48:347-358.

Bain, M., K. Arend, N. Haley, S. Hayes, J. Knight, S. Nack, D. Peterson, and M. Walsh. 1998. Sturgeon of the Hudson River 1993-1996. Final Report to the Hudson River Foundation, New York, NY. 83 pp.

Bain, M.B., N. Haley, D. Peterson, J. R. Waldman, and K. Arend. 2000. Harvest and habitats of Atlantic sturgeon *Acipenser oxyrinchus* Mitchill, 1815, in the Hudson River Estuary: Lessons for Sturgeon Conservation. Instituto Espanol de Oceanografia. Boletin 16:43-53.

Balazik, M.T., G.C. Garman, J.P. VanEenennaam, J. Mohler, and C. Woods III. 2012. Empirical evidence of fall spawning by Atlantic sturgeon in the James River, Virginia. Transactions of the American Fisheries Society 141(6):1465-1471.

Balazik, M.T., G.C. Garman, M.L. Fine, C.H. Hager, and S.P. McIninch. 2010. Changes in age composition and growth characteristics of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) over 400 years. Biology Letters 6:708–710.

Balazik, M.T., J.A. Musick. 2015. Dual annual spawning races in Atlantic sturgeon. PLoS ONE 10(5): e0128234.

Bemis, W.E. and B. Kynard. 1997. Sturgeon rivers: an introduction to acipenseriform biogeography and life history. Environmental Biology of Fishes 48: 167–183.

Bigelow, H.B. and W.C. Schroeder. 1953. Sea Sturgeon. In Fishes of the Gulf of Maine. Fishery Bulletin 74. Fishery Bulletin of the Fish and Wildlife Service, vol. 53.

Bigelow and Welsh. 1924. The Sturgeons. In Fishes of the Gulf of Maine. Bulletin of the United States Bureau of Fisheries 40:74-77.

Billard, R. and G. Lecointre. 2001. Biology and conservation of sturgeon and paddlefish. Reviews in Fish Biology and Fisheries 10:355–392.

Borodin, N. 1925. Biological observations on the Atlantic sturgeon (*Acipenser sturio*). Transactions of the American Fisheries Society 55:184-190.

Bowen, B.W. and J.C. Avise. 1990. Genetic structure of Atlantic and Gulf of Mexico populations of sea bass, menhaden, and sturgeon: Influence of zoogeographic factors and life-history patterns. Marine Biology 107:371-381.

Breece, M.W., D.A. Fox, K.J. Dunton, M.G. Frisk, A. Jordaan, and M.J. Oliver. 2016. Dynamic seascapes predict marine occurrence of an endangered species: Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus*. Methods in Ecology and Evolution. doi: 10.1111/2041-210X.12532.

Breece M.W., M.J. Oliver, M.A. Cimino, D.A. Fox. 2013. Shifting distributions of adult Atlantic sturgeon amidst post-industrialization and future impacts in the Delaware River: a maximum entropy approach. PLoS ONE 8(11): e81321. doi:10.1371/journal.pone.0081321.

Breitburg, D. 2002. Effects of hypoxia, and the balance between hypoxia and enrichment, on coastal fishes and fisheries. Estuaries 25(4b):767-781.

Bruce, D., J. Lazar, and A. McGowan. 2016. Project report: Atlantic sturgeon riverbed habitat mapping in Broad Creek, Marshyhope Creek, and the Nanticoke River, Delaware & Maryland 2015. NOAA Fisheries Office of Habitat Conservation, Chesapeake Bay Office, January 19, 2016.

Brundage III, H.M. and J. C. O'Herron, II. 2009. Investigations of juvenile shortnose and Atlantic sturgeons in the lower tidal Delaware River. Bull. N.J. Acad. Sci. 54(2):1–8.

Brundage III, H.M. and R.E. Meadows. 1982. The Atlantic sturgeon, *Acipenser oxyrinchus*, in the Delaware River Estuary. Fishery Bull. Vol. 80(2):337-343.

Bushnoe, T.M., J.A. Musick, D.S. Ha. 2005. Essential spawning and nursery habitat of Atlantic sturgeon (*Acipenser oxyrinchus*) in Virginia. Provided by Jack Musick, Virginia Institute of Marine Science, Gloucester Point, Virginia.

Calvo, L., H.M. Brundage, III, D. Haidvogel, D. Kreeger, R. Thomas, J.C. O'Herron, II, and E.N. Powell. 2010. Effects of flow dynamics, salinity, and water quality on Atlantic sturgeon, the shortnose sturgeon, and the Eastern oyster in the oligohaline zone of the Delaware Estuary. Final Report for Project No. 151265. Project Year 2008-2009. Submitted to the U.S. Army Corps of Engineers, Philadelphia District. 106 pp.

Caron, F., D. Hatin, and R. Fortin. 2002. Biological characteristics of adult Atlantic sturgeon (*Acipenser oxyrinchus*) in the Saint Lawrence River estuary and the effectiveness of management rules. Journal of Applied Ichthyology 18:580-585.

Ceasar, J., R. Collier, J. Edmond, F. Frey, G. Matisoff, A. Ng, and R. Stallard. 1976. Chemical dynamics of a polluted watershed, the Merrimack River in northern New England. Environmental Science and Technology 10(7):697-704.

Chesapeake Bay Foundation (CBF). 2015. 2014 State of the Bay Report. 11pp.

Collins, M.R., T.I.J. Smith, W.C. Post, and O. Pashuk. 2000. Habitat utilization and biological characteristics of adult Atlantic sturgeon in two South Carolina Rivers. Transactions of the American Fisheries Society 129:982–988.

Dadswell, M. 2006. A review of the status of Atlantic sturgeon in Canada, with comparisons to populations in the United States and Europe. Fisheries 31:218-229.

Dadswell, M. J., B. D. Taubert, T. S. Squiers, D. Marchette, and J. Buckley. 1984. Synopsis of Biological Data on Shortnose Sturgeon, *Acipenser brevirostrum*, LeSuer 1818.

Dees, L.T. 1961. Sturgeons. United States Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries. Washington, D.C.

Dovel, W. L. and T. J. Berggren. 1983. Atlantic sturgeon of the Hudson River Estuary, New York. New York Fish and Game Journal 30:140-172.

Dunton, K.J., A. Jordaan, D.O. Conover, K.A. McKown, L.A. Bonacci, and M.G. Frisk. 2015. Marine distribution and habitat use of Atlantic sturgeon in New York lead to fisheries interactions and bycatch. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 7(1):18-32.

Dunton, K.J., A. Jordaan, K.A. McKown, D.O. Conover, and M.J. Frisk. 2010. Abundance and distribution of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) within the Northwest Atlantic Ocean, determined from five fishery-independent surveys. Fishery Bulletin 108:450-465.

Dunton, K. J., D. Chapman, A. Jordaan, K. Feldheim, S.J. O'Leary, K.A. McKown, and M.G. Frisk, M. G. 2012. Genetic mixed-stock analysis of Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus* in a heavily exploited marine habitat indicates the need for routine genetic monitoring. Journal of Fish Biology 80:207–217. doi: 10.1111/j.1095-8649.2011.03151.x

Dzaugis, M. 2013. Diet and prey availability of sturgeons in the Penobscot River, Maine. Honors College. Paper 106. http://digitalcommons.library.umaine.edu/honors/106.

Environmental Protection Agency (EPA). 2003. Ambient water quality criteria for dissolved oxygen, water clarity and chlorophyll a for the Chesapeake Bay and its tidal tributaries. EPA 903-R-03-002. 343 pp.

Erickson, D.L., A. Kahnle, M.J. Millard, E.A. Mora, M. Bryja, A. Higgs, J. Mohler, M. DuFour, G. Kenney, J. Sweka, and E.K. Pikitch. 2011. Use of pop-up satellite archival tags to identify oceanic-migratory patterns for adult Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus* Mitchell, 1815. J. Appl. Ichthyology 27:356–365.

Eskin, R.A., K.H. Rowland, and D.Y. Alegre. 1996. Contaminants in Chesapeake Bay sediments 1984-1991, Chesapeake Bay Program, CBP/TRS 145/96.

Everly, A.W. and J. Boreman. 1999. Habitat use and requirements of important fish species inhabiting the Hudson River Estuary: Availability of Information. NOAA Technical Memorandum NMFS-NE-121.

Eyler, S. 2006. Atlantic sturgeon migratory movements and bycatch in commercial fisheries based on tagging data. Unpublished Report, prepared February 28, 2006. 32 pp.

Eyler, S., M. Mangold, and S. Minkkinen. 2004. Atlantic coast sturgeon tagging database. USFWS, Maryland Fishery Resources Office. Summary Report. 60 pp.

Fenster, M., and D. FitzGerald. 1996. Morphodynamics, stratigraphy, and sediment transport patterns of the Kennebec River estuary, Maine. Sedimentary Geology 107:99–120.

Fernandes, S.J., G.B. Zydlewski, J. Zydlewski, G.S. Wippelhauser, and M.T. Kinnison. 2010. Seasonal distribution and movements of shortnose sturgeon and Atlantic sturgeon in the Penobscot River Estuary, Maine. Transactions of the American Fisheries Society 139:1436–1449.

Fisher, M. 2009. Atlantic Sturgeon Progress Report. Delaware State Wildlife Grant, Project T-4-1, December 16, 2008 to December 15, 2009. 24 pp.

Fisher, M. 2011. Atlantic Sturgeon Progress Report. Delaware State Wildlife Grant, Project T-4-1, October 1, 2006 to October 15, 2010. 44 pp.

Friedrichs, C.T., 2009. York River physical oceanography and sediment transport. In: K.A. Moore and W.G. Reay (eds.), A Site Profile of the Chesapeake Bay National Estuarine Research Reserve, Virginia. Journal of Coastal Research, SI 57:17-22.

Gilbert, C.R. 1989. Atlantic and shortnose sturgeons. United States Department of Interior Biological Report 82, 28 pp.

Greene, K. E., J. L. Zimmerman, R. W. Laney, and J. C. Thomas-Blate. 2009. Atlantic coast diadromous fish habitat: A review of utilization, threats, recommendations for conservation, and research needs. Atlantic States Marine Fisheries Commission Habitat Management Series No. 9, Washington, D.C.

Grunwald, C., L. Maceda, J. Waldman, J. Stabile, and I. Wirgin. 2008. Conservation of Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus*: Delineation of stock structure and distinct population segments. Conservation Genetics 9(5):1111-1124.

Guilbard, F., J. Munro, P. Dumont, D. Hatin, and R. Fortin. 2007. Feeding ecology of Atlantic sturgeon and Lake sturgeon co-occurring in the St. Lawrence Estuarine Transition Zone. American Fisheries Society Symposium. 56:85-104.

Hager, C. 2011. Atlantic Sturgeon Review: Gather data on reproducing subpopulation on Atlantic Sturgeon in the James River. Final Report - 09/15/2010 to 9/15/2011. NOAA/NMFS contract EA133F10CN0317 to the James River Association. 21 pp.

Hager, C., J. Kahn, C. Watterson, J. Russo, and K. Hartman. 2014. Evidence of Atlantic sturgeon spawning in the York River System, Transactions of the American Fisheries Society, 143:5, 1217-1219.

Hale, E.A., Ian A. Park, Matthew T. Fisher, Richard A. Wong, Michael J. Stangl, and John H. Clark. 2016. Abundance estimate for and habitat use by early juvenile Atlantic sturgeon within the Delaware River Estuary. Transactions of the American Fisheries Society, 145:6, 1193-1201, DOI: 10.1080/00028487.2016.1214177.

Haley, N.J. 1999. Habitat characteristics and resource use patterns of sympatric sturgeons in the Hudson River Estuary. M.Sc. Thesis. University of Massachusetts, Amherst, MA 124 p.
Hammerson, G.A. 2004. The Connecticut River. Pages 56-65 In: Connecticut Wildlife: Biodiversity, Natural History, and Conservation. University Press of New England, Lebanon, NH.

Hammerson, G.A. 2004. Connecticut Wildlife: Biodiversity, Natural History, and Conservation. University Press of New England, Lebanon, NH.

Hatin, D., R. Fortin, and F. Caron. 2002. Movements and aggregation areas of adult Atlantic sturgeon (*Acipenser oxyrinchus*) in the St. Lawrence River estuary, Québec, Canada. Journal of Applied Ichthyology 18:586-594.

Hatin, D.R., S. Lachance, and D. Fournier. 2007. Effect of dredged sediment deposition on use by Atlantic sturgeon (*Acipenser oxyrinchus*) and Lake sturgeon (*Acipenser fulvescens*) at an open-water disposal site in the St. Lawrence Estuarine Transition Zone. American Fisheries Society Symposium 53:235-255.

Henshaw, R.E. (editor). 2011. Environmental History of the Hudson River: Human uses that changed the ecology, ecology that changed human uses. State University of New York Press, Albany, NY.

Hilton, E.J., B. Kynard, M. T. Balazik, A. Z. Horodysky, and C. B. Dillman. 2016. Review of the biology, fisheries, and conservation status of the Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus* Mitchill, 1815. J. Appl. Ichthyol., 1–37.

Holland, B.F., Jr., and G.F. Yelverton. 1973. Distribution and biological studies of anadromous fishes offshore North Carolina. Division of Commercial and Sports Fisheries, North Carolina Dept. of Natural and Economic Resources, Special Scientific Report No. 24. 130pp.

Housatonic Valley Association (HVA). 2006. Lower Housatonic and Lower Naugatuck Rivers Assessment Report. June 2006. 59 pp.

Industrial Economics, Incorporated (IEc). 2003. Economic Analysis of Critical Habitat Designation for the Gulf Sturgeon. Prepared for the Division of Economics, U.S. Fish & Wildlife Service. January 2003.

IEc. 2009. Economic Analysis of the Impacts of Designating Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Prepared for National Marine Fisheries Service, Southwest Region. September 28, 2009.

Johnson, J. H., D. S. Dropkin, B. E. Warkentine, J. W. Rachlin, and W. D. Andrews. 1997. Food habits of Atlantic sturgeon off the central New Jersey coast. Transactions of the American Fisheries Society 126:166-170.

Kahnle, A. W., K. A. Hattala, K. A. McKown, C. A. Shirey, M. R. Collins, T. S. Squiers, Jr., and T. Savoy. 1998. Stock status of Atlantic sturgeon of Atlantic Coast estuaries. Report for the Atlantic States Marine Fisheries Commission. Draft III.

Kahn, J.E., C. Hager, J. C. Watterson, J. Russo, K. Moore & K. Hartman. 2014. Atlantic sturgeon annual spawning run estimate in the Pamunkey River, Virginia, Transactions of the American Fisheries Society, 143:6, 1508-1514, DOI:10.1080/00028487.2014.945661

Kieffer, M.C. and B. Kynard. 1993. Annual movements of shortnose and Atlantic sturgeons in the Merrimack River, Massachusetts. Transactions of the American Fisheries Society 122:1088-1103.

King and Associates. 2014. (DRAFT) Economic Impact Analysis of Critical Habitat Designation for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*). Report to the National Marine Fisheries Service. Prepared by King and Associates, Incorporated. Solomons, MD.

King, T.L., B.A. Lubinski, and A.P. Spidle. 2001. Microsatellite DNA variation in Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and cross-species amplification in the Acipenseridae. Conservation Genetics 2:103-119.

Kistner, D.A. and N.R. Pettigrew. 2001. A Variable Turbidity Maximum in the Kennebec Estuary, Maine. Estuaries 24(5):680-687.

Klyashtorin, L.B. 1976. The sensitivity of young sturgeons to oxygen deficiency. Journal of Icthyology 16:677-681.

Kynard, B. and M. Horgan. 2002. Ontogenetic behavior and migration of Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*, and shortnose sturgeon, *A. brevirostrum*, with notes on social behavior. Environmental Behavior of Fishes 63:137-150.

Kynard, B., M. Horgan, M. Kieffer, and D. Seibel. 2000. Habitat used by shortnose sturgeon in two Massachusetts rivers, with notes on estuarine Atlantic sturgeon: A hierarchical approach. Transactions of the American Fisheries Society 129:487-503.

Laney, R.W., J.E. Hightower, B.R. Versak, M.F. Mangold, W.W. Cole Jr., and S.E. Winslow. 2007. Distribution, habitat use, and size of Atlantic sturgeon captured during cooperative winter tagging cruises, 1988–2006. Pages 167-182. In: J. Munro, D. Hatin, J. E. Hightower, K. McKown, K. J. Sulak, A. W. Kahnle, and F. Caron, (editors), Anadromous sturgeons: habitats, threats, and management. Am. Fish. Soc. Symp. 56, Bethesda, MD.

Lazzari, M. A., J. C. O'Herron, and R. W. Hastings. 1986. Occurrence of juvenile Atlantic sturgeon, *Acipenser oxyrhynchus*, in the upper tidal Delaware River. Estuaries 9:358–361.

Mangin, E. 1964. Croissance en Longueur de Trois Esturgeons d'Amerique du Nord: *Acipenser oxyrhynchus*, Mitchill, *Acipenser fulvescens*, Rafinesque, et *Acipenser brevirostris* LeSueur. Verh. Int. Ver. Limnology 15:968-974.

McCord, J.W., M.R. Collins, W.C. Post, and T.J. Smith. 2007. Attempts to develop an index of abundance for age-1 Atlantic sturgeon in South Carolina, USA. American Fisheries Society Symposium 56:397-403.

McFarlane, W.S. 2012. Defining a Nuisance: Pollution, Science, and Environmental Politics on Maine's Androscoggin River. Environmental History 17:307–335.

McLean, M.F., C.A. Simpfendorfer, M.R. Heupel, M. J. Dadswell, and M. J. W. Stokesbury. 2014. Diversity of behavioural patterns displayed by a summer feeding aggregation of Atlantic sturgeon in the intertidal region of Minas Basin, Bay of Fundy, Canada. Marine Ecology Progress Series 496:59–69.

McLean, M.F., M. J. Dadswell, and M. J. W. Stokesbury. 2013. Feeding ecology of Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus* Mitchill, 1815 on the infauna of intertidal mudflats of Minas Basin, Bay of Fundy. Journal of Applied Ichthyology 1–7.

Mohler, J.W. 2003. Culture manual for the Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*. U.S. Fish and Wildlife Service, Hadley, Massachusetts. 70 pp.

Moore, S. and J. Reblin. 2008. The Kennebec Estuary: Restoration Challenges and Opportunities. Biological Conservation, Bowdoinham, Maine.

Munro, J., R.E. Edwards, and A.W. Kahnle. 2007. Anadromous sturgeons: Habitats, threats, and management - synthesis and summary. American Fisheries Society Symposium 56:1-15.

Murawski, S.A. and A.L. Pacheco. 1977. Biological and fisheries data on Atlantic sturgeon, *Acipenser oxyrhynchus* (Mitchill). National Marine Fisheries Service Technical Series Report 10:1-69.

Nanticoke Restoration Work Group (NRWG). 2009. Nanticoke Watershed Restoration Plan. May 19, 2009. 48 pp.

Nelson, T.C., P. Doukakis, S.T. Lindley, A.D. Schreier, J.E. Hightower. L.R. Hildebrand, R.E. Whitlock, and M.A.H. Webb. 2013. Researh tools to investigate movements, migrations, and life history of sturgeons (Acipenseridae), with an emphasis on marine-oriented populations. PLoS ONE 8(8): e71552, doi:10.1371/journal.pone.0071552.

Niklitschek, E.S. and D.H. Secor. 2009. Dissolved oxygen, temperature and salinity effects on the ecophysiology and survival of juvenile Atlantic sturgeon in estuarine waters: I. Laboratory Results. J. Exp. Mar. Biol. Ecol. 381, Suppl. 1:150-160.

Niklitschek, E.S. and D.H. Secor. 2010. Experimental and field evidence of behavioral habitat selection by juvenile Atlantic (*Acipenser oxyrinchus*) and shortnose (*Acipenser brevirostrum*) sturgeons. Journal of Fish Bioliogy 77:1293-1308.

NMFS and USFWS (National Marine Fisheries Service and United States Fish and Wildlife Service). 1998. Status review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service and United States Fish and Wildlife Service. 126 pp.

NMFS. 2013. Endangered Species Act Section 7 Consultation on the Amendment of the Licenses for the Lockwood (2574), Shawmut (2322), Weston (2325), Brunswick (2284), and Lewiston Falls (2302) Projects, NER/2013/9613. Biological Opinion, July 19.

Oakley, N.C. 2003. Status of shortnose sturgeon, *Acipenser brevirostrum*, in the Neuse River, North Carolina. M.Sc. Thesis. North Carolina State University. 100 pp.

Odell, J., A. Eberhardt, D. Burdick, and P. Ingraham. 2006. Great Bay estuary compendium. The Nature Conservancy, Concord, New Hampshire.

O'Leary, S.J., K.J. Dunton, T.L. King. M.G. Frisk, and D.D. Chapman. 2014. Genetic diversity and effective size of Atlantic sturgeon, *Acipenser oxyrhinchus oxyrhinchus*, river spawning populations estimated from the microsatellite genotypes of marine-captured juveniles. Conservation Genetics DOI 10.1007/s10592-014-0609-9.

Oliver, M.J., M.W. Breece , D.A. Fox , D.E. Haulsee , J.T. Kohut , J. Manderson, and T. Savoy. 2013. Shrinking the Haystack: Using an AUV in an Integrated Ocean Observatory to Map Atlantic Sturgeon in the Coastal Ocean, Fisheries 38(5):210-216, DOI: 10.1080/03632415.2013.782861.

Pikitch, E.K., P. Doukakis, L. Lauck, P. Chakrabarty, and D.L. Erickson. 2005. Status, trends and management of sturgeon and paddlefish fisheries. Fish and Fisheries 6: 233–265.
Reay, W.G. 2009. Water quality within the York River. Journal of Coastal Research, SI(57):23-29.

Potomac Conservancy. 2014. River friendly growth: How we use the land on the Potomac River. 2014 State of the Nation's River Spotlight Edition. 8pp.

Potomac Crossing Consultants (PCC). 2000. Shortnose sturgeon biological assessment for the Woodrow Wilson Bridge Project. March 2000.

Reay, W. G. 2009. Water Quality within the York River. Journal of Coastal Research, SI (57), 23-39.

Richardson, B. and D. Secor. 2016. Assessment of critical habitats for recovering the Chesapeake Bay Atlantic sturgeon distinct population segment. Final Report. Section 6 Species Recovery Grants Program Award Number: NA13NMF4720042.

Richardson, B., C. Stence, M. Baldwin, C. Mason, A. Lazur, E. Markin, M.L. Bartron, S. Julian, and J.Kalie. 2007. Development of a captive brood stock program for Atlantic sturgeon (*Acipenser oxyrhinchus*) in Maryland. 2006 Progress Report for U.S. Fish & Wildlife Service State Wildlife Grant Funding, T-3, January 1, 2006 through December 31, 2006.

Rochard, E., G. Castelnaud, and M. LePage. 1990. Sturgeons (Pisces: Acipenseridae); threats and prospects. Journal of Fish Biology, 37 (Supplement A): 123-132.

Rochard, E., M. Lepage, and L. Meauzé. 1997. Identification et caractérisation de l'aire de répartition marine de l'esturgeon éuropeen Acipenser sturio a partir de déclarations de captures. Aquat. Living. Resour. 10:101-109.

Ryder, J.A. 1888. The sturgeons and sturgeon industries of the eastern coast of the United States, with an account of experiments bearing upon sturgeon culture. Bulletin of U.S. Fish Commission 8:231-329.

Savoy, T. 2007. Prey eaten by Atlantic sturgeon in Connecticut waters. American Fisheries Society Symposium 56:157-165.

Savoy, T. and D. Shake. 1993. Anadromous fish studies in Connecticut waters. Progress Report AFC-21-1. Connecticut Department of Environmental Protection. 44 pp.

Savoy, T., and D. Pacileo. 2003. Movements and important habitats of subadult Atlantic sturgeon in Connecticut waters. Transactions of the American Fisheries Society. 132: 1-8.

Savoy, T., L. Maceda, N.K. Roy, D. Peterson, and I. Wirgin. 2017. Evidence of natural reproduction of Atlantic sturgeon in the Connecticut River from unlikely sources. PLoS ONE 12(4): e0175085.

Schueller, P. and D.L. Peterson. 2010. Abundance and recruitment of juvenile Atlantic sturgeon in the Altamaha River, Georgia. Transactions of the American Fisheries Society 139(5):1526-1535.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada. Bulletin 184. pp. 80-82.

Scott, W. B., and M. C. Scott. 1988. Atlantic fishes of Canada. Canadian Bulletin of Fisheries and Aquatic Science No. 219. pp. 68-71.

Seaber, P.R., F.P. Kapinos, and G.L. Knapp. 1987. Hydrologic Unit Maps: U.S. Geological Survey Water-Supply Paper 2294, 63 pp.

Secor, D.H. and E. J. Niklitschek. 2001. Hypoxia and Sturgeons: Report to the Chesapeake Bay Program Dissolved Oxygen Criteria Team. Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science, Solomons, MD 20688, 29 March 2001. Technical Report Series No. TS-314-01-CBL.

Secor, D. H. and Niklitschek, J. E. 2002. Sensitivity of sturgeons to environmental hypoxia: physiological and ecological evidence. Pages 61-78 In R.V. Thurston (ed.), Fish Physiology, Toxicology, and Water Quality, Athens, GA: Environmental Protection Agency Office of Research and Development, Ecosystems Research Division.

Secor, D.H., E.J. Niklitschek, J.T. Stevenson, T.E. Gunderson, S.P. Minkkinen, B. Richardson, B. Florence, M. Mangold, J. Skjeveland, A. Henderson-Arzapalo. 2000. Dispersal and growth of yearling Atlantic sturgeon, *Acipenser oxyrinchus* released into Chesapeake Bay. Fishery Bulletin 98(4):800-810.

Shirey, C. A., C. C. Martin, and E. J. Stetzar. 1997. Abundance of subadult Atlantic sturgeon and areas of concentration within the Lower Delaware River. Final Report. Grant No. NA66FG0326. Delaware Division of Fish and Wildlife, Dover, DE. 22 pp.

Shirey, C., C. C. Martin, and E. J. Stetzar. 1999. Atlantic sturgeon abundance and movement in the Lower Delaware River. Final Report. Grant No. NA86FA0315, 34 pp.

Short, F.T.(ed.). 1992. The ecology of the Great Bay Estuary, New Hampshire and Maine: An estuarine profile and bibliography. NOAA Coastal Ocean Program Publication, 222 pp.

Shortnose Sturgeon Status Review Team (SSSRT). 2010. A Biological Assessment of shortnose sturgeon (*Acipenser brevirostrum*). Report to National Marine Fisheries Service, Northeast Regional Office. November 1, 2010. 417 pp.

Simpson, P.S. 2008. Movements and habitat use of Delaware River Atlantic sturgeon. Master of Science Thesis. Delaware State University, Dover, DE. 141 pp.

Smith, T.I.J. 1985. The fishery, biology, and management of Atlantic sturgeon, *Acipenser oxyrhynchus*, in North America. Environmental Biology of Fishes 14(1):61-72.

Smith, T.I.J. and J.P. Clugston. 1997. Status and management of Atlantic sturgeon, *Acipenser oxyrinchus*, in North America. Environmental Biology of Fishes 48:335-346.

Smith, T.I.J., D.E, Marchette, and G.F. Ulrich. 1984. The Atlantic sturgeon fishery in South Carolina. North American Journal of Fisheries Management 4:164-176.

Smith, T.I.J., D.E. Marchette and R.A. Smiley. 1982. Life history, ecology, culture and management of Atlantic sturgeon, *Acipenser oxyrhynchus oxyrhynchus*, Mitchill, in South Carolina. South Carolina Wildlife Marine Resources. Resources Department, Final Report to U.S. Fish and Wildlife Service Project AFS-9. 75 pp.

Smith, T.I.J., E.K. Dingley, and D.E. Marchette. 1980. Induced spawning and culture of Atlantic sturgeon. Progressive Fish-Culturist 42:147-151.

Sommerfield, C.K. and J.A. Madsen. 2003. Sedimentological and geophysical survey of the Upper Delaware Estuary. Final Report to the Delaware River Basin Commission. 127 pp.

South Berwick Conservation Commission (SBCC). 2009. Salmon Falls River Greenbelt Plan. July 2009. 24 pp.

Stein, A.B., K.D. Friedland, and M. Sutherland. 2004. Atlantic sturgeon marine distribution and habitat use along the Northeastern coast of the United States. Transactions of the American Fisheries Society 133:527–537.

Stetzar, E.J. 2015. Sturgeons in the Mid-Atlantic Region: A Multi-State Collaboration of Research and Conservation. Final Report. Section 6 Species Recovery Grants program Award Number: NAI0NMF4720030

Stevenson, J.T., and D.H. Secor. 1999. Age determination and growth of Hudson River Atlantic sturgeon, *Acipenser oxyrinchus*. Fishery Bulletin 97:153-166.

Sulak, K.J. and M. Randall. 2002. Understanding sturgeon life history: Enigmas, myths, and insights from scientific studies. Journal of Applied Ichthyology 18:519–528.

Susquehanna River Basin Commission (SRBC). 2013. State of the Susquehanna; 2013 Report. 20pp.

Sweka, J.A., J. Mohler, and M. J. Millard, T. Kehler, A. Kahnle, K. Hattala, G. Kenney, and A. Higgs. 2007. Juvenile Atlantic sturgeon habitat use in Newburgh and Haverstraw Bays of the Hudson River: Implications for population monitoring. North American Journal of Fisheries Management 27:1058–1067.

Taylor A.D., K. Ohashi, J. Sheng, and M.K. Litvak. 2016. Oceanic distribution, behaviour, and a winter aggregation area of adult Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*, in the Bay of Fundy, Canada. PLoS ONE 11(4): e0152470. doi:10.1371/journal.pone.0152470

Tiner, R.W. 2005. Assessing cumulative loss of wetland functions in the Nanticoke River watershed using enhanced national wetlands inventory data. Wetlands. Vol. 25(2); 405-419.

Trowbridge, P. 2007. New Hampshire Estuaries Project: Hydrologic Parameters for New Hampshire's Estuaries. New Hampshire Department of Environmental Services. December 2007.

United States Army Corp of Engineers (USACE). 2012. Environmental Assessment: Housatonic River Federal Navigation Project, Stratford and Milford, Connecticut. June 2012. 291 pp.
United States Geological Survey (USGS). 1984. A water-quality study of the tidal Potomac River and estuary-An overview. Water-Supply Paper 2233. 54 pp.

Van Den Avyle, M. J. 1984. Species profile: Life histories and environmental requirements of coastal fishes and invertebrates (South Atlantic): Atlantic sturgeon. U.S. Fish and Wildlife Service Report No. FWS/OBS-82/11.25, and U. S. Army Corps of Engineers Report No. TR EL-82-4, Washington, D.C.

Van Eenennaam, J.P., S.I. Doroshov, G.P. Moberg, J.G. Watson, D.S. Moore and J. Linares. 1996. Reproductive conditions of the Atlantic sturgeon (*Acipenser oxyrhynchus*) in the Hudson River. Estuaries 19:769-777.

Van Eenennaam, J.P., and S.I. Doroshov. 1998. Effects of age and body size on gonadal development of Atlantic sturgeon. Journal of Fish Biology 53:624-637.

Vladykov, V.D. and J.R. Greeley. 1963. Order Acipenseroidei. Pp. 24-60. In Fishes of Western North Atlantic. Memoir Sears Foundation for Marine Research, Number 1. 630 pp.

Waldman, J.R., J.T. Hart, and I.I. Wirgin. 1996. Stock composition of the New York Bight Atlantic sturgeon fishery based on analysis of mitochondrial DNA. Transactions of the American Fisheries Society 125:364-371.

Waldman, J.R., T. King, T. Savoy, L. Maceda, C. Grunwald, and I. Wirgin. 2013. Stock origins of subadult and adult Atlantic sturgeon, *Acipenser oxyrinchus*, in a non-natal estuary, Long Island Sound. Estuaries and Coasts 36:257–267.

Whitworth, W. 1996. Freshwater Fishes of Connecticut. State Geological and Natural History Survey of CT. Connecticut Department of Environmental Protection, Bull. 114. 243 pp.

Wippelhauser, G.S. 2012. A regional conservation plan for Atlantic sturgeon in the U.S. Gulf of Maine. Maine Department of Marine Resources. 37pp.

Wippelhauser, G.S., and T. S. Squiers, Jr. 2015. Shortnose sturgeon and Atlantic sturgeon in the Kennebec River System, Maine: a 1977–2001 retrospective of abundance and important habitat. Transactions of the American Fisheries Society 144(3):591-601.

Wirgin, I., L. Maceda, J.R. Waldman, S. Wehrell, M. Dadswell, and T. King. 2012. Stock Origin of Migratory Atlantic Sturgeon in Minas Basin, Inner Bay of Fundy, Canada, Determined by Microsatellite and Mitochondrial DNA Analyses. Transactions of the American Fisheries Society 141(5):1389-1398.
Wirgin, I., M.W. Breece, D.A. Fox, L. Maceda, K.W. Wark, and T. King. 2015a. Origin of Atlantic sturgeon collected off the Delaware coast during spring months. North American Journal of Fisheries Management 35(1):20-30.

Wirgin, I. L. Maceda, C. Grunwald, and T. L. King. 2015b. Population origin of Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus* by-catch in U.S. Atlantic coast fisheries. Journal of Fish Biology 86(4):1251–1270.

Appendix A

Final Regulatory Flexibility Analysis

INTRODUCTION

The Regulatory Flexibility Act (RFA) requires Federal regulatory agencies to examine the impacts of proposed and existing rules on small businesses, small organizations, and small governmental jurisdictions (i.e. small entities). Agencies preparing a proposed rule are required to develop an Initial Regulatory Flexibility Analysis (IRFA) to inform the agency, as well as the public, of the expected economic impacts to small entities of each alternative considered by the agency. A Final Regulatory Flexibility Analysis (FRFA) must also be prepared and made available to the public. This FRFA was prepared pursuant to section 604, and includes:
(1) a statement of the need for, and objectives of, the rule;

(2) a statement of the significant issues raised by the public comments in response to the initial regulatory flexibility analysis, a statement of the assessment of the agency of such issues, and a statement of any changes made in the proposed rule as a result of such comments;

(3) the response of the agency to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration in response to the proposed rule, and a detailed statement of any change made to the proposed rule in the final rule as a result of the comments;

(4) a description of and an estimate of the number of small entities to which the rule will apply or an explanation of why no such estimate is available;

(5) a description of the projected reporting, recordkeeping and other compliance requirements of the rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;

(6) a description of the steps the agency has taken to minimize the significant economic impact on small entities consistent with the stated objectives of applicable statutes, including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each one of the other significant alternatives to the rule considered by the agency which affect the impact on small entities was rejected.

1 STATEMENT OF THE NEED FOR, AND OBJECTIVES OF, THE RULE

This rule is needed in order to comply with the Endangered Species Act's (ESA) requirement to designate critical habitat to the maximum extent prudent and determinable when species are listed as threatened or endangered. The objectives of this action are to help conserve the threatened Gulf of Maine DPS of Atlantic sturgeon, and the endangered New York Bight and Chesapeake Bay DPSs of Atlantic sturgeon by identifying critical habitat areas, consistent with the best available scientific information, that contain the physical and biological features essential to the conservation of each DPS and which may require special management considerations or protection.

The critical habitat provisions of the ESA are intended to promote recovery of the ESA-listed species by prohibiting federal agency actions from destroying or adversely modifying the physical or biological features that are essential to conservation of the listed entity. Once critical habitat is designated, section 7 of the ESA requires Federal agencies to ensure that any action

they fund, authorize or carry out is not likely to destroy or adversely modify that habitat. The ESA section 7 consultation requirement for critical habitat does not apply to citizens engaged in activities on private land that do not involve a Federal agency. However, there may be an impact to private citizens that are engaged in activities that involve a Federal agency action. For example, small businesses involved in construction activities such as breakwater, dock, pier, jetty, seawall and harbor construction may be impacted if a federal agency must issue a permit for the work to be conducted, will provide funds for the work, or will otherwise be involved in carrying out the work. Such involvement by a federal agency triggers the need for ESA section 7 consultation. The physical features essential to the conservation of each Atlantic sturgeon DPS and which may require special management considerations or protections are focused on substrate, transitional estuarine habitat, water quality, and open passage. These physical features are essential to successful reproduction and recruitment of the Atlantic sturgeon DPSs. Protecting the physical features from destruction or adverse modification through critical habitat designation is expected to assist in increasing the abundance of each DPS to the point at which the protections of the ESA are no longer necessary.

2 SIGNIFICANT ISSUES RAISED BY PUBLIC COMMENTS, AGENCYASSESSMENT, AND CHANGES AS A RESULT OF SUCH COMMENTS

NMFS published a proposed rule on June 3, 2016, (81 FR 35701) to designate five, four, and five areas of critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs, respectively. NMFS received 1,577 responses to the request for comments. Of these, approximately 100 were letters, some with additional information and attachments, on the proposed rule and supporting analyses. One letter from an environmental advocacy group included a petition with 8,016 signatures, stating general support for designating critical habitat for the Chesapeake Bay DPS and urging us to make several specific changes to improve the critical habitat designation for the DPS. We also received approximately 1150 form letters from an environmental advocacy group stating their general support, and urging NMFS to expand the critical habitat designation to include the nearshore and offshore ocean and bay waters and rivers that sturgeon use as a corridor to travel from river to ocean and back again. An additional 40 form letters were received from an environmental advocacy group stating general support for the proposed designation of critical habitat for the Chesapeake Bay DPS. None of these comments focused specifically on the Initial Regulatory Flexibility Analysis presented in the Draft Biological Information and ESA Section 4(b)(2) Source Document (June 2016). However, we received numerous comments from maritime associations, tug and barge operator associations, pilot associations, and private shipbuilders, stating the critical habitat designations will negatively impact commerce as a result of delays to or preclusion of dredging of federal navigation channels, and delays for repairs to or preclusion of new construction of marine terminals, docks, and port infrastructure. They state that these effects will negatively impact commerce, and NMFS should exclude the federal navigation channels, dredge disposal sites, areas adjacent to marine terminals, docks, and port infrastructure from the critical habitat designations.

Critical habitat designations do not stop or prevent federal agency actions, including actions necessary to maintain safe navigation (e.g., maintenance dredging) and that support commerce. Even for those activities that may require federal agencies to consult with us under section 7 of the ESA, the critical habitat designations are unlikely to increase the number of consultations

since Atlantic sturgeon are present in the critical habitat areas, and consultation would also be required to consider the effects to the DPS. For actions that do not involve a federal agency action, the critical habitat designations have no effect on whether, when, or where those actions occur or continue to occur. We, therefore, did not amend the rule or our analysis as a result of the comments (Comments 1 and 2 in the preamble to the Final Rule).

3 RESPONSE OF THE AGENCY TO ANY COMMENTS FILED BY THE CHIEF COUNSEL FOR ADVOCACY OF THE SMALL BUSINESS ADMINISTRATION AND AGENCY RESPONSE

There were no comments from the Chief Counsel for Advocacy of the Small Business Administration on the proposed rule.

4 DESCRIPTION OF AND AN ESTIMATE OF THE NUMBER OF SMALL ENTITIES TO WHICH THE RULE WILL APPLY OR AN EXPLANATION OF WHY NO SUCH ESTIMATE IS AVAILABLE

The economic analysis described and estimated the number of small entities to which this rule may apply. These estimates are based on the best available information and take into account uncertainty.

Using the number of employees as the criteria for determining whether or not an establishment is a small business, on average, 99% of businesses in the counties and cities in which the Atlantic sturgeon critical habitat units occur are considered small businesses. For purposes of projecting the impacts of administrative Section 7 costs on small businesses in each critical habitat unit, it was assumed that the percent of private entities that are involved in those consultations that are small businesses is the same as the percent of businesses that are small businesses in counties that include critical habitat units. We did, however, revise and narrow how we define the boundaries of the critical habitat units after King and Associates completed the analysis. As a result, fewer small businesses are likely to be affected by the critical habitat designations than were projected based on the information available to the economist at that time.

Based on how the critical habitat units were identified at the time, King and Associates estimated private sector costs for each critical habitat unit using estimated private sector costs of $2,100 per informal consultation and $3,500 per formal consultation. To further address uncertainty, costs were estimated as low, medium, and high which results in a range of estimated ESA section 7 costs of about: $17,000 to $49,000 annually in the Gulf of Maine DPS; $30,000 to $96,000 annually in the New York Bight DPS; and, $10,000 to $29,000 annually in the Chesapeake Bay DPS.

The approach for estimating low, medium, and high costs likely overestimates the costs, particularly for the "Annual High" which is based on all consultations being conducted formally and the impacts being incremental (i.e., solely attributed to the critical habitat designation). King and Associates concluded that in most instances, the regulatory baseline conditions, including the listing of the Atlantic sturgeon, will greatly affect the number of incremental consultations. Specifically, King and Associates concluded that the number of incremental consultations will likely be relatively small, and will likely "only require informal consultations." We agree. All of the critical habitat areas are within the geographical area occupied by Atlantic sturgeon and, in

general, Atlantic sturgeon of various life stages occur year round in the particular areas proposed for designation. Therefore, if the identified areas were not designated as critical habitat, ESA section 7 consultation would still likely occur to determine whether an anticipated action may affect the Atlantic sturgeon DPS present in the area. Therefore, we do not consider the high and medium administrative costs estimates, both of which assume that all projected consultations will be incremental, to be as realistic as the low administrative costs estimates.

5 DESCRIPTION OF THE PROJECTED REPORTING, RECORDKEEPING AND COMPLIANCE REQUIREMENTS OF THE RULE, INCLUDING AN ESTIMATE OF THE CLASSES OF SMALL ENTITIES WHICH WILL BE SUBJECT TO THE REQUIREMENT AND THE TYPE OF PROFESSIONAL SKILLS NECESSARY FOR PREPARATION OF THE REPORT OR RECORD

This final rule does not introduce any new reporting, record-keeping requirements, or other compliance requirements.

6 DESCRIPTION OF THE STEPS THE AGENCY HAS TAKEN TO MINIMIZE THE SIGNIFICANT ECONOMIC IMPACT ON SMALL ENTITIES CONSISTENT WITH THE STATED OBJECTIVES OF APPLICABLE STATUTES, INCLUDING A STATEMENT OF THE FACTUAL, POLICY, AND LEGAL REASONS FOR SELECTING THE ALTERNATIVE ADOPTED IN THE FINAL RULE AND WHY EACH ONE OF THE OTHER SIGNIFICANT ALTERNATIVES TO THE RULE CONSIDERED BY THE AGENCY WHICH AFFECT THE IMPACT ON SMALL ENTITIES WAS REJECTED.

We considered the effect to small businesses throughout our analysis and, as stated above, there will be no significant economic impact to small businesses. Therefore, we have not made any changes from the proposed rule that would minimize significant economic impacts on small entities. It is unlikely that the rule will significantly reduce profits or revenue for small businesses. The administrative costs of ESA section 7 consultation are likely to be small given, in the absence of critical habitat designation, the same number and type of consultations would have occurred to consider the effects of federal actions on the Atlantic sturgeon DPS.

In the IRFA, we considered the alternative of not proposing critical habitat for the Gulf of Maine, New York Bight, or Chesapeake Bay DPS. We rejected this alternative because we determined the physical features forming the basis for the critical habitat designations are essential to the conservation of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. Thus, the lack of protection of the critical habitat features from adverse modification and/or destruction could result in continued declines in abundance of these Atlantic sturgeon DPSs. Such declines could also result in loss of associated economic and other values the DPSs provide to society. We rejected this alternative since it does not meet the legal requirements of the ESA and would not provide for the conservation of the DPSs.

In the IRFA, we also analyzed designating a subset of the identified critical habitat areas. Relative to the no action alternative, this alternative was expected to result in an increase in the number of section 7 consultations required to avoid adverse impacts to critical habitat but

possibly not as many as would occur if all critical habitat areas of the DPS were not designated. Nevertheless, we rejected this alternative because the physical features are essential to the conservation of the DPSs, and designating only some of the areas that are essential to the conservation of each DPS would not provide for the conservation of the DPSs. Therefore, this alternative does not meet the legal requirements of the ESA.

Finally, we analyzed designating all critical habitat areas identified for the DPS. We analyzed the economic, national security, and other relevant impacts of designating critical habitat. Our conservative identification of potential, incremental, economic impacts indicates that any such impacts, if they were to occur, would be very small. Any incremental economic impacts will consist solely of the administrative costs of consultation; no project modifications are projected to be required to address impacts solely to the proposed critical habitat. There are conservation benefits of the critical habitat designations, both to the species and to society. While we cannot quantify nor monetize these benefits, we believe they are not negligible and are an incremental effect of the designations.

Appendix B

Economic Impact Analysis of Critical Habitat Designation for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

Final Economic Impact Analysis of Critical Habitat Designation for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

Prepared by:

King and Associates, Incorporated

24 C Street, Suite # 1, PO Box 490

Solomons, MD 20688

Prepared for:

National Marine Fisheries Service,

Greater Atlantic Regional Fisheries Office,

Protected Resources Division,

55 Great Republic Drive

Gloucester, MA 01930

Revised April 2017 with Foreword by:

National Marine Fisheries Service,

Greater Atlantic Regional Fisheries Office,

Protected Resources Division

Foreword

On February 6, 2012, we, the National Marine Fisheries Service (NMFS), listed the New York Bight and Chesapeake Bay Distinct Population Segments (DPS) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) as endangered species, and the Gulf of Maine DPS of Atlantic sturgeon as a threatened species (77 FR 5880). We are designating critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs of Atlantic sturgeon in accordance with section 4(a)(3) of the Endangered Species Act (ESA).

Critical habitat is the specific area on which are found the physical or biological features essential to the conservation of the listed entity (e.g., species, subspecies, or DPS) and which may require special management or protection. We are required to identify the probable economic impacts of designating critical habitat, and to consider these impacts when specifying any areas as critical habitat. We identify the economic impacts of a critical habitat designation by comparing the impacts with and without the designation. The economic impacts that would occur solely because of the critical habitat designation are the focus of our analysis. We can describe the impacts either qualitatively or quantitatively (50 CFR § 424.19).

We contracted with King and Associates, Inc. to identify the probable economic impacts of designating critical habitat for each of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs of Atlantic sturgeon, and to draft the economic analysis. King and Associates, Inc. provided the analysis for each DPS in one document, Economic Impact Analysis of Critical Habitat Designation for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*), hereafter referred to as the draft economic impact analysis. We accepted the draft economic impact analysis from King and Associates, Inc.in April 2014.

Changes to the Critical Habitat Designations since We Accepted the Draft Economic Impact Analysis

We were required to obtain peer review of the draft economic impact analysis because the report met the definition of "influential scientific information" under the Information Quality Act. We posted the peer reviewer comments and our response to the comments, including making recommended edits to the draft impact analysis, at http://www.cio.noaa.gov/services_programs/prplans/ID294.html.

We changed the boundaries of the critical habitat areas after we received the draft economic impact analysis from King and Associates, Inc. The new boundaries more narrowly define the areas that were critical habitat. Since the boundaries that we initially identified to King and Associates, Inc. for the economic impact analysis were helpful for identifying economics data (e.g., for counties that overlapped with critical habitat areas), we did not ask for a revision of the draft economics impact analysis.

Based on information that we provided to King and Associates, Inc. for the draft economic analysis, the contracted economists projected there would be no section 7 consultation administrative costs over the next ten years as a result of designating the Housatonic River critical habitat unit. However, we subsequently determined that dredging of the federal navigation channel within the Housatonic River critical habitat unit as well as a maintenance and repair of a major highway bridge that spans the Housatonic River are activities likely to require

ESA section 7 consultation in the future. Therefore, the administrative section 7 costs as a result of designating the Housatonic River critical habitat unit are unlikely to be zero. We anticipate up to three consultations, either informal or formal, will occur over the next 10 years for federal agency actions that may affect the features of the Housatonic River critical habitat unit. We have, therefore, updated the administrative costs of Section 7 consultation for the Housatonic River critical habitat unit in this final economic impact analysis.

We are not designating critical habitat in the Union River or in the Susquehanna River because, upon further review, we determined that the rivers did not have the physical features essential to the Gulf of Maine and Chesapeake Bay DPSs of Atlantic sturgeon, respectively. We have removed the economics information for the Union River Critical Habitat Unit and the Susquehanna River Critical Habitat Unit from the final economics impact analyses for the Gulf of Maine and Chesapeake Bay DPSs of Atlantic sturgeon, respectively.

In response to public comments submitted on the proposed rule to designate critical habitat for the Atlantic sturgeon DPSs, we are designating 60 kilometers of the Nanticoke River and Marshyhope Creek, Maryland as critical habitat for the Chesapeake Bay DPS. Since we had not identified the Nanticoke River and Marshyhope Creek critical habitat unit at the time of the draft economic impact analysis, there is no information in the draft report for this critical habitat unit. We, therefore, added information for the Nanticoke River critical habitat unit to this final economic impact analysis report.

We also expanded the York River critical habitat unit by including an additional 14 kilometers of the Pamunkey River. Extending critical habitat for the York River critical habitat unit does not, however, change the economic analysis provided by King and Associates, Inc. since the revised critical habitat area occurs within the broader boundaries that King and Associates, Inc. considered for the draft economic impact analysis.

Nine nationwide consultations with the Environmental Protection Agency (EPA) are also expected to occur within the next 10 years. These consultations will involve all listed species and designated critical habitat under NMFS's jurisdiction, and thus costs attributable solely to this proposed rule are expected to be very small. To be conservative, we added nine consultations to each critical habitat unit, and nine to each DPS's total number of consultations. We spread the costs of these consultations ($5,080 each) evenly across all critical habitat units included in this proposed rule and the companion proposed rule to designate critical habitat for the Carolina and South Atlantic DPSs. This results in an additional total cost of $1,474.84 per critical habitat unit.

We made several changes for how we describe the physical features essential to the conservation of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs. However, the word changes were simply to provide greater clarity, and do not change what areas were identified as critical habitat, or the activities likely to be affected. Similarly, we replaced "RKM 0" with descriptive text to provide clarity for the downriver extent of each critical habitat unit.

We did not receive any public comments on the draft economic impacts analysis. Therefore, with the exception of the changes noted above, we are finalizing the draft economic impacts analysis as submitted to us by King and Associates, Inc. The remainder of this report is from King and Associates, Inc. (2014) unless otherwise noted.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report describes baseline economic and regulatory conditions, overall economic impacts, impacts on small entities, and other relevant impacts associated with the proposed designation of fourteen separate critical habitat units for the Gulf of Maine, New York Bight, and Chesapeake Bay distinct population segments (DPSs) of Atlantic sturgeon. Many impacts of the designation have not been quantified or monetized and so are described qualitatively. As a result, the report cannot clearly distinguish how most types of impacts will differ from one proposed critical habitat unit to another. The one exception involves impacts associated with administrative costs of Section 7 consultations. Information about numbers and types of past consultations in each critical habitat unit provided a basis for distinguishing between likely numbers of future consultations and related costs and impacts in different areas.

Baseline Information

The fourteen[1] proposed critical habitat units fall within cities and counties from Maine to Virginia. *Section 2* presents socioeconomic profiles of the cities and counties that contain each of the fourteen proposed critical habitat units; these profiles constitute the *economic baseline* for assessing designation impacts. Baseline economic conditions determine how designation impacts can be expected to differ from one area to another based on differences in socio-economic conditions and types and levels of business and industrial activities in each area. Federal laws, including the Endangered Species Act, Clean Water Act, and Rivers and Harbors Act, and a variety of state laws may provide protection for one or more of the essential features of Atlantic sturgeon critical habitat. These existing federal and state laws provide the *regulatory baseline* conditions for assessing the incremental impacts of the critical habitat designation. Lands adjacent to critical habitat units that are designated as federal, state, or local parkland provide an added layer of protection for the elements of the critical habitat because activities within these protected areas are regulated by federal and state laws that foster conservation, and because the ecosystems occurring within these parklands are preserved and protected. These areas are identified as providing additional baseline regulatory protection.

Economic Impacts

Administrative Consultation Costs

Analysis indicates that the primary source of impacts of this designation is the cost of Section 7 consultations themselves, and not the cost of project modifications resulting from consultations. For purposes of assessing the potential range of administrative Section 7 impacts, the number of consultations likely to occur over the next ten years was projected for each critical habitat unit based on the number of consultations that took place during the past ten years and likely would have involved Atlantic sturgeon if the species was listed at the time. Correspondence with federal and state action agencies on the level of activity anticipated over the next ten years indicated that numbers of consultations in each proposed critical habitat unit in the past are a reasonable basis for estimating future consultations.

Table ES-1 presents estimates of low, medium, and high administrative Section 7 costs associated with this designation in each critical habitat unit and total costs across each DPS. **Low cost projections** are based on estimated costs of informal and formal consultations, actual percentages of past consultations in each area that were informal and formal, and the assumption that the number of future consultations that will be incremental to this designation will be 50% of all relevant consultations that occurred in the past. **Medium cost projections** are based on the assumption that the same numbers of past informal and formal consultations will occur in the future, but assumes 100% of future consultations will be incremental to the

[1] King and Associates Inc., 2014 considered the probable economic impacts of fifteen critical habitat units identified by NMFS. See Foreword for a list of changes to the number of critical habitat units from the proposed rule to final rule designating critical habitat for the Atlantic sturgeon DPSs.

designation. **High cost projections** are based on the assumption that the same number of consultations will occur in the future as in the past, but that 100% of them will be formal and incremental to this designation.

Overall, 77% of past consultations in the Gulf of Maine DPS, 96 % of consultations in the New York Bight DPS, and 87% of past consultations in the Chesapeake Bay DPS were informal, and were estimated to have an average cost to all parties of $9,600. Formal consultations made up 23% of all consultations in the Gulf of Maine, 4% in the New York Bight, and 13% in the Chesapeake Bay, and were estimated to have average costs to all parties of $20,000.

Over ten years Administrative Section 7 consultation costs are estimated to range from approximately $816,574 to $2.71 million in the Gulf of Maine DPS, $1.42 million to $5.57 million in the New York Bight DPS, and $507,774 to $1.80 million in the Chesapeake Bay DPS. Over ten years, medium-range projected administrative Section 7 costs in specific critical habitat units range from approximately $107,000 to $610,000 for the Gulf of Maine DPS, $61,000 to $1.50 million for the New York Bight DPS, and $61,000 to $551,000 for the Chesapeake Bay DPS.

Project modification Costs

Project modifications that are required as a result of Section 7 consultations are another potential source of costs. Table ES-2 presents low, medium, and high cost estimates associated with modifications that may need to be made to projects in various project categories (described in *Section 3.4*) as a result of Section 7 consultation. At the present time there is no evidence that past Section 7 consultation in the designated units that would have involved sturgeon habitat resulted in any project modifications. Phone and email interviews with responsible parties at NMFS and other federal or state agencies provided no evidence that future Section 7 consultation resulting from this designation over the next ten years should be expected to require project modifications. At this time, therefore, the expected impacts of the designation associated with costs of project modifications are assumed to be near zero. The values presented in Table ES-2 are intended to be illustrative of the costs of typical project modifications that could result from the designation. The project modifications listed in Table ES-2 do not represent the universe of potential project modifications and the cost estimates listed do not reflect the full range of potential costs which will depend in critical ways on project and site conditions. The unit costs presented in Table ES-2 may be useful if and when new information appears indicating that some project modifications be required as a result of this designation.

Table ES-1. Projected 10 year and average annual number of Section 7 consultations and administrative costs per Critical Habitat Unit [1]

DPS	Unit	Projected Number of Section 7 Consultations[2]						Section 7 Consultation Costs[3]					
		Over Ten Years			Annual Average			Ten year Costs			Annualized Costs		
		Informal	Formal	Total	Informal	Formal	Total	Low[4]	Medium[5]	High[6]	Low	Medium	High
Gulf of Maine	Penobscot	31	10	41	3.1	1	4.1	$250,274.84	$499,074.84	$821,474.84	$25,027.48	$49,907.48	$82,147.48
	Kennebec	28	17	45	2.8	1.7	4.5	$305,874.84	$610,274.84	$901,474.84	$30,587.84	$61,027.48	$90,147.48
	Androscoggin	6	3	9	0.6	0.3	0.9	$60,274.84	$119,074.84	$181,474.84	$6,027.48	$11,907.48	$18,147.48
	Piscataqua	11	0	11	1.1	0	1.1	$54,274.84	$107,074.84	$221,474.84	$5,427.48	$10,707.48	$22,147.48
	Merrimack	28	1	29	2.8	0.1	2.9	$145,874.84	$290,274.84	$581,474.84	$14,587.48	$29,027.48	$58,147.48
	DPS TOTAL	**104**	**31**	**135**	**10.4**	**3.1**	**13.5**	**$816,574.20**	**$1,625,774.20**	**$2,707,374.20**	**$81,657.40**	**$162,577.40**	**$270,737.40**
New York Bight	Connecticut	55	2	57	5.5	0.2	5.7	$285,474.84	$569,474.84	$1,141,474.84	$28,547.48	$56,947.48	$114,147.48
	Housatonic	0	3	3	0	0.3	0.3	$31,474.84	$61,474.84	$61,474.84	$3,147.48	$6,147.48	$6,147.48
	Hudson	144	6	150	14.4	0.6	15	$752,674.84	$1,503,874.84	$3,001,474.84	$75,267.48	$150,387.48	$300,147.48
	Delaware	64	4	68	6.4	0.4	6.8	$348,674.84	$695,874.84	$1,361,474.84	$34,867.48	$69,587.48	$136,147.48
	DPS TOTAL	**263**	**12**	**275**	**26.3**	**1.2**	**27.5**	**$1,418,299.36**	**$2,830,699.36**	**$5,565,899.36**	**$141,829.94**	**$283,069.94**	**$556,589.94**
Chesapeake Bay	Nanticoke	0	3	3	0	0.3	0.3	$31,474.84	$61,474.84	$61,474.84	$3,147.48	$6,147.48	$6,147.48
	Potomac	51	3	54	5.1	0.3	5.4	$276,274.84	$551,074.84	$1,081,474.84	$27,627.48	$55,107.48	$108,147.48
	Rappahannock	5	2	7	0.5	0.2	0.7	$45,474.84	$89,474.84	$141,474.84	$4,547.48	$8,947.48	$14,147.48
	York	6	2	8	0.6	0.2	0.8	$50,274.84	$99,074.84	$161,474.84	$5,027.48	$9,907.48	$16,147.48
	James	16	2	18	1.6	0.2	1.8	$98,274.84	$195,074.84	$361,474.84	$9,827.48	$19,507.48	$36,147.48
	DPS TOTAL	**78**	**12**	**90**	**7.8**	**1,2**	**9**	**$501,774.20**	**$996,174.20**	**$2,405,600**	**$50,177.40**	**$99,617.40**	**$180,737.40**

[1] Updated per changes to the critical habitat units from the proposed rule to the final rule designating critical habitat for the Atlantic sturgeon DPSs. See Foreword.

[2] Projected number of Section 7 consultations from the critical habitat designation over the ten year forecasting period; based on past ten year Section 7 consultation records in each critical habitat area and discussions with federal action agencies.

[3]Average costs are projected to be $9,600 for informal consultations and $20,000 for formal consultations. (See Table 3.6).

[4]Low cost projections are based on the assumption that the same ratio of informal and formal consultations will occur in the next ten years as occurred in the past ten years, and that 50% of the consultations will be incremental (i.e., entire cost of consultation is due to this critical habitat designation).

[5]Medium cost projections are based on the assumption that the same ratio of informal and formal consultations will occur in the next ten years as occurred in the past ten years, and that 100% of the consultations will be incremental (i.e., entire cost of consultation is due to this critical habitat designation).

[6]High cost projections are based on the assumption that all future consultations will be formal (cost of $20,000 per consultation) and incremental (i.e., entire cost is due to this critical habitat designation).

(Note – Nine nationwide consultations with EPA are also expected to occur within the next 10 years. These consultations will involve all listed species and designated critical habitat under NMFS's jurisdiction, and thus costs attributable solely to this proposed rule are expected to be very small. To be conservative, we added nine consultations to each critical habitat unit, and nine to each DPS's total number of consultations. We spread the costs of these consultations ($5,080 each) evenly across all critical habitat units included in this proposed rule and the companion proposed rule to designate critical habitat for the Carolina and South Atlantic DPSs. This results in an additional total cost of $1,474.84 per critical habitat unit).

Table ES-2. Estimates of potential project modification costs

Activity Type	Project Modification Cost Estimate		
	Low	Medium	High
In-water construction	$29,835	$65,040	$100,245
Dredging[1]	$396,205	$979,773	$1,551,407
Bridges and culverts[1]	$48,929	$87,117	$125,306
Roads[1]	$42,962	$79,360	$115,759
Hydropower (unknown capacity)	$1,670,746	$8,986,224	$16,230,099
Utility lines	$119,339	$120,532	$121,726
Sand and gravel mining[2]	$1,208,307	$1,611,076	$2,013,845
NPDES - Major projects	$568,053	$751,835	$935,617
NPDES - Minor projects[2]	$64,443	$85,924	$107,405

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

Impacts on Small Businesses

This proposed critical habitat designation may affect small businesses, small nonprofit organizations, and small governmental jurisdictions that engage in activities that may affect the essential features identified for Atlantic sturgeon critical habitat, if there is a federal nexus for such activities that would require Section 7 consultations. The designation, therefore, could costs these entities time and money associated with administrative consultation costs and, potentially, with project modifications.

Using Small Business Administration criteria, on average, 99% of businesses in the counties and cities in which the proposed Atlantic sturgeon critical habitat units occur are considered small businesses. Using the same approach for making low, medium, and high overall Section 7 cost projections, and using estimates of private sector Section 7 consultation of approximately $2,100 per informal consultation and $3,500 per formal consultation, projected private sector costs were estimated for each critical habitat unit. Estimates of small business administrative Section 7 costs associated with the designation range from about $16,000 to $47,000 annually in the Gulf of Maine DPS, from about $30,000 to $97,000 annually in the New York Bight DPS, and from about $10,000 to $32,000 annually in the Chesapeake Bay DPS.

Other Relevant Impacts

Other relevant impacts of the proposed designation fall into three general categories: conservation benefits; educational and awareness benefits; and impacts on natural resources agencies that implement management plans in areas covered by the designation.

Based on records of past consultations and information provided by federal action agencies, few if any projected future consultations are likely to result in project modifications. Since project modifications associated with the designation would be the source of most conservation benefits, the failure of the impact analysis to identify any likely project modifications significantly limits other relevant impacts categorized as conservation benefits. However, the critical habitat designation itself can be expected to result in conservation benefits if project design decisions are made by action agencies and/or permittees or grantees to avoid the need for Section 7 consultation, or to assure that any necessary consultation does not result in any required project modifications.

The designation can also be expected to result in other relevant impacts if it increases public awareness of the value of critical habitat to the survival of the species and other values of critical habitat, and because the designation may result in changes in how state and local resource agencies implement other resource management plans. These other relevant impacts can result from the critical habitat designation

independently of the listing of the species, and can occur even if the designation does not result in project modifications that generate direct conservation benefits.

Conservation Benefits

Conservation benefits that may result from protecting critical habitat can be placed into two broad categories: those associated with the primary goal of species conservation (i.e., direct benefits); and those additional or ancillary benefits that result from the conservation efforts, but are not the purpose of the designation. (e.g., improved water quality and improved habitat for other species).

For purposes of analysis, each of these two categories of conservation benefits were classified further as being associated with "use values" (e.g., the economic value of commercial and recreational activities associated with species that are protected as a result of the critical habitat designation) or with "non-use" values (e.g., values that are classified in the economics literature as existence, bequest, altruistic, and option values). Use benefits associated with species recovery include potential future commercial and recreational fishing benefits. Use benefits associated with habitat protection include preserving river, estuarine, and marine habitats that are important to other commercial or recreational fish stocks, or are important for other recreational uses such as boating, swimming, etc. Nonuse values include the value that people place on conserving individual species or biodiversity in general or on various ecosystem services even though they do not actually use them or benefit from them directly. Nonuse benefits accrue when project planners avoid or modify activities in ways that protect habitat and promote species recovery.

Education, Awareness, and Other General Benefits from the Designation

Extensive research into the value that people place on the existence of species beyond their commercial and recreational uses indicates that education and awareness benefits could potentially arise from this critical habitat designation. Potential education and awareness benefits stem from two sources: (1) entities that engage in Section 7 consultation become more aware of sturgeon and the impacts of their activities on their survival, and (2) publicity about these consultations results in members of the general public becoming interested in Atlantic sturgeon and putting more value on the species. The potential exists, therefore, for the designation to result in individuals and business entities who are involved in Section 7 consultation altering their activities to benefit the species or essential features, and for others to engage in similar efforts because they learn of the critical habitat designation through outreach materials. The voluntary reporting of sturgeon encounters or observations by members of the public, and reporting of data such as environmental features associated with the encounters, would be typical beneficial outcomes of the designation increasing public awareness of the Atlantic sturgeon and their critical status.

Impact on Natural Resource Agencies with Existing Management Plans

Many previous analyses of critical habitat impacts have included an evaluation of the impacts of a designation on relationships among private and public entities that are involved in management or conservation efforts. These impacts often include outcomes that involve new conservation strategies that benefit listed species and generate ancillary environmental benefits. These analyses also found that the additional regulatory layer of a designation could positively or negatively impact the conservation benefits associated with other listed species or other environmental resources that are protected under existing or proposed management or conservation plans. Section 7 consultations related to this designation are not expected to result in project modifications that will favorably or adversely impact the costs or outcomes of management plans of natural resource agencies. The impacts of the designation on natural resource agencies or their existing management plans, therefore, are expected to be minimal.

ACRONYMS

ACEC – (Massachusetts) Areas of Critical Environmental Concern

AoT – (New Hampshire DES) Alteration of Terrain Bureau

BMR – (New York) Bureau of Marine Resources

CBF – Chesapeake Bay Foundation

CCMA – Connecticut Coastal Management Act

CEPA - Connecticut Environmental Policy Act

CEQ – (Connecticut) Council on Environmental Quality

CESA – Connecticut Endangered Species Act

CPI – Consumer Price Index

CWA – Clean Water Act

CZM – (Massachusetts Office of) Coastal Zone Management

CZMA – Coastal Zone Management Act

CZMP – (Maryland) Coastal Zone Management Program

DACF – (Maine) Department of Agriculture, Conservation and Forestry

DCNR – (Pennsylvania) Department of Conservation and Natural Resources

DCR – (Massachusetts) Department of Conservation and Recreation

DCR – (Virginia) Department of Conservation and Recreation

DDOE – District Department of the Environment

DEC – (New York State) Department of Environmental Conservation

DEEP – (Connecticut) Department of Energy and Environmental Protection

DEP – (Maine) Department of Environmental Protection

DEQ – (Virginia) Department of Environmental Quality

DFG – (Massachusetts) Department of Fish and Game

DMR – (Maine) Department of Marine Resources

DNR – Department of Natural Resources

DNREC – Delaware Department of Natural Resources and Environmental Control

DOD – Department of Defense

DOT – Department of Transportation

DPR – (Delaware) Department of Parks and Recreation

DPS – Distinct Population Segment

DU – Ducks Unlimited

ECL – (New York) Environmental Conservation Law

EEA – (Massachusetts Executive Office of) Energy and Environmental Affairs

EFH – Essential Fish Habitat

EIS – Environmental Impact Statement

EO – Executive Order

EPA – Environmental Protection Agency

ESA – Endangered Species Act

ESU – Evolutionary Significant Units

FEMA – Federal Emergency Management Agency

FERC – Federal Energy Regulatory Commission

FHWA – Federal Highway Administration

FMP – Fishery Management Plan

FPA – Federal Power Act

FWA – (New York) Freshwater Wetlands Act

FWD – (DDOE) Fisheries & Wildlife Division

GDP – Gross Domestic Product

IEc – Industrial Economics, Inc.

IFW – (Maine Department of) Inland Fisheries and Wildlife

INRMP – Integrated Natural Resources Management Plan

LNG – Liquefied Natural Gas

LURC – (Maine) Land Use Regulation Commission

MassDEP – Massachusetts Department of Environmental Protection

MDA - Maryland Department of Agriculture

MDE – Maryland Department of the Environment

MEPA – Massachusetts Environmental Protection Act

MESA – Maine Endangered Species Act

MESA – Massachusetts Endangered Species Act

MS4 – Municipal Separate Storm Sewer System

NAICS – North American Industrial Classification System

NCP – National Contingency Plan

NEPA – National Environmental Policy Act

NERR – National Estuarine Research Reserve

NHDES – New Hampshire Department of Environmental Services

NHDFG – New Hampshire Department of Fish and Game

NHESP – (Massachusetts) Natural Heritage & Endangered Species Program

NJAC - New Jersey Administrative Code

NJDEP - New Jersey Department of Environmental Protection

NMFS – National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

NPDES - National Pollutant Discharge Elimination System

NPS – National Park Service

NRA – (DDOE) Natural Resources Administration

NRC – Nuclear Regulatory Commission

NRPA – (Maine) Natural Resources Protection Act

NWR – National Wildlife Refuge

NYCRR - New York Codes, Rules and Regulations

OAP – (New York) Ocean Action Plan

OEP – (NHDES) Office of Energy and Planning

OMB – Office of Management and Budget

PCTS – Public Consultation Tracking System

PFBC - Pennsylvania Fish and Boat Commission

PGC – Pennsylvania Game Commission

PNHP – Pennsylvania Natural Heritage Program

PRHP – (New York Office of) Parks, Recreation and Historic Preservation

RFA – Regulatory Flexibility Act

RHA – Rivers and Harbors Act

RPA – Reasonable and Prudent Alternative

RPM – Reasonable and Prudent Measure

SBA – Small Business Administration

SF – State Forest

SIA – Sikes Improvement Act

SLOPES – State and Local Operating Procedures for Endangered Species

SP – State Park

SWAP – (Massachusetts) State Wildlife Action Plan

SWMD – (DDOE) Storm Water Management Division

TMDL – Total Maximum Daily Load

USACE – United States Army Corps of Engineers

USCG – United States Coast Guard

USDA – United States Department of Agriculture

USFWS – United States Fish and Wildlife Service

VDGIF – Virginia Department of Game and Inland Fisheries

VDOF – Virginia Department of Forestry

WASA – (District of Columbia) Water and Sewer Authority

WMA – Wildlife Management Area

WMP – (New Jersey) Wastewater Management Plans

WPA – (Massachusetts) Wetlands Protection Act

WPD – (DDOE) Watershed Protection Division

WQD – (DDOE) Water Quality Division

WQMP – (New Jersey) Water Quality Management Plans

WQS – (District of Columbia) Water Quality Standards

WTP – Willingness-to-Pay

LIST OF TABLES

LIST OF FIGURES

Page Intentionally Left Blank

1 INTRODUCTION

Section 4(b)(2) of the Endangered Species Act (ESA) requires the National Marine Fisheries Service (NMFS) to consider the economic impact, impact on small businesses, impacts on national security, and any other relevant impact, of specifying a particular area as critical habitat, and provides discretion to NMFS in excluding any area from designation if the benefits of excluding that area outweigh the benefits of inclusion and provided exclusion would not result in the extinction of the species. This report contains an analysis of the economic impacts of NMFS designating critical habitat under Section 4 of the ESA for the Gulf of Maine, New York Bight, and Chesapeake Bay distinct population segments (DPS) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), which were listed under the ESA on February 6, 2012 (77 FR 5880). NMFS will use this information in its consideration of including or excluding particular areas as critical habitat for each of the Atlantic sturgeon DPSs.

1.1 Structure of Report

Under the ESA, a DPS is treated the same as a species or subspecies. Since NMFS listed Atlantic sturgeon as separate DPSs under the ESA, critical habitat must be designated specific to each DPS. Therefore, the economic analyses presented here are three separate analyses; one for each of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs.

This report describes the applicable laws, court rulings, Executive Orders (EOs), and policies relevant to an economic analysis. Also included is a description of the methods that were used to conduct the economic analysis for each of these three DPSs and the results. Information common to the economic analyses of all three DPSs is presented once while information specific to each DPS is presented under separate headings.

The remainder of the report is structured as follows. *Section 1.2* describes the preliminary determination of environmental features and specific areas for the Atlantic sturgeon that meet the definition of critical habitat in Section 3 of the ESA, and which form the basis for identifying impacts that may result from the designation. *Section 1.3* summarizes the requirements of other laws, EOs, and policies that are applicable to evaluating the impacts of Federal regulatory actions. *Section 1.4* describes the framework for the impacts analysis. *Section 2* describes the regulatory and socioeconomic baselines applicable to the impact analysis. *Section 3* presents assessments of the economic impacts of the critical habitat designation. *Section 4* examines potential impacts on small businesses. *Section 5* considers other relevant impacts of the critical habitat designation; and *Section 6* synthesizes the impacts resulting from the critical habitat designation.

1.2 Essential Features and Critical Habitat Areas Identified by NMFS

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

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

NMFS has identified the geographic area occupied by the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs as the range of each DPS at the time of its listing (77 FR 5880 February 6, 2012). Given the biological attributes of the species, the range of each DPS includes only in-water habitat (e.g.

riverbank to riverbank) that is naturally accessible to Atlantic sturgeon (e.g., downriver of an impassable dam, natural falls, or other impassable barrier).

Atlantic sturgeon is a bottom feeding, anadromous species that spawns in freshwater habitats between the salt front and fall line of large rivers, where optimal flows are 46-76 cm/s and depths of 1.8-27 meters (Borodin 1925, Leland 1968, Scott and Crossman 1973, Crance 1987, Bain et al. 2000). Minimum water depths and flow are necessary to adequately hydrate and aerate newly deposited eggs, facilitate successful development and downstream migration of the newly spawned Atlantic sturgeon, and allow adult fish to access spawning substrate within the river and return to the lower estuary and ocean.

Sturgeon eggs are deposited over hard bottom substrate (e.g., cobble) and become adhesive shortly after fertilization (Murawski and Pacheco 1977, Van den Avyle 1983, Gilbert 1989, Smith and Clugston 1997, Mohler 2003). Hatching occurs in a matter of days. Late-stage larvae assume a demersal existence and are believed to use the interstitial spaces between rocks, pebbles, and cobble, to hide from predators (Smith et al. 1980, Bain et al. 2000, Kynard and Horgan 2002, Mohler 2003, ASMFC 2009). Exposure to even low levels of salinity can kill Atlantic sturgeon during their first few weeks of life. As they grow and develop, however, juvenile Atlantic sturgeon expand their range into higher salinity waters of the natal estuary where they remain for months or years before emigrating to marine waters (Holland and Yelverton 1973, Dovel and Berggen 1983, Waldman et al. 1996, ASSRT 2007).

A key habitat-based conservation objective for each DPS is facilitating juvenile recruitment into the adult population by protecting habitat essential for spawning, reproduction, and rearing of the offspring in the natal estuary. Based upon the best scientific data available, NMFS identified the physical and biological features that are essential to the conservation of the species because they are necessary for successful spawning, reproduction, and recruitment.

[2]Those essential habitat features are:

1. Suitable hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 ppt range) for settlement of fertilized eggs, refuge for larvae, and early life stage development.
2. Transitional salinity zones inclusive of 0.5-30 ppt and soft substrate (e.g., sand, mud) downstream of spawning sites for juvenile foraging and physiological development.
3. Water depth of 1.8 to 27 meters absent physical barriers to passage (e.g., locks, dams, reservoirs, gear, etc.) between the river mouth and spawning sites with adequate water quality[3] for unimpeded movement of spawning and non-spawning adults to and from spawning sites as well as seasonal and physiological-dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary.

NMFS has determined that these features may require special management considerations or protections given the significant impacts from human activities, such as dredging, dams, other water diversions, and point and nonpoint source runoff. The impacts from these activities, combined with those from natural factors (e.g., major storm events), may affect the features essential for the conservation of the sturgeon and could impair habitat that is necessary for spawning, reproduction, and recruitment.

---

[2] NMFS subsequently changed how the features were described to provide greater clarity. The description of the features here does not reflect the regulatory text of the final rule designating critical habitat for the Atlantic sturgeon DPSs.

[3] Adequate water quality refers to waters that would, in their natural state, be adequate for use by Atlantic sturgeon. Waters that have been rendered less suitable for Atlantic sturgeon (e.g., waters that are seasonally too warm and/or have low dissolved oxygen) due to anthropogenic effects (e.g., water withdrawals, water diversions, contamination) are still part of the critical habitat if those same waters would naturally have been used by Atlantic sturgeon and the other essential features are present.

Since the essential features occur within river estuarine habitat, NMFS used the Hydrologic Unit Code (HUC) system as the basis for delineating the critical habitat boundaries of each DPS. The HUC system is watershed-based and provides consistency and continuity for defining critical habitat boundaries for the three DPSs. NMFS chose to use the smallest units of the HUC system (i.e., 12-digit HUC) since these best fit to the scale of the specific areas within the watershed where the essential features occur. Nevertheless, the essential features occur in multiple adjoining 12-digit HUC units in some rivers. In those cases, NMFS has defined the critical habitat boundaries inclusive of all of the adjoining HUC units in which the essential features occur.

[4]Based on this approach, NMFS has identified four critical habitat units for the Gulf of Maine DPS, comprised of single or multiple 12-digit HUC units, that occur within Maine, New Hampshire, and Massachusetts rivers. Four critical habitat units were identified for the New York Bight DPS and five critical habitat units were identified for the Chesapeake Bay DPS. For simplicity, NMFS refers to each critical habitat unit by the name of the river in which the area occurs (Table 1-1).

Table 1-1. Critical Habitat Units identified by NMFS for each of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs

DPS	Critical Habitat Unit	Segment of the River Containing the Critical Habitat Unit
Gulf of Maine	Penobscot	Penobscot River from RKM 0 to the fall line
	Kennebec	Kennebec River from RKM 0 to the Ticonic Falls
	Androscoggin	Androscoggin River from RKM 0 to the Brunswick Dam
	Piscataqua	Piscataqua River from RKM 0 to its end
	Merrimack	Merrimack River from RKM 0 to the Essex Dam
New York Bight	Connecticut	Connecticut River from RKM 0 to the Holyoke Dam
	Housatonic	Housatonic River from RKM 0 to the Derby Dam
	Hudson	Hudson River from RKM 0 to the Federal Dam
	Delaware	Delaware River from RKM 0 to the fall line
Chesapeake Bay	Nanticoke	(See Foreword)
	Potomac	Potomac River from RKM 0 to the fall line
	Rappahannock	Rappahannock River from RKM 0 to the fall line
	York	Areas in the York, Mattaponi, and Pamunkey Rivers from RKM 0 to approximately 120 KM upriver on the Mattaponi River and approximately 150 KM upriver on the Pamunkey River
	James	James River from RKM 0 to Boshers Dam

1.2.1 Key Legal Interpretations

The ESA does not specify methods for identifying and considering the economic impacts of critical habitat designation, and previous designations have used a variety of approaches based on the relevant circumstances of the species and the habitat involved. The legislative history of the ESA informs these analyses, and several important court opinions have evaluated the legal sufficiency of these analyses, and clarified a number of important aspects of these statutory provisions. Several courts have reviewed previous economic impact analyses of critical habitat designations, and addressed whether the traditional economic methodology of baseline or incremental impacts analysis may be used. In *New Mexico Cattle Growers Assoc. et al. v. USFWS*, 248 F.3d 1277 (10th Cir. 2001), the court ruled that given US Fish and Wildlife Service's (USFWS) underlying assumption that critical habitat did not add any protection beyond what listing of the species already provided, the baseline economic impacts analysis was not

[4] See Foreword for a list of changes to the critical habitat units from the proposed rule to final rule designating critical habitat for the Atlantic sturgeon DPSs. The text provided here describing the segment of the river containing the critical habitat unit is not the regulatory text for the designated critical habitat areas.

consistent with the ESA. The court required USFWS to analyze the total economic impacts of critical habitat designation, even if those impacts are attributable co-extensively to other causes, such as listing of the species (Id. at 1285). In *Cape Hatteras Access Preservation Alliance et al. v. U.S. Dept. of the Interior*, 344 F. Supp. 2d 108 (D.D.C. 2004), the district court agreed with previous courts and found that the basis of USFWS' belief that impacts of critical habitat designation were wholly co-extensive with impacts of listing was based on conflating the regulatory definitions of "destruction or adverse modification" and "to jeopardize" a listed species (Id. at 128-29). However, given the distinction between adverse modification of critical habitat and jeopardy, the Cape Hatteras court disagreed with the Tenth Circuit and ruled that the baseline approach is a reasonable method for assessing the actual costs of a particular critical habitat designation (Id. at 130). In *Center for Biological Diversity v. Bureau of Land Management*, 422 F. Supp. 2d 1155, 1153 (N.D. Cal. 2006), the court reviewed the Cape Hatteras and New Mexico Cattle Growers cases and ruled that co-extensive costs could not be the basis for excluding areas from a designation.

NMFS has followed the Tenth Circuit's "total costs" approach, including identification of co-extensive costs and benefits, in circumstances where data have not allowed making a credible distinction between the impacts of consultations that would result from critical habitat designation, in addition or compared to the impacts that would result from species listing alone. (See e.g., Proposed Rule Designating Critical Habitat for Southern Resident Killer Whales, 71 FR 34571 at 34577, June 15, 2006). At least one court has ruled that continued use of the total impacts approach and inclusion of co-extensive impacts can be appropriate as long as the impacts of designating critical habitat are not presumed to be wholly co-extensive with the impacts of listing the species (*Home Builders Association of Northern California et al. v. USFWS*, 2007 U.S. Dist. LEXIS 5208 [E.D. Cal. Jan. 24, 2007]). This opinion indicates that a valid total impacts analysis, one that meaningfully analyzes impacts above and beyond listing, must at minimum give proper consideration to the recovery benefits resulting from a critical habitat designation (Id. at 19-21). Regarding consideration of economic impacts in the Home Builders case, the court noted that the term "impacts" is not specific and can be both positive and negative (Id. at 54, citing *Butte Envtl. Council v. Norton*, slip op., 04-0096, at 12 (N.D. Cal. Oct. 28, 2004)).

Most relevant to the economic impact analysis presented in this report is the decision by the U.S. Court of Appeals for the Ninth Circuit in *Arizona Cattle Growers Association v. Salazar*, 606 F.3d 1160, 1173 (9th Cir. 2010) in a rule that states: "To determine the incremental impacts of designating critical habitat, the Services compare the protections provided by the critical habitat designation (the world with the particular designation) to the combined effects of all conservation-related protections for the species and its habitat in the absence of the designation of critical habitat (the world without designation, i.e., the baseline condition including listing)."

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

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

EO 12866, Regulatory Planning and Review, provides guidance to Federal agencies on the development and analysis of regulatory actions. The overarching regulatory philosophy established by EO 12866 is:

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

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

The Statement of Regulatory Philosophy and Principles in EO 12866, Regulatory Planning and Review, states in part:

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

Office of Management and Budget (OMB) guidance to Federal agencies on implementing EO 12866 states that good regulatory analyses include three basic elements: (1) a statement of the need for the action, (2) an examination of alternative approaches, and (3) an evaluation of benefits and costs of the final action and the main alternatives (OMB Circular A-4, Sept. 17, 2003). Further, OMB Circular A-4 states that proper evaluation of the benefits and costs of regulations requires:

- Explaining how the actions required by the rule are linked to the expected benefits
- Identifying an appropriate baseline
- Identifying the expected undesirable side effects and ancillary benefits of the final rule

OMB Circular A-4 (2003) provides additional explanations of what should be included in benefit-cost analysis:

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

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

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

Cases reviewing critical habitat impacts analyses have applied principles similar to those of the OMB guidance, for example: all important costs and benefits should be included in an impacts analysis (e.g., *Center for Biological Diversity v. Bureau of Land Management*, 422 F. Supp. 2d 1155, 1153 [N.D. Cal. 2006], in which the court found that USFWS' impacts analysis was unbalanced in ignoring available data in the record regarding the economic benefits of designation; and important impacts that can only be evaluated if non-monetary metrics can be included in the analysis (e.g., *Home Builders Association of Northern California*, 2006 U.S. Dist. LEXIS 80255 [E.D. Cal., Nov. 1, 2006], which found that the USFWS properly determined that monetizing the benefits of designation was infeasible, and that benefits were best expressed in biological terms).

1.4 Framework for Economic Analysis

1.4.1 Focus of Analysis

The focus of this economic impact analysis is the effects of Section 7 of the ESA, which requires Federal agencies to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. In practice, this requires federal agencies to consult with NMFS whenever they propose an action that may affect a listed species or its designated critical habitat, and then to modify any action that could adversely affect critical habitat. Because the requirement for Section 7 consultation only applies to activities that are carried out, permitted, or funded by Federal agencies, the designation of critical habitat will not afford any protections for species with respect to strictly private activities.

If a proposed Federal action will likely destroy or adversely modify critical habitat, NMFS may recommend that the Federal agency or the project permittee or grantee implement a reasonable and prudent alternative (RPA) to the proposed action that would avoid destruction or adverse modification of critical habitat. Thus, economic impacts that may result from Section 7 consultation include the administrative costs of performing the consultation, costs of modifications to the proposed action in order to implement an RPA, and secondary costs to local or regional economies that result from the project modification. In addition, because critical habitat is by definition "essential to the conservation" of the species, conservation benefits to the listed species would be expected to result when the consultation process avoids destruction or adverse modification of its critical habitat. Adverse impacts to other components of the ecosystem may similarly be avoided through consultation and implementation of RPAs. Designation and protection of critical habitat could also result in project modifications that avoid adverse impacts to critical habitat and other components of the ecosystem.

Commenters on previous critical habitat designations have suggested that secondary costs to regional economies can also result from project modifications prescribed through Section 7 consultation. For example, concerns have been expressed that proposing critical habitat in areas of residential development would lead to reduced revenues and employment in construction-related firms, potential lost tax revenues associated with decreased residential development, and even impairment of regional growth (Elliott D. Pollack and Company 1999). In other designations, commenters have expressed concerns that critical habitat designation may require alteration in shipping channels, dredging projects, or commercial fishing

activities to such an extent that it would result in regional economic impacts (Industrial Economics, Incorporated [IEc] 2003).

The first step in assessing the economic impacts of Section 7 requirements is to identify land use and water use activities within or in the vicinity of the areas being proposed for critical habitat that may be affected by Section 7 of the ESA. The potential impacts of Section 7 are then estimated by comparing "without Section 7" or "baseline" conditions with conditions under a "with Section 7" scenario. Baseline conditions represent the level of protection that would be afforded the species under the ESA if Section 7 protective measures were absent, including levels of protection provided by other federal, state, and local laws. The "with Section 7" scenario identifies land use activities that may affect the species or its designated critical habitat, are not limited by baseline regulatory conditions, and are likely to involve a federal nexus that will require future consultations under Section 7 of the Act.

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

Once Section 7 impacts are identified, the analysis proceeds to consider the subset of impacts that can be attributed exclusively to the critical habitat designation. To do this, the analysis adopts a "with and without critical habitat" approach to determine those effects that may be attributed solely to the proposed designation of critical habitat, and are therefore incremental to the critical habitat designation. Specifically, the "with and without critical habitat" approach distinguishes between Section 7 impacts that will likely be associated with the implementation of the jeopardy provisions of Section 7 and those that will likely be associated with the implementation of the adverse modification provision of Section 7. In many cases, impacts associated with the jeopardy standard remain unaffected by the designation of critical habitat and thus would not normally be considered an effect of a critical habitat rulemaking.

The critical habitat designation for the three DPSs of sturgeon addressed in this report encompasses state-owned lands beneath tidally influenced and navigable waters up to the high water mark in eleven states, including Maine, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and in the District of Columbia. The majority of riparian lands bordering riverine critical habitat units are in private ownership. Areas adjacent to the proposed critical habitat designation also encompass some lands under local or federal ownership, including federal lands being managed by the Forest Service, the Air Force, the Navy, the National Park Service, the U.S. Army Corps of Engineers, and the Fish and Wildlife Service.

For private lands subject to critical habitat designation, Section 7 consultation and modifications to land uses and activities can only be required when a federal nexus, or connection, exists. A federal nexus arises if the activity or land use of concern involves federal permits, federal funding, or another form of federal involvement. Section 7 consultation is not required for activities on non-federal lands that do not involve a federal nexus.

In addition to activities occurring within the areas proposed for critical habitat designation, this report will examine activities that take place adjacent to those areas that are sponsored or permitted by federal agencies and may adversely modify the proposed critical habitat area.

This report provides a comprehensive assessment of activities that could be impacted by the critical habitat designation, but attempts to estimate only those impacts that are reasonably foreseeable, including, but not limited to, activities that are currently authorized, permitted, or funded, or for which proposed

plans are currently available to the public. Accordingly, the analysis bases estimates of impacts only on activities that are likely to result in Section 7 consultation within a ten-year time horizon.

1.4.2 Methodological Approach

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

- Determine "without Section 7" economic, regulatory, and environmental conditions to provide a description of baseline conditions for assessing potential economic impacts;
- Assess how current and projected future activities that are likely to take place on federal and private land could adversely affect proposed critical habitat;
- Establish whether such activities taking place on privately owned property within the proposed critical habitat boundaries are likely to involve a federal nexus;
- Assess the likelihood that identified federal actions and non-Federal actions having a federal nexus will require consultations under Section 7 of the Act;
- Determine how many and what types of project modifications may be required as a result of expected Section 7 consultation;
- Estimate the per-unit costs of expected Section 7 consultations, and the per-unit cost of resulting project modifications, and other economic impacts, including those associated with "triggering" other environmental regulations, "stigmatizing" properties or businesses, and having secondary impacts on local and regional economies;
- Assess the extent to which critical habitat designation will create costs for small businesses and/or affect property values as a result of modifications or delays to projects, stigma effects, or uncertainty;
- Determine what ancillary benefits may be associated with the designation of critical habitat, including potential protections provided to other fish and water-dependent species, biodiversity, ecosystem services, new outreach and educational opportunities, and impacts on natural resource agencies with existing management plans.

2 RELEVANT BASELINE INFORMATION

For this critical habitat designation, the following sections characterize: 1) the relevant economic baseline, 2) the regulatory baseline, which consists of existing laws and regulations that may protect critical habitat features in the absence of the designation, and 3) baseline benefits and values provided by the essential features that will be afforded protection as a result of the designation. To the extent possible these baseline conditions will be characterized separately for each critical habitat unit and quantified.

2.1 Economic Baseline

This section summarizes key socioeconomic information for the counties where the critical habitat units are located, and where activities are most likely to be affected by the designation. The fifteen designated critical habitat units and the counties where they are located are shown in Table 2-1. The information presented in the subsections below is organized by critical habitat unit, from north to south, for all three northern DPSs of Atlantic sturgeon. The types and levels of economic activities that currently exist in these counties constitute baseline economic conditions for purposes of assessing incremental impacts of designating each proposed habitat area. Baseline economic conditions are important to present because the same level of impact in different areas could be more or less important depending on what the baseline conditions are.

[5]Table 2-1. Critical Habitat Units

DPS	Critical Habitat Unit	State	Counties and Cities
Gulf of Maine	Penobscot	Maine	Hancock, Penobscot, and Waldo
	Kennebec	Maine	Kennebec, Lincoln, Sagadahoc, Somerset, and Waldo
	Androscoggin	Maine	Androscoggin, Cumberland, and Sagadahoc
	Piscataqua	Maine	York
		New Hampshire	Rockingham and Strafford
	Merrimack	Massachusetts	Essex
		New Hampshire	Rockingham
New York Bight	Connecticut	Connecticut	Hartford, Middlesex, New London, and Tolland
		Massachusetts	Hampden
	Housatonic	Connecticut	Fairfield, Litchfield, and New Haven
	Hudson	New Jersey	Bergen, Hudson, and Monmouth
		New York	Albany, Bronx, Columbia, Dutchess, Greene, Kings, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Ulster, and Westchester
	Delaware	Delaware	Kent, New Castle, Sussex
		New Jersey	Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, and Salem
		Pennsylvania	Bucks, Delaware, and Philadelphia
Chesapeake Bay	Nanticoke	Maryland	Dorchester and Wicomico
	Potomac	District of Columbia	District of Columbia
		Maryland	Charles, Montgomery, Prince George's, and St. Mary's
		Virginia	Arlington, Fairfax, King George, Loudoun, Northumberland, Prince William, Stafford, and Westmoreland counties; cities of Alexandria and Falls Church
	Rappahannock	Virginia	Caroline, Essex, King George, Lancaster, Middlesex, Richmond, Spotsylvania, Stafford, and Westmoreland counties; city of Fredericksburg
	York	Virginia	Gloucester, Hanover, James City, King and Queen, King William, New Kent and York
	James	Virginia	Charles City, Chesterfield, Dinwiddie, Henrico, Isle of Wight, James City, Prince George, Surry, and York counties; cities of Colonial Heights, Hampton, Hopewell, Newport News, Norfolk, Petersburg, Portsmouth, Richmond, Suffolk, and Williamsburg

[5] See Foreword for a list of changes to the critical habitat units from the proposed rule to final rule designating critical habitat for the Atlantic sturgeon DPSs.

2.1.1 Gulf of Maine DPS

2.1.1.1 Penobscot Critical Habitat Unit

The Penobscot Critical Habitat Unit is located in the state of Maine, and occurs within Hancock, Penobscot, and Waldo counties (Figure 2-1). According to the U.S. Census Bureau, the three counties comprise a total area of 6,760 square miles (17,508 square kilometers). Nearly 85 percent (5,713 square miles or 14,797 square kilometers) of the total area is land and the remaining 15 percent (1,047 square miles or 2,711 square kilometers) is water. The largest cities are Bangor, Orono, and Brewer, Maine.

Based on U.S. Census Bureau estimates, the total population of the three counties increased from 232,990 in July 2000 to 247,127 persons in April 2010; an increase of 14,137 persons (6.1 percent) over the 11-year period. In 2010, the total number of occupied housing units was reported to be103,618, an increase of 9 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 2.0 percent to 3.6 percent in the counties within the unit.

Median household income in 2011 was reported to be between $41,728 and $47,421 in the counties that make up the unit, and between 12.4 percent and 16.3 percent of the county population lived below the poverty level, in comparison to the statewide Maine median household income of $47,898 and poverty rate of 12.8 percent.

According to the U.S. Census the population of the three Maine counties where this Critical Habitat Unit is located grew by 0.01 percent in 2012, which was significantly lower than the overall Maine population growth rate of 0.1 percent and the national population growth rate of 1.7 percent. During 2012 the real GDP in the state of Maine grew by 0.5 percent, which was significantly below 2012 real national GDP growth rate of 2.5 percent.

As presented in Table 2-3, the retail trade sector and health care and social assistance sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the three counties include the accommodation and food services sector and the manufacturing sector.

Table 2-2. Employment Profile by Industry Sector in Penobscot Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)
11	Agriculture, forestry, fishing and hunting	2,181	129,475	168	1,010	41,9
21	Mining, quarrying, and oil and gas extraction	15	1,049	6	80	2
22	Utilities	19	744	17	395	35,2
23	Construction	3,429	143,089	857	3,943	176,7
31-33	Manufacturing	513	18,733	267	7,097	265,1
42	Wholesale trade	274	18,131	275	2,801	119,9
44-45	Retail trade	1,700	64,339	1,265	15,514	371,5
48-49	Transportation and warehousing	587	40,792	278	3,061	125,7
51	Information	222	4,052	116	1,689	66,8
52	Finance and insurance	292	12,863	354	4,235	117,8
53	Real estate and rental and leasing	1,743	112,327	273	925	29,2
54	Professional, scientific, and technical services	2,026	55,926	539	3,990	191,9
55	Management of companies and enterprises	0	0	43	1,811	2,3
56	Administrative and support and waste management and remediation services	1,513	26,687	330	3,980	93,7
61	Educational services	488	4,920	82	2,251	46,5
62	Health care and social assistance	1,444	34,993	837	18,654	778,0
71	Arts, entertainment, and recreation	1,090	22,249	178	10 1,196	26,7
72	Accommodation and food services	328	13,093	710	7,428	142,6
81	Other services (except public administration)	2,605	60,408	646	3,381	79,6
99	Industries not classified	0	0	7	23	
	TOTAL	**20,469**	**763,870**	**7,248**	**83,464**	**2,712,2**

a The U.S., Canada, and Mexico developed the North American Industry Classification System (NAICS) as the new industry classification system, which replaces the U.S. Standard Industrial Classification (SIC) system to provide comparable statistics across the three countries.
b A "non-employer firm" is defined as one that has no paid employees, has annual business receipts of $1,000 or more ($1 or more in the construction industries), and is subject to Federal income taxes. Most non-employers are self-employed individuals operating very small unincorporated businesses, which may or may not be the owner's principal source of income. N Not available or not comparable.
c "Receipts" (net of taxes) are defined as the revenue for goods produced, distributed, or services provided, including revenue earned from premiums, commissions and fees, rents, interest, dividends, and royalties. Receipts exclude all revenue collected for local, State, and Federal taxes. N Not available or not comparable..
d "Employer establishments" consist of full- and part-time employees, including salaried officers and executives of corporations who were on the payroll in the pay period including March 12. Included are employees on sick leave, holidays, and vacations; not included are proprietors and partners of unincorporated businesses.
e "Number of employees" represents full- and part-time employees, including salaried officers and executives of corporations who were on the payroll in the pay period including March 12. Included are employees on sick leave, holidays, and vacations; not included are proprietors and partners of unincorporated businesses. Where a range of employees was presented to avoid disclosing data for individual businesses, the average of the range was used.
f "Total annual payroll" includes all forms of compensation, such as salaries, wages, commissions, bonuses, vacation allowances, sick-leave pay, and the value of payments in-kind (e.g. free meals and lodgings) paid during the year to all employees. D Withheld to avoid disclosing data for individual businesses; data are included in broader industry totals.
Source: U.S. Census Bureau, 2011 County Business Patterns

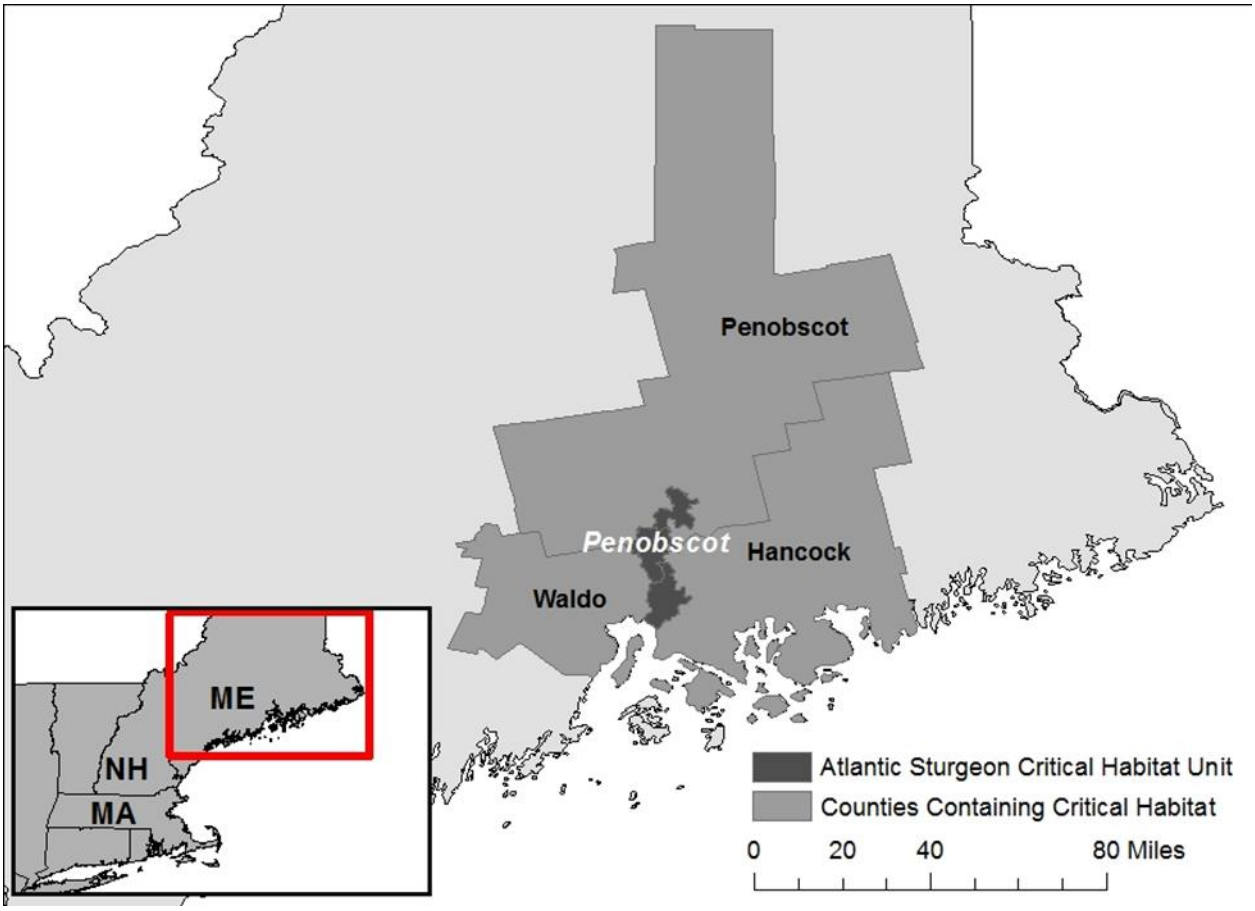


Figure 2-1. Location Map of Penobscot Critical Habitat Unit

2.1.1.2 Kennebec Critical Habitat Unit

The Kennebec Critical Habitat Unit is located in the state of Maine, and occurs within Kennebec, Lincoln, Sagadahoc, Somerset, and Waldo counties (Figure 2-2). According to the U.S. Census Bureau, the five counties comprise a total area of 6,969 square miles (18,050 square kilometers). More than 89 percent (6,234 square miles or 16,145 square kilometers) of the total area is land and the remaining 11 percent (736 square miles or 1,905 square kilometers) is water. The largest cities include Augusta, and Waterville, Maine.

Based on U.S. Census Bureau estimates, the total population of the five counties increased from 273,112 in July 2000 to 282,669 persons in April 2010; an increase of 9,803 persons (3.6 percent) over the 11-year period. In 2010, the total number of occupied housing units was reported to be 119,723, an increase of 8 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.9 percent to 3.5 percent in the counties within the unit.

Median household income in 2011 was reported to be between $37,875 and $56,865 in the counties that make up the unit, and between 9.4 percent and 18.5 percent of the county population lived below the poverty level, in comparison to the statewide Maine median household income of $47,898 and poverty rate of 12.8 percent.

According to the U.S. Census the population in the five Maine counties where this Critical Habitat Unit is located grew by 0.4 percent in 2012, which was four times higher than the overall Maine population growth rate of 0.1 percent, and significantly below the national rate of 1.7 percent. During 2012 the real GDP in the state of Maine grew by 0.5 percent, which was significantly below 2012 real national GDP growth rate of 2.5 percent.

As presented in Table 2-3, the health care and social assistance sector and manufacturing sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the five Maine counties include the retail trade sector and the construction sector.

Table 2-3. Employment Profile by Industry Sector in Kennebec Unit Counties (2011)

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	1,957	74,523	159	491	184
21	Mining, quarrying, and oil and gas extraction	11	454	4	80	
22	Utilities	9	417	20	494	6,5
23	Construction	4,262	189,791	1,015	4,497	196,6
31-33	Manufacturing	591	20,313	319	15,822	329,6
42	Wholesale trade	373	20,216	247	2,988	130,5
44-45	Retail trade	2,192	83,058	1,267	15,265	369,9
48-49	Transportation and warehousing	628	45,616	213	1,779	59,8
51	Information	238	5,257	127	1,909	77,3
52	Finance and insurance	305	15,896	319	3,784	89,4
53	Real estate and rental and leasing	1,758	108,996	229	696	22,8
54	Professional, scientific, and technical services	2,371	74,342	653	3,337	161,9
55	Management of companies and enterprises	0	0	34	1,109	22,4
56	Administrative and support and waste management and remediation services	1,769	32,132	344	3,034	86,7
61	Educational services	530	8,259	110	2,619	85,6
62	Health care and social assistance	1,737	45,464	927	20,596	766,0
71	Arts, entertainment, and recreation	1,323	20,472	179	1,119	24,4
72	Accommodation and food services	370	12,267	694	7,007	132,8
81	Other services (except public administration)	3,135	75,301	767	3,189	89,7
99	Industries not classified	0	0	21	42	2
	TOTAL	**23,559**	**832,774**	**7,648**	**89,857**	**2,671,3**

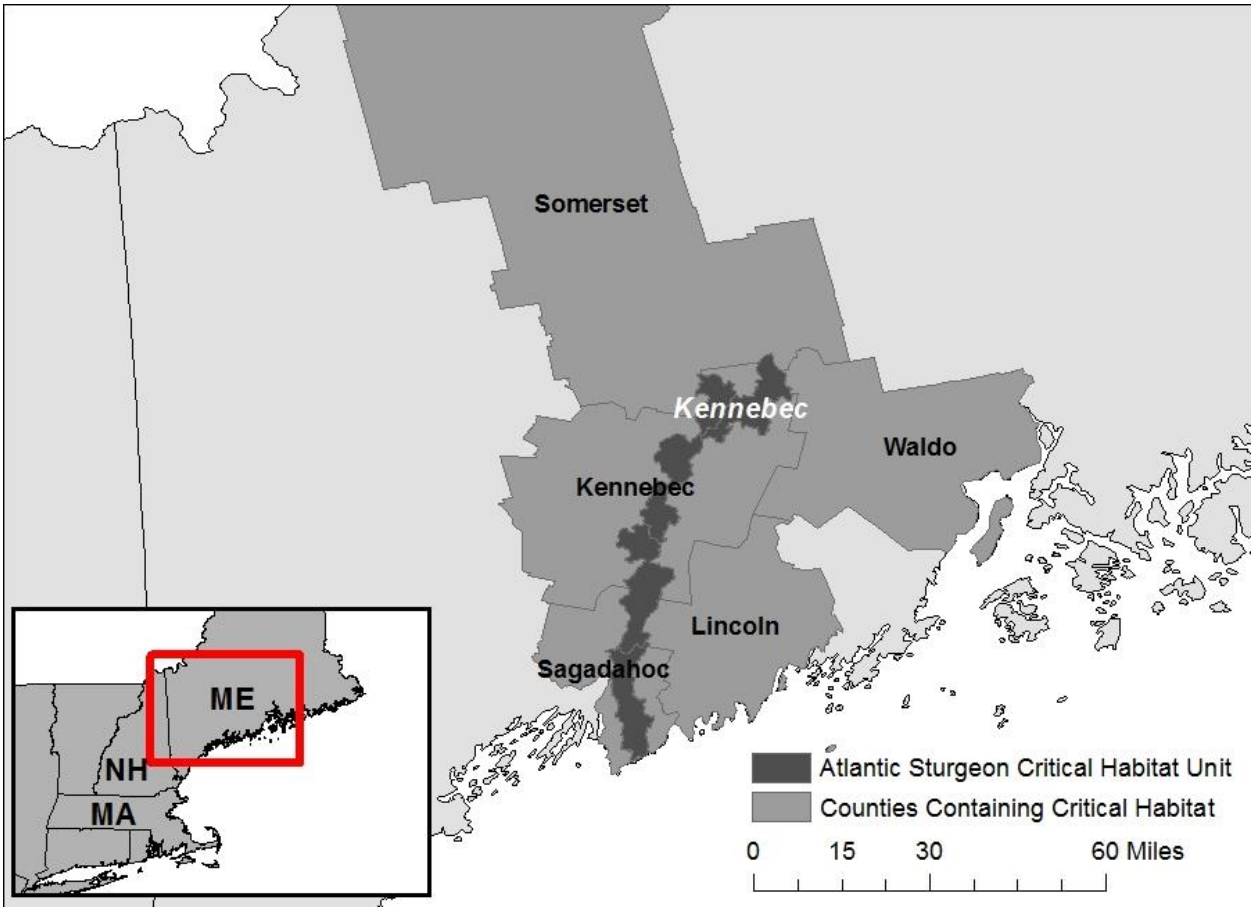


Figure 2-2. Location Map of Kennebec Critical Habitat Unit

2.1.1.3 Androscoggin Critical Habitat Unit

The Androscoggin Critical Habitat Unit is located in the state of Maine, and occurs within Androscoggin, Cumberland, and Sagadahoc counties (Figure 2-3). According to the U.S. Census Bureau, the three counties comprise a total area of 2,084 square miles (5,398 square kilometers). Nearly 75 percent (1,560 square miles or 4,040 square kilometers) of the total area is land and the remaining 25 percent (525 square miles or 1,359 square kilometers) is water. The largest cities in these counties include Brunswick, Topsham, and Bath, Maine.

Based on U.S. Census Bureau estimates, the total population of the three counties increased from 404,619 in July 2000 to 424,669 persons in April 2010; an increase of 20,050 persons (5.0 percent) over the 11-year period. In 2010, the total number of occupied housing units was reported to be 176,742, an increase of 8 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.7 percent to 2.4 percent in the counties within the unit.

Median household income in 2011 was reported to be between $45,699 and $57,267 in the counties that make up the unit, and between 9.4 percent and 14.2 percent of the county population lived below the poverty level, in comparison to the statewide Maine median household income of $47,898 and poverty rate of 12.8 percent.

According to the U.S. Census the population in the three counties in Maine where this Critical Habitat Unit is located grew by 0.5 percent in 2012, which was more than twice the state of Maine population growth rate of 0.1 percent, and significantly below the national rate of 1.7 percent. During 2012 the real

GDP in the state of Maine grew by 0.5 percent, which was significantly below 2012 national real GDP growth rate of 2.5 percent.

As presented in Table 2-4, the health care and social assistance sector and retail trade sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the three Maine counties include the manufacturing sector and the accommodation and food services sector.

Table 2-4. Employment Profile by Industry Sector in Androscoggin Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	1,439	72,081	104	189	5,471
21	Mining, quarrying, and oil and gas extraction	19	1,158	6	10	D
22	Utilities	12	221	24	630	47,593
23	Construction	4,622	249,176	1,615	10,190	477,188
31-33	Manufacturing	629	24,876	562	21,684	667,038
42	Wholesale trade	514	40,396	654	8,040	425,297
44-45	Retail trade	2,676	113,057	2,019	29,319	714,084
48-49	Transportation and warehousing	821	39,395	326	7,340	299,595
51	Information	537	14,044	278	5,783	279,851
52	Finance and insurance	794	156,264	782	16,880	1,134,567
53	Real estate and rental and leasing	4,350	452,693	653	3,454	129,921
54	Professional, scientific, and technical services	5,571	203,296	1,643	12,473	753,176
55	Management of companies and enterprises	0	0	91	4,673	392,029
56	Administrative and support and waste management and remediation services	2,272	52,691	780	12,159	370,455
61	Educational services	1,019	14,409	195	7,666	209,355
62	Health care and social assistance	2,977	94,868	1,811	41,994	1,778,817
71	Arts, entertainment, and recreation	2,430	40,213	284	2,907	56,964
72	Accommodation and food services	428	19,128	1,243	18,732	329,233
81	Other services (except public administration)	3,985	104,261	1,289	8,098	203,835
99	Industries not classified	0	0	22	80	315
	TOTAL	**35,095**	**1,692,227**	**14,381**	**212,301**	**8,274,784**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

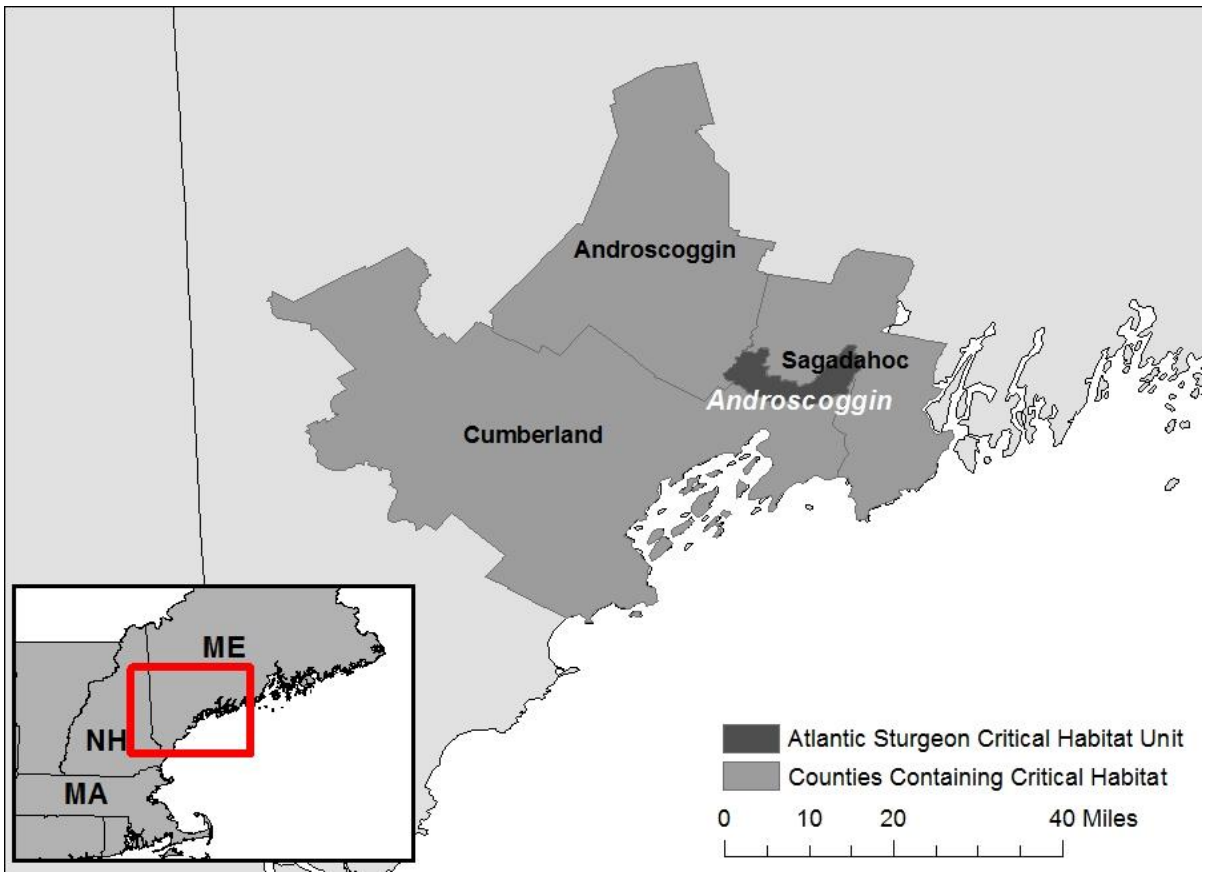


Figure 2-3. Location Map of Androscoggin Critical Habitat Unit

2.1.1.4 Piscataqua Critical Habitat Unit

The Piscataqua Critical Habitat Unit is located in the states of New Hampshire and Maine, and occurs within Rockingham and Strafford counties in New Hampshire and York County in Maine (Figure 2-4). According to the U.S. Census Bureau, the three counties comprise a total area of 2,449 square miles (6,343 square kilometers). Nearly 84 percent (2,055 square miles or 5,321 square kilometers) of the total area is land and the remaining 16 percent (395 square miles or 1,022 square kilometers) is water. The largest cities are Portsmouth, New Hampshire and Berwick, Maine.

Based on U.S. Census Bureau estimates, the total population of the three counties increased from 576,334 in July 2000 to 615,497 persons in April 2010; an increase of 39,163 persons (6.8 percent) over the 11-year period. In 2010, the total number of occupied housing units was reported to be 243,142, an increase of 10 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.6 percent to 2.1 percent in the counties within the unit.

Median household income in 2011 was reported to be between $56,552 and $77,470 in the counties that make up the unit, and between 4.9 percent and 10.8 percent of the county population lived below the poverty level, in comparison to the statewide New Hampshire median household income of $64,664 and poverty rate of 8.0 percent and Maine median household income of $47,898 and poverty rate of 12.8 percent.

According to the U.S. Census, the population in the three counties in Maine and New Hampshire where this Critical Habitat Unit is located grew by 0.9 percent in 2012, which was higher than the weighted average population growth rate of 0.2 percent in the two states in which it is located, Maine and New

Hampshire; but significantly below the national average of 1.7 percent. During 2012 the real GDP in these two states grew by an average of 0.5 percent, which was significantly below the national real GDP growth rate of 2.5 percent.

As presented in Table 2-5, the retail trade sector and health care and social assistance sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the three counties include the manufacturing sector and the accommodation and food services sector.

Table 2-5. Employment Profile by Industry Sector in Piscataqua Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	987	51,609	45	172	4,539
21	Mining, quarrying, and oil and gas extraction	15	1,825	9	30	1,279
22	Utilities	41	2,572	43	1,616	151,985
23	Construction	8,430	553,360	2,088	9,509	498,432
31-33	Manufacturing	1,013	47,859	787	25,842	1,348,718
42	Wholesale trade	988	103,733	827	8,863	579,891
44-45	Retail trade	4,258	232,453	2,856	41,567	1,021,379
48-49	Transportation and warehousing	1,031	64,760	394	6,313	234,124
51	Information	662	23,831	244	3,765	207,763
52	Finance and insurance	1,166	76,932	779	10,893	500,057
53	Real estate and rental and leasing	5,472	450,198	601	2,391	93,096
54	Professional, scientific, and technical services	8,087	355,956	1,690	11,829	701,562
55	Management of companies and enterprises	0	0	94	2,457	318,678
56	Administrative and support and waste management and remediation services	3,411	96,853	1,062	12,322	432,303
61	Educational services	1,400	23,983	213	6,327	201,770
62	Health care and social assistance	3,070	101,343	1,745	31,482	1,317,785
71	Arts, entertainment, and recreation	2,829	66,799	332	4,085	95,268
72	Accommodation and food services	615	37,170	1,884	22,969	457,769
81	Other services (except public administration)	6,212	191,008	1,510	8,182	216,359
99	Industries not classified	0	0	25	46	450
	TOTAL	**49,687**	**2,482,244**	**17,228**	**210,660**	**8,383,207**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

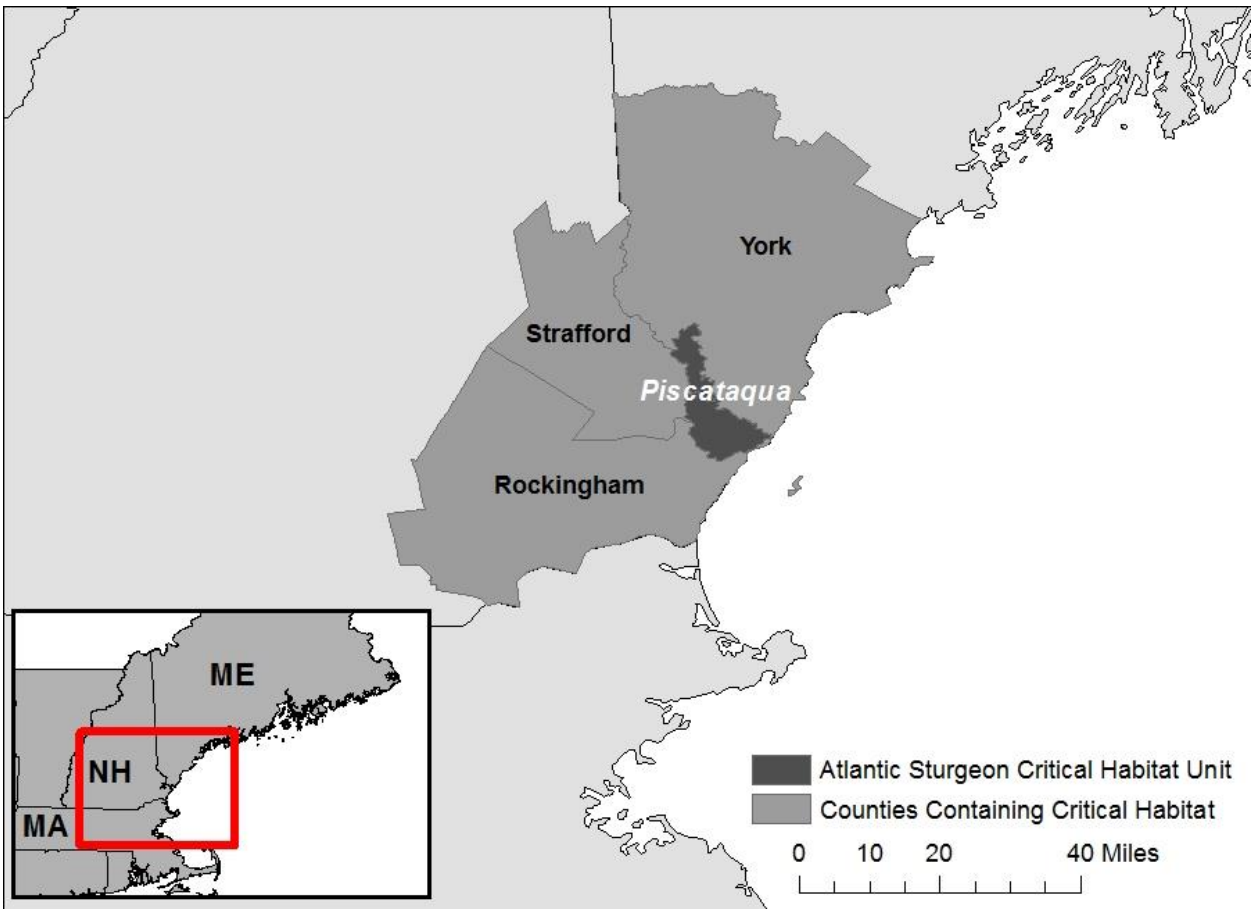


Figure 2-4. Location Map of Piscataqua Critical Habitat Unit

2.1.1.5 Merrimack Critical Habitat Unit

The Merrimack Critical Habitat Unit is located in the states of Massachusetts and New Hampshire, and occurs within Essex County in Massachusetts and Rockingham County in New Hampshire (Figure 2-5). According to the U.S. Census Bureau, the two counties comprise a total area of 1,622 square miles (4,202 square kilometers). Nearly 74 percent (1,196 square miles or 3,097 square kilometers) of the total area is land and the remaining 26 percent (427 square miles or 1,106 square kilometers) is water. The largest cities are Haverhill, North Andover, and Newburyport, Massachusetts.

Based on U.S. Census Bureau estimates, the total population of the two counties increased from 1,000,778 in July 2000 to 1,038,382 persons in April 2010; an increase of 37,604 persons (3.8 percent) over the 11-year period. In 2010, the total number of occupied housing units was reported to be 400,989, an increase of 6 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.4 percent to 1.6 percent in the counties within the unit.

Median household income in 2011 was reported to be between $65,785 and $77,470 in the counties that make up the unit, and between 4.9 percent and 10.6 percent of the county population lived below the poverty level, in comparison to the statewide Massachusetts median household income of $65,981 and poverty rate of 10.7 percent and New Hampshire median household income of $64,664 and poverty rate of 8.0 percent.

Between 2010 and 2012 the population in the two counties in New Hampshire and Massachusetts that make up this Critical Habitat Unit grew by 1.5 percent, which was slightly above the average population

growth rate of 1.3 percent in the two states in which they are located, and below the national average of 1.7 percent. During 2012 the real GDP in these two states grew by a weighted average of 1.3 percent, which was significantly below the national GDP growth rate of 2.5 percent.

As presented in Table 2-6, the health care and social assistance sector and retail trade sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the two counties include the manufacturing sector and the accommodation and food services sector.

Table 2-6. Employment Profile by Industry Sector in Merrimack Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	1,176	59,802	84	270	11,359
21	Mining, quarrying, and oil and gas extraction	D	D	5	47	2,494
22	Utilities	74	8,214	51	2,090	138,862
23	Construction	10,580	714,245	2,733	15,195	905,426
31-33	Manufacturing	1,354	75,435	1,291	51,005	3,516,133
42	Wholesale trade	1,637	173,391	1,448	18,960	1,431,656
44-45	Retail trade	6,076	363,656	4,151	62,722	1,634,001
48-49	Transportation and warehousing	2,335	115,016	594	9,554	365,158
51	Information	1,267	44,655	455	8,329	604,447
52	Finance and insurance	2,288	185,418	1,353	17,252	1,381,778
53	Real estate and rental and leasing	8,508	756,246	881	3,942	164,130
54	Professional, scientific, and technical services	16,253	816,265	3,150	21,945	1,520,658
55	Management of companies and enterprises	0	0	151	8,445	908,086
56	Administrative and support and waste management and remediation services	5,820	171,230	1,644	25,053	904,715
61	Educational services	2,697	39,496	413	12,213	383,939
62	Health care and social assistance	6,486	223,957	2,915	72,403	2,951,039
71	Arts, entertainment, and recreation	4,980	118,641	553	8,601	188,693
72	Accommodation and food services	926	43,719	2,624	38,061	684,608
81	Other services (except public administration)	10,066	312,847	2,636	15,732	421,607
99	Industries not classified	0	0	64	65	1,997
	TOTAL	**82,523**	**4,222,233**	**27,196**	**391,884**	**18,120,786**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

Commercial fishing is also an important economic component in the Merrimack River Unit. The port of Gloucester, Massachusetts, is in Essex County. Table 2-7 shows the most recent commercial landings data (volume and value) available at this port.

Table 2-7. Volume and Value of Commercial Landings at Port in Merrimack Unit

Port	Millions of lbs	Millions $
Gloucester, MA[1]	82.6	57.4

[1] 2012 landings data

Source: NMFS Office of Science and Technology

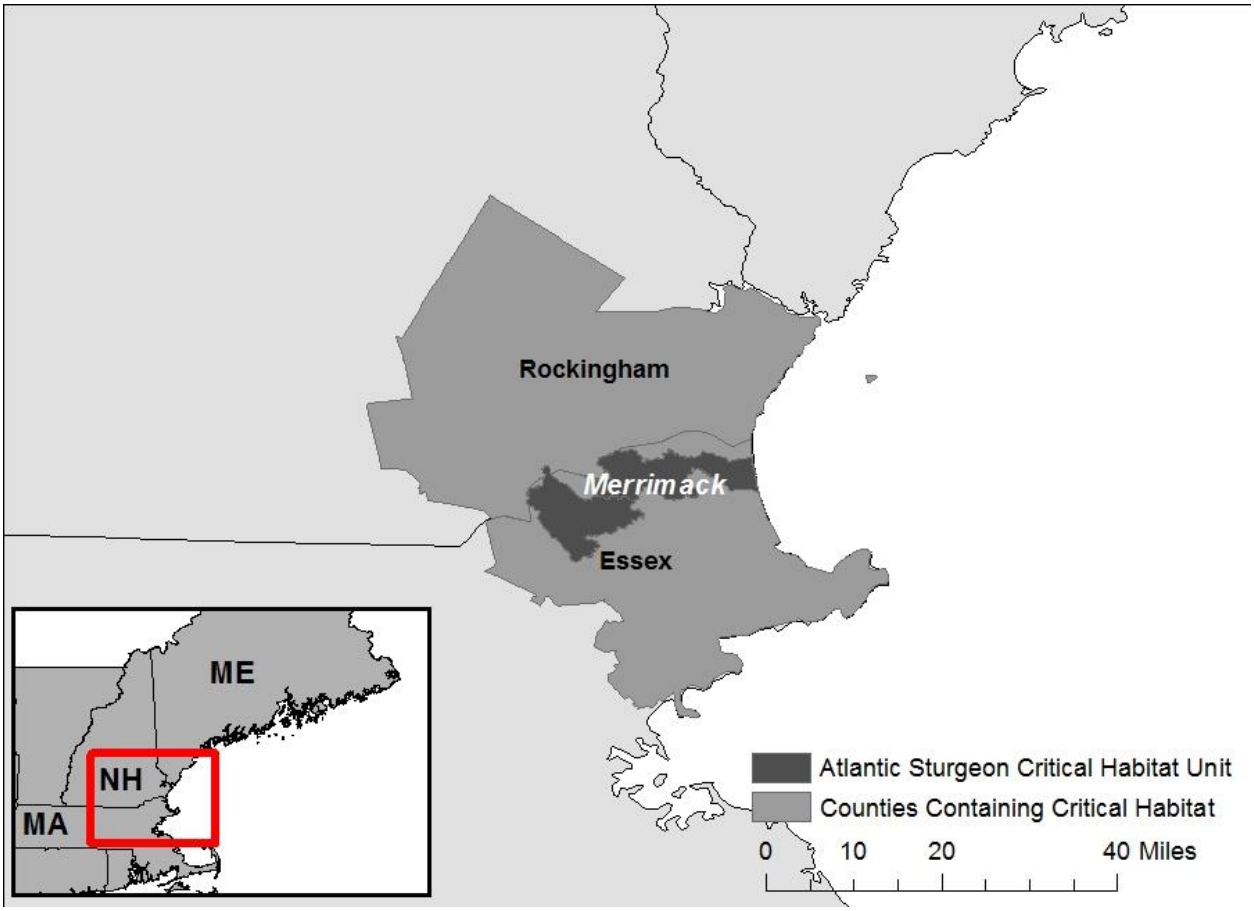


Figure 2-5. Location Map of Merrimack Critical Habitat Unit

2.1.2 New York Bight DPS

2.1.2.1 Connecticut Critical Habitat Unit

The Connecticut Critical Habitat Unit is located in the states of Connecticut and Massachusetts, and occurs within Hartford, Middlesex, New London, and Tolland counties in Connecticut and Hampden County in Massachusetts (Figure 2-6). According to the U.S. Census Bureau, the five counties comprise a total area of 3,012 square miles (7,802 square kilometers). Nearly 93 percent (2,799 square miles or 7,250 square kilometers) of the total area is land and the remaining 7 percent (213 square miles or 553 square kilometers) is water. The largest cities are Hartford and East Hartford, Connecticut. Other significant populated places include Middletown, Enfield, Glastonbury, Wethersfield, and South Windsor, Connecticut and East Longmeadow, Massachusetts.

Based on U.S. Census Bureau estimates, the total population of the five counties increased from 1,863,934 in July 2000 to 1,949,926 persons in April 2010; an increase of 85,992 persons (4.6 percent) over the 11-year period. In 2010, the total number of occupied housing units was reported to be 759,517, an increase of 5 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.0 percent to 1.5 percent in the counties within the unit.

Median household income in 2011 was reported to be between $48,866 and $80,333 in the counties that make up the unit, and between 5.9 percent and 16.6 percent of the county population lived below the poverty level, in comparison to the statewide Connecticut median household income of $69,243 and

poverty rate of 9.5 percent and Massachusetts median household income of $65,981 and poverty rate of 10.7 percent.

Between 2010 and 2012 the population in the five counties in Massachusetts and Connecticut where this Critical Habitat Unit is located grew by a weighted average rate of 2.2 percent, which was two times the average population growth rate of 1.1 percent in the states in which it is located, and above the national average of 1.7 percent. During 2012 the real GDP of the two states grew by a weighted average rate of 1.4 percent, which was below the national real GDP growth rate of 2.5 percent.

As presented in Table 2-8, the health care and social assistance sector and retail trade sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the five counties include the manufacturing sector and the accommodation and food services sector.

Table 2-8. Employment Profile by Industry Sector in Connecticut Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	736	30,677	43	167	2,020
21	Mining, quarrying, and oil and gas extraction	36	5,005	25	202	14,106
22	Utilities	73	1,647	77	7,103	160,528
23	Construction	14,616	1,015,548	4,018	28,235	1,716,669
31-33	Manufacturing	1,798	106,629	2,410	97,953	4,896,802
42	Wholesale trade	1,926	208,862	2,040	32,398	1,896,619
44-45	Retail trade	9,718	554,747	6,878	99,592	2,624,929
48-49	Transportation and warehousing	3,630	213,284	913	23,972	873,217
51	Information	1,622	55,764	714	18,486	1,255,012
52	Finance and insurance	3,966	331,042	2,817	69,329	6,606,338
53	Real estate and rental and leasing	14,821	1,366,126	1,567	9,136	429,480
54	Professional, scientific, and technical services	18,272	817,967	4,202	50,015	3,527,931
55	Management of companies and enterprises	0	0	318	13,742	1,272,696
56	Administrative and support and waste management and remediation services	8,247	227,447	2,399	36,562	1,250,722
61	Educational services	3,832	53,850	601	27,481	807,819
62	Health care and social assistance	10,638	307,017	5,428	152,714	6,722,880
71	Arts, entertainment, and recreation	6,919	138,178	745	12,297	273,377
72	Accommodation and food services	1,382	70,575	4,239	82,696	1,632,794
81	Other services (except public administration)	15,106	433,727	4,841	33,322	967,871
99	Industries not classified	0	0	59	74	1,089
	TOTAL	**117,338**	**5,938,092**	**44,334**	**795,476**	**36,932,899**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

Commercial fishing is also an important economic component in New London County. The ports of New London and Stonington, Connecticut, are found here. Table 2-9 shows the most recent commercial landings data (volume and value) available at these ports.

Table 2-9. Volume and Value of Commercial Landings at Ports in Connecticut Unit

Ports	Millions of lbs	Millions $
New London, CT[1]	5.0	9.5
Stonington, CT[2]	3.1	8.8

[1] 2012 landings data

[2] 2011 landings data

Source: NMFS Office of Science and Technology

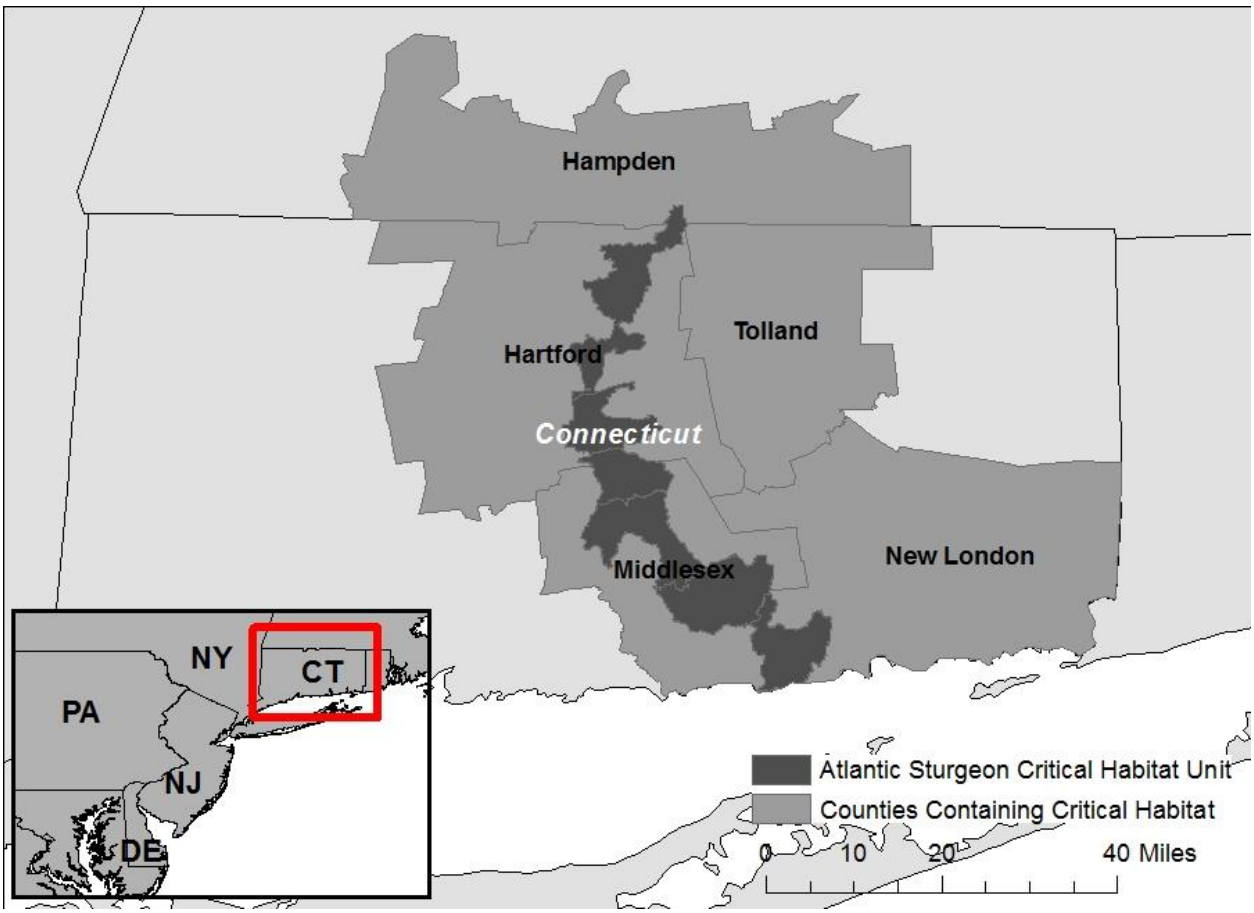


Figure 2-6. Location Map of Connecticut Critical Habitat Unit

2.1.2.2 Housatonic Critical Habitat Unit

The Housatonic Critical Habitat Unit is located in the state of Connecticut, and occurs within Fairfield, Litchfield, and New Haven counties (Figure 2-7). According to the U.S. Census Bureau, the three counties comprise a total area of 2,644 square miles (6,847 square kilometers). Nearly 81 percent (2,151 square miles or 5,572 square kilometers) of the total area is land and the remaining 19 percent (492 square miles or 1,275 square kilometers) is water. Major cities include Milford and Stratford, Connecticut. Other significant populated places include Monroe and Brookfield, Connecticut.

Based on U.S. Census Bureau estimates, the total population of the three counties increased from 1,888,768 in July 2000 to 1,969,233 persons in April 2010; an increase of 80,465 persons (4.3 percent) over the 11-year period. In 2010, the total number of occupied housing units was reported to be 746,687, an increase of 4 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.7 percent to 2.0 percent in the counties within the unit.

Median household income in 2011 was reported to be between $62,497 and $82,558 in the counties that make up the unit, and between 6.1 percent and 11.4 percent of the county population lived below the poverty level, in comparison to the statewide Connecticut median household income of $69,243 and poverty rate of 9.5 percent.

Between 2010 and 2012 the population in the three Connecticut counties where this Critical Habitat Unit is located grew by 0.8 percent, which was slightly higher than the average population growth rate of 0.5 percent in Connecticut, and less than half the national average of 1.7 percent. During the 2012 real GDP

of Connecticut declined by 0.1 percent, which was significantly below the national real GDP growth rate of 2.5 percent.

As presented in Table 2-10, the health care and social assistance sector and retail trade sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the three counties include the manufacturing sector and the accommodation and food services sector.

Table 2-10. Employment Profile by Industry Sector in Housatonic Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	526	22,526	35	174	5,545
21	Mining, quarrying, and oil and gas extraction	23	3,348	41	857	7,897
22	Utilities	124	6,446	89	5,583	165,487
23	Construction	19,295	1,591,240	4,565	25,271	1,513,499
31-33	Manufacturing	1,900	125,157	2,401	73,560	4,627,418
42	Wholesale trade	2,765	337,480	2,630	42,767	3,512,898
44-45	Retail trade	10,221	667,732	7,075	98,588	2,921,200
48-49	Transportation and warehousing	3,721	213,953	929	18,563	885,645
51	Information	2,576	133,356	990	21,396	1,548,413
52	Finance and insurance	7,495	840,902	3,708	51,993	10,415,392
53	Real estate and rental and leasing	21,524	2,089,830	1,811	11,588	641,267
54	Professional, scientific, and technical services	29,304	1,808,263	5,813	53,146	4,665,678
55	Management of companies and enterprises	0	0	390	23,835	3,226,814
56	Administrative and support and waste management and remediation services	12,191	393,160	3,136	51,514	2,170,526
61	Educational services	5,268	97,485	827	47,612	2,221,127
62	Health care and social assistance	13,430	465,651	5,678	143,581	6,692,189
71	Arts, entertainment, and recreation	9,374	277,433	952	14,555	480,702
72	Accommodation and food services	2,201	114,553	4,502	57,490	1,109,419
81	Other services (except public administration)	17,150	550,206	5,240	33,846	1,012,165
99	Industries not classified	0	0	83	96	2,086
	TOTAL	**159,088**	**9,738,721**	**50,895**	**776,015**	**47,825,367**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

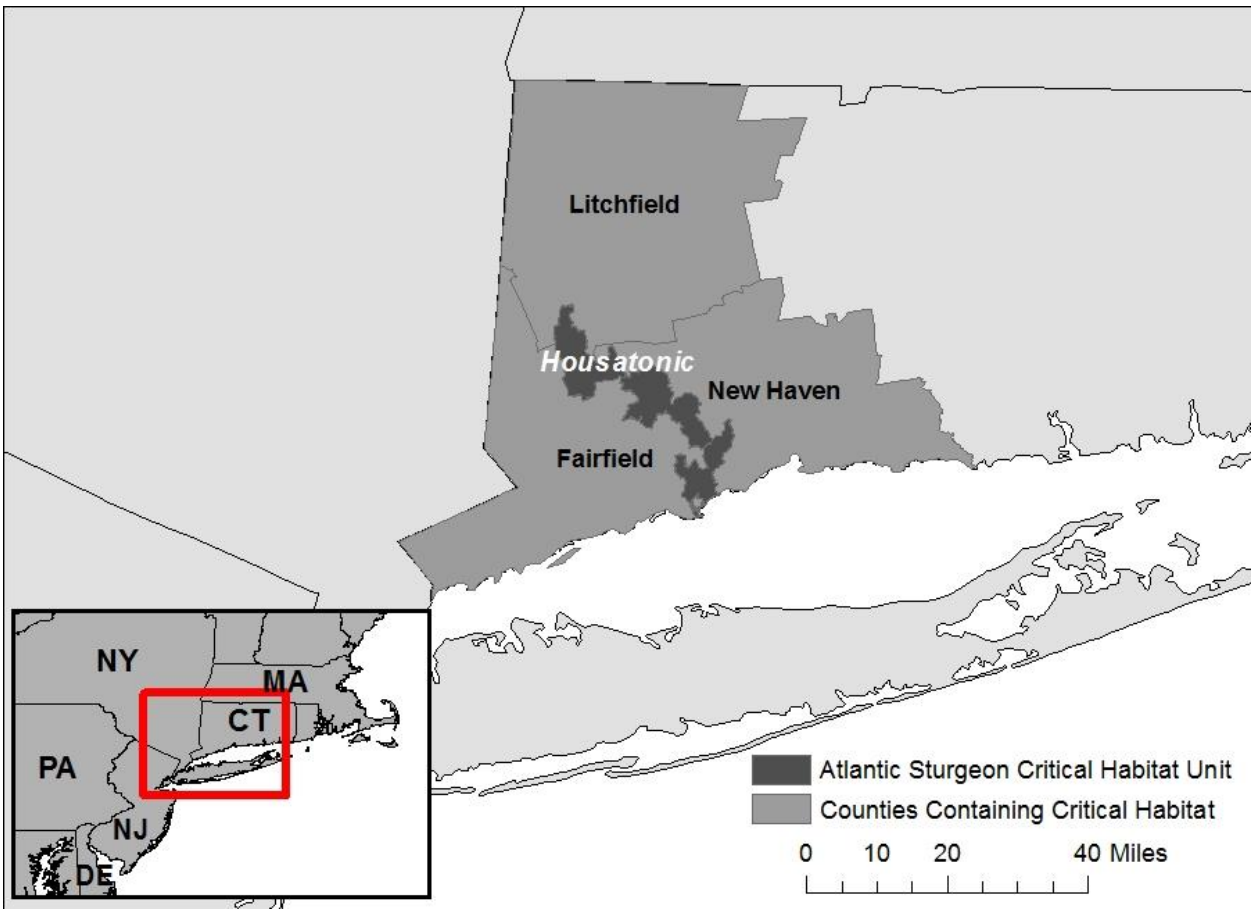


Figure 2-7. Location Map of Housatonic Critical Habitat Unit

2.1.2.3 Hudson Critical Habitat Unit

The Hudson Critical Habitat Unit is located in the states of New York and New Jersey, and occurs within Albany, Bronx, Columbia, Dutchess, Greene, Kings, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Ulster, and Westchester counties in New York and Bergen, Hudson, and Monmouth counties in New Jersey (Figure 2-8). According to the U.S. Census Bureau, the sixteen counties in New York and three counties in New Jersey comprise a total area of 8,562 square miles (22,176 square kilometers). Nearly 92 percent (7,912 square miles or 20,491 square kilometers) of the total area is land and the 8 remaining percent (651 square miles or 1,685 square kilometers) is water. Major cities include New York, Yonkers, Albany, and Troy, New York and Jersey City, Union City, Bayonne, and Hoboken, New Jersey.

Based on U.S. Census Bureau estimates, the total population of the nineteen counties increased from 12,980,922 in July 2000 to 13,353,756 persons in April 2010; an increase of 372,834 persons (2.9 percent) over the 11-year period. In 2010, the total number of occupied housing units was reported to be 5,037,371, an increase of 4 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.2 percent to 4.5 percent in the counties within the unit.

Median household income in 2011 was reported to be between $34,744 and $92,711 in the counties that make up the unit, and between 5.4 percent and 28.5 percent of the county population lived below the poverty level, in comparison to the statewide New York median household income of $56,951 and

poverty rate of 14.5 percent and New Jersey median household income of $71,180 and poverty rate of 9.4 percent.

According to the U.S. Census, the population in the sixteen counties in New York and three counties in New Jersey where this Critical Habitat Unit is located grew by 1.6 percent in 2012, which was significantly higher than the overall New York state growth rate of 0.1 percent, and near the national average of 1.7 percent. During 2012 the real GDP of New York state grew by 1.3 percent, which was below the national real GDP growth rate of 2.5 percent.

As presented in Table 2-11, the health care and social assistance sector and retail trade sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the nineteen counties include the professional, scientific, and technical services sector and the finance and insurance sector.

Table 2-9. Employment Profile by Industry Sector in Hudson Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	1,627	70,161	230	1,429	43,839
21	Mining, quarrying, and oil and gas extraction	153	9,555	77	1,140	43,109
22	Utilities	965	36,328	296	31,862	943,317
23	Construction	92,100	3,461,511	26,924	195,132	12,802,415
31-33	Manufacturing	11,468	567,115	9,874	187,745	8,508,830
42	Wholesale trade	25,175	2,697,270	25,358	264,553	18,300,529
44-45	Retail trade	79,179	3,585,830	53,744	570,498	17,096,492
48-49	Transportation and warehousing	90,369	4,155,150	8,955	173,191	7,978,183
51	Information	24,618	1,062,270	8,633	223,191	21,202,099
52	Finance and insurance	35,955	3,509,432	19,838	439,536	95,138,681
53	Real estate and rental and leasing	132,405	16,055,787	25,959	136,685	7,643,497
54	Professional, scientific, and technical services	188,290	9,410,814	44,364	446,160	42,075,395
55	Management of companies and enterprises	0	0	1,999	150,162	21,448,657
56	Administrative and support and waste management and remediation services	79,487	1,719,238	16,564	296,864	12,743,036
61	Educational services	35,408	563,816	5,831	275,897	11,522,726
62	Health care and social assistance	141,502	4,544,196	39,677	997,045	46,045,570
71	Arts, entertainment, and recreation	100,047	3,322,785	8,329	116,253	5,514,298
72	Accommodation and food services	24,532	731,989	33,884	433,268	10,492,163
81	Other services (except public administration)	175,612	3,888,930	38,704	256,725	9,368,380
99	Industries not classified	0	0	717	898	18,771
	TOTAL	**1,238,892**	**59,392,177**	**369,957**	**5,198,234**	**348,929,987**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

Commercial fishing is also an important economic component in Monmouth County. The port of Belford, New Jersey, is found here. Table 2-13 shows the most recent commercial landings data (volume and value) available at this port.

Table 2-10. Volume and Value of Commercial Landings at Ports in Connecticut River Unit

Port	Millions of lbs	Millions $
Belford, NJ [1]	2.7	2.2

[1] 2003 landings data

Source: NMFS Office of Science and Technology

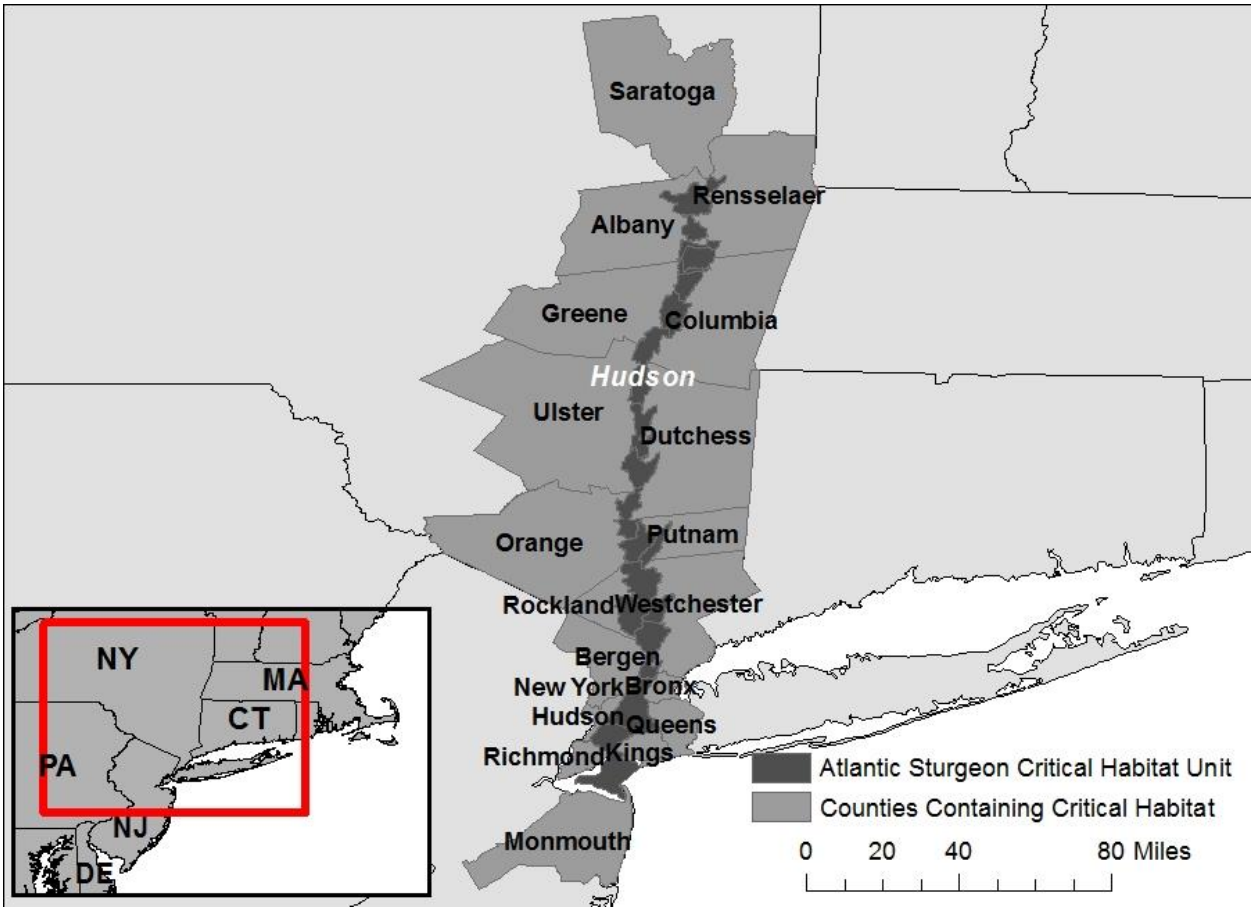


Figure 2-8. Location Map of Hudson Critical Habitat Unit

2.1.2.4 Delaware Critical Habitat Unit

The Delaware Critical Habitat Unit is located in the states of Delaware, Pennsylvania, and New Jersey, and occurs within Kent, New Castle and Sussex counties in Delaware, Bucks, Delaware and Philadelphia counties in Pennsylvania, and Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, and Salem counties in New Jersey (Figure 2-9). According to the U.S. Census Bureau, the three counties in Delaware, three counties in Pennsylvania, and seven counties in New Jersey comprise a total area of 6,727 square miles (17,424 square kilometers). Nearly 82 percent (5,504 square miles or 14,256 square kilometers) of the total area is land and the remaining 18 percent (1,223 square miles or 3,168 square kilometers) is water. Major cities include Wilmington, Delaware, Philadelphia, Pennsylvania, and Trenton and Camden, New Jersey.

Based on U.S. Census Bureau estimates, the total population of the thirteen counties increased from 5,300,458 in July 2000 to 5,545,606 persons in April 2010; an increase of 245,148 persons (4.6 percent) over the 11-year period. In 2010, the total number of occupied housing units was reported to be 2,098,339, an increase of 5.7 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.1 percent to 4.5 percent in the counties within the unit.

Median household income in 2011 was reported to be between $36,957 and $77,798 in the counties that make up the unit, and between 5.2 percent and 25.6 percent of the county population lived below the poverty level, in comparison to the statewide Delaware median household income of $59,317 and poverty rate of 11.2 percent, Pennsylvania median household income of $51,651 and poverty rate of 12.6 percent, and New Jersey median household income of $71,180 and poverty rate of 9.4 percent.

According to the U.S. Census, the population in the thirteen counties in Delaware, New Jersey, and Pennsylvania where this Critical Habitat Unit is located grew by 0.9 percent in 2012, which was near the weighted average population growth rate of 0.7 percent in the three states where it is located, and significantly below the national average of 1.7 percent. During 2012 the real GDP of these three states grew by an average of 1.5 percent, which was below the national GDP growth rate of 2.5 percent.

As presented in Table 2-13, the health care and social assistance sector and retail trade sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the thirteen counties include the accommodations and food services sector and the professional, scientific, and technical services sector.

Table 2-11. Employment Profile by Industry Sector in Delaware Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	1,493	83,398	131	1,411	19,018
21	Mining, quarrying, and oil and gas extraction	16	1,371	55	497	32,881
22	Utilities	315	9,306	183	11,253	617,412
23	Construction	33,460	1,966,825	10,986	78,046	4,571,220
31-33	Manufacturing	3,608	202,557	4,312	143,839	8,175,075
42	Wholesale trade	5,766	573,333	6,411	102,464	7,663,728
44-45	Retail trade	27,090	1,376,266	19,145	262,746	6,793,238
48-49	Transportation and warehousing	13,805	763,960	2,984	73,166	2,947,790
51	Information	5,042	204,581	2,044	61,479	4,517,729
52	Finance and insurance	11,038	810,546	7,657	122,922	10,111,268
53	Real estate and rental and leasing	39,983	3,646,008	4,632	32,924	1,567,696
54	Professional, scientific, and technical services	53,235	2,550,445	14,545	148,807	11,687,179
55	Management of companies and enterprises	0	0	1,779	50,444	4,952,366
56	Administrative and support and waste management and remediation services	23,753	602,538	6,901	131,574	4,814,057
61	Educational services	10,902	158,521	1,866	134,895	5,904,478
62	Health care and social assistance	32,270	967,684	15,378	412,263	18,127,343
71	Arts, entertainment, and recreation	19,621	462,798	1,910	36,532	1,357,428
72	Accommodation and food services	5,678	288,765	12,876	180,786	3,366,385
81	Other services (except public administration)	41,877	1,125,243	13,372	95,637	2,755,404
99	Industries not classified	0	0	174	210	3,705
	TOTAL	**328,952**	**15,794,145**	**127,341**	**2,081,895**	**99,985,400**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

Commercial fishing is also an important economic component in the Delaware River Unit. The port of Cape May-Wildwood, New Jersey, is found here. Table 2-15 shows the most recent commercial landings data (volume and value) available at this port.

Table 2-12. Volume and Value of Commercial Landings at Ports in Delaware Critical Habitat Unit

Port	Millions of lbs	Millions $
Cape May-Wildwood, NJ [1]	27.8	71.7

[1] 2012 landings data

Source: NMFS Office of Science and Technology

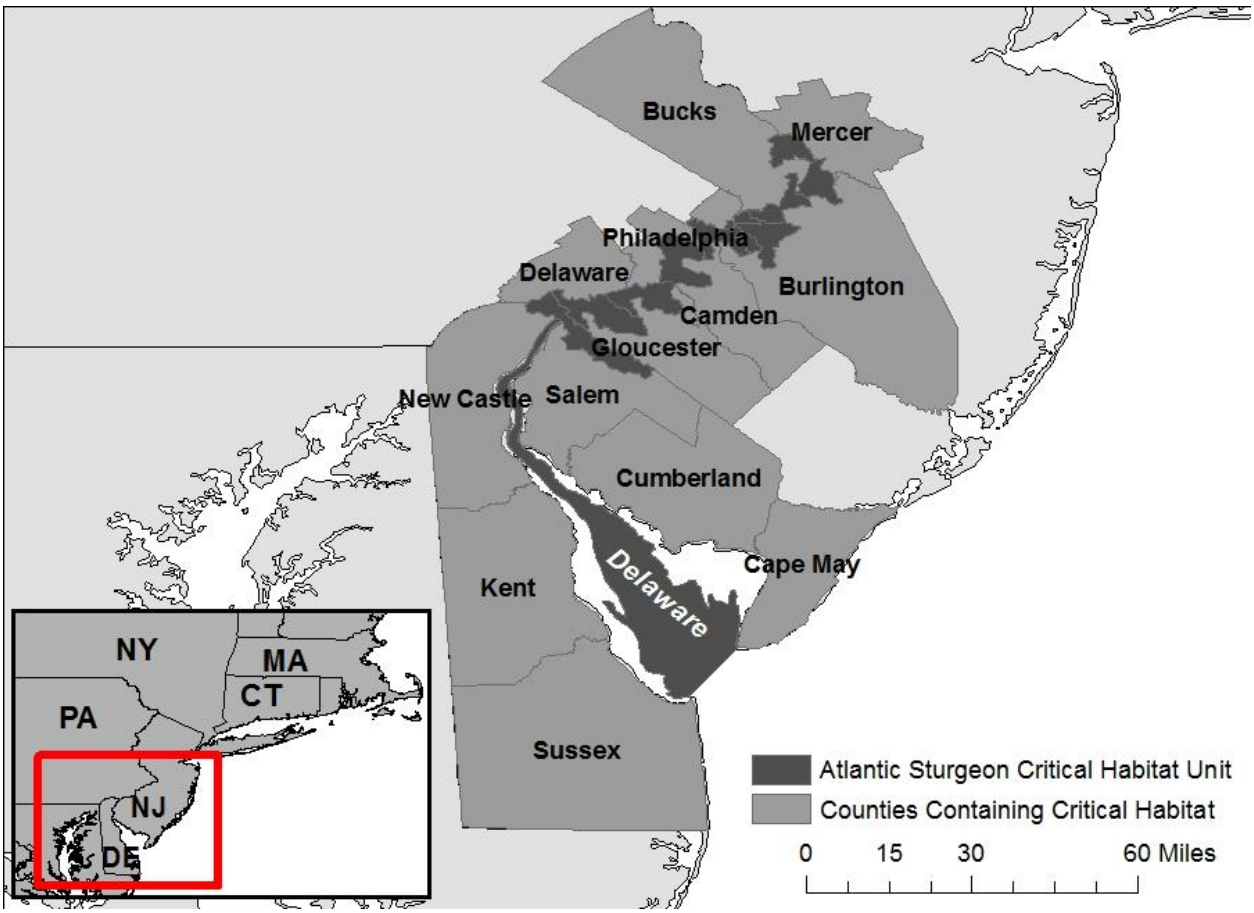


Figure 2-9. Location Map of Delaware Critical Habitat Unit

2.1.3 Chesapeake Bay DPS

2.1.3.1 Nanticoke Critical Habitat Unit

The Nanticoke Critical Habitat Unit is located in the state of Maryland, and occurs within Dorchester and Wicomico counties. According to the U.S. Census Bureau, the two counties comprise a total area of 1,383 square miles (2,222 square kilometers). Nearly 66 percent (915 square miles or 1,473 square kilometers) of the total area is land. The largest city in each county is Cambridge and Salisbury.

Based on U.S. Census Bureau estimates, the total population of the two counties increased from 131,592 in July 2000 to 132,807 persons in April 2010; an increase of 1,215 persons over the 11-year period. In 2010, the total number of occupied housing units was reported to be 50,742, an increase of approximately 11 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 9.6 percent to 10.1 percent in the counties within the unit.

Median household income in 2011 was reported to be between $34,077 and $39,035 in the counties that make up the unit, and approximately 13.0 percent of the population in each county lived below the poverty level, in comparison to the statewide Maryland median household income of $72,419 and poverty rate of 9.0 percent.

According to the U.S. Census, the population in the two Maryland counties that make up this Critical Habitat Unit grew by less than 1 percent, and about 2 percent in 2012. The average Maryland population growth rate is 1.9 percent, and the national average of 1.7 percent.

As presented in Table 2-15, the retail trade sector and health care and social assistance sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the two counties include the construction sector, and the accommodation and food services sector.

Table 2-13. Employment Profile by Industry Sector in Nanticoke Unit Counties (2011)

NAICS Code	Industry Code Description	Number of Employees	Annual Payroll ($1,000)
11	Agriculture, forestry, fishing and hunting	17	$6,836
21	Mining, quarrying, and oil and gas extraction	4	$575, D
22	Utilities	7	D
23	Construction	337	$88,256
31-33	Manufacturing	127	$212,133
42	Wholesale trade	160	$77,215
44-45	Retail trade	500	$174,831
48-49	Transportation and warehousing	143	$65,411
51	Information	58	$47,670, D
52	Finance and insurance	181	$63,491
53	Real estate and rental and leasing	149	$21,968
54	Professional, scientific, and technical services	270	$65,000
55	Management of companies and enterprises	13	D
56	Administrative and support and waste management and remediation services	173	$64,477
61	Educational services	31	$9,833, D
62	Health care and social assistance	424	$431,683
71	Arts, entertainment, and recreation	39	$5,130
72	Accommodation and food services	262	$71,857
81	Other services (except public administration)	336	$43,762
99	Industries not classified	1	D
	Total	3,232	$1,576,953

Source: U.S. Census Bureau, 2011 County Business Patterns

2.1.3.2 Potomac Critical Habitat Unit

The Potomac Critical Habitat Unit is located in the states of Virginia and Maryland and the District of Columbia, and occurs within Arlington, Fairfax, King George, Loudoun, Northumberland, Prince William, Stafford, and Westmoreland counties and Alexandria and Falls Church cities in Virginia and Charles, Montgomery, Prince George's, and St. Mary's counties in Maryland (Figure 2-10). According to the U.S. Census Bureau, these counties and cities comprise a total area of 4,807square miles (12,450 square kilometers). Nearly 84 percent (4,032 square miles or 10,443 square kilometers) of the total area is land and the remaining 16 percent (775 square miles or 2 007 square kilometers) is water. Major cities include Washington, DC, Arlington and Alexandria, Virginia, and Bethesda, Maryland. Other significant populated places include McLean and Baileys Crossroads, Virginia, and Potomac, Suitland, and Fort Washington, Maryland.

Based on U.S. Census Bureau estimates, the total population of the counties and cities increased from 4,340,172 in July 2000 to 5,026,915 persons in April 2010; an increase of 686,743 persons (15.8 percent) over the 11-year period. In 2010, the total number of occupied housing units was reported to be 1,877,890, an increase of 15 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.1 percent to 4.1 percent in the counties within the unit.

Median household income in 2011 was reported to be between $51,256 and $120,332 in the counties that make up the unit, and between 3.4 percent and 18.2 percent of the county population lived below the poverty level, in comparison to the statewide Virginia median household income of $63,302 and poverty rate of 10.7 percent, Maryland median household income of $72,419 and poverty rate of 9.0 percent, and District of Columbia median household income of $61,835 and poverty rate of 18.2 percent.

According to the U.S. Census, the populations in the District of Columbia and the counties and cities in Maryland and Virginia where this Critical Habitat Unit is located grew by a weighted average rate of 4.1 percent in 2012. This was near the average population growth rate of 4.2 percent in DC, MD, and VA, and significantly higher than the national average of 1.7 percent. During 2012 the real GDP in Washington, DC, Maryland, and Virginia, where this unit is located, grew by an average of 1.5 percent, which was below the national real GDP growth rate of 2.5 percent.

As presented in Table 2-16, the professional, scientific, and technical services sector and health care and social assistance sector were the two largest employment sectors in these counties and cities in 2011. Other major employment sectors in the counties and cities along the Potomac include the retail trade sector and the administrative and support and waste management and remediation services sector.

Table 2-14. Employment Profile by Industry Sector in Potomac Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	1,159	33,037	106	437	7,853
21	Mining, quarrying, and oil and gas extraction	62	4,455	38	752	17,181
22	Utilities	258	10,423	133	6,155	250,198
23	Construction	34,860	1,963,367	9,569	117,776	6,956,623
31-33	Manufacturing	2,974	120,051	1,647	35,555	1,824,571
42	Wholesale trade	4,130	340,632	3,676	52,404	4,010,917
44-45	Retail trade	24,068	856,773	13,804	223,722	6,267,344
48-49	Transportation and warehousing	22,449	843,225	2,019	45,479	1,997,804
51	Information	8,494	330,229	3,162	96,882	9,925,111
52	Finance and insurance	9,647	782,368	6,341	88,651	8,682,955
53	Real estate and rental and leasing	40,522	3,957,798	5,996	46,965	2,831,819
54	Professional, scientific, and technical services	91,661	5,134,819	27,836	492,967	47,503,921
55	Management of companies and enterprises	0	0	1,151	46,208	4,799,745
56	Administrative and support and waste management and remediation services	33,911	811,178	7,369	218,247	9,462,022
61	Educational services	16,279	261,516	2,400	86,761	3,687,112
62	Health care and social assistance	39,708	1,331,373	13,200	252,388	12,327,228
71	Arts, entertainment, and recreation	24,235	499,580	1,682	34,934	1,121,021
72	Accommodation and food services	6,353	189,826	10,381	213,232	4,509,842
81	Other services (except public administration)	53,582	1,405,162	14,275	173,887	9,640,831
99	Industries not classified	0	0	323	314	6,526
	TOTAL	**414,352**	**18,875,812**	**125,108**	**2,233,716**	**135,830,624**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

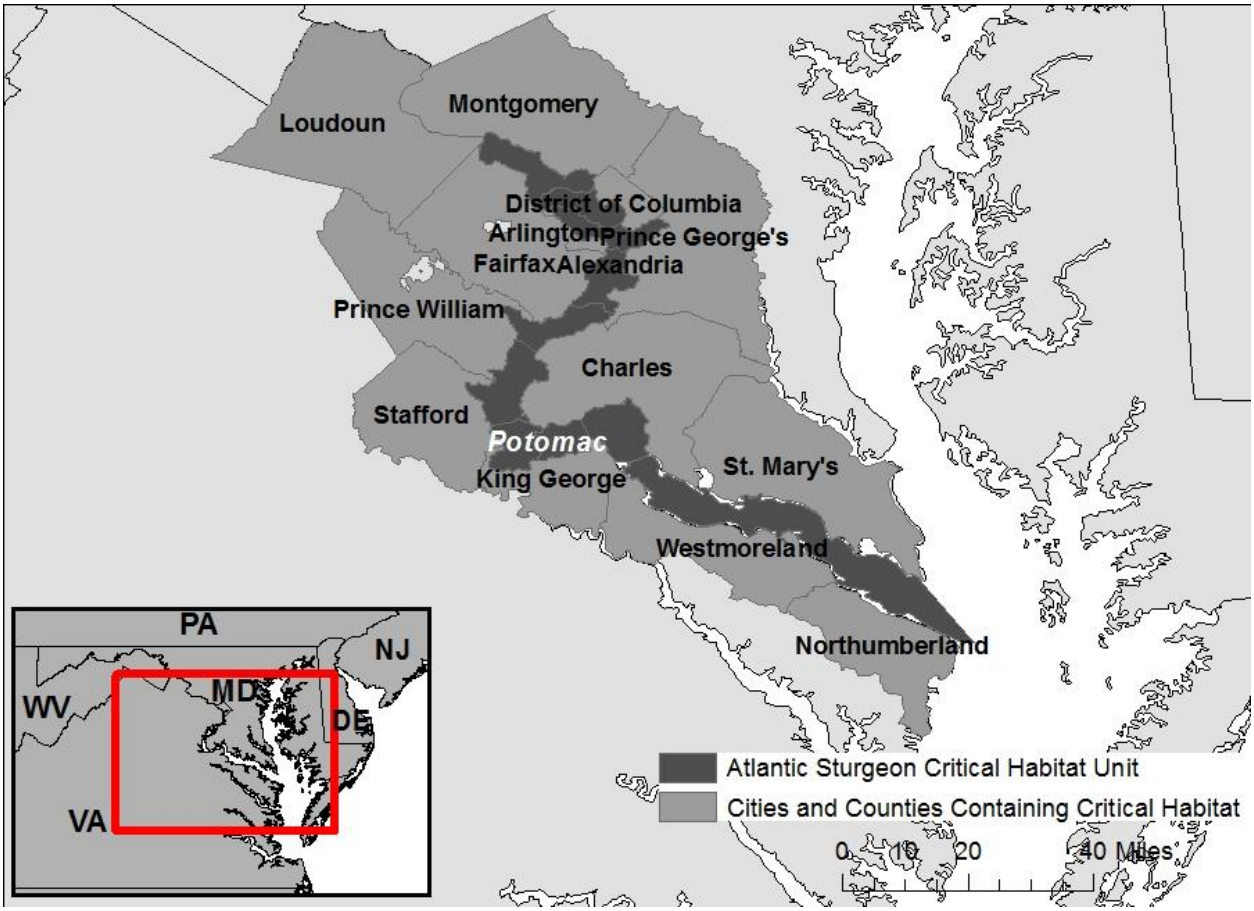


Figure 2-10. Location Map of Potomac Critical Habitat Unit

2.1.3.3 Rappahannock Critical Habitat Unit

The Rappahannock Critical Habitat Unit is located in the state of Virginia, and occurs within Caroline, Essex, King George, Lancaster, Middlesex, Richmond, Spotsylvania, Stafford, and Westmoreland counties and the city of Fredericksburg (Figure 2-11). According to the U.S. Census Bureau, the nine counties and one city comprise a total area of 2,626 square miles (6,802 square kilometers). Nearly 89 percent (2,336 square miles or 6,050 square kilometers) of the total area is land and the remaining 11 percent (290 square miles or 752 square kilometers) is water. The largest cities are Fredericksburg, King George, Falmouth and Tappahannock, Virginia.

Based on U.S. Census Bureau estimates, the total population of the nine counties and one city increased from 298,059 in July 2000 to 387,982 persons in April 2010; an increase of 89,923 persons (30.2 percent) over the 10-year period. In 2010, the total number of occupied housing units was reported to be 137,007, an increase of 28 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.6 percent to 4.1 percent in the counties within the unit.

Median household income in 2011 was reported to be between $44,498 and $94,658 in the counties that make up the unit, and between 4.4 percent and 16.1 percent of the county population lived below the poverty level, in comparison to the statewide Virginia median household income of $63,302 and poverty rate of 10.7 percent.

According to the U.S. Census, the population in the nine Virginia counties and one Virginia city where this Critical Habitat Unit is located grew by 2.8 percent in 2012. This was slightly higher than the state

population growth rate of 2.3 percent and significantly above the national average of 1.7 percent. During 2012 the real GDP of Virginia grew by 1.1 percent, which was below the national real GDP growth rate of 2.5 percent.

As presented in Table 2-17, the retail trade sector and health care and social assistance sector were the two largest employment sectors in these counties and city in 2011. Other major employment sectors in the nine counties and one city include the accommodation and food services sector and the professional, scientific, and technical services sector.

Table 2-15. Employment Profile by Industry Sector in Rappahannock Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	406	11,166	27	153	2,265
21	Mining, quarrying, and oil and gas extraction	5	557	7	150	D
22	Utilities	13	484	19	725	D
23	Construction	3,429	178,965	1,043	5,708	242,504
31-33	Manufacturing	263	8,486	209	4,318	152,020
42	Wholesale trade	316	19,634	263	2,866	114,771
44-45	Retail trade	2,197	73,817	1,299	19,336	468,770
48-49	Transportation and warehousing	1,029	67,501	257	2,974	108,813
51	Information	262	7,282	124	1,807	54,340
52	Finance and insurance	383	15,953	404	6,095	104,416
53	Real estate and rental and leasing	2,706	188,985	333	1,345	42,536
54	Professional, scientific, and technical services	2,902	114,661	997	11,354	839,162
55	Management of companies and enterprises	0	0	38	1,405	21,060
56	Administrative and support and waste management and remediation services	2,202	46,201	412	4,354	112,048
61	Educational services	636	8,138	89	1,107	23,957
62	Health care and social assistance	1,529	33,308	701	15,462	658,219
71	Arts, entertainment, and recreation	1,161	17,881	148	2,226	28,627
72	Accommodation and food services	295	8,119	726	13,052	179,887
81	Other services (except public administration)	3,356	86,440	992	5,854	139,116
99	Industries not classified	0	0	10	23	74
	TOTAL	**23,090**	**887,578**	**8,098**	**100,314**	**3,292,585**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

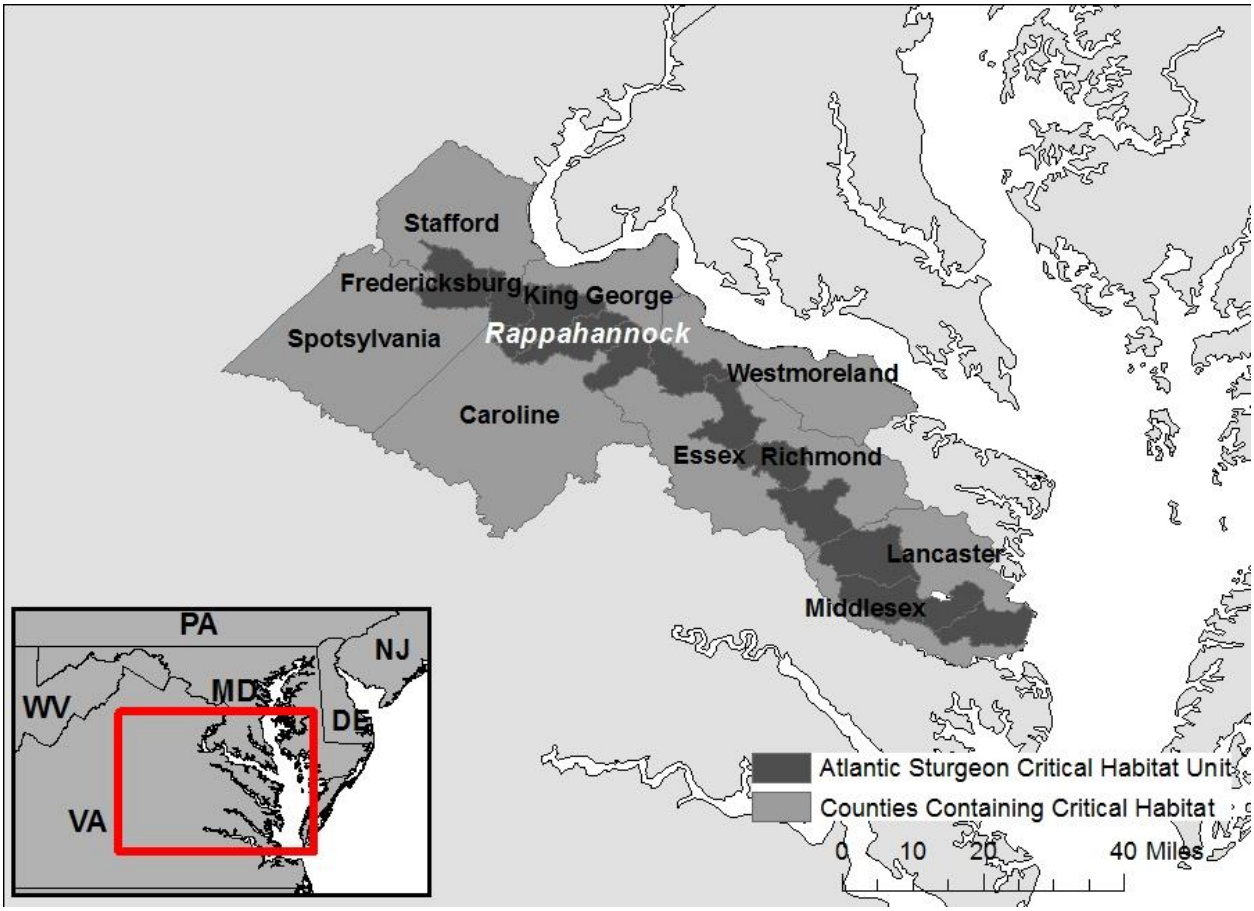


Figure 2-4. Location Map of Rappahannock Critical Habitat Unit

2.1.3.4 York-Mattaponi-Pamunkey Critical Habitat Unit

The York Critical Habitat Unit is located in the state of Virginia, and occurs within Gloucester, Hanover, James City, King and Queen, King William, New Kent and York counties (Figure 2-12). According to the U.S. Census Bureau, the seven counties comprise a total area of 1,993 square miles (5,161 square kilometers). Nearly 87 percent (1,739 square miles or 4,504 square kilometers) of the total area is land and the remaining 13 percent (254 square miles or 657 square kilometers) is water. The largest cities include Mechanicsville, Gloucester Point, and West Point, Virginia.

Based on U.S. Census Bureau estimates, the total population of the seven counties increased from 258,737 in July 2000 to 310,503 persons in April 2010; an increase of 51,766 persons (20 percent) over the 10-year period. In 2010, the total number of occupied housing units was reported to be 117,272, an increase of 23 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.7 percent to 2.3 percent in the counties within the unit.

Median household income in 2011 was reported to be between $48,170 and $83,747 in the counties that make up the unit, and between 4.1 percent and 9.7 percent of the county population lived below the poverty level, in comparison to the statewide Virginia median household income of $63,302 and poverty rate of 10.7 percent.

According to the U.S. Census, the population in the seven Virginia counties where this Critical Habitat Unit is located grew by 1.5 percent in 2012, which was significantly below the state population growth

rate of 2.3 percent and slightly below the national average of 1.7 percent. During 2012 the real GDP of Virginia grew by 1.1 percent, which was below the national real GDP growth rate of 2.5 percent.

As presented in Table 2-18, the retail trade sector and accommodation and food services sector were the two largest employment sectors in these counties in 2011. Other major employment sectors in the seven counties include the health care and social assistance sector and the construction sector.

Table 2-16. Employment Profile by Industry Sector in York Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	375	13,271	51	1,059	4,834
21	Mining, quarrying, and oil and gas extraction	D	D	10	180	6,468
22	Utilities	4	20	13	365	D
23	Construction	2,544	158,221	1,306	8,664	348,158
31-33	Manufacturing	259	9,725	227	5,816	258,827
42	Wholesale trade	342	22,436	382	5,363	244,682
44-45	Retail trade	1,953	65,419	1,107	16,460	378,674
48-49	Transportation and warehousing	535	31,718	165	2,306	79,470
51	Information	218	4,379	95	795	17,024
52	Finance and insurance	694	38,762	370	2,115	98,751
53	Real estate and rental and leasing	2,694	178,566	311	1,232	45,355
54	Professional, scientific, and technical services	3,275	131,459	792	4,225	208,706
55	Management of companies and enterprises	0	0	30	2,201	27,996
56	Administrative and support and waste management and remediation services	1,701	35,832	519	5,925	218,661
61	Educational services	729	12,815	77	2,555	3,905
62	Health care and social assistance	1,155	36,514	615	11,146	452,029
71	Arts, entertainment, and recreation	1,231	18,824	148	6,080	40,961
72	Accommodation and food services	236	9,378	582	11,907	183,196
81	Other services (except public administration)	2,767	74,117	867	4,981	118,526
99	Industries not classified	0	0	10	21	41
	TOTAL	**20,712**	**841,456**	**7,677**	**93,396**	**2,736,264**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

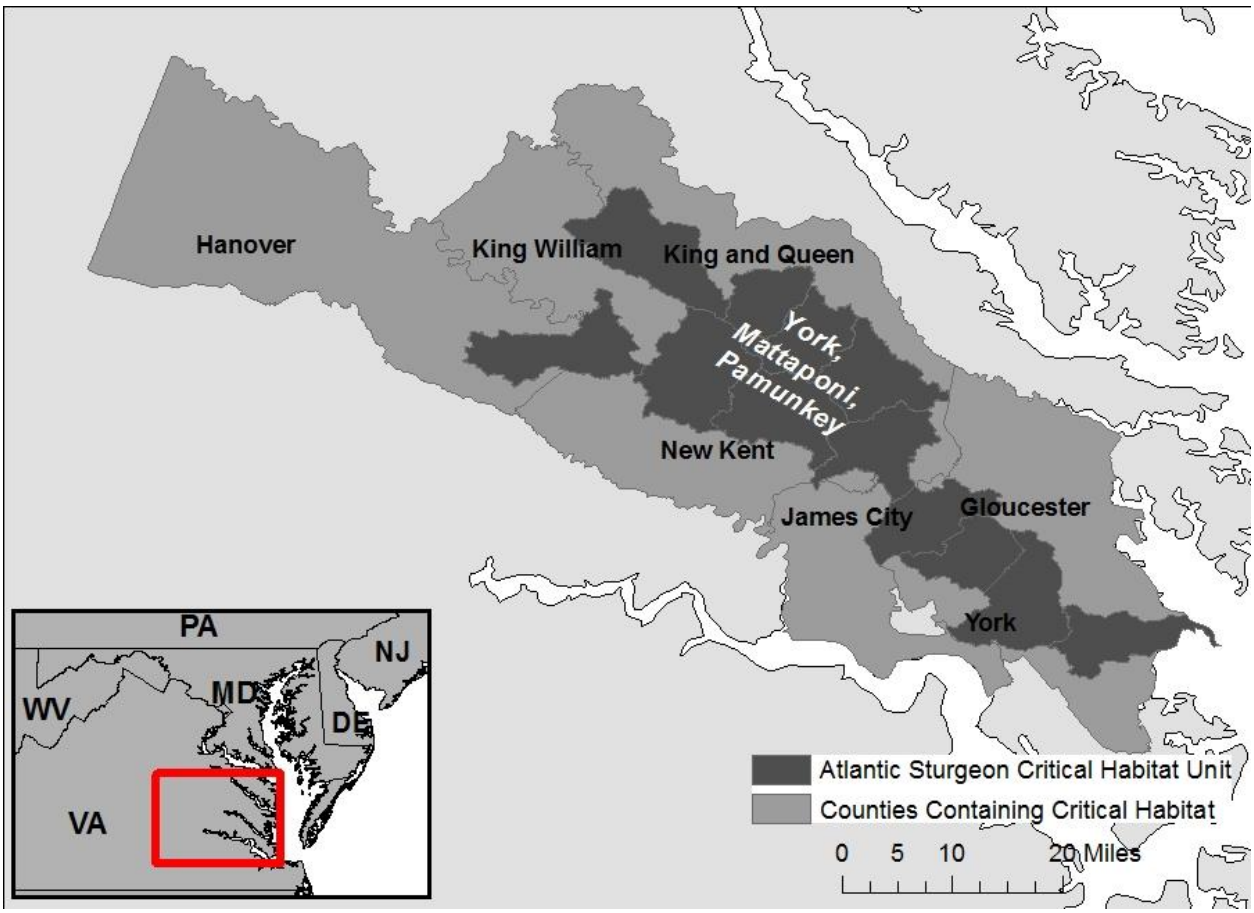


Figure 2-5. Location Map of York Critical Habitat Unit

2.1.3.5 James Critical Habitat Unit

The James Critical Habitat Unit is located in the state of Virginia, and occurs within Charles City, Chesterfield, Dinwiddie, Henrico, Isle of Wight, James City, Prince George, and Surry counties and Colonial Heights, Hampton, Hopewell, Newport News, Norfolk, Petersburg, Portsmouth, Richmond, Suffolk, and Williamsburg cities (Figure 2-13). According to the U.S. Census Bureau, the eight counties and ten cities comprise a total area of 3,683square miles (9,540 square kilometers). Nearly 86 percent (3,176 square miles or 8,225 square kilometers) of the total area is land and the remaining 14 percent (508 square miles or 1,315 square kilometers) is water. Major cities include Norfolk, Richmond, Newport News, Hampton, and Portsmouth, Virginia. Other significant populated places include Tuckahoe, Petersburg, Hopewell, and Chester, Virginia.

Based on U.S. Census Bureau estimates, the total population of the eight counties and ten cities increased from 1,735,676 in July 2000 to 1,900,736 persons in April 2010; an increase of 165,060 persons (9.5 percent) over the 10-year period. In 2010, the total number of occupied housing units was reported to be 734,733, an increase of 10 percent over 2000 levels. The homeowner vacancy rate in 2010 ranged from 1.1 percent to 4.6 percent in the counties within the unit.

Median household income in 2011 was reported to be between $36,289 and $83,747 in the counties that make up the unit, and between 4.1 percent and 26.3 percent of the county population lived below the poverty level, in comparison to the statewide Virginia median household income of $63,302 and poverty rate of 10.7 percent.

According to the U.S. Census, the population in the eight Virginia counties and ten Virginia cities where this Critical Habitat unit is located grew by 1.4 percent in 2012, which was significantly slower than the state population growth rate of 2.3 percent, and below the national average of 1.7 percent. During 2012 the real GDP of Virginia grew by 1.1 percent, which was below the national GDP growth rate of 2.5 percent.

As presented in Table 2-19, the health care and social assistance sector and retail trade sector were the two largest employment sectors in these cities and counties in 2011. Other major employment sectors in the eight counties and ten cities include the accommodation and food services sector and the professional, scientific, and technical services sector.

Table 2-19. Employment Profile by Industry Sector in James Unit Counties (2011)

NAICS Code[a]	Industry Code Description	Non-Employer Establishments[b]	Non-Employer Receipts ($1,000)[c]	Employer Establishments[d]	Number of Employees[e]	Annual Payroll ($1,000)[f]
11	Agriculture, forestry, fishing and hunting	535	30,847	54	576	3,477
21	Mining, quarrying, and oil and gas extraction	12	298	18	309	481
22	Utilities	37	1,588	84	8,369	9,378
23	Construction	9,948	505,607	3,825	37,830	1,668,058
31-33	Manufacturing	1,033	36,735	1,101	45,688	2,174,186
42	Wholesale trade	1,492	97,599	1,970	28,212	1,632,795
44-45	Retail trade	8,409	259,024	6,769	100,645	2,342,576
48-49	Transportation and warehousing	3,899	205,622	1,058	25,917	976,986
51	Information	1,316	33,516	854	17,189	843,595
52	Finance and insurance	3,551	192,085	2,912	46,965	3,517,448
53	Real estate and rental and leasing	13,018	1,182,132	2,002	13,747	568,497
54	Professional, scientific, and technical services	13,812	518,808	5,146	59,746	3,701,463
55	Management of companies and enterprises	0	0	314	15,828	1,479,847
56	Administrative and support and waste management and remediation services	9,091	163,304	2,298	53,329	1,907,432
61	Educational services	3,232	41,796	548	15,702	396,451
62	Health care and social assistance	9,707	220,076	4,501	116,085	5,315,020
71	Arts, entertainment, and recreation	6,328	87,007	617	15,865	184,167
72	Accommodation and food services	1,650	68,423	4,069	80,691	1,192,585
81	Other services (except public administration)	18,146	388,664	4,908	42,355	1,131,402
99	Industries not classified	0	0	77	149	1,272
	TOTAL	**105,216**	**4,033,131**	**43,125**	**725,197**	**29,047,116**

See footnotes in Table 2-2.

Source: U.S. Census Bureau, 2011 County Business Patterns

Commercial fishing is also an important economic component in the James River Unit. The Hampton Roads Area (Virginia) port is found here. Table 2-21 shows the most recent commercial landings data (volume and value) available at this port.

Table 2-20. Volume and Value of Commercial Landings at Ports in James Unit

Port	Millions of lbs	Millions $
Hampton Roads Area, VA[1]	13.5	64.1

[1] 2012 landings data

Source: NMFS Office of Science and Technology

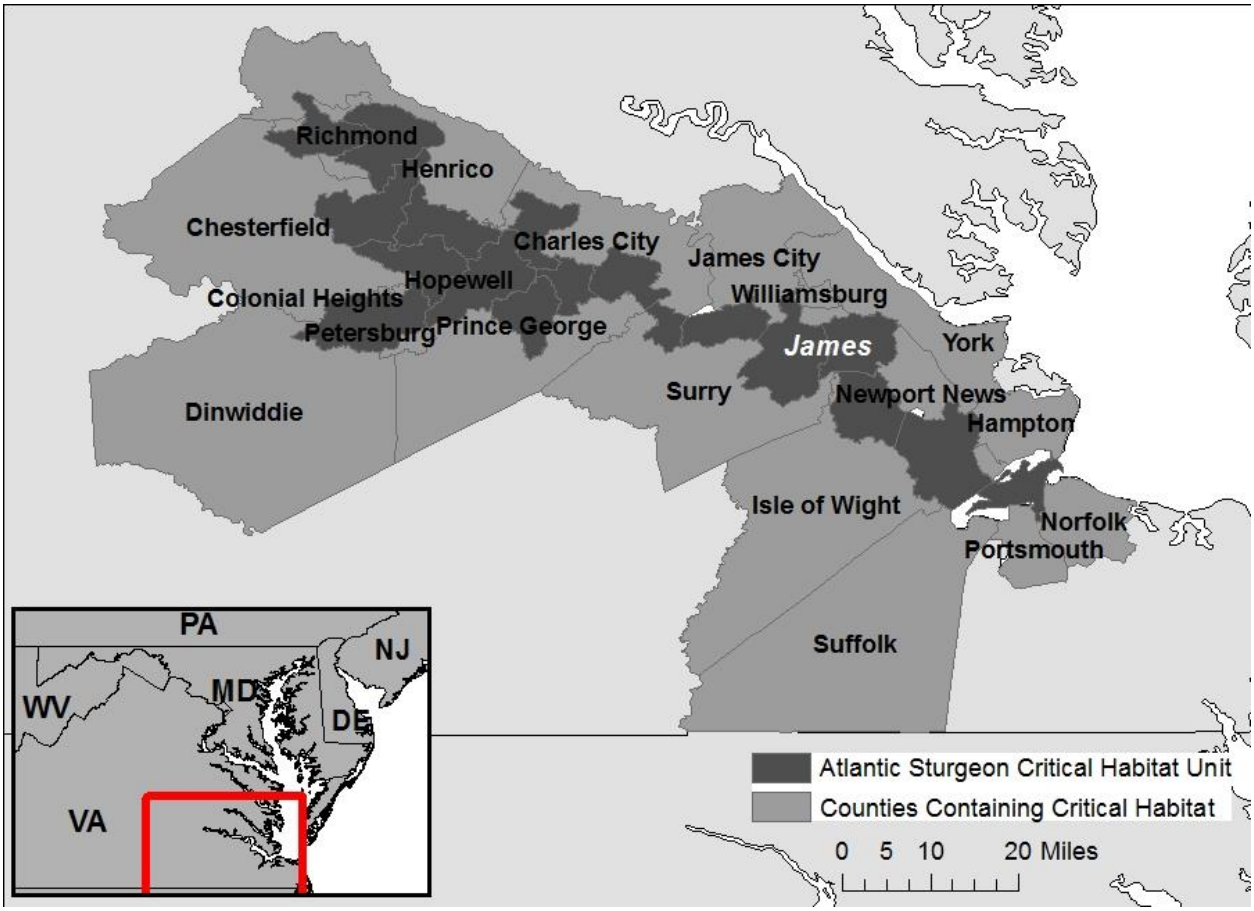


Figure 2-13. Location Map of James Critical Habitat Unit

2.2 Existing Laws and Regulations that May Protect Critical Habitat Features

The essential features that form the basis of the critical habitat designation for the three northern DPSs of Atlantic sturgeon are generalized as: water quality, water depth, substrate, salinity, and a lack of physical barriers. Existing federal, state, and local laws and regulations that provide some protection for the specific habitat features form the regulatory baseline (or without Section 7) conditions for assessing the incremental impacts of the critical habitat designation. These laws and regulations may also influence the outcomes and impacts of Section 7 consultation or any project modifications that result from those consultations.

Federal laws that provide the most protection for these habitat features include Sections 401 and 404 of the Clean Water Act (CWA), Section 10 of the Rivers and Harbors Act (RHA), and the National Park Service Organic Act. State laws and county and local regulations, zoning ordinances and permitting requirements can also directly or indirectly provide protections to some of these features. Protected areas, such as Federal and State parks, provide additional protection within their borders. The following subsections describe regulatory baseline protections that are provided in all designated areas by federal laws and regulations, and in each specific designated area by state laws and regulations and local ordinances and protected areas.

3.1.1 Federal Laws and Regulations

The critical habitat provisions of the ESA focus on species recovery and, in this application, are intended to provide protection to Atlantic sturgeon beyond what is provided by other federal and state regulations.

Table 2-21 lists and describes specific federal laws and regulations that may already offer some protection for Atlantic sturgeon habitat.

Table 2-21. Federal laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
Endangered Species Act	The freshwater, estuarine and marine habitats of the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs of Atlantic sturgeon currently receive some level of protection through the Section 7 consultation process due to each DPS's ESA status. Under the Section 7 consultation process, habitat impacts are evaluated to determine if the proposed impacts may result in harm or take of the ESA-listed entity (e.g., DPS in the case of Atlantic sturgeon) by "impairing essential behavioral patterns," such as feeding or sheltering (50 CFR §222.102). In the absence of a critical habitat designation, habitat impacts that constitute take of Atlantic sturgeon belonging to a particular DPS could only be addressed through Section 7 if the impacts would jeopardize the continued existence of that DPS of Atlantic sturgeon, by appreciably reducing the likelihood of both survival and recovery (50 CFR §402.02). Lesser impacts to habitat that constitute incidental take of ESA-listed Atlantic sturgeon could be minimized through reasonable and prudent measures (RPMs) identified in biological opinions. In contrast, habitat features identified through the critical habitat designation are protected from destruction or adverse modification through Section 7 consultation, based on the effects on the habitat's ability to conserve the listed species and not on impacts to both the survival and recovery of the species itself. Gulf of Maine DPS Atlantic sturgeon occupy some of the same habitats as Atlantic salmon. http://www.fws.gov/endangered/laws-policies/
National Environmental Policy Act	Federal agencies and others using federal funds or assets must comply with the requirements of the National Environmental Policy Act (NEPA) to assess the environmental impacts of major federal projects or decisions such as issuing permits, spending federal money, or affecting federal lands. An Environmental Impact Statement (EIS) is prepared and made available for public comment for projects that the federal agency views as having potentially significant environmental impacts. In-water construction activities and activities that affect water quantity or quality, substrate conditions, or that block fish passages have typically been subject to NEPA. EISs associated with these projects have considered potential environmental impacts, including impacts on Atlantic sturgeon, Atlantic salmon, and other fish species that occupy or use areas designated as critical habitat, as well as potential impacts on the features of those habitats. http://www.epa.gov/compliance/nepa/
Clean Water Act	The broad goal of the CWA is to have water bodies that have, wherever attainable, water quality that provides for the protection and propagation of fish, shellfish, and wildlife, and supports recreation in and on the water ("fishable/swimmable"). When the Army Corps of Engineers issues permits for

	the discharge of material into navigable waters, the US Environmental Protection Agency (EPA) is authorized to prohibit the use of a site for disposal based on a determination that discharges would have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas, wildlife, or recreational uses. Under Section 303(d) of the CWA, states, territories, and authorized tribes are required to develop lists of impaired waters. These are waters for which technology-based regulations and other required controls are not stringent enough to meet the water quality standards set by states. The law requires that states establish priority rankings for waters on the lists and develop Total Maximum Daily Loads (TMDLs), for these waters. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards. TMDLs are established for nutrient, pathogens, mercury, and other metals which protects water quality, and for sediments which affect both water quality and substrate features that are critical habitat features. Under Section 303d water quality standards define the goals for a water body and consist of four basic elements: designated uses (*e.g.* recreation, water supply, aquatic life, agriculture), water quality criteria to protect designated uses (numeric pollutant concentrations and narrative requirements), an antidegradation policy to maintain and protect existing uses and high quality waters, and general policies addressing implementation issues (*e.g.*, low flows, variances, mixing zones). These standards provide significant protection for the critical habitat features of Atlantic sturgeon. Section 401 of the CWA may provide additional protection to critical habitat by requiring that all applicants for a federal license or permit to conduct activity that may result in discharge to navigable waters submit a state certification to the licensing or permitting agency. The state certification must establish that the discharge complies with the requirements of Sections 301, 302, 303, 306, and 307 of the CWA. Section 404 of the Clean Water Act requires parties to obtain a permit from the Corps prior to discharging dredge or fill material into "water of the United States." In-water and coastal construction activities occurring within the critical habitat areas may require Section 404 permitting. The Corps' review of projects for the issuance of Section 404 permits requires Section 7 consultation with NMFS and USFWS under the Act to the extent that a project may affect listed species or critical habitat. As part of the Section 404 permit process, the Corps reviews the potential effects of the proposed action on plant and animal populations and recommends efforts to avoid adverse effects to these populations in addition to the wetlands and water systems on which they depend. In general, CWA-based conservation efforts for plants and animals include: • Select sites or manage discharges to ensure that habitat remains suitable for indigenous species; • Avoid sites having unique habitat or other value, including habitat of threatened or endangered species;

	• Utilize habitat development and restoration techniques to minimize adverse impacts and compensate for destroyed habitat; • Time discharge to avoid biologically critical time periods; and • Avoid the destruction of remnant natural sites within areas already affected by development. Section 404 of the CWA also includes a permit program for the discharge of dredged or fill material into navigable waters that requires permit applicants to show that they have "taken steps to avoid wetland impacts, where practicable, minimized potential impacts to wetlands, and provided compensation for any remaining, unavoidable impacts through activities to restore or recreate wetlands." These steps frequently involve project modifications that reduce the flow of nutrients and sediments from impacted or restored wetlands in ways that protect critical in-water habitat features. http://www.epa.gov/owow/wetlands/facts/fact10.html
Rivers and Harbors Act	Section 10 of the Rivers and Harbors Act regulates the construction of any structure in or over any navigable water of the United States, as well as the excavating from or depositing of material in such waters and the accomplishment of any other work affecting the course, location, condition, or capacity of such waters. Under Section 10, these projects require approval from the Corps and are subject to permit requirements. The permit review process includes adherence to 404(b)(1) guidelines. These guidelines, established by the EPA, constitute the substantive environmental criteria used in evaluating activities regulated under Section 404 of the Clean Water Act. For example, projects must be evaluated to identify appropriate and practicable changes to the project plan to minimize environmental impact of the discharges. Accordingly, permit conditions associated with Section 10 permits provide baseline protection for Atlantic sturgeon and its habitat.
Magnuson-Stevens Fishery Management and Conservation Act (Magnuson-Stevens Act): Essential Fish Habitat 16 (U.S.C. 1801 *et seq.*)	Fishery management plans developed under the Magnuson-Stevens Act are required to describe and identify essential fish habitat (EFH) for covered fisheries, and are required to provide for the protection of the habitat by minimizing, to the extent practical, the adverse effects on the habitat caused by fishing (16 U.S.C. §1853(a)(7)). The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C. §1802(10)). The Magnuson-Stevens Act requires all federal agencies to consult with NMFS regarding actions they undertake or authorize that may adversely affect EFH. NMFS will recommend measures to protect or conserve EFH, and federal agencies must respond in writing on measures proposed to avoid or offset impacts to EFH; or explain its reasons for proposing to proceed inconsistently with NMFS' recommendations (16 U.S.C. §1855 (b)). Although the individual essential features for Atlantic sturgeon critical habitat are not specifically addressed in the Magnuson-Stevens Act, it does offer some level of protection where the proposed critical habitat overlaps with EFH areas of species managed under a Magnuson-Stevens Act fishery management plan.

National Coastal Zone Management Act	The Coastal Zone Management Act (CZMA) of 1972 provides for management of the nation's coastal resources and balances economic development with environmental conservation. The CZMA emphasizes the primacy of state decision-making regarding the coastal zone. The National Coastal Zone Management Program authorized by the CZMA is a voluntary partnership between the federal government and coastal states. The program is administered at the Federal level by the National Oceanic and Atmospheric Administration's (NOAA) Office of Ocean and Coastal Resource Management, but allows states to design programs that best address their unique coastal challenges and laws and regulations. Currently 34 states have approved coastal management programs, including the states with areas being considered for critical habitat designation. The National Coastal Zone Management Program includes a number of components that may provide protection to Atlantic sturgeon. The federal consistency provision ensures that federal actions, including federally authorized and funded actions, with reasonably foreseeable effects on coastal uses and resources must be consistent with the policies of a state's approved coastal management program. The Coastal Zone Enhancement Program provides incentives to states to enhance their coastal zone management programs within nine key areas including special area management planning, energy and government facility siting, and aquaculture. The Coastal and Estuarine Land Conservation Program provides funding to states and local governments to purchase valuable coastal lands. This act established a federal grant program managed by the Department of Commerce to "encourage and assist the states with development and implementation of management programs for coastal areas." Among other measures, these programs should include the "protection of natural resources, including wetlands, flood plains, estuaries, beaches, dunes, barrier islands, and fish and wildlife and their habitat." http://ipl.unm.edu/cwl/fedbook/czma.html
Anadromous Fish Conservation Act	This Act authorizes the Secretary of the Interior to enter into cooperative agreements with states and other non-federal interests to "conserve, develop, and enhance the anadromous fish resources of the U.S." The cooperative agreements must be in writing and describe: the actions to be taken by each party; the benefits anticipated to be derived by each party; the estimated costs to each party; the agreement term; the terms for disposing of property acquired by the Secretary under this agreement; and any other terms the Secretary deems appropriate. http://ipl.unm.edu/cwl/fedbook/anadfish.html
Federal Power Act	Section 10(j) of the FPA requires FERC to consider both power and non-power resources during the licensing process and instructs FERC to actively solicit input regarding "adequate and equitable" fish and wildlife measures from federal and state resource agencies." FERC must consider these recommendations during the licensing process, but does not have to incorporate the recommendations into the license if they "may be inconsistent with the purposes and requirements of the FPA" or if the recommendations are not

	supported by substantial evidence. Section 18 of the FPA provides that FERC require facility owners/operators to construct, maintain, and operate, at their own expense, fishways if operation of the facility will impact the passage of fish species in the project area or planned for introduction in the area.
Response Plans for Onshore Oil Pipelines	Pursuant to these regulations, each owner or operator of an onshore pipeline "may not handle, store, or transport oil in that pipeline unless the operator has submitted a response plan." The response plan must: "plan for resources for responding to a worst case discharge, as determined by the owner or operator, and to a substantial threat of such discharge; be consistent with the National Contingency Plan (NCP); and include a core plan consisting of an information summary, immediate notification procedures, spill detection and mitigation procedures, and other measures.
Water Resources Development Act of 1992	Section 204 of this Act "authorizes projects for the protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands, in connection with dredging an authorized Federal navigation project." http://www.senate.gov/~epw/wrda92.pdf http://laws.fws.gov/lawsdigest/wat1992.html
Fish and Wildlife Coordination Act	The purpose of this Act is to ensure that fish and wildlife resources are equally considered with other resources during the planning of water resources development projects by: 1) authorizing the Secretaries of Agriculture and Commerce to provide assistance with federal and state agencies in protecting game species and studying the effects of pollution on wildlife; 2) requiring consultation with the Bureau of Fisheries prior to constructing any new dams to provide for fish migration; and 3) requiring consultation with the Fish and Wildlife Service for water impoundment or diversion projects with a federal nexus. 16 U.S.C. §§1-667e. http://www4.law.cornell.edu/uscode/16/661.html
Wilderness Act (16 USC §§ 1131-1136 1964)	The Wilderness Act established the National Wilderness Preservation System. With a few exemptions, no commercial enterprise or permanent road is allowed within a wilderness area. Temporary roads, motor vehicles, motorized equipment, landing of aircraft, structures and installations are only allowed for administration of the area. Measures may be taken to control fire, insects and disease. Prospecting for mineral or other resources, if carried on in a manner compatible with the preservation of wilderness, is allowed. The Wilderness Act may offer protections to Atlantic sturgeon by limiting land-disturbing activities in Wilderness Areas in National Forests. Human activity in wilderness areas is likely to be greatly reduced when compared to non-wilderness areas, which is likely to benefit Atlantic sturgeon. To the extent that Wilderness Area designations have precluded human activity and plans for activity in areas containing Atlantic sturgeon, then Wilderness Area impacts are incorporated into the baseline.
The Sikes Improvement Act (16 USC §670 1997)	The Sikes Improvement Act (SIA) requires military installations to prepare and implement an Integrated Natural Resources Management Plan (INRMP). The purpose of the INRMP is to provide for:

	• The conservation and rehabilitation of natural resources on military installations; • The sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and non-consumptive uses; and • Subject to safety requirements and military security, public access to military installations to facilitate the use of the resources. INRMPs developed in accordance with SIA may provide protection to Atlantic sturgeon on military lands.
National Park Service Organic Act (16 U.S.C. 1 *et seq.*)	Passed in 1916, the National Park Service Organic Act created the National Park Service (NPS) and charged the Service with the creation of national parks and monuments and "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." The Act also gave the Secretary of the Interior the ability to make rules and regulations for the protection, use, and management of National Park lands. Protection to individual essential features may be afforded through the NPS' mission to conserve the scenery, natural objects, and wildlife "by such means as will leave them unimpaired for the enjoyment of future generations."
Federal Agricultural Improvement and Reform Act of 1996 **Public Law No. 104-127**	This law, which is administered by the United States Department of Agriculture, creates incentives for agricultural improvements that improve water quality. Included are financial incentives to protect wildlife habitat, mitigate or prevent wetlands loss, and create animal waste management facilities. It also provides funds for permanent or thirty-year conservation easements on agricultural land.
Atlantic Coastal Fisheries Cooperative Management Act, 1993 (**MRS Title 12 Chapter 419 SS4601-4656)**	This Act coordinates the management of coastal migratory fisheries along the U.S. Atlantic coast by providing a mechanism to ensure Atlantic coastal state compliance with mandated conservation measures in Commission-approved fishery management plans. State interests, coordination and compliance is represented by the formation of the Atlantic States Marine Fisheries Commission. Each of the 15 Atlantic coast states is represented by commissioners who participate in deliberations in the Commission's five main policy arenas: interstate fisheries management, research and statistics, habitat conservation, sport fish restoration, and law enforcement. http://www.asmfc.org/
Inter-jurisdictional Fisheries Act **(TITLE 16 CHAPTER 61)**	The purpose of this Act is to promote and encourage state activities in support of the management of inter-jurisdictional fishery resources; and to promote and encourage management of inter-jurisdictional fishery resources throughout their range.

2.2.2State Laws and Regulations

In addition to the federal protections described above, state agencies in the ten states and the District of Columbia have management programs that provide protection for lands and waters in or near Atlantic sturgeon habitat. These include approved coastal management programs under the CZMA and CWA as well as programs affecting land use that provide protection to Atlantic sturgeon habitat by restricting activities that degrade water quality, alter water flows, or damage bottom habitat. This section describes protections provided by these plans that are relevant to the areas proposed to be designated as critical habitat for the three northern DPSs of Atlantic sturgeon.

2.2.1.1 Maine

2.2.1.1.1 Maine Environmental Agencies

- **Maine Department of Environmental Protection (DEP)**: The Maine Department of Environmental Protection (DEP) is responsible for protecting and restoring Maine's natural resources and enforcing the state's environmental laws. Legislative mandate directs DEP to prevent, abate and control the pollution of the air, water and land. The charge is to preserve, improve and prevent diminution of the natural environment of the state. The Department is also directed to protect and enhance the public's right to use and enjoy the State's natural resources. The Department administers programs, educates and makes regulatory decisions that contribute to the achievement of this mission.
- **Maine Forest Service**
- **Department of Inland Fisheries and Wildlife (IFW)**
- **Land Use Regulation Commission (LURC)**
- **Bureau of Land and Water Quality**
- **Maine Coastal Program**
- **Maine Natural Areas Program**
- **Department of Marine Resources (DMR) - ASMFC Member**
- **Natural Resources Information and Mapping Center**
- **Bureau of Parks and Lands (Maine State Parks)**
- **Maine Department of Marine Resources**
- **Wells National Estuarine Research Reserve Management Authority**

2.2.1.1.2 Maine State Laws and Regulations

Below is a list and brief description of specific Maine state laws and regulations that already offer some protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-22).

Table 2-17. Maine state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Law/ Regulation	Overview
Maine Endangered Species Act (MESA) **(MRS Title 12 § 7751-7759)**	The Maine Endangered Species Act, which is administered by the Maine Department of Inland Fisheries and Wildlife, is designed to protect state-listed endangered and threatened species and their habitats. Local and state governments are prohibited from funding, permitting, licensing or carrying out projects that will significantly alter “essential” habitat or violate protection guidelines as determined by the Commissioner of the Department of Inland Fisheries and Wildlife.

	http://www.state.me.us/ifw/wildlife/endangered/
Natural Resources Protection Act (NRPA) **(Title 38 M.R.S.A. Section 480)**	The Natural Resources Protection Act (NRPA) regulates activities occurring over or adjacent to protected natural resources. The Department of Environmental Protection requires an approved permit for activities such as dredging, bulldozing, removing or displacing soil, sand, vegetation or other materials, draining or de-watering, filling, construction, repair or alteration of permanent structures. The DEP will only grant permits for activities that will not unreasonably interfere with existing scenic, aesthetic, recreational or navigational uses; will not cause unreasonable erosion of soil or sediment; and will not unreasonably harm the state's critical natural resources. http://www.maine.gov/dep/land/nrpa/index.html
Coastal Management Policy **(Title 38 M.R.S.A. Sections 1801 to 1803)**	This statement of policy is directed toward balancing the competing uses of Maine's coast. The policies, which are administered by the State Planning Office, Department of Environmental Protection and Department of Conservation, encourage developing ports and harbors, managing marine resources and shorelines, increasing recreation and tourism and protecting natural and scenic areas, and water and air quality. http://www.mainelegislature.org/legis/statutes/38/title38sec1801.html
Finfish Licenses **(MRS Title 12 § 621)**	Finfish fishermen are required to have a license in order to participate in commercial fishery trade. Fishermen must limit the use of nets and purse seines in the vicinity of weirs. These are structures that provide important connections between ocean and river habitats---transition zones that are crucial to the survival of anadromous fish. Also, fishermen are prohibited from fishing in groundfish spawning areas once they have been identified in order to maintain the juvenile stock of finfish. (MRS 12 Chapter 621 §6501-6594 2001). http://www.mainelegislature.org/legis/statutes/12/title12ch621sec0.html
Maine Waterway Development and Conservation Act, 1983 **(MRS Title 38 § 630-640)**	Mandates that a permit be issued for the construction, reconstruction, alteration or removal of hydropower projects. http://www.mainelegislature.org/legis/statutes/38/title38ch0sec0.html
Land Use Regulation Law, 1971 **(MRS Title 12 § 683-685)**	Creates the Land Use Regulatory Commission (LURC) and identifies its mission. LURC is tasked with permitting dams in the unorganized territory. http://www.mainelegislature.org/legis/statutes/12/title12ch0sec0.html
Mandatory Shoreland Zoning Act **(Title 38 M.R.S.A. Sections 435 to 447)**	Administered by the Dept. of Environmental Protection, the Mandatory Shoreland Zoning Act requires local governments to restrict certain land uses within a certain distance of larger bodies of water, streams, or wetlands within their jurisdiction. Some objectives of the law may provide baseline protection to Atlantic sturgeon habitat. These objectives include prevention and control of water pollution, protection of fish spawning grounds and aquatic life, to protect

	freshwater and coastal wetlands, and to anticipate and respond to the impacts of development in shoreland areas. http://www.maine.gov/dep/land/slz/index.html
Water Pollution Control Law **(Title 38 M.R.S.A. Sections 411 to 424)**	Administered by the Dept. of Environmental Protection, this law is designed to implement water pollution control measures by granting funds for municipal pollution abatement projects, and requiring licenses for discharges of waste into bodies of water. http://www.mainelegislature.org/legis/statutes/38/title38ch0sec0.html
Interstate Water Pollution Control **(Title 38 M.R.S.A. Sections 491 to 501)**	Administered by the Signatory States of the New England Water Pollution Control Compact, as a member of the New England Interstate Water Pollution Control Compact, Maine works together with Massachusetts, Connecticut, Rhode Island, New Hampshire, and Vermont to manage interstate waters to meet the industry and agriculture's growing need for water and the growing population's increasing need for clean water for consumption and recreation. http://www.mainelegislature.org/legis/statutes/38/title38ch0sec0.html
Subdivision Law **(Title 30-A M.R.S.A. Sections 4401 to 4407)**	Administered by the State Planning Office, the Subdivision Law requires local governments to review applications for subdivisions. A subdivision will not be approved if it has an undue effect on the natural beauty of the area, or on rare and irreplaceable natural areas. In addition, the developer must map and identify all freshwater wetlands within the proposed area regardless of their size and indicate any rivers, streams, lakes and ponds so the town may consider the potential impact of the subdivision on these natural resources. http://www.mainelegislature.org/legis/statutes/12/title12ch0sec0.html
Site Location of Development Law (Site Law) **(Title 38 M.R.S.A. Sections 481 to 490)**	This Site Location of Development Law (Site Law) is administered by the Department of Environmental Protection. It requires review of developments, such as metallic mineral and advanced exploration projects, large structures and subdivisions, oil terminal facilities, and projects occupying more than 20 acres, that may have a substantial effect on the environment. The project must meet applicable standards for stormwater management, groundwater protection, infrastructure, wildlife and fisheries, noise, and unusual natural areas. http://www.mainelegislature.org/legis/statutes/38/title38ch0sec0.html
Maine Forest Practices Act **(Title 12 M.R.S.A. Section 8867 to 8869)**	The Maine Forest Practices Act is administered by the Department of Conservation, Maine Forest Service. The law creates size limits, establishes requirements for buffer zones and requires reforestation within clear cuts. In addition, the law also requires a forest management plan for clear cuts over 20 acres and expands the authority of the Maine Forest Service to create and enforce water quality protection rules. http://www.mainelegislature.org/legis/statutes/12/title12ch0sec0.html
Erosion & Sedimentation Control Law	The erosion control provision requires that a person or persons engaging in an activity involving filling, displacing or exposing earthen materials take

(MRS Title 38 § 420-C)	measures to prevent unreasonable erosion of soil or sediment beyond the project site or into a protected natural resource. http://www.maine.gov/dep/land/erosion/index.html
Water Classification Program, 1950 **(MRS Title 38 § 464-470)**	Classifies Maine's surface waters, establishes water quality goals, and directs the state to meet these goals. http://www.mainelegislature.org/legis/statutes/38/title38ch0sec0.html
Maine Rivers Policy, 1983 **(MRS Title 12 § 401-406)**	Declares general policy guidelines for managing Maine's rivers. http://www.mainelegislature.org/legis/statutes/12/title12ch0sec0.html
Non-Point Source Pollution Program, 1991 **(MRS Title 38 § 410-H)**	Enacted to combat Non-Point Source Pollution (NPS). Implements the Maine Department of Environmental Protection's "best management practice" guidelines for such sources. http://www.mainelegislature.org/legis/statutes/38/title38ch0sec0.html

2.2.1.2 New Hampshire

2.2.1.2.1 New Hampshire Environmental Agencies

- **New Hampshire Department of Environmental Services (NHDES)**
- **New Hampshire Department of Fish and Game (NHDFG):** Responsible for conservation, management and protection of these resources and their habitats. Informs and educates the public about these resources; and provides the public with opportunities to use and appreciate these resources.
- **NHDES, Office of Energy and Planning (OEP):** Responsible generally for assisting planning, growth management, and development activities within and among cities and towns, in order to encourage smart growth (N.H. Rev. Stat. Ann. § 4-C:1(II)(c)). State law establishes within OEP a program for municipal and regional assistance in the areas of resource protection and growth management (N.H. Rev. Stat. Ann. § 4-C:7).
- **NHDES, Alteration of Terrain Bureau:** Permits are issued by the NHDES Alteration of Terrain (AoT) Bureau. This permit protects New Hampshire surface waters, drinking water supplies and groundwater by controlling soil erosion and managing stormwater runoff from developed areas.

2.2.1.2.2 New Hampshire State Laws and Regulations

Below is a list and brief description of specific New Hampshire state laws and regulations that already offer some protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-23).

Table 2-23. New Hampshire state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Law/ Regulation	Overview

Endangered Species Conservation Act **(Revised Statutes Annotated (RSA) 212-A)**	Administered by the New Hampshire Fish and Game Department, the New Hampshire Endangered Species Conservation Act protects state-listed endangered and threatened species and their habitats as necessary to "maintain and enhance their numbers." The state prohibits the taking, possession, transportation or sale of endangered species and regulates these activities with regard to threatened species. http://www.gencourt.state.nh.us/rsa/html/XVIII/212-A/212-A-mrg.htm
Nongame Species Management Act **(RSA 212-B)**	Administered by New Hampshire Department of Fish and Game, this Act regulates the "taking, possession, and handling of nongame species" for their protection and proliferation. This Act requires that a nongame management program be implemented that includes public education about nongame species; research regarding species' populations, distribution and future trends; and management measures to maintain and promote the health of non-game species populations. Programs may be established, including acquisition of land or aquatic habitat, as deemed necessary for the conservation of non-game species. http://www.gencourt.state.nh.us/rsa/html/XVIII/212-B/212-B-mrg.htm
Atlantic Marine Fisheries Compact **(RSA 213)**	The Atlantic Marine Fisheries Compact is an interstate compact among the 15 Atlantic coast states: Connecticut, Delaware, Florida, Georgia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, and Virginia. Each state is represented by three commissioners who balance the needs of their state in five areas: interstate fisheries management, research and statistics, fisheries science, habitat conservation, and law enforcement http://www.gencourt.state.nh.us/rsa/html/XVIII/213/213-mrg.htm
Connecticut River Atlantic Salmon Compact **(RSA 213-A)**	Administered by the New Hampshire Department of Fish and Game, the Compact seeks to promote the restoration of anadromous Atlantic salmon in the Connecticut River basin by the development of a joint interstate program for stocking, protection, management, research and regulation. The purpose is to restore Atlantic salmon to the Connecticut River in numbers as near as possible to their historical abundance. Ten Commissioners represent New Hampshire, Massachusetts, Connecticut, Vermont, the United States Fish and Wildlife Service, the National Marine Fisheries Service, and the public to provide guidance to the restoration program on all administrative and biological issues for all migratory fish species. http://www.gencourt.state.nh.us/rsa/html/XVIII/213-A/213-A-mrg.htm
New Hampshire Coastal Program	Administered by the New Hampshire Department of Environmental Services, the New Hampshire Coastal Program is one of 34 federally approved coastal programs authorized under the Coastal Zone Management Act and is administered by DES. The Coastal Program provides funding and staff assistance to towns and cities, and other local and regional groups who protect clean water, restore coastal habitats, and help make communities more resilient to flooding and other natural hazards. The Coastal Program supports the region's economy by helping to preserve the environmental health of the coast and Great Bay and Hampton-Seabrook estuaries for fishing and shellfishing,

	and assisting with the maintenance of ports, harbors and tidal rivers for commercial and recreational uses. http://des.nh.gov/organization/divisions/water/wmb/coastal/index.htm
Dam Bureau and Dam Removal And River Restoration Program **(RSA 482 and** **NH Code Admin. Rules Env-Wr 100-700)**	Administered by the New Hampshire Dam Bureau, the NHDES Dam Bureau regulates the repair, (re)construction, maintenance, and operation of new and existing dams. In addition, the Bureau is responsible for regulating the retention and/or release of stored water to support a variety of uses (e.g., hydropower generation, autumn lake drawdowns to make room for spring runoff, flood flow management and mitigation, fisheries and water quality protection) for both public and private purposes. http://des.nh.gov/organization/divisions/water/dam/categories/overview.htm
New Hampshire Wildlife Action Plan	Administered by The New Hampshire Fish and Game Department, New Hampshire's Wildlife Action Plan was mandated and funded by the federal government through the State Wildlife Grants program. It focuses on distribution and habitat, species and habitat condition, species and habitat risk assessment, and conservation actions, providing New Hampshire decision-makers with important tools for restoring and maintaining critical habitats and populations of the state's species of conservation and management concern. http://www.wildlife.state.nh.us/Wildlife/wildlife_plan.htm
New Hampshire Land and Community Heritage Investment Program **(RSA 227-M)**	Administered by the New Hampshire Land and Community Heritage Investment Program and formed in 2000, the purpose is to conserve and preserve the state's natural, cultural, and historic resources through the acquisition of lands, and cultural and historic resources. Grants are available to municipalities or other political subdivisions of the state of New Hampshire. http://www.lchip.org/
Shoreland Water Quality Protection Act **(RSA 483-B)**	Enacted in 1991, the Shoreland Water Quality Protection Act (previously the Comprehensive Shoreland Protection Act) establishes minimum standards for the subdivision, use and development of shorelands adjacent to the state's public water bodies. These include shoreland buffer and setback standards, limits on impervious surfaces, shoreland protection along rivers and permit requirements for certain activities within the protected shoreland. http://des.nh.gov/organization/divisions/water/wetlands/cspa/categories/overview.htm

2.2.1.3 Massachusetts

2.2.1.3.1 Massachusetts Environmental Agencies

- **Massachusetts Department of Conservation and Recreation (DCR):** The purpose of the DCR is to protect, promote and enhance Massachusetts natural, cultural and recreational resources for the well-being of all. Objectives include improving outdoor recreational opportunities and natural resource conservation.

- **Massachusetts Department of Environmental Protection (DEP):** The Department of Environmental Protection is the state agency responsible for ensuring clean air and water, the safe management of toxics and hazards, the recycling of solid and hazardous wastes, the timely cleanup of hazardous waste sites and spills, and the preservation of wetlands and coastal resources.
- **Massachusetts Department of Fish and Game (DFG):** The Department of Fish and Game works to preserve the state's natural resources and people's right to conservation of those resources, as protected by Article 97 of the Massachusetts Constitution. To carry out this mission, the Department exercises responsibility over the Commonwealth's marine and freshwater fisheries, wildlife species, plants, and natural communities, as well as the habitats that support them.
- **Massachusetts Office of Coastal Zone Management (CZM):** The Massachusetts Office of Coastal Zone Management (CZM) is the lead policy and planning agency on coastal and ocean issues within the Executive Office of Energy and Environmental Affairs (EEA). Objectives are to balance the impact of human activities with the protection of coastal and marine resources through planning, public involvement, education, research, and sound resource management. CZM receives annual federal grant funds from NOAA as authorized by the Coastal Zone Management Act. As a networked program with a strong regional and local role, CZM emphasizes coordination, collaboration, and partnerships to address coastal issues.

2.2.1.3.2 Massachusetts State Laws and Regulations

Below is a list and brief description of specific Massachusetts state laws and regulations that already offer some protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-24).

Table 2-18. Massachusetts state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Law/Regulation	Overview
Massachusetts Environmental Protection Act (MEPA) **(MGL c. 30 s. 61** **301 CMR 11.00)**	The MEPA requires that state agencies review, evaluate, and determine the impact on the natural environment of all activities conducted by them. In addition, state agencies must use all practicable measures to minimize damage to the environment and, where damage cannot be avoided, to minimize and mitigate damage to the maximum extent practicable. http://www.mass.gov/eea/agencies/mepa/about-mepa/
Mass. Endangered Species Act (MESA) and Promulgated Regulations **(MGL Chapter 131A** **321 CMR 10.00)**	The Massachusetts Endangered Species Act (MESA) was enacted in December 1990 to protect rare species and their habitats by prohibiting the "take" of any plant or animal species listed as Endangered, Threatened, or Special Concern by the Massachusetts Division of Fisheries and Wildlife. Atlantic sturgeon is listed as endangered under MESA. http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/regulatory-review/mass-endangered-species-act-mesa/
Public Waterfront Act **(MGL c. 91)**	Administered by the Massachusetts Department of Environmental Protection (MassDEP), MassDEP regulates activities on both coastal and inland waterways, including construction, dredging and filling in tidelands, great ponds and certain rivers and streams.

	http://www.mass.gov/eea/agencies/massdep/water/regulations/
Massachusetts Rivers Protection Act, 1996 **(MGL c. 258)**	The purpose of this Act is to protect the private or public water supply; to protect the ground water; to provide flood control; to prevent storm damage; to prevent pollution; to protect land containing shellfish; to protect wildlife habitat; and to protect the fisheries. http://www.mass.gov/eea/agencies/massdep/water/regulations/massachusetts-rivers-protection-act.html
Dredging and Filling - Wetlands and Waterways **(MGL c. 21 s. 26-35** **310 CMR 9.00)**	Provides that no person shall remove, fill, dredge or alter any bank, riverfront area, fresh water wetland, coastal wetland, beach, dune, flat, marsh, meadow or swamp bordering on the ocean or on any estuary, creek, river, stream, pond, or lake, or any land under said waters or any land subject to tidal action, coastal storm flowage, or flooding, other than in the course of maintaining, repairing or replacing, but not substantially changing or enlarging, an existing and lawfully located structure or facility used in the service of the public and used to provide electric, gas, sewer, water, telephone, telegraph and other telecommunication services, without filing written notice of his intention to so remove, fill, dredge or alter, including such plans as may be necessary to describe such proposed activity and its effect on the environment and without receiving and complying with an order of conditions and provided all appeal periods have elapsed. http://www.mass.gov/eea/agencies/massdep/water/regulations/
Water Management Act **(MGL c. 21G** **MassDEP 310 CMR 36.00)**	This Act gives 'the Commission' the authority to adopt the principles, policies and guidelines necessary for the effective planning and management of water use and conservation in the commonwealth and for the administration of this chapter as necessary and proper to ensure an adequate volume and quality of water for all citizens of the commonwealth, both present and future. Such principles, policies and guidelines shall be designed to protect the natural environment of the water in the commonwealth; to assure comprehensive and systematic planning and management of water withdrawals and use in the commonwealth, recognizing that water is both finite and renewable; and to allow continued and sustainable economic growth throughout the commonwealth and increase the social and economic well-being and safety of the commonwealth's citizens and of its work force. http://www.mass.gov/eea/agencies/massdep/water/regulations/
Wetlands Protection Act **(MGL Chapter 131A, Sec. 40** **310 CMR 10.00)**	The Wetlands Protection Act (WPA) protects rare animal species by prohibiting alterations that would have short or long-term adverse effects on the wetland habitats of rare wildlife species. The regulations require that proposed alterations to wetland habitats of rare wildlife be reviewed by the Natural Heritage & Endangered Species Program. http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/regulatory-review/endangered-species-and-the-wetlands-protection-act.html

Areas of Critical Environmental Concern (ACEC) **(MGL c. 21A §§ 27** **St. 1974, c. 806 s. 40e)**	Administered by the Department of Conservation and Recreation, Areas of Critical Environmental Concern (ACECs) are places in Massachusetts that receive special recognition because of the quality, uniqueness and significance of their natural and cultural resources. These areas are identified and nominated at the community level and are reviewed and designated by the state's Secretary of Environmental Affairs. ACEC designation creates a framework for local and regional stewardship of critical resources and ecosystems. http://www.mass.gov/eea/agencies/dcr/conservation/acec/
Dam Safety **(MGL c. 253 §§ 44-50)**	Administered by the Department of Conservation and Recreation, the Office of Dam Safety maintains records of dams located throughout the Commonwealth, ensures compliance with acceptable practices pertaining to dam inspection, maintenance, operation and repair of dams. http://www.mass.gov/eea/agencies/dcr/conservation/dam-safety/
Endangered Species Natural Heritage Program **(MGL c. 131 s. 23** **321 CMR 10.00)**	Administered by the Department of Fish and Game, the Natural Heritage & Endangered Species Program (NHESP), part of the Massachusetts Division of Fisheries and Wildlife, is one of the programs forming the Natural Heritage Network. NHESP is responsible for the conservation and protection of hundreds of species that are not hunted, fished, trapped, or commercially harvested in the state. The Program's highest priority is protecting the vertebrate and invertebrate animals and native plants that are officially listed as Endangered, Threatened or of Special Concern in Massachusetts. http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/
Marine Fisheries Regulations **(Regulation: 322 CMR 1.00 to 12.00)**	These regulations pertain to marine fisheries management in Massachusetts and include restrictions that may offer some protection to the Atlantic sturgeon, including restrictions on the take of anadromous fish, use of nets and weirs, regulation of catches and restoration and management programs in place for other species. http://www.mass.gov/eea/agencies/dfg/dmf/laws-and-regulations/marine-fisheries-regulations.html
Massachusetts Clean Water Act **(MGL ch. 21, §§ 26 – 53)**	Administered by the MassDEP, the Massachusetts Clean Water Act essentially mirrors the federal Clean Water Act. The Act authorizes the DEP to adopt standards of minimum water quality and prescribe effluent limitations, permit programs and procedures applicable to the management and disposal of pollutants, including, where appropriate, prohibition of discharges. The Act also requires the DEP to administer programs for the preservation and restoration of the publicly-owned lakes and great ponds within Massachusetts. https://malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter21/Section26
Land Protection Program	The Land Protection Program is a joint project of the Department of Fish and Game and the Division of Fisheries and Wildlife. The Land Protection Program's purpose is to protect and preserve the Commonwealth's biological diversity and to provide public access routes and areas for recreation including

	hunting, fishing, trapping, wildlife observation, and other passive wildlife-related recreation.
State Wildlife Action Plan (SWAP)	Administered by Massachusetts Division of Fisheries and Wildlife and approved in 2006, SWAP is a comprehensive document that will help guide wildlife conservation decision making for Massachusetts' wildlife for many years. The objectives are to identify and describe key habitats and species, identify problems affecting species and habitats, suggest conservation actions and monitor to evaluate effectiveness. http://www.mass.gov/eea/agencies/dfg/dfw/wildlife-habitat-conservation/state-wildlife-conservation-strategy.html

2.2.1.4 Connecticut

2.2.1.4.1 Connecticut Environmental Agencies

- **Connecticut Department of Energy and Environmental Protection (DEEP):** The Connecticut Department of Energy and Environmental Protection (DEEP) is charged with conserving, improving and protecting the natural resources and the environment of the state of Connecticut as well as making cheaper, cleaner and more reliable energy available for the people and businesses of the state. The agency is also committed to playing a positive role in rebuilding Connecticut's economy and creating jobs – and to fostering a sustainable and prosperous economic future for the state.
- **Connecticut Council on Environmental Quality (CEQ):** This is the state agency that monitors environmental progress and makes recommendations for correcting deficiencies in state laws and programs. CEQ produces an annual report, *Environmental Quality in Connecticut*, stating the quality of the air, land, wildlife, rivers, and streams of Connecticut.

2.2.1.4.2 Connecticut State Laws and Regulations

Below is a list and brief description of specific Connecticut state laws and regulations that already offer some protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-25).

Table 2-19. Connecticut state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
Connecticut Endangered Species Act (CESA) **Connecticut General Statutes (CGS) Section 26-303**	This Act was enacted in 1989 to ensure that state agency projects did not adversely impact species with populations that are threatened or endangered in Connecticut. CESA establishes a program for the protection of state endangered and threatened species and species of special concern within the DEEP. The overall goal of the legislation is to conserve, protect, restore and enhance any endangered or threatened species and their essential habitat The Act authorizes the Commissioner to adopt regulations establishing procedures for determining the status of native species as endangered, threatened, or species of special concern, listing native wildlife and native plants determined to be in those three categories, identifying the essential habitats for endangered and threatened species, and establishing criteria for petitions to add or remove species from the respective lists of species or

	identified essential habitats. Atlantic sturgeon is listed as threatened under CESA. http://www.ct.gov/deep/cwp/view.asp?a=2702&q=323486
Connecticut Environmental Policy Act (CEPA) **CGS 22a-1a through 22a-1h**	The purpose of the CEPA is to identify and evaluate the impacts of proposed state actions that could have the potential to significantly affect the environment. This evaluation enables the state agency proposing or funding a project to judge the appropriateness of proceeding with the action in light of its environmental impacts. The process also provides opportunity for public review and comment through an early public scoping process as well as later review of any Environmental Impact Evaluation (EIE). http://www.ct.gov/deep/cwp/view.asp?a=2709&q=324144&deepNav_GID=1511
Connecticut Coastal Management Act (CCMA) **CGS 22a-91 through 22a-113j**	Connecticut's Coastal Management Program is administered by the Department of Energy and Environmental Protection. Under the statutory umbrella of the CCMA, enacted in 1980, the Program ensures balanced growth along the coast, restores coastal habitat, improves public access, protects water-dependent uses, public trust waters and submerged lands, promotes harbor management, and facilitates research. The Coastal Management Program also regulates work in tidal, coastal and navigable waters and tidal wetlands under the CCMA, the Structures Dredging and Fill statutes (Section 22a-359 through 22a-363f) and the Tidal Wetlands Act (Section 22a-28 through 22a-35). Development of the shoreline is regulated at the local level through municipal planning and the zoning boards and commissions under the policies of the CCMA, with technical assistance and oversight provided by Program staff. The Connecticut Coastal Management Act also created a statewide coastal zone restoration policy encouraging the restoration of degraded tidal wetlands as well as restoration of riverine migratory corridors for anadromous fish passage and barrier beaches. http://www.ct.gov/deep/cwp/view.asp?a=2705&q=323536&
Interstate Wildlife Violator Compact **Public Act No. 13-248**	This law commits Connecticut to the terms of the Interstate Wildlife Violator Compact. It requires the DEEP commissioner, or his designee, Connecticut's compact administrator and authorizes DEEP to adopt regulations to carry out the compact. The compact is an agreement requiring member states to recognize hunting, fishing, and trapping license sanctions in other member states and take reciprocal action. It establishes a process by which wildlife violations by a non-resident of a member state are handled as if the person were a resident. Under the compact, violators are issued a ticket and released rather than arrested and having to post a cash bond as a condition of release. Thirty-nine other states participate in the compact. http://www.cga.ct.gov/2013/act/pa/2013PA-00248-R00SB-01020-PA.htm
Fish Spawning Areas and Refuges	This Act allows the state to establish fish spawning areas and refuges on any waters, establish closed areas and safety zones on public lands and waters and,

CGA 26-102-1	with the consent of the owner, on private lands and waters, and close any such area to fishing and trespassing. http://www.cga.ct.gov/2011/pub/chap490.htm#Sec26-102.htm
Soil and Water Conservation **22a-315-10 through 19**	The Connecticut Council on Soil and Water Conservation works together on a number of natural resource issues, primarily focusing on erosion and sedimentation control, water quality and quantity, and overall land use issues. http://www.ctcouncilonsoilandwater.org/
Dam Safety **Section 22a-401 to 22a-411**	The Dam Safety Section of the Inland Water Resources Division is charged with the responsibility for administration and enforcement of Connecticut's dam safety laws. The existing statutes require that permits be obtained to construct, repair or alter dams, dikes or similar structures and that existing dams, dikes and similar structures be registered and periodically inspected to assure that their continued operation and use does not constitute a hazard to life, health or property. http://www.ct.gov/deep/lib/deep/regulations/22a/22a-409-1through2.pdf
Clean Water Fund **22a-482-1 through 4**	Provides funding for projects in order to attain designated water quality standards (i.e., dissolved oxygen), enhance water resource value or prevent impact to potable water supplies. http://www.ct.gov/deep/lib/deep/regulations/22a/22a-482-1through4.pdf
Commercial and Sport Fishing in the Marine District **26-159A**	These regulations specifically prohibit a person from taking, possessing, selling, exchanging or offering for sale or exchange in Connecticut any Atlantic sturgeon (*Acipenser oxyrinchus*) or shortnose sturgeon (*Acipenser brevirostrum*). Any such sturgeon caught must be immediately returned, without avoidable injury, to the waters from which it was taken (26-159a-1). http://www.ct.gov/deep/lib/deep/regulations/26/26-159a.pdf
Commercial Fishing in the Inland and Marine Districts **26-142a**	Defines areas where inland commercial fishing is permitted and imposes restrictions and limitations of inland and marine commercial fisheries, including inland species approved for commercial fishing, specific-area limitations, and gear restrictions. These regulations generally provide some protection to aquatic species and their habitats. http://www.ct.gov/deep/lib/deep/regulations/26/26-142a.pdf

2.2.1.5 New York

2.2.1.5.1 New York Environmental Agencies

- **New York State Department of Environmental Conservation (DEC):** DEC is responsible for administration and enforcement of the Environmental Conservation Law (ECL). The Department's major responsibilities as assigned in ECL are: regulation of hazardous and toxic wastes; oil and chemical spills; abatement of water, land and air pollution; recycling programs, environmental monitoring, fish and wildlife laws, marine and coastal resources; forestry management, manage forest preserves and recreational facilities, protect tidal and freshwater

wetlands and flood plains; protect water resources; administer the wild, scenic and recreational rivers program; regulate mining activities; and environmental conservation and education.

- **DEC's Bureau of Marine Resources**

2.2.1.5.2 New York State Laws and Regulations

New York State regulations are maintained in the Official New York Codes, Rules and Regulations (NYCRR). Laws controlling the use and management of New York's natural resources are found in the Environmental Conservation Law (ECL), which established the Department of Environmental Conservation (DEC) and authorized the programs and responsibilities of the DEC.

Below is a list and brief description of specific New York state laws and regulations that already offer some protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-26).

Table 2-20. New York state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
New York State Endangered Species Act **ECL § 11-0535**	The purpose of the Act is to perpetuate and restore native animal life within New York State for the use and benefit of current and future generations, based upon sound scientific practices and in consideration of social values, so as not to foreclose these opportunities to future generations.
Protection of Waters Regulatory Program **Article 15, Title 5**	The DEC created the Protection of Waters Regulatory Program to prevent undesirable activities on water bodies by establishing and enforcing regulations that are compatible with the preservation, protection and enhancement of the present and potential values of the water resources.
Instream Habitat Protection program	The Bureau of Habitat's Instream Habitat Protection Unit primarily functions to mitigate the adverse environmental impacts from the operation of hydroelectric stations. The operation of hydroelectric plants can cause serious ecological impacts. Fish can be killed directly as they pass through the turbines used to produce electricity. Water impounded by hydroelectric dams may cause downstream river sections to completely dry up, turn flowing rivers into ponds, and prevent upstream spawning migration of fish.
Freshwater Wetlands Act (FWA) **ECL Article 24**	The FWA provides DEC and the Adirondack Park Agency with the authority to regulate freshwater wetlands in the state. The Act was passed in 1975 to preserve, protect and conserve freshwater wetlands, to prevent the despoliation and destruction of freshwater wetlands, and to regulate use and development of such wetlands to secure the natural benefits of freshwater wetland, consistent with the general welfare and beneficial economic, social, and agricultural development of the state.
Tidal Wetlands Act **ECL Article 25**	Provides protection and preservation to tidal wetlands from dredging and filling activities, thereby preserving ecosystem benefits (including but not limited to their value for marine food production, wildlife habitat, flood and hurricane and storm control, recreation, cleansing ecosystems, absorption of silt and organic material, education and research, and open space and aesthetic appreciation).

	http://www.dec.ny.gov/lands/4940.html
New York Ocean and Great Lakes Ecosystem Conservation Act **ECL Article 14**	The purpose of the Act is to promote understanding, protection, restoration and enhancement of New York's ocean and Great Lakes ecosystems, in part by establishing ecosystem-based management as the framework to better manage activities that affect New York's coastal ecosystems and developing guidelines for agency programs and activities. http://codes.lp.findlaw.com/nycode/ENV/14/14-0103#sthash.zrMeNynB.dpuf
Reservoir Releases Regulations **ECL Article 15, Title 8**	The purpose of these regulations is to regulate the volume and rate of the flow of water from the Schoharie reservoir via the Shandaken tunnel into the Esopus creek to protect and enhance the recreational use of the waters in the creek while ensuring an adequate water supply for New York City.
Estuary Management Plans	Peconic Estuary, Long Island South Shore Estuary Reserve, New York/New Jersey Harbor and Hudson River Estuary are the four estuaries in this area, each with its own unique geographical layout. The New York State Department of Environmental Conservation, along with EPA, other state agencies, and local municipalities devised management plans for each of these areas to address their different aspects of problems and protection strategies. http://www.dec.ny.gov/lands/207.html
Coastal Erosion Hazard Areas Law **ECL Article 34**	This law empowers DEC to identify and map coastal erosion hazard areas and to adopt regulations (6 NYCRR Part 505) to control certain activities and development in those areas. http://www.dec.ny.gov/lands/86541.html
New York Ocean Action Plan (OAP)	The New York Ocean Action Plan (OAP) is a coordinated and inclusive effort focused on improving the health of ocean ecosystems and their capacity to provide sustainable benefits to New Yorkers. Together, scientists, resource managers, and a wide range of stakeholders take stock of New York's ocean-related activities and programs. Through a five-year action plan, the goal of the OAP is to achieve better-managed and healthier ocean ecosystems that will benefit people, communities, and the natural world. Grounded in short-term actions to reach long-term goals, the OAP guides state government funding, research, management, outreach, and education choices. http://www.dec.ny.gov/lands/84428.html
Marine Habitat Protection	New York's marine habitats support a diverse array of fish, wildlife, and plant species. These productive areas include tidal wetlands, submerged aquatic vegetation like eelgrass, estuaries and open waters, mud and sandflats, and natural and artificial reefs. Habitats like these produce over 75% of the commercially and recreationally important finfish and shellfish species in the world. Marine habitats like tidal wetlands and barrier beaches also protect New York's shoreline from erosion and flooding. It is the responsibility of the DEC's Bureau of Marine Resources (BMR), Marine Habitat Protection Section to protect and restore these valuable resources.

Water Resources Law	The law covers: non-Agricultural Water Withdrawal Reporting and Permitting, Agricultural Water Withdrawal Reporting, Registration and Permitting, Water Well Contractor Program, Drought Information, and Water Conservation http://www.dec.ny.gov/lands/313.html

2.2.1.6 New Jersey

2.2.1.6.1 New Jersey Environmental Agencies

- **New Jersey Department of Environmental Protection (NJDEP):** The NJDEP is the primary state agency responsible for the protection of the air, waters, land, and natural and historic resources of the state to ensure continued public benefit. Statutes are implemented through rules (i.e. regulations) that are codified in the New Jersey Administrative Code (NJAC). The rules that are utilized by the Department of Environmental Protection and other environmental agencies are codified at Title 7 of the NJAC. More information about New Jersey's environmental rules and regulations can be found at http://www.state.nj.us/dep/rules/.

2.2.1.6.2 New Jersey State Laws and Regulations

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

Table 2-27. New Jersey state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Description
State Park Service Code **NJAC 7:2**	Administered by the New Jersey Department of Environmental Protection, this Act governs the use of all state parks, forests, recreation areas, historic sites, natural areas, marinas, golf courses, botanical gardens, and other lands, waters and facilities under the jurisdiction of the Department and assigned to the State Park Service. Name of Program Responsible for Rule: Parks and Forestry. For more information: http://www.nj.gov/dep/rules/rules/njac7_2.pdf
Natural Areas and the Natural Areas System **NJAC 7:5A**	Administered by the NJ Department of Environmental Protection, the accepted use of natural areas by the public as well as a list of natural areas in the Natural Areas System is described. Name of Program Responsible for Rule: Natural Lands Management. For more information: http://www.nj.gov/dep/rules/rules/njac7_5a.pdf
State Trails System **NJAC 7:5D**	Administered by the New Jersey Department of Environmental Protection, it establishes the standards, procedures and practices for designating and maintaining trails as a part of the State Trails System. Name of Program Responsible for Rule: Parks and Forestry. For more information: http://www.nj.gov/dep/rules/rules/njac7_5d.pdf

Coastal Permit Program Rules **NJAC 7:7**	Administered by the NJ Department of Environmental Protection, the rules describe how to apply for a coastal permit under the Coastal Area Facility Review Act, how to apply for a permit under the Wetlands Act of 1970, and how to apply for a permit under the Waterfront Development Law. Main topics include CAFRA, waterfront development, coastal wetlands and coastal permits. Name of Program Responsible for Rule: Parks and Forestry. For more information: http://www.nj.gov/dep/rules/rules/njac7_7.pdf
Freshwater Wetlands Protection Act Rules **NJAC 7:7A**	Administered by the NJ Department of Environmental Protection, the rules describe what activities may and may not be conducted in and adjacent to freshwater wetlands and state open waters. Explains how to apply for a permit to conduct activities in wetlands, state open waters and transition areas. Name of Program Responsible for Rule: Land Use Regulation For more information: http://www.nj.gov/dep/rules/rules/njac7_7a.pdf
Coastal Zone Management **NJAC 7:7E**	Administered by the New Jersey Department of Environmental Protection, Coastal Zone Management provides standards for coastal permit applications for coastal activities and developments under CAFRA, the Waterfront Development Law and Wetlands Act of 1970. This also provides standards for reviewing Federal Consistency Determinations under the Federal Coastal Zone Management Act and Water Quality Certificates in coastal areas under Section 401 of the Federal Clean Water Act. Name of Program Responsible for Rule: Land Use Regulation For more information: http://www.nj.gov/dep/rules/rules/njac7_7e.pdf
Surface Water Quality Standards **NJAC 7:9B**	Administered by the New Jersey Department of Environmental Protection to protect surface water resources. The standards address stream classifications, water designated uses, water quality criteria to protect uses, anti-degradation policies and procedures for implementing water quality standards. Name of Program Responsible for Rule: Water Monitoring and Standards For more information: http://www.nj.gov/dep/rules/rules/njac7_9b.pdf
Safe Drinking Water Act **NJAC 7:10**	Administered by the New Jersey Department of Environmental Protection, this Act governs the construction and operation of water systems; establishes drinking water standards to ensure for the provision of a safe and adequate water supply for consumption by the public. It also establishes standards for construction and procedures for certifications of water supply systems under the Reality Improvement, Sewerage and Facilities Act, N.J.S.A. 58:11-23. Name of Program Responsible for Rule: Water Supply For more information: http://www.nj.gov/dep/rules/rules/njac7_10.pdf

Flood Hazard Area Control **NJAC 7:13**	Administered by the New Jersey Department of Environmental Protection, this provides permitting standards and procedures for projects to be conducted in flood plains in order to minimize or avoid flood damage. Includes construction standards, standards for protection of near-stream vegetation, and methods of determining flood hazard area along waterways. Name of Program Responsible for Rule: Land Use Regulation For more information: http://www.nj.gov/dep/rules/rules/njac7_13.pdf
Water Pollution Control Act **NJAC 7:14**	Administered by the New Jersey Department of Environmental Protection, this Act, also known as the Clean Water Enforcement Act (CWEA), provides requirements for the construction of wastewater treatment facilities. Name of Programs Responsible for Rule: Water Quality, Water Compliance and Enforcement For more information: http://www.nj.gov/dep/rules/rules/njac7_14.pdf
Pollutant Discharge Elimination System **NJAC 7:14A**	Administered by the New Jersey Department of Environmental Protection, this provides for the regulation of the discharge of pollutants to the surface and ground waters of the state. Name of Program Responsible for Rule: Water Quality For more information: http://www.state.nj.us/dep/dwq/714a.htm
Water Quality Management Planning **NJAC 7:15**	Administered by the New Jersey Department of Environmental Protection, this describes water quality management policies and procedures concerning water quality management planning, including statewide, area wide, and county water quality management plans (WQMPs) and wastewater management plans (WMPs). It also: provides review process and procedures for WQMP consistency determinations, revisions and amendments including WMPs; describes the process used to identify water quality limited segments; sets forth two general approaches for development of total maximum daily loads; and, establishes policies and procedures for the award of grant funds to watershed management groups. Name of Program Responsible for Rule: Watershed Management For more information: http://www.nj.gov/dep/rules/rules/njac7_15.pdf
Dam Safety Standards **NJAC 7:20**	Administered by the New Jersey Department of Environmental Protection, this governs the design, construction, inspection, operation, maintenance, modifications and repair of dams in New Jersey which raise the water height of a stream by more than five feet. Name of Program Responsible for Rule: Dam Safety For more information: http://www.nj.gov/dep/rules/rules/njac7_20.pdf

Administration of Lake Restoration Projects **NJAC 7:23**	Administered by the New Jersey Department of Environmental Protection, this establishes policies and procedures for eligibility and distribution of grants and loans to government agencies and private lake associations for lake restoration projects. Name of Program Responsible for Rule: Engineering and Construction For more information: http://www.nj.gov/dep/rules/rules/njac7_23.pdf
Dam Restoration and Inland Waters Projects Loan Program **NJAC 7:24A**	This program, administered by the New Jersey Department of Environmental Protection and subject to the availability of funds, establishes policies and procedures for eligibility and distribution of grants and loans to government agencies, private lake associations and owners of private dams for dam restoration and inland waters projects. Name of Program Responsible for Rule: Dam Safety For more information: http://www.nj.gov/dep/rules/rules/njac7_20.pdf
Division of Fish and Wildlife Rules **NJAC 7:25**	Administered by the New Jersey Department of Environmental Protection, these rules govern the management and harvest of fish and wildlife within the state. Name of Program Responsible for Rule: Fish and Wildlife For more information: http://www.nj.gov/dep/fgw/
Green Acres Program **NJAC 7:36**	Administered by the New Jersey Department of Environmental Protection, this program provides criteria under which Green Acres will award funding to counties, municipalities, and nonprofit organizations for the acquisition and development of land for outdoor recreation and conservation purposes. Procedures and standards are provided for the disposal, or diversion to a use other than recreation and conservation, of those lands acquired with Green Acres assistance or otherwise encumbered with Green Acres restrictions. Name of Program Responsible for Rule: Green Acres For more information: http://www.nj.gov/dep/greenacres/regs.pdf
Highlands Water Protection and Planning Act Rules **NJAC 7:38**	Administered by the New Jersey Department of Environmental Protection, these rules describe obtaining a determination regarding whether or not an activity in the Preservation Area is regulated and/or exempt (Highlands Applicability Determination); describes obtaining a permit (Highlands Preservation Area Approval) for a major Highlands development (regulated activity) in the Preservation Area; describes obtaining an approval to conduct a regulated activity if the activity involves health and safety, redevelopment, a claim of taking without just compensation, or 100% affordable housing (Highlands preservation area approval with waiver); and describes obtaining a determination regarding the Highlands resources present on a specific site (Highlands resource area determination). Name of Program Responsible for Rule: Land Use Regulation For more information: http://www.nj.gov/dep/rules/rules/njac7_38.pdf

2.2.1.7 Pennsylvania

2.2.1.7.1 Pennsylvania Environmental Agencies

- **The Department of Environmental Protection:** The mission is to protect Pennsylvania's air, land and water from pollution and to provide for the health and safety of its citizens through a cleaner environment by working with individuals, organizations, governments and businesses to prevent pollution and restore natural resources.
- **DEP's Office of Water Management:** Plans, directs and coordinates departmental programs associated with the management and protection of the Commonwealth's vast water resources. Staff administer and oversee departmental programs involving surface and groundwater quantity and quality planning, and soil and water conservation. The office also coordinates policies, procedures, and regulations which influence public water supply withdrawals and quality, sewage facilities planning, point source municipal and industrial discharges, encroachments upon waterways and wetlands, dam safety, earth disturbance activities and control of storm water and non-point source pollution. In addition, the Office of Water Management also coordinates the planning, design and construction of flood protection and stream improvement projects.
- **Department of Conservation and Natural Resources:** Established on July 1, 1995, the Pennsylvania Department of Conservation and Natural Resources is charged with maintaining and preserving the 120 state parks; managing the 2.2 million acres of state forest land; providing information on the state's ecological and geologic resources; and establishing community conservation partnerships with grants and technical assistance to benefit rivers, trails, greenways, local parks and recreation, regional heritage parks, open space and natural areas.
- **Pennsylvania Fish and Boat Commission (PFBC):** The mission of the Pennsylvania Fish and Boat Commission is to protect, conserve, and enhance the Commonwealth's aquatic resources and provide fishing and boating opportunities.
- **Pennsylvania Game Commission:** The Pennsylvania Game Commission (PGC) regulates all hunting and trapping throughout the state while the PFBC regulates all fishing and boating activities.

2.2.1.7.2 Pennsylvania State Laws and Regulations

Below is a list and brief description of specific Pennsylvania state laws and regulations that already offer some protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-28).

Table 2-21. Pennsylvania state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
Pennsylvania Scenic Rivers Act, act of December 5, 1972 (P.L. 1277, No. 283), 32 P.S. §§ 820.21-820.29	Administered by the Department of Conservation and Natural Resources (DCNR), the purpose is to establish the Pennsylvania Scenic Rivers System to protect the aesthetic and recreational values of many of the rivers of Pennsylvania and to practice sound conservation policies and practices within the scenic rivers system. http://www.dcnr.state.pa.us/legal/majorlaws/index.htm
Keystone Recreation, Park and Conservation Fund Act, 1993 **P.L. 359, No. 50**	This act authorizes, subject to a referendum, the Commonwealth to incur indebtedness of $50,000,000 to fund nature preserves and wildlife habitats and improvements to and expansion of state parks, community parks and recreation facilities, historic sites, zoos, and public libraries. http://www.dcnr.state.pa.us/legal/majorlaws/index.htm

Pennsylvania Natural Heritage Program	Founded in 1982, the Pennsylvania Natural Heritage Program (PNHP) gathers and manages information regarding the status and location of Pennsylvania's rare species and habitats and native natural communities. PNHP's goal is to build, maintain, and provide accurate and accessible ecological information needed for conservation, development planning and natural resource management.
Wild Resource Conservation Act, 1982 **P.L. 597, No. 170** **32 P.S. §§ 5301-5314**	The purpose of this Act is to preserve and enhance flora and fauna species, including those that are rare or endangered, which are not commonly pursued, killed or consumed either for sport or profit. To carry out this purpose, the act creates a Wild Resource Conservation Fund supported by voluntary contributions. The Department of Revenue is directed to provide a check-off on the Pennsylvania State income tax return forms so that voluntary contributions to the fund may be made from income tax refunds. The act also authorizes raising money for the fund by the sale of items of personal property. http://www.dcnr.state.pa.us/legal/majorlaws/index.htm
The Interstate Wildlife Violator Compact	The Interstate Wildlife Violator Compact is an agreement that recognizes suspension of hunting, trapping and fishing privileges in member states. This means that illegal activities in one state can affect a person's hunting, trapping or fishing privileges in all participating states. Any person whose license privileges or rights are suspended in a member state may also be suspended in Pennsylvania. If a person's hunting, trapping or fishing rights are suspended in Pennsylvania, they may be suspended in other member states as well. This cooperative interstate effort enhances the Pennsylvania Game Commission's ability to protect and manage wildlife resources. http://www.portal.state.pa.us/portal/server.pt?open=514&objID=1595918&mode=2
Environmental Stewardship and Watershed Protection Act, 1999	This act provides money to protect open space and critical habitats, conserve river resources, create greenways, build community parks and playgrounds, and enhance tourism. It is administered by DCNR, DEP,PA Department of Agriculture.
Growing Greener, 1999	Provides funding to protect and preserve farmland and open space, maintain parks, clean up abandoned mines, restore watersheds, and upgrade sewer systems.
Project 70 Land Acquisition and Borrowing Act	Administered by DCNR, this act created funding for acquisition of land for conservation. http://www.dcnr.state.pa.us/legal/majorlaws/index.htm
Open Space Law, **PA Act 442**	Funding program and education aimed to preserve open space. Includes (but not limited to) protection and conservation of water resources and watersheds; existing or planned park, forest, wildlife preserve, nature reserve, or other recreation or conservation site by controlling the use of contiguous or nearby lands in order to protect the scenic, aesthetic or watershed values of the site; natural or scenic resources, including but not limited to soils, beaches, streams, floodplains, or marshes.

Dam Safety and Encroachments Act, 1978 **Act 325**	This Act gives DEP the authority to regulate dams, reservoirs, water obstructions, and encroachments, in part to protect natural resources and conserve the water quality, natural regime and carrying capacity of watercourses. Dredging and filling activities are also regulated (as encroachments). http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-52060/Act%20394%20of%201937.pdf
Floodplain Management Act, 1978, Act 166	In part, this act authorizes a comprehensive and coordinated program of floodplain management, based upon the National Flood Insurance Program, designed to preserve and restore the efficiency and carrying capacity of the streams and floodplains of the Commonwealth. http://www.pacode.com/secure/data/025/chapter106/chap106toc.html
Conservation District Law, **Act of May 15, 1945, P.L. 547**	Policy that provides for the conservation of the soil, water, and related resources of Pennsylvania, and for the control and prevention of soil erosion, and, thereby, to preserve natural resources; assist in the control of floods; prevent impairment of dams and reservoirs; assist in maintaining the navigability of rivers and harbors; http://pacd.org/webfresh/wp-content/uploads/2009/06/217.pdf

2.2.1.8 Delaware

2.2.1.8.1 Delaware Environmental Agencies

- **Delaware Department of Natural Resources and Environmental Control (DNREC)**
- **DNREC, Shoreline and Waterway Management Section:** This agency maintains and improves Delaware's shoreline and waterways (bays and canals). Overall, the Section manages the shoreline through regulation of coastal construction activities and implementation of dune and beach management practices. Regulates coastal construction through programs and permit requirements for construction in beach areas

2.2.1.8.2 Delaware State Laws and Regulations

Below is a list and brief description of specific Delaware state laws and regulations that already offer some protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-29).

Table 2-29. Delaware state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
Coastal Zone Act **Title 7, Chapter 70**	The Coastal Zone Act Program regulates existing heavy industrial activities, as well as new and existing manufacturing activities in Delaware's Coastal Zone. Certain new activities, such as the bulk transfer of raw materials, are not allowed in the Coastal Zone, which runs the length of the state. http://www.dnrec.delaware.gov/Admin/CZA/Pages/default.aspx

Delaware Dam Safety Law	Adopted in 2004 this provides the framework for proper design, construction, operation, maintenance, and inspection of dams in the interest of public health, safety, and welfare. http://www.dnrec.delaware.gov/swc/Drainage/Pages/DamSafety.aspx
Erosion and Sedimentation Control	The Sediment and Stormwater Management program operates within the Division of Watershed Stewardship's Drainage and Stormwater Section. The program employs a comprehensive approach to sediment control (both during and after construction) and stormwater management that includes monitoring of stormwater quantity and water quality control. Program responsibilities include: sediment control and inspection during construction, post-construction inspection of permanent stormwater facilities, stormwater quantity and water quality control. http://delcode.delaware.gov/title7/c040/index.shtml
Beach Preservation Act	The purpose of the Beach Preservation Act is to enhance, preserve and protect the public and private Delaware beaches, to mitigate beach erosion, to create civil and criminal remedies for acts destructive of beaches, to prescribe the penalties for such acts and to vest in the Department of Natural Resources and Environmental Control the authority to adopt such rules and regulations it deems necessary to effectuate the purposes of the Act. http://delcode.delaware.gov/title7/c068/
Surface Water Discharges	Administered by DNREC Division of Water, the Surface Water Discharges Section regulates point and non-point sources of pollution to surface waters of the state, working with individuals, municipalities and industry to ensure that wastewater is property treated, stormwater is properly managed, and biosolids and residual wastes are beneficially reused. http://www.dnrec.delaware.gov/wr/Information/Pages/RegulationsOverview.aspx
Tidal Finfish **DAC Title 7: 3500**	This regulation is directed at management and conservation of coastal finfishery resources in cooperation with the federal government, local governments of Delaware and the governments of other states. This regulation provides the legal framework by which the users of Delaware's finfishery resource can participate in the state's responsibility of governing fishing for, and the taking of, finfish in a manner that is both biologically and socioeconomically sound. Section 3571 includes a moratorium on the possession of Atlantic sturgeon. http://regulations.delaware.gov/AdminCode/title7/3000/3500/3511.shtml
Wildlife **DAC Title 7: 3900**	This regulation addresses endangered species and state wildlife area protection for intertidal areas of the Delaware River and Bay. http://regulations.delaware.gov/AdminCode/title7/3000/3900%20Wildlife/3900.shtml

7504 Regulations Governing the Use of Subaqueous Lands **DAC Title 7: 7500**	Subaqueous lands within the boundaries of Delaware constitute an important resource of the state and require protection against uses or changes which may impair the public interest in the use of tidal or navigable waters. The purposes of this regulation are to deal with or to dispose of interest in public subaqueous lands, and to place reasonable limits on the use and development of private subaqueous land, in order to protect the public interest by employing orderly procedures for granting interests in public subaqueous land, and for issuing permits for uses of or changes in private subaqueous lands. http://regulations.delaware.gov/AdminCode/title7/7000/7500/7504.shtml#TopOfPage
7502 Wetlands Regulations **Title 7: 7500**	This regulation provides for the preservation of the coastal wetlands which are crucial to the protection of the natural environment of coastal areas and to prevent their despoliation and destruction consistent with the historic right of private ownership of lands. http://regulations.delaware.gov/AdminCode/title7/7000/7500/7502.shtml#TopOfPage

2.2.1.9 Maryland

2.2.1.9.1 Maryland Environmental Agencies

- **Maryland Department of the Environment (MDE)**: The MDE was created in 1987 to protect and preserve the state's air, water and land resources and safeguard the environmental health of Maryland's citizens. MDE's duties also encompass enforcement of environmental laws and regulations, long-term planning and research. MDE provides technical assistance to Maryland industry and communities for pollution and growth issues and environmental emergencies.
- **Maryland Department of Natural Resources (DNR)**: The Department of Natural Resources leads Maryland in securing a sustainable future for the environment, society, and economy by preserving, protecting, restoring, and enhancing the state's natural resources.

2.2.1.9.2 Maryland State Laws and Regulations

Below is a list and brief description of specific Maryland state laws and regulations that already offer some protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-30).

Table 2-30. Maryland state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
Critical Area Act **Title 8, Subtitle 18 of the Natural Resources**	The law identified the "Critical Area" of the Chesapeake Bay and its tributaries and created a statewide Critical Area Commission to oversee the development and implementation of local land use programs with the goals of: minimizing adverse impacts on water quality that result from pollutants that are discharged from structures or conveyances or that have run off from surrounding lands; conserving fish, wildlife, and plant habitat in the Critical Area; and establishing land use policies for development in the Critical Area which accommodate growth and also address the fact that, even if pollution is controlled, the

	number, movement, and activities of persons in the Critical Area can create adverse environmental impacts. http://www.dnr.state.md.us/criticalarea/
Habitat Protection Areas (HPAs)	Habitat Protection Areas are areas within the Critical Area that have been identified and designated for special protection through the Critical Area regulations. These areas include the Critical Area Buffer, nontidal wetlands, habitats of threatened and endangered species and species in need of conservation, specific plant and wildlife habitats, and anadromous fish propagation waters. The Heritage Division of the Department of Natural Resources maintains maps and comprehensive data on the protected species, their habitats, and the locations of these habitats within the Critical Area. http://www.dnr.state.md.us/criticalarea/faq.asp#8
Coastal Zone Consistency/ Coastal Zone Management Program (CZMP)	Administered by Maryland Department of Natural Resources (DNR) - Tidewater Administration, Maryland's CZMP was approved in 1978 and established specific goals, objectives, and policies for the protection, preservation and orderly development of the state's coastal resources. Maryland's CZMP is a comprehensive and coordinated program, based on existing state laws and authorities. http://dnr.maryland.gov/ccp/coastal_policy.asp
Chesapeake Bay Agreement	Administered by the Chesapeake Bay Commission, the primary goal of the agreement is to improve water quality sufficiently to sustain the living resources of the Chesapeake Bay and its tidal tributaries, and to maintain that water quality into the future. The agreement has five sections containing commitments to protect and restore living resources, vital habitats, and water quality through sound land use by promoting stewardship and engaging communities throughout the 64,000 square mile watershed. The agreement is designed to build on past restoration actions and will continue all Bay Program commitments outlined in previous agreements or Executive Council directives.
Areas of Critical State Concern	Upon approval by local governments, the Division of State Planning may designate individual wetlands (or other areas) as Areas of Critical State Concern. These areas will receive special protection with regard to permitted activities within their boundaries.
Chesapeake Bay Initiative	The Chesapeake Bay Foundation (CBF) and Ducks Unlimited, Inc. (DU) have joined forces in an initiative to restore, protect, and enhance wetlands, stream buffers and wildlife habitat in Maryland, Pennsylvania, and Virginia. The partnership's goal is to restore more than 10,000 acres of wetlands and 120 miles of stream banks to improve water quality in the Bay region. The restoration project will work with federal and state conservation programs by bringing landowners to the programs, and by providing technical, financial, and managerial expertise to the projects. DU has identified the Chesapeake Bay as its highest priority in the Atlantic flyway and critical to the long-term sustainability of many species of waterfowl. CBF has established a goal of increasing 125,000 acres of wetlands in the Bay watershed. CBF has critical

	knowledge of the region and 30 years' experience in restoration, outreach, education, and fundraising. To date, over 3,300 acres of habitat have been restored on public and private land.
Nongame and Endangered Species Conservation Act **Code of Maryland Regulations 08.03.08**	Administered by the Maryland Department of Natural Resources (DNR) - Wildlife and Heritage Division, this Act is supported by regulations (Code of Maryland Regulations 08.03.08) which contain the official State Threatened and Endangered Species list. Secondarily, DNR's Fisheries Service maintains an official list of game and commercial fish species that are designated as threatened or endangered in Maryland (Code of Maryland Regulations 08.02.12). The Wildlife and Heritage Division tracks the status of over 1100 native plants and animals that are among the rarest in Maryland and most in need of conservation. Of these species, the Maryland Department of Natural Resources officially recognizes 659 species and subspecies as endangered, threatened, in need of conservation, or endangered extirpated. Only 37, or 3% of the total tracked species, are listed by the U.S. Fish and Wildlife Service as nationally endangered or threatened. http://www.mde.state.md.us/programs/Water/WetlandsandWaterways/Regulations/Pages/Programs/WaterPrograms/Wetlands_Waterways/regulations/lawsandprograms3.aspx
Chesapeake Bay Critical Area Law	Administered by the Critical Area Commission, Maryland Department of Natural Resources (DNR), the purpose of the law is to regulate activities within 1,000 feet of tidal waters of the Chesapeake Bay with the intent of improving the water quality and habitat in the Bay. The provision for protecting nontidal wetlands in the Critical Area was the most stringent of any federal or state program being implemented in Maryland prior to passage of the State Nontidal Wetlands Act in 1989. The criteria require that local jurisdictions protect the hydrologic regime and water quality of wetlands by minimizing alterations to the drainage area, surface/subsurface flow of water, and overall water quality.
Watershed Protection and Restoration Act, 2012 **(HB 987)**	This act established a requirement that Maryland's ten largest jurisdictions pass legislation to generate local funds to implement their 5-year stormwater permits. The program establishes a system of stormwater remediation fees and a local watershed protection and restoration fund that must be implemented by counties and municipalities that are subject to a National Pollutant Discharge Elimination System (NPDES) Phase I Municipal Separate Storm Sewer System (MS4) permit in Maryland. http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/SedimentandStormwaterHome/Pages/Programs/WaterPrograms/sedimentandstormwater/home/index.aspx
Nontidal Wetlands Protection Act & Program	Administered by the Maryland Department of the Environment, the Nontidal Wetlands Protection Act seeks to protect nontidal wetlands by regulating and restricting all activities that could impact nontidal wetlands or waters of the state. The Act also helps to insure "no net loss" in wetlands, by requiring

	mitigation or compensation for any wetland losses. The Act also has provisions for the structuring of a smooth and expedient application review process, for dealing with developments in wetlands. http://www.mde.state.md.us/programs/Water/WetlandsandWaterways/Regulations/Pages/Programs/WaterPrograms/Wetlands_Waterways/regulations/lawsandprograms3.aspx
Sediment & Erosion Control Program and Law	Administered by the Maryland Department of the Environment - Nonpoint Source Program, the Sediment Control Law of 1970 requires that local governments adopt erosion and sediment control ordinances to control runoff from construction sites. State law exempts only agricultural land management practices and the construction of agricultural facilities (except in Calvert County), construction of single-family homes on lots more than two acres (provided that earth disturbances are less than 1/2 acre), and minor projects of limited volume and area from the requirement to obtain, implement, and maintain an approved erosion and sediment control plan.
Shore Erosion Control Program	Administered by the Maryland Department of Natural Resources - Shore Erosion Control Program, the Shore Erosion Control Program was established in 1968 by act of the Maryland's General Assembly for the purpose of addressing shoreline and streambank erosion problems along the Chesapeake Bay and its tributaries. The Shore Erosion Control Program provides both technical and financial assistance to landowners in completing both structural and non-structural shore erosion control projects. Non-structural projects are often preferred, but structural projects are used in areas with high rates of erosion. http://www.dnr.state.md.us/ccs/restoration.asp
Rural Legacy Program (Natural Resources Article, §§5-9A-03, Annotated Code of Maryland)	The Rural Legacy Program, a keystone of Maryland's "Smart Growth Initiatives," was enacted by the 1997 Maryland General Assembly. The Program encourages local governments and private land trusts to identify Rural Legacy Areas and to competitively apply for funds to complement existing land conservation efforts or to develop new ones. Easements or fee estate purchases are sought from willing landowners in order to protect areas vulnerable to sprawl development that can weaken an area's natural resources, thereby jeopardizing the economic value of farming, forestry, recreation and tourism. http://www.dnr.state.md.us/land/rurallegacy/index.asp
Stormwater Management **Code of Maryland Regulations (COMAR) 26.17.02**	Administered by the Maryland Department of the Environment, this legislation was passed in 1982 to manage stormwater runoff to reduce stream channel erosion, pollution, and flooding to avoid adverse impacts on land and water resources. Any land developed for residential, commercial, industrial, or institutional use requires an approved plan. http://mde.maryland.gov/programs/Water/Pages/index.aspx
Stream ReLeaf	Administered by the Maryland Department of Natural Resources, Maryland's Stream ReLeaf project is a pledge to lead the Bay states in reforesting 600 miles

	of streams and rivers by the year 2010. American Forests has joined as a partner to help publicize the initiative and develop funding from businesses. http://www.dnr.state.md.us/forests/programapps/ripfbi.html
Tributary Strategies	Maryland's Tributary Teams meet regularly in each of the Bay's ten major tributaries to help implement pollution prevention measures needed to address local water quality problems. A major focus of their efforts is controlling nutrient pollution from farm fields and horse pastures, wastewater treatment plants, construction and road building activities, and of suburban properties. http://www.dnr.maryland.gov/waters/tribstrat/
Water Quality Improvement Act of 1998	Administered by Maryland Department of Agriculture (MDA), the Water Quality Improvement Act of 1998 is designed to protect the health of Maryland's citizens and its waterways by establishing both short and long-term strategies for reducing nutrient levels in rivers and streams.
Waterway Construction Statute	Administered by Maryland Department of the Environment - Wetlands & Waterways Program, this statute established a permanent State Water Resources Commission. Waterway construction regulations assure that activities in a waterway or its floodplain, an area defined as waters of the state, do not create flooding on upstream or downstream property, maintain fish habitat and migration, and protect waterways from erosion.

2.2.1.10 Washington, DC

2.2.1.10.1 District of Columbia Environmental Agencies

- **District Department of the Environment, Natural Resources Administration:** The core function of the Natural Resources Administration (NRA) of the District Department of the Environment (DDOE) is to conserve, protect, and improve the soil, water, and living resources of the District of Columbia, and to protect its aquatic resources from pollution and degradation. NRA achieves its objectives by using a combination of federal and District authorities, such as: strategic planning; setting and enforcing water quality standards; and monitoring and assessing the quality of the aquatic and wildlife resources. There are four divisions within the Natural Resources Administration:
    - The **Fisheries & Wildlife Division (FWD)** develops, supports, and implements programs for urban fish and wildlife conservation, protection, recreation, and sustainability. FWD achieves its objectives by employing innovative and traditional scientific methods to obtain the best natural resource data available, and by elevating environmental awareness and stewardship through education, outreach and community involvement.
    - The **Water Quality Division (WQD)** restores and protects the surface and ground waters of the District through: setting and enforcing water quality standards; monitoring and assessing the quality of the waters and aquatic resources; and developing and implementing policies to protect and restore the water quality and aquatic resources.
    - The **Watershed Protection Division (WPD)** conserves the soil and water resources of the District and protects its watersheds from nonpoint source pollution.

The **Storm Water Management Division (SWMD)** administers the MS4 permit issued to three district agencies (Department of Transportation, Department of Public Works and DDOE) and the District of Columbia Water and Sewer Authority (WASA) by the US EPA under the National Pollutant Discharge

Elimination System (NPDES), and oversees their activities to ensure that permit compliance activities are prioritized, budgeted and implemented.

2.2.1.10.2 District of Columbia Laws and Regulations

Below is a list and brief description of specific District of Columbia laws and regulations that already offer some protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-31).

Table 2-22. District of Columbia state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
Title 19, Chapter 15 - Fish and Wildlife	The rules provide the minimum guidelines and procedures for the implementation of section 4 of D.C. Law 5-188, the Water Pollution Control Act of 1984, which mandates the protection of aquatic animals and plants and the restoration and preservation of aquatic life in the District's waters for aesthetic enjoyment, recreation, and industry. Read more: http://www.environmentguru.com/pages/elements/element.aspx?id=1069237#ixzz2tJeS5DNB http://www.dcregs.dc.gov/Gateway/ChapterHome.aspx?ChapterNumber=19-15
Title 21 Chapter 6 – Riparian Rights and Water Privileges	This chapter covers construction, repair, and dredging in DC waters; application for a permit; time limitations; artificial fill; riparian rights and water privileges petitions; initiation of proceedings by the District; intervention of interested parties; hearing of petitions; conduct of hearings; fees for permits; and enforcement and penalties Read more: http://www.environmentguru.com/pages/elements/element.aspx?id=1069225#ixzz2tJcQ3VAn http://green.dc.gov/service/water-quality-regulations
Habitat Restoration Program	The Habitat Restoration Program plans, funds, and oversees activities that will protect and restore river, stream, and wetland habitats in the District of Columbia. The intent of these activities is to improve water quality in the District's waterways and improve the ecological diversity found within the District's borders. http://green.dc.gov/service/habitat-restoration
Anacostia River Clean Up and Protection Act of 2009	This Act protects the aquatic and environmental assets of the District of Columbia, bans the use of disposable non-recyclable plastic carryout bags, and establishes a fee on disposable carryout bags provided by any business that sells food or alcohol products. Read more: http://www.environmentguru.com/pages/elements/element.aspx?id=1069194#ixzz2tJf2wLD5

Title 21, Chapter 14 - Submerged Aquatic Vegetation Regulations	Providing for the management of submerged aquatic vegetation, this chapter covers the harvesting plan approval; exemptions, application, letter of notification and plan contents; criteria for approval; conditions and limitations; timeframe for approvals and the review process; herbicides; and violations. Read more: http://www.environmentguru.com/pages/elements/element.aspx?id=1069227#ixzz2tJg67EdU http://green.dc.gov/service/water-quality-regulations
Water Pollution Control Act of 1984 DC Law 5-188	This Act regulates against water pollution and preserves and restores aquatic life in District waters for aesthetic enjoyment, for recreation, and for industry. http://green.dc.gov/service/water-quality-regulations
Comprehensive Stormwater Management Enhancement Amendment Act of 2008	This Act establishes stormwater management programs to reduce the amount of stormwater pollutants that are discharged into District rivers and streams. It also requires the mayor to offer financial assistance programs to mitigate the impact of increases in stormwater user fees on low-income residents of the District. Read more: http://www.environmentguru.com/pages/elements/element.aspx?id=1069197#ixzz2tJfYE68W
Title 21, Chapter 5 – Water Quality and Pollution	The Water Quality Control component fulfills the function of policy planning as well as regulatory control of surface water, ground water and wetlands. In addition, it conducts special studies on pollutant fate and transport to identify probable sources and impacts, river/stream sediment and water column quality not covered by ambient monitoring, wet weather nonpoint source runoff quantity and quality, and discharge-related facility inspections. It also tracks permit violations. http://green.dc.gov/service/water-quality-regulations
Title 21, Chapter 11 – Water Quality Standards	This chapter establishes the Water Quality Standards (WQS) for the waters of the District of Columbia. This chapter covers the surface waters, antidegradation policy, wetlands, implementation and applicability, site-specific standards, rivers, applicability of ground water standards, beneficial use classes for ground water, ground water classification, ground water standards, ground water monitoring for potential contamination, and enforcement. Read more: http://www.environmentguru.com/pages/elements/element.aspx?id=1069226#ixzz2tJgS9d6f http://green.dc.gov/service/water-quality-regulations

2.2.1.11 Virginia

2.2.1.11.1 Virginia Environmental Agencies

- **Virginia Department of Conservation and Recreation**

- **Virginia Department of Environmental Quality (DEQ):** DEQ administers state and federal laws and regulations for air quality, water quality, water supply and land protection. In addition, other programs cover a variety of environmental activities, such as improving the ability of businesses and local governments to protect the environment, and offering technical and financial assistance for air and water quality improvements.
- **Virginia Department of Game and Inland Fisheries (VDGIF):** VDGIF is responsible for the management of inland fisheries, wildlife, and recreational boating in Virginia. The mission, in part, is to maintain optimum populations of all species and to provide outdoor recreational opportunities.
- **The State Water Control Board** promulgates Virginia's water regulations, covering a variety of permits, permit fees, ground water management areas, ground water withdrawals and petroleum storage tanks.

2.2.1.11.2 Virginia State Laws and Regulations

Below is a list and brief description of specific Virginia state laws and regulations that already offer some protection for Atlantic sturgeon habitat and links to websites where more information about them can be found (Table 2-32).

Table 2-32. Virginia state laws and regulations providing baseline protection to Atlantic sturgeon critical habitat essential features

Regulation	Overview
Chesapeake Bay Preservation Act **9 VAC 25-830**	Administered by the Department of Conservation and Recreation, State Water Control Board, this body of regulations contains criteria that will provide for the protection of water quality, and that also will accommodate economic development. All counties, cities and towns in Tidewater Virginia must comply with this chapter. Other local governments not in Tidewater Virginia may use the criteria and conform their ordinances as provided in this chapter to protect the quality of state waters in accordance with § 10.1-2110 of the Code of Virginia. http://www.townhall.virginia.gov/L/ViewChapter.cfm?chapterid=1145
Coastal Lands Management	The Department of Conservation and Recreation, Division of Chesapeake Bay Local Assistance * regulates activities in Chesapeake Bay Resource Management Areas and Resource Protection Areas within 84 localities in Virginia's coastal zone through a state-local cooperative program established pursuant to the Chesapeake Bay Preservation Act; Code of Virginia § 10.1-2100 thru § 10.1-2114 and Chesapeake Bay Preservation Area Designation and Management Regulations; Virginia Administrative Code 9 VAC 10-20-10 et seq. *prior to July 1, 2004, the Division was a separate agency known as the Chesapeake Bay Local Assistance Department. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
Coastal Natural Hazard Areas	This policy covers areas vulnerable to continuing and severe erosion and areas susceptible to potential damage from wind, tidal, and storm-related events including flooding. New buildings and other structures should be designed and sited to minimize the potential for property damage due to storms or shoreline

	erosion. The areas of concern are highly erodible areas and coastal high hazard areas, including flood plains. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
Coastal Natural Resource Areas	These areas are vital to estuarine and marine ecosystems and/or are of great importance to areas immediately inland of the shoreline. Such areas receive special attention from the Commonwealth because of their conservation, recreational, ecological, and aesthetic values. These areas are worthy of special consideration in any planning or resources management process and include the following resources: Wetlands; Aquatic Spawning, Nursery, and Feeding Grounds; Coastal Primary Sand Dunes; Barrier Islands; Significant Wildlife Habitat Areas; Public Recreation Areas; Sand and Gravel Resources; Underwater Historic Sites http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
Coastal Zone Management Act of 1972	The CZMA directs state programs to preserve, protect, develop, and where possible, restore and enhance the resources of the nation's coastal zone for this and succeeding generations. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
DGIF Fisheries, Wildlife, and Boating Regulations **15 VAC 10** **Code of Va Title 29.1**	Administered by the Department of Game and Inland Fisheries, these regulations (Virginia Administrative Code) pertain to the hunting, taking, capture, killing, possession, sale, purchase, and transportation of any wild bird, wild animal, or inland water fish, and the feeding of any game, game animals, or fur-bearing animals as defined in § 29.1-100, or the feeding of any wildlife that results in property damage, endangers any person or wildlife, or creates a public health concern. http://www.dgif.virginia.gov/enforcement/
Erosion and Sediment Control Regulations **9 VAC 25-840**	Administered by the Department of Conservation and Recreation, State Water Control Board, the Erosion and Sediment Control Regulations specify minimum statewide standards to achieve the effective control of soil erosion, sediment, deposition and nonagricultural precipitation runoff resulting from land-disturbing activities. The objective is to prevent the degradation of property, stream channels, waters and other natural resources in the Commonwealth. Land disturbing activities include, but are not limited to, clearing, grading, excavation and filling of land. These standards provide the basis for local erosion and sediment control programs adopted pursuant to the Erosion and Sediment and Control Law and also apply to land-disturbing activities carried out by state agencies. http://www.townhall.virginia.gov/L/ViewChapter.cfm?chapterid=2185
Fisheries Management	The Virginia Department of Game and Inland Fisheries regulates commercial and recreational fishing through Code of Virginia § 28.2-200 thru 28.2-713 and Code of Virginia § 29.1-100 thru 29.1-570. This management program stresses

	the conservation and enhancement of finfish and shellfish resources and the promotion of commercial and recreational fisheries to maximize food production and recreational opportunities. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
Greenways	Greenways are open space corridors that can be managed for conservation, recreation, and/or alternative transportation. Greenways often follow natural or existing land or water features such as ridgelines, stream valleys, rivers, canals, utility corridors, abandoned rail lines and others. Although each greenway is unique, most connect recreational, natural, cultural, and/or historic areas. Some greenways are designed for people to use for recreation and non-motorized transportation, while others are designed for wildlife, biodiversity, and scenic beauty. Greenways may be publicly or privately-owned.
Parks, Natural Areas, and Wildlife Management Areas	Parks, Wildlife Management Areas, and Natural Areas are provided for the recreational pleasure of the citizens of the Commonwealth and the nation by local, state, and federal agencies. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
Point Source Water Pollution Control	The Virginia Department of Environmental Quality regulates discharges into state waters through Virginia Pollutant Discharge Elimination System and Virginia Pollution Abatement permits (accomplished through the implementation of the National Pollutant Discharge Elimination System permit program established pursuant to Section 402 of the federal Clean Water Act). The point source program - the Virginia Pollutant Discharge Elimination System permit program - is administered by the State Water Control Board pursuant to Code of Virginia § 62.1-44.15. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
Shoreline Sanitation	The Virginia Department of Health regulates the installation of septic tanks, sets standards concerning soil types suitable for septic tanks, and specifies minimum distances that tanks must be placed away from streams, rivers, and other waters of the Commonwealth. This program, which includes shellfish closures due to bacterial contamination, is administered by the Department of Health through Code of Virginia § 32.1-164 thru § 32.1-165. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
State Water Control Law (§62.1-44.2 et seq)	The Chesapeake Bay Preservation Act, Erosion and Sediment Control Law and the Stormwater Management Act are consolidated under the State Water Control Law. These programs, formerly with the Soil and Water Conservation Board, are under the jurisdiction of the State Water Control Board The purpose of this law to: (1) protect existing high quality state waters and restore all other state waters to such condition of quality that any such waters will permit all reasonable public uses and will support the propagation and

	growth of all aquatic life, including game fish, which might reasonably be expected to inhabit them; (2) safeguard the clean waters of the Commonwealth from pollution; (3) prevent any increase in pollution; (4) reduce existing pollution; (5) promote and encourage the reclamation and reuse of wastewater in a manner protective of the environment and public health; and (6) promote water resource conservation, management and distribution, and encourage water consumption reduction in order to provide for the health, safety, and welfare of the present and future citizens of the Commonwealth. http://www.deq.virginia.gov/LawsRegulations/Laws.aspx
Stormwater Management Regulations **9 VAC 25-870**	Administered by the Department of Conservation and Recreation, State Water Control Board, the Stormwater Management Regulations specify minimum technical criteria and administrative procedures for stormwater management programs which local goverments are authorized to adopt to achieve the effective control of precipitation runoff from land development projects. These regulations also establish minimum technical criteria and administrative procedures that apply to land development projects that are conducted by state agencies. http://www.townhall.virginia.gov/L/ViewChapter.cfm?chapterid=1145
Subaqueous Land Management	Administered by the Virginia Marine Resources Commission, the management program for subaqueous lands establishes conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects on marine and fisheries resources, wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards established by the Department of Environmental Quality, Water Division. The program is administered by the Marine Resources Commission (Code of Virginia § 28.2-1200 thru 28.2-1213). http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
Tidal Wetlands Program	The tidal wetlands program is administered by the Marine Resources Commission under Code of Virginia § 28.2-1301 thru § 28.2-1320. The purpose of the wetlands management program is to preserve tidal wetlands, prevent their despoliation, and accommodate economic development in a manner consistent with wetlands preservation. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
Virginia Scenic Rivers Program	The intent of the Program is to identify, designate and help protect rivers and streams that possess outstanding scenic, recreational, historic and natural characteristics of statewide significance for future generations. http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/LawsRegulationsGuidance.aspx

Virginia Land Conservation Incentives Act of 1999	The purpose of this act is to supplement existing land conservation programs to further encourage the preservation and sustainability of Virginia's unique natural resources, wildlife habitats, open spaces and forested resources.
Virginia Outdoors Plan	Planning for coastal access is provided by the Department of Conservation and Recreation in cooperation with other state and local government agencies. The Virginia Outdoors Plan, which is published by the Department, identifies recreational facilities in the Commonwealth that provide recreational access. The Virginia Outdoors Plan also serves to identify future needs of the Commonwealth in relation to the provision of recreational opportunities and shoreline access. Prior to initiating any project, consideration should be given to the proximity of the project site to recreational resources identified in the Virginia Outdoors Plan. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
Virginia Water Protection Permit Program	The Virginia Water Protection Permit Program administered by the Department of Environmental Quality includes protection of wetlands, both tidal and non-tidal. This program is authorized by Code of Virginia § 62.1-44.15.5 and the Water Quality Certification requirements of Section 401 of the Clean Water Act of 1972. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx
Waterfront Recreational Land Acquisition	It is the policy of the Commonwealth to protect areas, properties, lands that have scenic beauty, recreational utility, historical interest, or unusual features. Such areas may be acquired, preserved, and maintained for the citizens of the Commonwealth. http://www.deq.state.va.us/Programs/CoastalZoneManagement/LawsRegulationsGuidance.aspx

3.1.2 Protected Areas

The land areas adjacent to the proposed critical habitat units include a variety of national and state parks, national wildlife refuges, state wildlife management areas, etc. In general, these facilities serve as an added layer of protection for the elements of the critical habitat because activities within the facilities are regulated by federal and state laws that foster conservation, and the diverse and rich natural ecosystems prevalent within these parklands are preserved and protected thus providing a benefit to adjacent critical habitat units. These parklands and other protected areas are shown for the Gulf of Maine DPS in Figure 2-14, the New York Bight DPS in Figure 2-15, and the Chesapeake Bay DPS is Figure 2-16. Select protected areas are described below. Any federally-owned protected areas are described in detail in each unit. Other types of protected areas are defined in the section below, and then listed for each unit.

2.2.1.12 Types of Protected Areas

2.2.1.12.1 State Parks

Agencies tasked to manage state parks (SP) often include the protection and management of natural and cultural resources in their mission statements. These resources are designed to provide a range of recreational and educational opportunities as well as environmental and economic benefits for present and

future generations. The types of land typically falling under the jurisdiction of state park agencies can include state parks, public lands, historic sites, public preserved lands and greenways. These areas include marshland, swamps, beaches, wooded parks, parkways, lakes, reservoirs, waterfalls and old growth forests. In some cases other specific types of areas are managed such as submerged lands (ME), multi-use trails (NH), natural lands (NJ), golf courses (NY), geologic wonders (PA) and water (MD). Table 2-34 below provides a list of the types of lands managed by each state park agency and the corresponding website link for the NE region areas.

Table 2-32. State park agencies, types of land managed and website links in the NE region

State	Types of Lands Managed	Link
Maine	State Parks Public Lands Historic Sites Submerged Lands Public Reserved Lands	http://www.maine.gov/dacf/parks/about/index.shtml)
New Hampshire	State Parks Historic Sites Multi-use Trails	http://www.nhstateparks.org/
Massachusetts	State Parks Historic Parkways	http://www.mass.gov/eea/agencies/dcr/massparks/
Connecticut	State Parks	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325086&deepNav_GID=1650
New Jersey	State Parks Recreation Areas Historic Sites Natural Lands	http://www.state.nj.us/dep/parksandforests/
New York	State Parks Historic Sites Recreational Areas	http://nysparks.com/parks/
Delaware	State Parks Preserves Greenways	http://www.destateparks.com/ http://www.dnrec.delaware.gov/parks/Home/Pages/AboutUs.aspx
Pennsylvania	State Parks Trails Scenic Areas Old Growth Forests Geologic Wonders Natural Areas	http://www.dcnr.state.pa.us/wheretogo/index.htm
Maryland	State Parks	http://www.dnr.state.md.us/publiclands/
DC	National Parks	http://www.nps.gov/state/dc/index.htm?program=all
Virginia	State Parks	http://www.dcr.virginia.gov/state-parks/

2.2.1.12.2 State Wildlife Management Areas (WMA)

Public lands such as state wildlife management areas (WMAs) are usually managed by state wildlife and heritage services. These areas are used for conservation and enhancement of wildlife populations and associated habitats for public enjoyment of wildlife dependent recreation. WMAs are primarily used for hunting-related activities and are managed in various ways including applying prescribed burns, planting food plots, establishing native plant species, managing wetlands and timber forestry. In addition to managing natural resources WMA agencies also provide for wildlife-dependent recreation by installation and maintenance of parking lots, roads, trails and boating facilities. Specific WMAs are listed below within each individual unit.

Table 2-33. State WMAs and associated website links in the NE region

State	Link
Maine	http://www.maine.gov/ifw/wildlife/land/department/wma.html
New Hampshire	http://www.wildnh.com/Wildlife/WMA_index.htm
Massachusetts	http://www.mass.gov/eea/agencies/dfg/dfw/maps-destinations/wildlife-management-areas.html
Connecticut	http://www.depdata.ct.gov/wildlife/maps/huntingareas.asp?deepNav=|
New Jersey	http://www.state.nj.us/dep/fgw/wmas.htm
New York	http://www.dec.ny.gov/outdoor/7768.html
Delaware	http://www.dnrec.delaware.gov/fw/Hunting/Pages/HuntingMaps.aspx
Pennsylvania	http://www.portal.state.pa.us/portal/server.pt?open=514&objID=619923&mode=2
Maryland	http://www.dnr.state.md.us/wildlife/Publiclands/index.asp
DC	http://green.dc.gov/service/fisheries-and-wildlife
Virginia	http://www.dgif.virginia.gov/wmas/

2.2.1.12.3 State Forests

Most states have agencies in a forestry division that manage and provide stewardship for wooded habitats. Their missions generally include insuring that the forests remain healthy and vigorous while serving the recreational, natural diversity, preservation (geologic and historical), raw materials (sustainable timber harvesting) and maintenance of wildlife and fisheries habitat needs of the citizens of that state. Management programs for state forests also typically include maintaining the aesthetic and cultural values of the forest as well as preservation and reforestation activities. Management of forests by state agencies often includes managing areas on private lands as well as state owned property. State forestry divisions also work to prevent and suppress wildfires, protect forested lands from destructive insects and disease, conserve native plants, promote tree planting, manage deer and other wildlife, protect water quality and manage mining and natural gas activity.

Table 2-23. State forest (SF) management agencies and website link for the NE region

State	Link
Maine	http://www.maine.gov/dacf/mfs/index.shtml
New Hampshire	http://www.nhdfl.org/
Massachusetts	http://www.mass.gov/eea/agencies/dcr/conservation/forestry-and-fire-control/forestry.html
Connecticut	http://www.ct.gov/deep/cwp/view.asp?a=2697&q=322868&deepNav_GID=1631
New Jersey	http://www.state.nj.us/dep/parksandforests/forest/index.html
New York	http://www.dec.ny.gov/lands/40672.html
Delaware	http://dda.delaware.gov/forestry/forest.shtml
Pennsylvania	http://www.dcnr.state.pa.us/forestry/index.aspx
Maryland	http://www.dnr.state.md.us/forests/mdforests.asp
DC	http://dc.gov/DC/DDOT/About+DDOT/Who+We+Are/Agency+Organization/Urban+Forestry+Administration+%28UFA%29
Virginia	http://dof.virginia.gov/stateforest/index.htm

2.2.1.12.4 State Nature Preserves, Conservation Areas and other State Managed Protected Areas

Other types of protected areas including state nature preserves, conservation areas, historic sites and others are managed by individual states or in partnerships with citizen groups, non-profits, federal agencies, universities and management groups. These areas are managed for varying goals including conservation, recreation, sustainable use (hunting, timber harvest, etc.) and sometimes for generating

funding to support management and infrastructure. Some individual state-specific examples are given below.

New York – Unique Areas

The New York Department of Environmental Conservation (NY DEC) manages land based on four classifications: Forest Preserve, State Forests, Wildlife Management Areas and Conservation Easements. Within the State Forest classification (which is described as state forest land outside the boundaries of preserves) there is further classification into:

- Reforestation Areas
- Multiple Use Areas
- Unique Areas
- State Nature and Historic Preserves

The Unique Areas definition (NY DEC 2014) states " A parcel of land owned by the state acquired due to its special natural beauty, wilderness character, or for its geological, ecological or historical significance for the state nature and historical preserve, and may include lands within a forest preserve county outside the Adirondack and Catskill Parks."

Maryland Natural Areas

Recognition as a Natural Area in Maryland carries a commitment to sustainable management of a given area to conserve the natural features that the area was established to recognize and protect. The goals of this effort are to identify and conserve Natural Areas for future generations while increasing public awareness of these special natural places.

2.2.1.12.5 National Estuarine Research Reserve System

The National Estuarine Research Reserve (NERR) System is a partnership program between NOAA and states along the coast (NOAA OCRM 2014). Funding, guidance and technical assistance is provided through NOAA and each reserve is managed by a lead state agency or university. The NERR system includes 28 areas that are protected for long-term research, water quality monitoring, education and coastal stewardship.

2.2.1.13 Gulf of Maine DPS

2.2.1.13.1 Penobscot Critical Habitat Unit

No federal protected areas fall within the Penobscot River Unit.

Table 2-24. State Protected Areas in the Penobscot Critical Habitat Unit

Protected Area Name	Ownership	Link
Howard L. Mendel (Marsh Stream) WMA	Maine Department of Inland Fisheries and Wildlife (IFW)	http://www.maine.gov/ifw/wildlife/land/department/region_b/howardmendall.htm
Sandy Point WMA	Maine IFW	http://www.maine.gov/ifw/wildlife/land/department/region_b/sandypoint.htm

2.2.1.13.2 Kennebec Critical Habitat Unit

Sunkhaze Meadows National Wildlife Refuge

The Sunkhaze Meadows National Wildlife Refuge was established in 1988 and is comprised of three units: the Sunkhaze Meadows Unit (11,485 acres in Milford, ME), the Benton Unit (334 acres near Bangor, ME) and the Sandy Spring Unit (58 acres in Unity, ME). The Sunkhaze Meadow Unit protects the second-largest peatland in Maine and is bisected by the Sunkhaze Stream Unit creating a diversity of protected wetlands.

Table 2-25. State Protected Areas in the Kennebec Critical Habitat Unit

Protected Area Name	Ownership	Link
Popham Beach SP	Maine Department of Agriculture, Conservation and Forestry (DACF)	http://www.maine.gov/cgi-bin/online/doc/parksearch/index.pl?search_radio=1&state_park=22&historic_site=&public_reserved_land=&shared_use_trails=&town=&distance=&submit=Go+%BB
Kennebunk Plains WMA	Maine IFW	http://www.maine.gov/ifw/wildlife/land/department/region_a/kennebunkplains.htm
Merrymeeting Bay WMA	Maine IFW	http://www.maine.gov/ifw/wildlife/land/department/region_b/merrymeetingbay.htm
Alonzo H. Garcelon WMA	Maine IFW	http://www.maine.gov/ifw/wildlife/land/department/region_b/alonzogarcelon.htm
Steve Powell (Swan Island) WMA	Maine IFW	http://www.maine.gov/ifw/wildlife/land/department/region_b/stevepowell.htm

2.2.1.13.3 Androscoggin Critical Habitat Unit

No federal protected areas fall within the Androscoggin Critical Habitat Unit.

Table 2-26. State Protected Areas in the Androscoggin Critical Habitat Unit

Protected Area Name	Ownership	Link
Muddy River WMA	Maine IFW	http://www.topshammaine.com/index.asp?SEC=CAC2F3C7-CC71-4F35-989A-87124FA9A746&Type=B_BASIC

2.2.1.13.4 Piscataqua Critical Habitat Unit

No federal protected areas fall within the Piscataqua Critical Habitat Unit.

Table 2-38. State Protected Areas in the Piscataqua Critical Habitat Unit

Protected Area Name	Ownership	Link
Vaughan Woods SP	Maine DACF	http://www.maine.gov/cgi-bin/online/doc/parksearch/index.pl?search_radio=1&state_park=22&historic_site=&public_reserved_land=&shared_use_trails=&town=&distance=&submit=Go+%BB
Odiorne Point SP	New Hampshire Division of Parks and Recreation	http://www.nhstateparks.org/explore/state-parks/odiorne-point-state-park.aspx

2.2.1.13.5 Merrimack Critical Habitat Unit

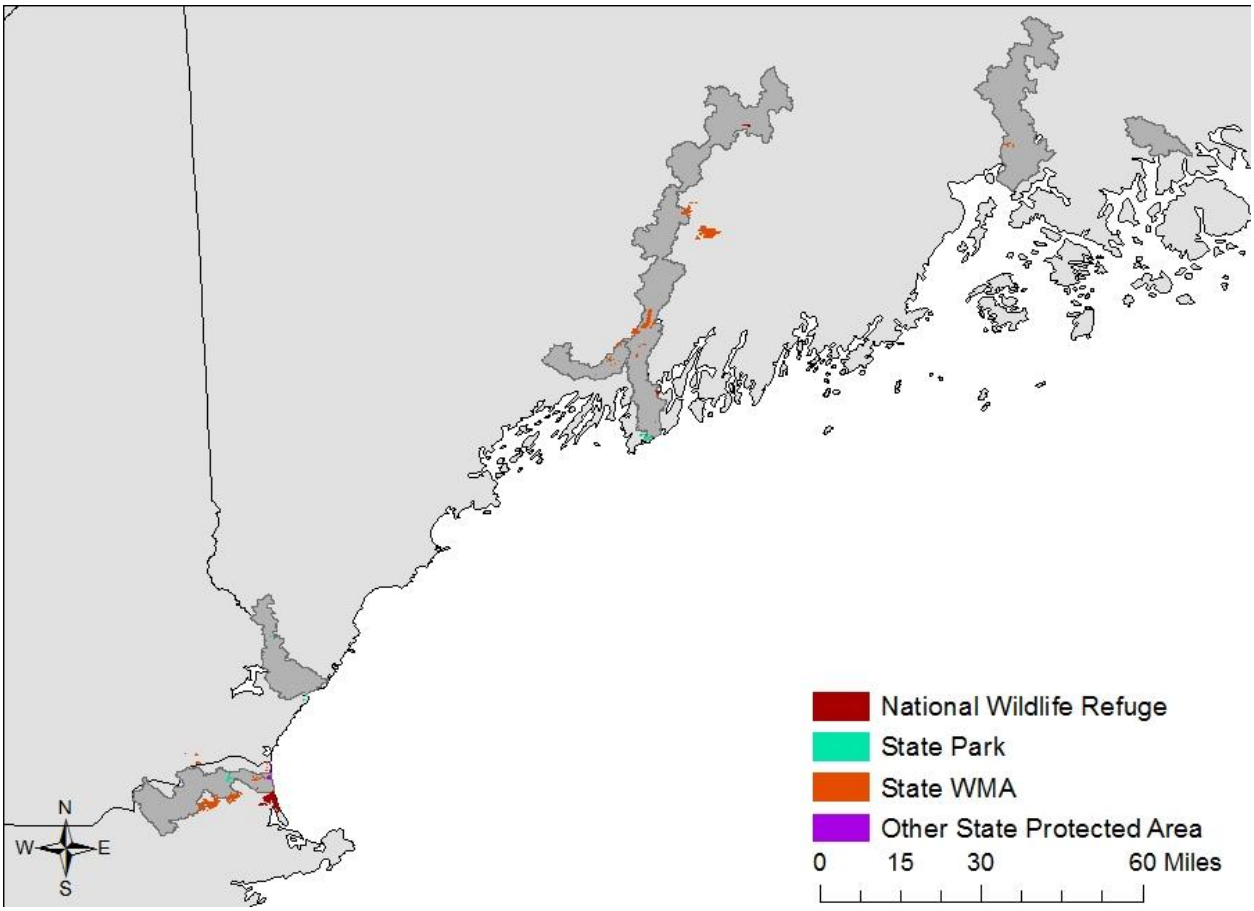
No federal protected areas fall within the Merrimack Critical Habitat Unit.

Table 2-27. State Protected Areas in the Merrimack Critical Habitat Unit

Protected Area Name	Ownership	Link
Salisbury Beach State Reservation	MA Department of Conservation and Recreation (DCR)	http://www.mass.gov/eea/agencies/dcr/massparks/region-north/salisbury-beach-state-reservation.html
Maudslay SP	MA DCR	http://www.mass.gov/eea/agencies/dcr/massparks/region-north/maudslay-state-park.html
Crane Pond WMA	MA Department of Fish and Game (DFG)	http://www.essexheritage.org/attractions/crane-pond-wildlife-management-area
Martin H Burns WMA	MA DFG	http://www.essexheritage.org/attractions/martin-burns-wildlife-management-area-downfall-management-area

Salisbury Salt Marsh WMA	MA DFG	http://www.essexheritage.org/attractions/salisbury-salt-marsh-wildlife-management
Richard Sargent WMA	NH Department of Fish and Game	http://www.wildlife.state.nh.us/Wildlife/WMAs/WMA_Sargent.htm

Figure 2-6. Protected Areas in the Gulf of Maine DPS



2.2.1.14 New York Bight DPS

2.2.1.14.1 Connecticut Critical Habitat Unit

No federal protected areas fall within the Connecticut Critical Habitat Unit.

Table 2-40. State Protected Areas in the Connecticut Critical Habitat Unit

Protected Area Name	Ownership	Link
Beckett Hill SP Scenic Reserve	CT Department of Energy and Environmental Protection (DEEP)	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=445284&deepNav_GID=1650#BecketHill
River Highlands SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=434748&deepNav_GID=1650
Brainard Homestead SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=445284&deepNav_GID=1650#BrainardHomestead
Connecticut Valley Railroad SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=433674&deepNav_GID=1650

Dart Island SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=445284&deepNav_GID=1650#DartIsland
Dinosaur SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325194&deepNav_GID=1650
George Dudley Seymour SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=446328&deepNav_GID=1650
Gillette Castle SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325204&deepNav_GID=1650
Haddam Island SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=445284&deepNav_GID=1650#HaddamIsland
Haddam Meadows SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325206&deepNav_GID=1650
Hurd SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325224&deepNav_GID=1650
Millers Pond SP Scenic Reserve	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325240&deepNav_GID=1650
Selden Neck SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=435364&deepNav_GID=1650
Windsor Meadows SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=458128&deepNav_GID=1650#WindsorMeadows
Cockaponset SF	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325056&deepNav_GID=1650
Meshomasic SF	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=445284&deepNav_GID=1650#Meshomasic
Nehantic SF	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325064&deepNav_GID=1650
Matianuck Sand Dunes Natural Area Preserve	CT DEEP	http://www.ctmuseumquest.com/?page_id=23203
Cromwell Meadows WMA	CT DEEP	http://www.ct.gov/deep/lib/deep/wildlife/pdf_files/maps/maps_hunting_area/map110.pdf
Great Island Wildlife Area	CT DEEP	http://www.lisrc.uconn.edu/coastalaccess/site.asp?siteid=535
Higganum Meadows WMA	CT DEEP	http://www.ct.gov/deep/lib/deep/wildlife/pdf_files/maps/maps_hunting_area/map214.pdf
Lord's Cove WMA	CT DEEP	http://www.ct.gov/deep/lib/deep/wildlife/pdf_files/maps/maps_hunting_area/map276.pdf
Nott Island WMA	CT DEEP	http://www.ct.gov/deep/lib/deep/wildlife/pdf_files/maps/maps_hunting_area/map355.pdf
Ragged Rock Creek Marsh WMA	CT DEEP	http://www.ct.gov/deep/lib/deep/wildlife/pdf_files/maps/maps_hunting_area/map416.pdf
Wangunk Meadows WMA	CT DEEP	http://www.ct.gov/deep/lib/deep/wildlife/pdf_files/maps/maps_hunting_area/map509.pdf

2.2.1.14.2 Housatonic Critical Habitat Unit

Stewart B. McKinney National Wildlife Refuge

The Stewart B. McKinney National Wildlife Refuge was established in 1972 and was the first federally-owned conservation land in the state. It was first known as the Salt Meadow National Wildlife Refuge and was renamed in 1987 to honor the late U.S. Congressman Stewart B. McKinney. The refuge is made up of 10 units that span 70 miles of Connecticut coastline. The refuge provides resting, feeding and nesting habitat for many species of wading birds, shore birds, songbirds and terns, including the endangered roseate tern. The refuge encompasses over 1,000 acres of forest, barrier beach, tidal wetland and fragile island habitats.

Table 2-41. State Protected Areas in the Housatonic Critical Habitat Unit

Protected Area Name	Ownership	Link
Silver Sands SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325262&deepNav_GID=1650
George C. Waldo SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=445284&deepNav_GID=1650#GeorgeWaldo
Indian Well SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325226&deepNav_GID=1650
Kettletown SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325230&deepNav_GID=1650
Lovers Leap SP Scenic Reserve	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=433316&deepNav_GID=1650
Osbornedale SP	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325246&deepNav_GID=1650
Charles E. Wheeler Wildlife Area	CT DEEP	http://www.lisrc.uconn.edu/coastalaccess/site.asp
Lake Zoar Wildlife Area (Kettletown SP)	CT DEEP	http://www.ct.gov/deep/cwp/view.asp?a=2716&q=325230&deepNav_GID=1650
Duck Island Natural Area Preserve	Long Island Sounds Stewardship Area	http://longislandsoundstudy.net/2012/10/duck-island/?doing_wp_cron=1392327219.9421648979187011718750
Popes Island Wildlife Area	CT DEEP	http://www.townofstratford.com/content/39828/1300/10239/12616.aspx
Paugussett SF	CT DEEP	http://www.ct.gov/deep/lib/deep/wildlife/pdf_files/maps/maps_hunting_area/map372.pdf

2.2.1.14.3 Hudson Critical Habitat Unit

Gateway National Recreation Area

Gateway National Recreation Area includes three units located on the coast of New York and New Jersey: Sandy Hook Unit, Jamaica Bay Unit and Staten Island Unit. Many areas are grouped together to form one park. These include Jamaica Bay Wildlife Refuge, Jacob Riis Park, Fort Tilden, Frank Charles Park, Hamilton Beach, Floyd Bennett Field, Canarsie Pier, Great Kills Park, Fort Wadsworth and Miller Field. Gateway's three park units include historic forts, former airports, recreation areas and America's oldest operating lighthouse. Ecosystems include ocean beaches, maritime forests, freshwater ponds and salt marshes. The park includes important habitat for over 300 species of migratory birds.

Palisades Interstate Park Commission (Palisades Parks Conservancy)

The Palisades Interstate Park Commission is a federally chartered bi-state public/private partnership that works to protect open space and offer recreation and education programs and improvements to areas and facilities. The partnership works to promote and expand the preservation of natural, historical and cultural resources for the benefit of the public. Several parks managed by the conservancy fall in the Hudson River unit and are described below.

- **Bristol Beach Park** is a 165-acre park in the town of Saugerties, NY that was transferred from the New York State Department of Environmental Conservation to the Palisades Parks Conservancy. The park borders the western bank of the Hudson River and the area has remained undeveloped.
- **Franny Reese Preserve Park** is located in Highland, NY along the Hudson River.
- **Hook Mountain Park** is a 676-acre undeveloped park stretching along seven miles of waterfront and cliff slopes on Rockland Lake and the Hudson River Valley. It provides habitat for many

types of hawks and the Audubon Society estimates that over 12,000 hawks fly by Hook Mountain each fall. In 1997 Hook Mountain was designated a NY State Important Bird Area.

- **Palisades Park** is located in New Jersey with headquarters just off the Palisades Interstate Parkway. This park includes several scenic and historic areas: Allison Park, Alpine Area, Englewood Area, Ross Dock, State Line Lookout and Waughaw Ridge.
- **Haverstraw Beach** is located in New York with view of Haverstraw Bay (the widest point of the Hudson River and a known aggregation area for juvenile Atlantic sturgeon). The beach is only accessible by bicycle or on foot.

Brooklyn Bridge (Empire-Fulton Ferry) Park

Brooklyn Bridge Park (including Empire-Fulton Ferry Park) is an-85 acre sustainable waterfront park stretching over a mile along Brooklyn's East River shore. The park is managed by the Brooklyn Bridge Park Corporation in partnership with the Brooklyn Bridge Park Conservancy. The park is designed as a recreational, environmental and cultural destination and supports itself financially.

Table 2-28. State Protected Areas in the Hudson Critical Habitat Unit

Protected Area Name	Ownership	Link
Liberty SP	NJ Department of Environmental Protection (NJDEP)	http://www.state.nj.us/dep/parksandforests/parks/liberty.html
Richard J. Sullivan Natural Area	NJDEP	http://www.folsp.org/history/richard_j_sullivan.htm
Stockport Flats (part of the Hudson River NERR)	New York State Department of Environmental Conservation (DEC)	http://www.dec.ny.gov/lands/92355.html
Bristol Beach State Conservation Land		
Nutten Hook NERR	New York DEC	http://www.scenichudson.org/ourwork/landpreservation/successstories/little-nutten-hook
Albany Pine Bush Preserve	New York DEC	https://www.albanypinebush.org/
Bear Mountain SP	NY State Office of Parks, Recreation and Historic Preservation (PRHP)	http://nysparks.com/parks/13/details.aspx
Blauvelt SP	NYSOPRHP	http://nysparks.com/parks/49/details.aspx
Catskill SP	NYSDEC	http://www.dec.ny.gov/lands/43013.html
Clarence Fahnestock Memorial SP	NYSDEC	http://www.dec.ny.gov/outdoor/84386.html
East River SP	New York PRHP	http://nysparks.com/parks/155/details.aspx
Gantry Plaza SP	New York PRHP	http://nysparks.com/parks/149/details.aspx
Harriman SP	New York PRHP	http://nysparks.com/parks/145/details.aspx
High Tor SP	New York PRHP	http://nysparks.com/parks/78/details.aspx
Hudson Highlands SP	New York PRHP	http://nysparks.com/parks/9/details.aspx
Hudson River Islands SP	New York PRHP	http://nysparks.com/parks/98/details.aspx
Hudson River Park	State of NY	http://www.hudsonriverpark.org/
Mills Norrie (Margaret Lewis Norrie) SP	New York PRHP	http://nysparks.com/parks/171/details.aspx
Nyack Beach SP	New York PRHP	http://nysparks.com/parks/156/details.aspx
Ogden Mills & Ruth Livingston Mills SP	New York PRHP	http://nysparks.com/parks/33/details.aspx
Peebles Island SP	New York PRHP	http://nysparks.com/parks/111/details.aspx
Roberto Clemente SP	New York PRHP	http://nysparks.com/parks/140/details.aspx
Rockefeller SP Preserve	New York PRHP	http://nysparks.com/parks/59/details.aspx
Rockland Lake SP	New York PRHP	http://nysparks.com/parks/81/details.aspx

Schodack Island SP	New York PRHP	http://nysparks.com/parks/146/details.aspx
Storm King SP	New York PRHP	http://nysparks.com/parks/152/details.aspx
Tallman Mountain SP	New York PRHP	http://nysparks.com/parks/119/details.aspx
Piermont Marsh NERR	New York DEC	http://www.dec.ny.gov/lands/92365.html
Brandow Point Unique Area	NY State	http://www.dos.ny.gov/communitieswaterfronts/pdfs/8-22-12/coastal_consistency/coastal_assessment_form_attachment_a.pdf
Castle Rock Unique Area	New York DEC	http://www.dec.ny.gov/lands/34747.html
Kowawese Unique Area	New York DEC	http://www.dec.ny.gov/outdoor/7804.html
Middle Ground Flats Unique Area	NY State	http://www.search.its.ny.gov/search?q=cache:riYwOpfnDM4J:docs.dos.ny.gov/communitieswaterfronts/LWRP/Athens_V/Original/Athens%2520SII.pdf+Middle+Ground+Flats&output=xml_no_dtd&ie=UTF-8&client=default_frontend&proxystylesheet=default_frontend&site=default_collection&access=p&oe=UTF-8
Montrose Point SF	New York DEC	http://www.dec.ny.gov/lands/34976.html
Turkey Point SF	New York DEC	http://www.dec.ny.gov/lands/74170.html
Minisceongo Creek ERR	New York DEC	http://www.dec.ny.gov/lands/49580.html
Rogers Island WMA	New York DEC	http://www.dec.ny.gov/outdoor/86076.html
Tivoli Bays WMA	New York DEC	http://www.dec.ny.gov/animals/36997.html

2.2.1.14.4 Delaware Critical Habitat Unit

Great Marsh Preserve

The Great Marsh (DE) is a 17,000-acre coastal wetland near the mouth of the Delaware Bay that is protected by the Nature Conservancy. The Great Marsh contains habitats such as fresh and saltwater wetlands, intertidal mud flats and Atlantic white cedar swamps.

Cape May National Wildlife Refuge

The Cape May National Wildlife Refuge (NJ) was established in 1989 and encompasses 11,500 acres of grasslands, saltmarshes, bogs, maritime forests, and beachfront habitat within the Cape May peninsula.

Supawna Meadows National Wildlife Refuge

Supawna Meadows National Wildlife Refuge (NJ) is found along the Delaware River estuary just north of the Salem River in Salem County, NJ. It is 3,000 acres included as part of the larger Cape May National Wildlife Refuge. Almost 80% of the refuge is tidal marsh habitat providing feed and resting areas for waterfowl. Migratory birds such as warblers and sparrows use the upland areas of the refuge as resting and feeding areas during migration and for nesting during the summer. Ospreys, bald eagle, northern harrier, short-eared owl and barn owls also nest on the refuge.

Bombay Hook National Wildlife Refuge

Bombay Hook National Wildlife Refuge (DE), located along the coast of Delaware, was established in 1937 and includes one of the largest remaining expanses of tidal salt marsh in the mid-Atlantic region. The refuge is primarily marsh used by migratory birds, but also includes freshwater impoundments and upland habitats that are managed for other wildlife.

Prime Hook National Wildlife Refuge

Prime Hook National Wildlife Refuge (DE) was established in 1963 and includes 10,144 acres of salt marsh, freshwater marsh, pond and impoundment, wooded swamp and upland grassland and forest habitat for migratory birds. The refuge is an important stopover site for migratory birds as they travel the Atlantic

Flyway and provides protected breeding habitat for federally and state-listed threatened and endangered species, as well as many neo-tropical migrating bird species.

John Heinz at Tinicum National Wildlife Refuge

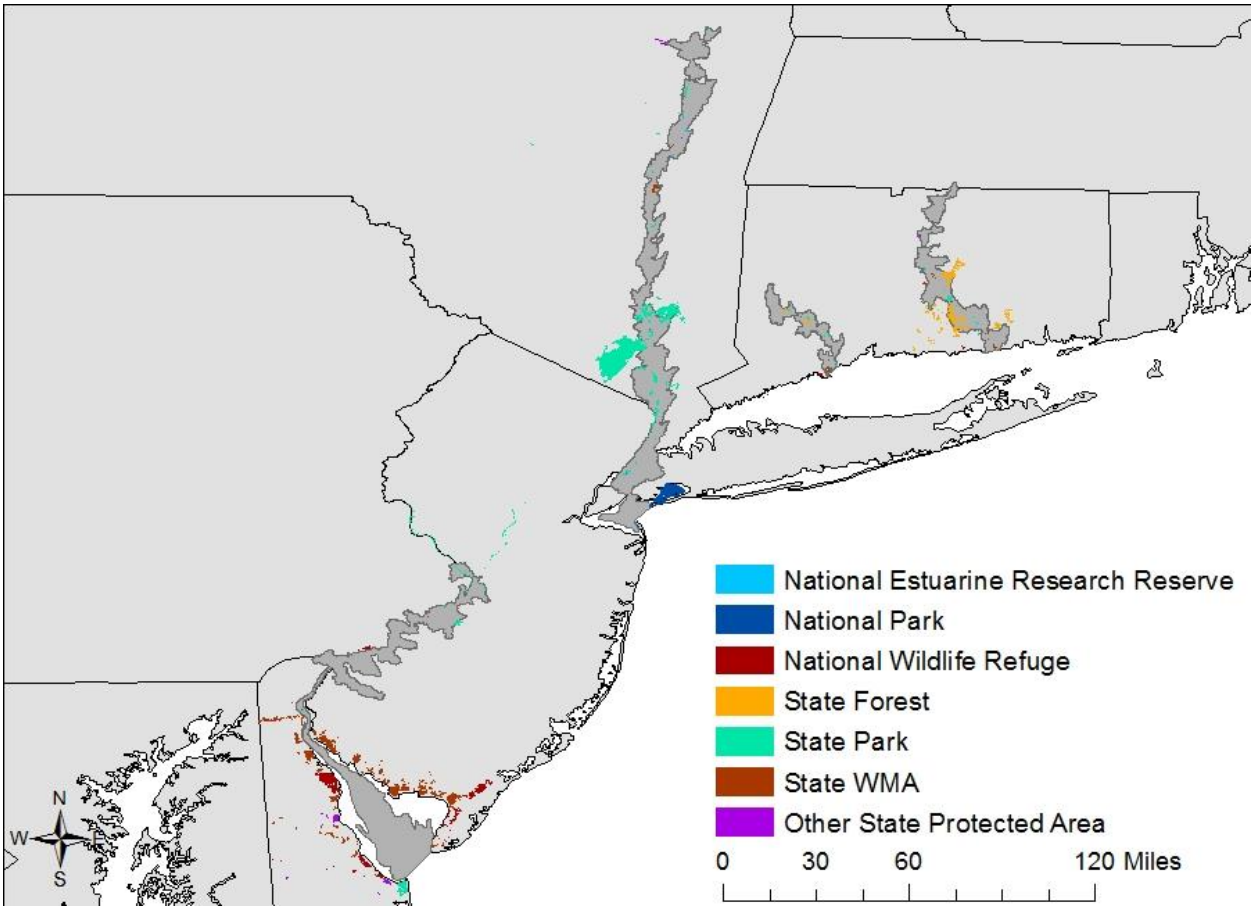
The John Heinz National Wildlife Refuge (PA) was established in 1972 and includes the natural area known as Tinicum Marsh in the urban area of Philadelphia. The refuge includes freshwater tidal marsh, open water, mudflat and forest habitat that support a rich diversity of fish, wildlife, and plants native to the Delaware Estuary.

Table 2-29. State Protected Areas in the Delaware Critical Habitat Unit

Protected Area Name	Ownership	Link
Fort Delaware SP	Delaware Division of Parks and Recreation (DPR)	http://www.destateparks.com/park/fort-delaware/
Pea Patch Island Nature Preserve	Delaware DPR	http://www.dnrec.delaware.gov/coastal/Pages/PeaPatchIslandSAMP.aspx
Beach Plum Island Nature Preserve		http://www.ecodelaware.com/place.php?id=300
Bellevue SP	Delaware DPR	http://www.destateparks.com/park/bellevue/index.asp
Bellevue Woods Nature Preserve	Delaware DPR	http://www.destateparks.com/downloads/maps/bellevue/BVSP_Map-WEB2013.pdf
Cape Henlopen SP	Delaware DPR	http://www.destateparks.com/park/cape-henlopen/index.asp
Fort DuPont SP	Delaware DPR	http://www.destateparks.com/park/fort-dupont/index.asp
Fox Point SP	Delaware DPR	http://www.destateparks.com/park/fox-point/index.asp
Milford Neck Wildlife Area	DNREC: Division of Fish & Wildlife	http://www.ecodelaware.com/place.php?id=269 http://www.dnrec.delaware.gov/fw/Hunting/Documents/WMA%20Maps%202013/milford%20neck%20overview.pdf
Woodland Beach Wildlife Area	DNREC: Division of Fish & Wildlife	http://www.ecodelaware.com/place.php?id=272 http://www.dnrec.delaware.gov/fw/Hunting/Documents/WMA%20Maps%202013/WB%20Waterfowl.pdf
Ted Harvey Conservation Area	DNREC: Division of Fish & Wildlife	http://www.ecodelaware.com/place.php?id=273
Augustine Wildlife Area	DNREC: Division of Fish & Wildlife	http://www.ecodelaware.com/place.php?id=265
C&D Canal Wildlife Area	DNREC: Division of Fish & Wildlife	http://www.ecodelaware.com/place.php?id=275
Little Creek Wildlife Area	DNREC: Division of Fish & Wildlife	http://www.ecodelaware.com/place.php?id=268
Cedar Swamp Wildlife Area	DNREC: Division of Fish & Wildlife	http://www.ecodelaware.com/place.php?id=276
Washington Crossing SP	NJDEP	http://www.state.nj.us/dep/parksandforests/parks/washcros.html
Delaware and Raritan Canal SP	NJDEP	http://www.state.nj.us/dep/parksandforests/parks/drcanal.html
Rancocas SP	NJDEP	http://www.state.nj.us/dep/parksandforests/parks/rancocas.html
Pennsauken Access WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/pennsauken_access.pdf
Harrisonville Lake WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/harrisonville_lake.pdf

Logan Pond WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/logan_pond.pdf
Fortescue WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/fortescue.pdf
New Sweden WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/new_sweden.pdf
Taylor Preserve	NJ Natural Lands Trust	http://taylorwildlifepreserve.org/
Fort Mott SP	NJDEP	http://www.state.nj.us/dep/parksandforests/parks/fortmott.html
Cape Island WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/cape_island_no.pdf http://www.state.nj.us/dep/fgw/pdf/wmamaps/cape_island_so.pdf
Dennis Creek WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/dennis_creek.pdf
Department of Defense Ponds WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/dod_ponds.pdf
Dix WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/dix.pdf
Egg Island WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/egg_isl.pdf
Heislerville WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/heislerville.pdf
Higbee Beach WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/ensp/higbee.htm
Mad Horse Creek WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/mad_horse_crk.pdf
Nantuxent WMA	NJDEP: Division of Fish and Wildlife	http://www.state.nj.us/dep/fgw/pdf/wmamaps/nantuxent.pdf
Delaware Canal SP	PA Department of Conservation and Natural Resources (DCNR)	http://www.dcnr.state.pa.us/stateparks/findapark/delawarecanal/index.htm
Neshaminy SP	PA DCNR	http://www.dcnr.state.pa.us/stateparks/findapark/neshaminy/index.htm

Figure 2-7. Protected Areas in the New York Bight DPS



2.2.1.15 Chesapeake Bay DPS

2.2.1.15.1 Nanticoke Critical Habitat Unit

Blackwater National Wildlife Refuge

In 2016, the USFWS announced that it acquired 410 acres of land adjoining the Nanticoke River in Wicomico and Dorchester counties for the Blackwater National Wildlife Refuge (NWR). The land is primarily forested freshwater tidal wetlands. The remainder of Blackwater NWR is not within the Nanticoke River Critical Habitat Unit.

Table 2-30. State Protected Areas in the Nanticoke Critical Habitat Unit

See http://dnr.maryland.gov/Pages/lands.aspx

Protected Area Name and Type	Ownership	Link
Nanticoke	Maryland Department of Natural Resources (DNR)	http://dnr.maryland.gov/Pages/lands.aspx

2.2.1.15.2 Potomac Critical Habitat Unit

Chesapeake & Ohio Canal National Historic Park

The Chesapeake and Ohio Canal National Historic Park runs along the Potomac River following an old canal town path from Cumberland, MD to Georgetown, DC. The park was established in 1971 and includes approximately 12,000 acres and runs along the 184.5 miles of the canal.

George Washington Memorial Parkway

The George Washington Memorial Parkway (DC, MD, VA) was established in 1930 and is a landscaped commemorative road and park that includes 7,600 acres along the Potomac River near Alexandria, VA. It protects the landscape, historic sites and native habitat along the Potomac River.

Great Falls National Park

Great Falls National Park (VA) includes 800 mostly forested acres on the Potomac River upstream of Washington, DC. The Potomac River drops 77 feet in less than a mile in this location. The park was established in 1966 as a unit within the George Washington Memorial Parkway.

Fort Washington Park

Fort Washington Park (MD) includes Historic Fort Washington and over 900 acres of Potomac River shoreline, forest and meadows. The fort was built in 1809 and was used on and off as a military structure until it was turned over to the United States Department of the Interior in 1946.

Oxon Cove Park and Oxon Hill Farm

Oxon Cove Park and Oxon Hill Farm (MD) is located on the Potomac River downstream from Washington, DC and was a plantation home from 1812 turned into a hospital farm and now a park. It was entrusted to the National Park service in 1959. The park includes an area of broad Potomac River floodplain and a high upland terrace cut by small intermittent drainages.

Piscataway Park

Piscataway Park (MD) is a waterfront park along the shores of the Potomac River across from Historic Mount Vernon. It took about 10 years to establish the park (1961-1972) and is a scenic easement to preserve the view from Mount Vernon. Piscataway Park has a public fishing pier, two boardwalks over fresh water tidal wetlands, a variety of nature trails, meadows, and woodland areas. The Park is also home to National Colonial Farm.

Potomac River National Wildlife Refuge Complex

In 1998, Elizabeth Hartwell Mason Neck National Wildlife Refuge (NWR), Occoquan Bay NWR, and Featherstone NWR, were reorganized into the Potomac River National Wildlife Refuge Complex. All three refuges are located on the Potomac River downstream from Washington, DC.

- **Elizabeth Hartwell Mason Neck National Wildlife Refuge**

  Elizabeth Hartwell Mason Neck National Wildlife Refuge (VA) includes 2,277 acres and was established in 1969 as the first national wildlife refuge established specifically for the protection of our nation's symbol, the bald eagle. The refuge provides wildlife a relatively remote area of upland forests and freshwater marshes extending into the Potomac River close to a heavily urbanized area. The refuge includes Great Marsh, a 207-acre tidal freshwater marsh, and one of Virginia's largest breeding great blue heron colonies. Common species observed include bald eagle, wood thrush, white-tailed deer, groundhog, and wood duck.

- **Occoquan Bay National Wildlife Refuge**

  Occoquan Bay National Wildlife Refuge (VA) was established in 1998 and is located on the shore of the Potomac River downstream from Washington, DC. The refuge is made up of 50% wetland habitats that include wet meadows, bottomland hardwoods, open freshwater marsh, and tidally influenced marshes and streams. About 20% of the habitat is upland meadows, with the

remaining vegetated areas consisting of mature or second growth forest. These 640 acres provides much needed habitat for migratory birds close to an urban center.

- **Featherstone National Wildlife Refuge**

  Featherstone National Wildlife Refuge (VA) was established in 1979 and consists of 325 acres of woodland and freshwater tidal marsh. Featherstone NWR was established with the purpose of protecting the features of a contiguous wetlands area.

Table 2-31. State Protected Areas in the Potomac River Unit

Protected Area Name	Ownership	Link
Chapman SP	Maryland DNR	http://www.dnr.state.md.us/publiclands/southern/chapman.asp
St Clements Island SP	Maryland DNR	http://www.dnr.state.md.us/publiclands/southern/stclements.asp
Smallwood SP	Maryland DNR	http://www.dnr.state.md.us/publiclands/southern/smallwood.asp
Point Lookout SP	Maryland DNR	http://www.dnr.state.md.us/publiclands/southern/pointlookout.asp
Islands of the Potomac WMA	Maryland DNR	http://www.dnr.state.md.us/land/stewardship/pdfs/wildlands_maps/IslandsofthePotomac.pdf
Chicamuxen WMA	Maryland DNR	http://dnr.maryland.gov/wildlife/Publiclands/southern/chicamuxen.asp
Dierrsen WMA	Maryland DNR	http://dnr.maryland.gov/wildlife/Publiclands/central/dierssen.asp
Nanjemoy Natural Resource Mgmt Area	Maryland DNR	http://dnr.maryland.gov/wildlife/Publiclands/pdfs/Nanjemoy_NRMA.pdf
Doncaster Demonstration Forest	Maryland DNR	http://dnr.maryland.gov/publiclands/southern/doncasterdf.asp
Caledon SP	Virginia Department of Conservation and Recreation (Virginia DCR)	http://www.dcr.virginia.gov/state-parks/caledon.shtml
Leesylvania SP	Virginia DCR	http://www.dcr.virginia.gov/state-parks/leesylvania.shtml
Mason Neck SP	Virginia DCR	http://www.dcr.virginia.gov/state-parks/mason-neck.shtml
Westmoreland SP	Virginia DCR	http://www.dcr.virginia.gov/state-parks/westmoreland.shtml
Widewater SP (in development)	Virginia DCR	http://www.dcr.virginia.gov/pr_relz_detail.shtml?id=2013-08-13-09-08-51-14255

2.2.1.15.3 Rappahannock Critical Habitat Unit

Fredericksburg and Spotsylvania National Military Park

The Fredericksburg and Spotsylvania National Military Park (VA) is a 7,600-acre park designed to preserve, maintain, protect and provide access to the cultural and natural resources of the Civil War battlefields of Fredericksburg, Chancellorsville, Wilderness and Spotsylvania Court House and associated sites, and to interpret and commemorate them in the larger context of the Civil War and American History for the benefit and education of visitors and the general public. The park is mostly forest with some open field habitat, marshland and streams.

Rappahannock River Valley National Wildlife Refuge

Part of the Eastern Virginia Rivers National Wildlife Refuge Complex, the Rappahannock River Valley NWR (VA) was established in 1996 and consists of 8,707 acres with a goal of protecting 20,000 acres of

wetlands and associated uplands along the Rappahannock River and its major tributaries. The refuge is located in Essex, King George, Caroline, Richmond, and Westmoreland counties and includes fresh water tidal marsh, forest swamp, upland deciduous forest, mixed pine forest, and grassland habitats.

Table 2-32. State Protected Areas in the Rappahannock Critical Habitat Unit

Protected Area Name	Ownership	Link
Belle Isle SP	Virginia DCR	http://www.dcr.virginia.gov/state-parks/belle-isle.shtml
Lands End WMA	Virginia Department of Game and Inland Fisheries (VDGIF)	http://www.dgif.virginia.gov/wmas/detail.asp?pid=5
Pettigrew WMA	VDGIF	http://www.dgif.virginia.gov/wmas/detail.asp?pid=7

2.2.1.15.4 York Critical Habitat Unit

No federal protected areas fall within the York River Unit.

Table 2-33. State Protected Areas in the York Critical Habitat Unit

Protected Area Name	Ownership	Link
Catlett Islands, Sweet Hall Marsh, Taskinas Creek and Goodwin Islands NERR	The Chesapeake Bay NERR in Virginia	http://www.vims.edu/cbnerr/
Dragon Run SF	Virginia Department of Forestry (VDOF)	http://www.dof.virginia.gov/stateforest/list/dragon-run.htm
Sandy Point SF	VDOF	http://www.dof.virginia.gov/stateforest/list/sandy-point.htm
Zoar SF	VDOF	http://www.dof.virginia.gov/stateforest/list/zoar.htm
Middle Peninsula SP (in development)	Virginia DCR	http://www.virginiaoutdoors.com/article/more/3341
York River SP	Virginia DCR	http://www.virginiaoutdoors.com/parks/details/york-river-state-park

2.2.1.15.5 James Critical Habitat Unit

James River National Wildlife Refuge

James River National Wildlife Refuge (VA) was established in 1991 and includes 4,325 acres set aside to conserve endangered species of fish, wildlife and plants. The refuge is part of the Eastern Virginia Rivers NWR Complex. The refuge provides important breeding and roosting habitat for resident and migrating eagles. The refuge includes a number of areas with special conservation status:

- Ramsar Wetlands of International Importance
- Lower James River Important Bird Area
- Anadromous Fish Use Area (alewife, American shad, Atlantic sturgeon, striped bass, blueback herring, yellow perch, and hickory shad)
- Bald Eagle Concentration Area
- National Park Service's Captain John Smith Chesapeake National Historic Trail

Presquile National Wildlife Refuge

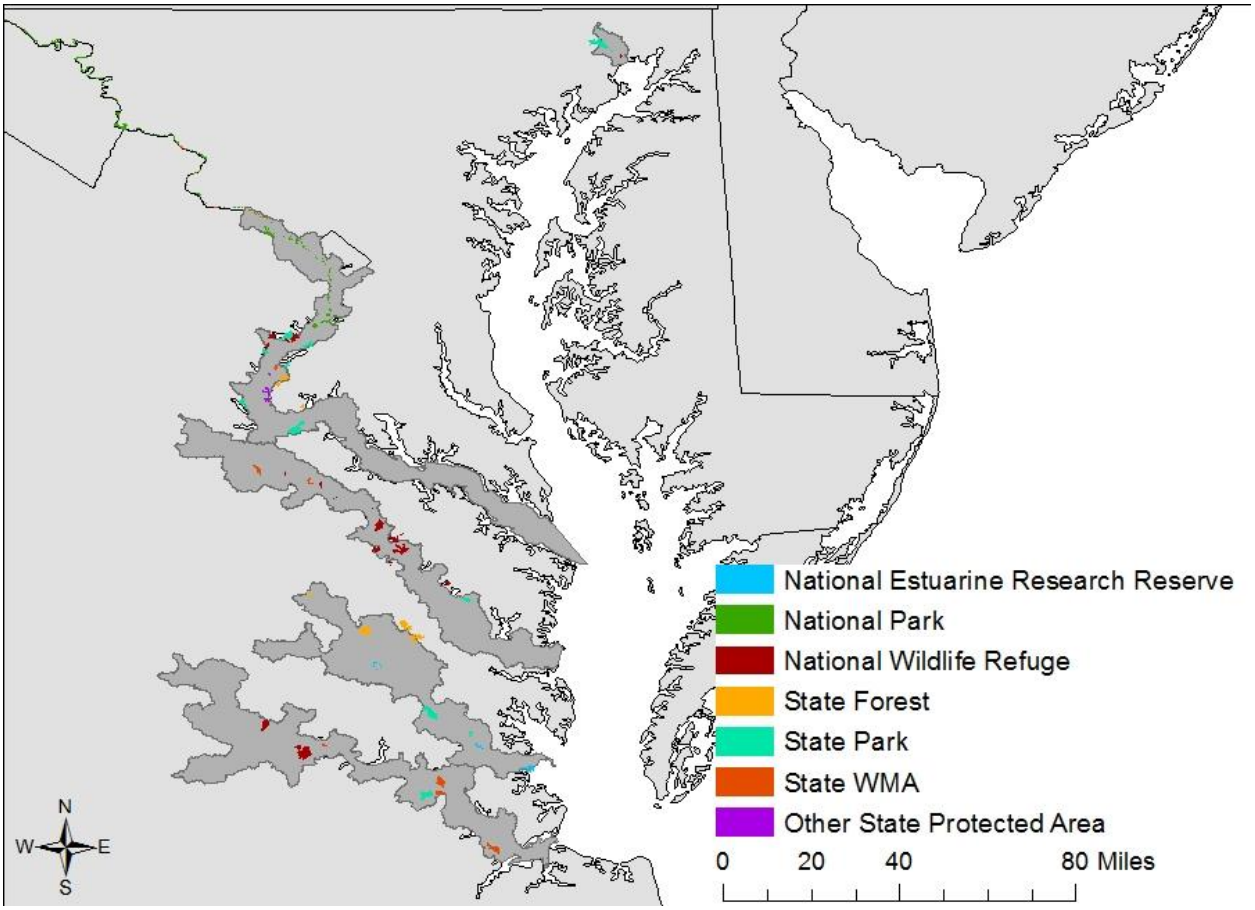
Presquile National Wildlife Refuge (VA) was established in 1953 and includes 1,329 acres of isolated wetlands, forests and grasslands providing important habitat and stopover sites for migratory birds as they travel up and down the Atlantic Flyway. The refuge is part of the Eastern Virginia Rivers NWR Complex.

Table 2-48. State Protected Areas in the James Critical Habitat Unit

Protected Area Name	Ownership	Link

Chippokes Plantation SP	Virginia DCR	http://www.virginiaoutdoors.com/parks/details/chippokes-plantation-state-park
Hog Island WMA	VDGIF	http://www.dgif.virginia.gov/wmas/detail.asp?pid=4
Ragged Island	VDGIF	http://www.dgif.virginia.gov/wmas/detail.asp?pid=9
Kittewan Wildlife Preserve	Charles City County (VA)	http://www.charlescity.org/2007/2rivers.php

Figure 2-8. Protected Areas in the Chesapeake Bay DPS[6]



2.3 Baseline Benefits of the Critical Habitat

Existing habitat features in areas proposed to be designated as critical habitat for Atlantic sturgeon support a range of environmental and economic benefits. These benefits may be protected or altered as a result of Section 7 consultation to avoid the destruction or adverse modification of critical Atlantic sturgeon habitat. Therefore, they constitute a relevant part of the baseline conditions that need to be used to assess the incremental impacts of critical habitat designations.

Some of these baseline benefits involve "use" values that are associated with water-based commercial and recreational activities, such as fishing, swimming, snorkeling, and sightseeing. These values can sometimes be measured in terms of business sales, household income, jobs, user days, participation rates, or other quantitative measures. Other baseline benefits involve "nonuse" values that people place on species or habitat features or water-based ecosystem services that accrue to society in general as public

[6] Map does not include USFWS lands acquired in 2016 along the Nanticoke River that are now part of the Blackwater National Wildlife Refuge.

goods and are difficult or impossible to quantify or monetize. Nonuse values are often described using terms like existence value, bequest value, and option value, and reflect the benefits that people associate with knowing that natural habitats and the species they support exist, will exist for future generations, and will be available for them to enjoy, perhaps, sometime in the future.

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

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

At this time it is also not possible to predict the location and magnitude of project modifications that may result from Section 7 consultation in order to identify which natural resources and environmental features, functions, and services constitute baseline conditions that could be impacted by this designation. Also, nonuse values associated with these existing baseline conditions are usually estimated using stated preference or contingent valuation surveys that have not been conducted to identify which baseline nonuse benefits are important in each critical habitat unit. *Section 3* describes, in qualitative terms, how various baseline benefits may be impacted by project modifications that result from Section 7 consultation. The potential impacts of the designation itself on baseline environmental conditions are addressed as "conservation benefits" as part of *Section 5*.

3 ECONOMIC IMPACTS

Section 2 of this report described the economic baseline for the areas where the features of critical habitat exist for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs of Atlantic sturgeon, and protections already afforded the sturgeon and its habitat in these areas by existing Federal and state laws and regulations and protected areas. These constitute the baseline conditions against which the economic impacts of the critical habitat designation will be compared and measured in this section and following sections.

This section describes the types of economic impacts that can result from critical habitat designation; the types of activities that have a Federal nexus and may occur and be impacted; and the numbers and types of Section 7 consultations and resulting project modifications that are expected in each unit during the next ten years. In the final subsection, projected numbers of consultations and resulting project modifications are used with estimated ranges of unit costs per consultation and per project modification to estimate the economic impacts of the designation in each critical habitat unit over the next ten years.

3.1 Sources of Economic Impacts

The following sections identify economic impacts that may result from the critical habitat designation. As discussed above, direct economic impacts are associated with the implementation of Section 7 of the ESA which requires consultation among Federal agencies to ensure that their proposed actions are not likely to

result in the destruction or adverse modification of designated critical habitat. These direct economic impacts are associated with the costs of these Section 7 consultations and the costs associated with any required project modifications that result from these consultations. Indirect economic impacts may result if the critical habitat designation triggers state or local regulations that restrict land or water use decisions, or if concerns about ongoing Section 7 consultation or the need for future consultation and potential project modifications have stigma effects on real estate markets or business investments.

3.1.1 Direct Economic Impacts

Section 7(a)(2) of the ESA requires federal agencies (action agencies) to consult with NMFS whenever activities that they undertake, authorize, permit, or fund may affect a listed species or designated critical habitat. In some cases, consultations will involve NMFS and another federal agency only, such as the US Army Corps of Engineers (USACE). Often, they will also include third parties involved in projects on non-federal lands with a Federal nexus, such as private landowners conducting activities that require a federal permit or public or private entities receiving Federal funding. In addition, action agencies may engage in programmatic consultations to develop strategies to consider impacts to the sturgeon and its habitat at the program level, rather than at the individual project level. For example, USACE conducts programmatic consultations with NMFS to consider endangered and threatened species when reviewing water development or dredging projects.

During a consultation, NMFS, the action agency, and, if applicable, the private entity applying for federal funding or permitting communicate with one another in an effort to minimize potential adverse effects to the species and/or to the proposed critical habitat. These communications may occur via written letters, phone calls, in-person meetings, and the number, duration, and complexity of these interactions depend on many factors related to the species of concern, the activity under consideration, the potential effects on the species and/or its critical habitat associated, and the backgrounds of the parties involved.

In general, the economic impacts of a critical habitat designation depends on the need for and characteristics of four outcomes that are described below and include: (1) Technical assistance provided by NMFS prior to a Section 7 consultation, (2) Informal Section 7 consultation, (3) Formal Section 7 consultation and (4) project modifications that are required as a result of Section 7 consultation. Some economic impacts may also be associated with costs of initial project design decisions undertaken specifically to avoid the need for Technical Assistance or Section 7 consultation.

This subsection provides an overview of the components of the Section 7 consultation process that can generate direct economic impacts and the types of those impacts. The types of direct economic impacts described are associated primarily with public and private sector costs stemming from the four outcomes listed above. In some circumstances, direct economic impacts may also result from costs associated with planned activities being designed or modified in advance in order to avoid needing Technical Assistance or requiring a Section 7 consultation.

3.1.1.1 Technical Assistance Costs

Frequently, NMFS responds to requests for technical assistance from other federal agencies, state agencies, local municipalities, and private landowners and developers with questions regarding whether specific activities may affect a listed species or its critical habitat. Technical assistance costs represent the estimated economic costs of informal conversations between these entities and NMFS regarding such potential effects. Most likely, such conversations will occur between municipal or private property owners and NMFS regarding lands designated as critical habitat or lands adjacent to critical habitat. NMFS' technical assistance activities are voluntary and occur in instances where a federal nexus does not exist. Costs to NMFS of providing technical assistance to private parties are expected to be small relative to other economic impacts to NMFS, action agencies, and third parties; therefore, this analysis does not quantify the instances and costs of technical assistance efforts.

3.1.1.2 Section 7 Consultation Costs

Section 7 consultation with the Services may be either informal or formal. *Informal consultation* consists of informal discussions among the Services, the action agency, and the applicant concerning an action that may affect a listed species or its designated critical habitat, and are designed to identify and remove potential impacts at an early stage in the planning process. By contrast, a *formal consultation* is required if the action agency determines that the proposed action may affect a listed species or designated critical habitat in ways that cannot be resolved through informal consultation. Regardless of the type of consultation or proposed project, Section 7 consultation can require substantial administrative effort on the part of all participants. The costs of these efforts are an important component of the impacts assessment.

There are three circumstances under which the designation of critical habitat can result in Section 7 consultation with NMFS beyond those required by the listing. First, new consultation may result when activities involving a Federal nexus are proposed in or near critical habitat. Second, more intensive consultation may occur when actions that would previously have been resolved during informal consultation must proceed to formal consultation in order to consider habitat impacts. Third, the re-initiation of a consultation may occur when new information or circumstances generated by the designation of critical habitat result in potential adverse impacts to critical habitat that were not addressed during previous consultations related to effects of the action to the species.

3.1.1.3 Project Modification Costs

The Section 7 consultation process may result in modifications to a proposed project under three circumstances. First, they may be a result of voluntary conservation measures suggested by NMFS during the informal consultation process that avoid or minimize impact to a species and/or its habitat (harm avoidance), thereby removing the need for formal consultation. Second, formal consultation may result in project modifications that are agreed upon by the action agency and the applicant and are included in the project description as avoidance and minimization measures. Third, the modifications may be designated in the NMFS' biological opinion on the proposed action as reasonable and prudent measures (RPMs) and/or discretionary conservation recommendations to assist the action agency in meeting its obligations under Section 7(a)(1) of the Act. NMFS' consultation regulations specify that RPMs, along with the terms and conditions that implement them, cannot alter the basic design, location, scope, duration, and timing of the action, and may only involve minor changes (50 CFR §402.14(i)(2)).

In some cases, NFMS may determine that the project is likely to jeopardize the continued existence of the species and/or destroy or adversely modify its designated critical habitat. In these cases NMFS will include reasonable and prudent alternatives (RPAs) to the proposed project that must avoid jeopardy or destruction or adverse modification. By definition, RPAs must be: consistent with the intended purpose of the action, capable of being implemented in a way that is consistent with the action agency's legal authority and jurisdiction, and be economically and technologically feasible (50 CFR §402.02). The RPAs are typically developed by NMFS in cooperation with the action agency and, when applicable, the applicant. Alternatively, the action agency can develop its own RPAs, or seek an exemption for the project. All of these project modifications have the potential to involve direct cost to the action agency and/or the applicant. In certain instances, these modifications can lead to broader secondary impacts involving third parties, related industries and markets, and regional economies.

3.1.2 Indirect Economic Impacts

The designation of critical habitat, under certain circumstances, may affect actions that do not have a federal nexus and are not subject to the provisions of Section 7 under ESA, in ways that result in indirect economic impacts. These economic impacts may include changes in real estate prices and project values resulting from stigma effects, project delays, and uncertainty resulting from the designation, as well as

related indirect impacts on regional markets and economies. These potential indirect impacts are described briefly below.

3.1.2.1 Time Delays

In addition to the indirect effects of compliance with laws triggered by the designation, project proponents, land managers, and landowners may face additional indirect impacts. These can include impacts due to project delays associated with the need to reinitiate consultation or compliance with additional regulations triggered by the designation of critical habitat. In the case of land location within or adjacent to the designation, there may be a loss in property values due to regulatory uncertainty, or a loss or gain in property values resulting from public perceptions regarding the effects of critical habitat. These potential effects are described in greater detail below.

Both public and private entities may experience incremental time delays in implementing projects and undertaking other activities due to requirements associated with the need to reinitiate the Section 7 consultation process and compliance with other laws triggered by the designation. To the extent that delays result from the designation, they need to be considered in the impact analysis. Specifically, an economic analysis should assign to the critical habitat designation the costs of impacts associated with any incremental time delays associated with Section 7 consultation or other requirements that are triggered by the designation and are above and beyond project delays resulting from baseline regulatory processes. The incremental impacts of the designation should not include impacts associated with time delays resulting from the listing, or the application of other federal, state, or local laws or regulations not triggered by the critical habitat designation which should be assigned to the baseline.

3.1.2.2 Regulatory Uncertainty

The Service conducts each Section 7 consultation on a case-by-case basis and issues a biological opinion on formal consultations based on species-specific and site-specific information. As a result, government agencies and affiliated private parties who need to consult with the Service under Section 7 may face uncertainty concerning whether project modifications will be recommended by the Service and what the nature and costs of these modifications will be. This uncertainty may diminish as consultations are completed and additional information becomes available on the effects of specific activities on critical habitat and potential avoidance measures. However, a degree of regulatory uncertainty may persist which may result in a project proponent incurring higher costs to fund and implement a proposed activity. Where information is available, the economic analysis should consider the potential impacts associated with regulatory uncertainty resulting from the critical habitat designation.

3.1.2.3 Stigma Impacts

In some cases, the public may perceive that the critical habitat designation may result in limitations on private property uses above and beyond those associated with anticipated project modifications and regulatory uncertainty described above. Public attitudes about the limits or restrictions that critical habitat may impose can cause real economic effects to property owners, regardless of whether such limits are actually imposed. All else equal, perceived or anticipated limitations or restrictions on uses of property that is designated as critical habitat may result in it having a lower market value than an identical property that is not within the boundaries of critical habitat. As the public becomes aware of the true regulatory burden imposed by critical habitat, the impact of the designation on property markets may change. However, even if it disappears short-term stigma impacts may have resulted in land cost impacts that will not be recovered. Where data exists that suggests stigma impacts on private property values are real or likely the economic analysis should consider their implications within or near the areas of the proposed designation. Where a critical habitat designation is not likely to result in stigma impacts, the impact analysis should not speculate about their potential.

3.1.2.4 Induced changes in State and Local Laws

Some state laws may require landowners and managers to consider the effects of their actions on sensitive species and habitat. As a result new information about the importance of critical habitat in the state to the recovery of a threatened or endangered species that results from the designation could trigger more stringent state and local regulatory requirements and related compliance costs. Critical habitat designations may also provide new information to nearby communities about the sensitive ecological nature of the geographic region, potentially triggering changes in other state or local laws that could have additional economic impacts. In cases where these state and local regulatory changes would not have been triggered "but for" the critical habitat designation, they are "incremental" impacts of the designation. Such state and local regulatory changes could have negative impacts associated with stigma effects and project delays similar to those associated directly with the critical habitat designation. However, they may also have positive impacts. For example, *Section 6* of this report describes how increased public awareness of species and habitat conditions and related changes in state and local regulations and voluntary changes in land and water use that result from the designation can generate significant environmental and economic benefits associated not only with sturgeon, but with other fish, bird, and terrestrial species that directly or indirectly benefit from protecting essential sturgeon habitat features.

3.1.2.5 Impacts on Regional Economies

The consultation process and related project modifications could directly affect the operations of Federal agencies and private entities (e.g., dredging by the USACE, maintenance of oil and gas pipelines by private entities) and thereby disrupt regional economic activity enough to have secondary economic impacts associated with business sales, jobs, household incomes, and taxes. For example, changes in dredging activities by the USACE could affect both suppliers of dredging equipment, dredging contractors and their employees, and commercial traffic utilizing dredged waterways and related ports and port facilities. As a result, project modifications or other restrictions or delays that impose direct cost and revenue impacts on some intermediate commercial enterprises can have subsequent detrimental effects on the industries they support. Some directly and indirectly impacted industries or activities, such as shipping or fishing, may be central to the local economy but will also be linked by their purchases and sales with industries located elsewhere in the region. As a result, any significant local economic impacts in or near a critical habitat area can be expected to generate multiplier impacts throughout the regions where they are located.

3.2 Method Used to Estimate Economic Impacts

3.2.1 General Approach

The impacts of the critical habitat designation are associated with the costs of Section 7 consultation that result, and the costs and benefits of any project modifications that are implemented because of those consultations. The method used to estimate these impacts involved the following six tasks.

1. Identify activities that may trigger Section 7 consultation and, for each activity, the types of project modifications that could be required as a result of those consultations.
2. For each activity type, estimate the number of Technical Assistance collaborations and Informal and Formal Section 7 consultations that are likely to result from the critical habitat designation in each critical habitat unit.
3. Determine the number of projected Section 7 consultations in each critical habitat unit that are likely to result in project modifications.
4. Estimate the typical unit cost of Technical Assistance collaborations and Section 7 consultation, and, for each activity type, the typical cost of any resulting project modifications.

5. Use projected numbers of consultations and project modifications in each critical habitat unit over a ten-year period and their estimated unit costs to project the economic impacts of the designation in each critical habitat unit on an annual basis and over a ten-year period.

6. Describe, and to the extent possible, monetize or quantify any indirect economic impacts associated with stigma effects, uncertainty, changes in local and state regulations and regional economic conditions that are likely to result from the designation.

The following sections describe how these tasks were undertaken and present estimates of the numbers and unit costs of incremental Section 7 consultations and project modifications expected to be associated with the designation. The final section uses estimates of unit costs of consultations and projected numbers of consultations, and unit costs of project modifications and projected numbers of project modifications, to generate estimates of ten year and average annual economic impacts of the designation for each critical habitat unit, and for all critical habitat units combined.

3.2.2 Activities That May Trigger Section 7 Consultation

The NMFS Public Consultation Tracking System (PCTS) includes 15 general categories and 100 more specific sub-categories of land-based and water-based activities that could affect fish habitat, and constitutes the universe of activities that could trigger Section 7 consultation as a result of this critical habitat designation. Because the proposed critical habitat units extend up-river from each river mouth and do not include coastal or ocean areas, a number of the activities in the PCTS will not be affected by this designation (e.g., ocean disposal) or are likely to occur only rarely (e.g., tidal power). Therefore, NMFS fishery scientists refined this universe by identifying the 13 activities and 82 sub-activities that have significant potential to adversely affect one or more of the essential features of critical habitat for Atlantic sturgeon.

This list of potentially impacted activities was further refined based on a review of ten years of PCTS records (January 2003 through September 2013) in each of the proposed critical habitat areas that NMFS determined either involved Atlantic sturgeon, or would have if Atlantic sturgeon critical habitat was designated at the time. This review of PCTS records in each river system over the past ten years, as well as interviews and correspondence with federal action agencies regarding this record and current, pending, and proposed projects, provided the basis for identifying 41 activities as being most likely to trigger Section 7 consultation over the next ten years as a result of the critical habitat designations. These 41 activities are listed in Table 3.1.

NMFS's PCTS tracking system indicates that Section 7 consultation related to the activities listed in Table 3.1 over the past ten years often involved multiple federal agencies that all have a nexus with proposed activities. The next subsection provides descriptions of these activities organized according to which federal agency has the most direct federal nexus, initiated most activity-based Section 7 consultation in the past, and is most likely to initiate Section 7 consultation related to these activities as a result of this critical habitat designation.

Table 3-1. Categories and activities likely to trigger Section 7 consultation for Atlantic sturgeon critical habitat

Category	Activity
Artificial Propagation	Aquaculture
Military	Acoustic testing
	Drydock operations
	Pier repairs
Ocean	Beach renourishment
	Disposal
Research	Fish monitoring

	Fishery
Restoration	Estuary
	Fish passage
	Riverine
	Waterway
Transportation	Airport
	Bridge
	Culvert
	Moorage
	Port/terminal/harbor/marina
	Railroad
	Right-of-way
	Road/highway
	Ship/vessel/aircraft operation
Utility	Hydropower
	Pipeline
	Power plant
	Tidal power
	Transmission line
Water quality	Aquatic criteria
	NPDES[1]
	TMDLs
	Wastewater
Waterway	Boat/dock/pier
	Channel reconstruction
	Dam
	Dredging
	Excavation
	Fill
	Flood control
	Geotechnical exploration
	Shoreline stabilization
	Special event
	Streambank stabilization

[1] NPDES Section 7 consultation with NMFS is only initiated in those states where authority to issue permits has not been authorized by EPA (see *Section 3.2.2.2.1*, below)

3.2.2.1 U.S. Army Corps of Engineers

USACE is responsible for carrying out or permitting the majority of activities that have the potential to affect riverine, estuarine, and marine areas. USACE civil works districts undertake projects to maintain navigation channels and water infrastructure, conduct environmental restoration, and maintain flood control.

USACE regulatory districts grant permits for private activities that occur in navigable waterways or involve modifying navigable waterways for construction and maintenance of structures under section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act. USACE typically consults with the Services when issuing individual standard permits for such projects, but the presence of critical habitat may also cause USACE to elevate nationwide and regional permits and consider them as individual permits. Alternatively, USACE may update its State and Local Operating Procedures for Endangered Species (SLOPES), which govern how USACE considers effects on endangered and threatened species

when granting section 404 and section 10 permits. Updating the SLOPES could streamline the permit process for private activities located in or near sturgeon critical habitat by providing a programmatic approach to consider the sturgeon in nationwide and regional permits, removing the need to elevate each permit and consider it individually.

Activities in the New England, New York, Philadelphia, Baltimore and Norfolk district offices of USACE are potentially affected by the proposed critical habitat for the three northern DPSs of Atlantic sturgeon.

Since the beginning of 2003, USACE district offices in the region have been engaged in 270 Section 7 consultations (~25 per year) that represent the types of projects that would affect Atlantic sturgeon, their critical habitat, or both, and would therefore be expected to result in Atlantic sturgeon-related Section 7 consultation if they occurred in the future. Future consultations and potential project modifications associated with USACE-operated and regulated activities in one or more of the critical habitat units are associated with the following categories of projects.

3.2.2.1.1 Dredging

USACE is responsible for maintaining and improving waterways to support navigation. USACE uses dredges to maintain navigation channels at specified depths and widths to allow for transport of shipped goods and other boat traffic. Furthermore, USACE must occasionally engage in emergency dredging to repair the effects of tropical storms and hurricanes. USACE also conducts contract dredging projects for other federal agencies, such as Coast Guard and military facilities. In addition to large-scale projects at industrial port facilities, USACE issues permits to private parties seeking to undertake small dredging projects to maintain local access to navigation channels.

USACE plans the location and timing of dredging projects to ensure that channel reliability is always maintained. Frequency of dredging varies widely, from almost constant maintenance dredging to once every ten or twenty years, depending on the level of use of the waterway for shipping and the natural rate of sediment deposition.

Dredging to maintain navigation channels may impact all five essential features of Atlantic sturgeon critical habitat, although, depending on site-specific characteristics, these impacts may be positive, negative or neutral. The major risks of dredging projects to sturgeon habitat are elevated turbidity causing increased siltation on spawning or reproduction and recruitment areas, and reduction or the blockage of migratory passage through channels and inlets. Channel maintenance dredging, involves removing silt, usually from shoreline erosion, that has adversely affected navigability and may also be adversely affecting substrate conditions for sturgeon. Dredging to deepen or widen navigation channels may involve removing rock and gravel substrate that is providing critical sturgeon habitat and exposing identical or similar substrate or it may expose substrate that provides significantly better sturgeon habitat (e.g., more rock and gravel and less sand) or worse sturgeon habitat (e.g. more sand and less rock and gravel).

In the past ten years, there have been approximately 114 dredging-related consultations that would likely have involved Atlantic sturgeon critical habitat, had it been designated at the time.

3.2.2.1.1.1 Dredged Material Placement

Material dredged from navigation channels must be placed in a suitable, USACE-approved disposal site. The most common disposal methods are: ocean placement, downdrift disposal on coastal beaches, confined disposal facilities either in open water or upland, flow-lane or within-banks placement, and open water disposal. Placement of dredged material into open water or aquatic confined disposal sites located in rivers, estuaries or nearshore waters poses a risk from disposal of dredged material on spawning and feeding habitat. Upland disposal and downdrift placement of sandy dredged material on beaches and other restoration projects pose less risk to sturgeon habitat. Here again the placement of dredged material that consists of mostly rock and gravel in areas that are currently sandy or covered with silt could improve sturgeon habitat while the placement of sandy or silty dredged material could adversely affect sturgeon habitat.

3.2.2.1.2 Boat docks/piers

Under the authority of the Clean Water Act and the Rivers and Harbors Act, the USACE maintains permitting authority over activities such as dock and pier construction. Each year, numerous private landowners seek permits from USACE to construct docks, boat launches, and other structures in and adjacent to rivers and bays. Most of these projects are very small-scale and are regulated under Nationwide and Regional permits, which do not require individual Section 7 consultation. However, large-scale marine construction projects may require individual permits.

Projects of this type have the potential to impact most essential features of Atlantic sturgeon critical habitat. In-water construction could negatively impact substrate suitable for spawning, as well as water depth, water quality, and could potentially obstruct passage.

In addition to the USACE, other federal agencies, such as FERC, the US Coast Guard, FAA, Federal Emergency Management Agency (FEMA), USFWS, and branches of the military have engaged in about 76 consultations related to in-water construction in the past ten years.

3.2.2.1.3 Streambank Stabilization

Streambank and shoreline protection consists of restoring and protecting banks of streams, lakes, estuaries, and excavated channels against scour and erosion by using vegetative plantings, soil bioengineering, and structural systems. These systems can be used alone or in combination. The two basic categories of protection measures are those that work by reducing the force of water against a streambank or shoreline and those that increase their resistance to erosive forces. Streambank stabilization projects often include the discharge of dredged or fill material into waters of the United States, thereby requiring a permit under the CWA.

There were about 15 consultations involving streambank stabilization in the three northeastern Atlantic sturgeon DPSs in the past ten years. In addition to the USACE, the Federal Highway Administration (FHWA) has also consulted on streambank stabilization projects. Streambank stabilization projects have the potential to affect all essential features of Atlantic sturgeon critical habitat with the exception of salinity.

3.2.2.1.4 Fill

Any development project that would require the discharge of fill materials into navigable waters would require a Section 404 permit under the Clean Water Act. In some cases, USACE may need a permit to fill areas of a given waterway due to scouring beneath a dam, for instance. Depending on site-specific characteristics, fill may also be a part of dredged material placement operations. Filling has the potential to impact each essential feature of Atlantic sturgeon critical habitat, with the exception of salinity.

Approximately 11 consultations related to fill activities that likely would have involved Atlantic sturgeon critical habitat occurred in the past ten years. In addition to USACE, the FHWA also consulted on fill activities.

3.2.2.1.5 Excavation

Under the authority of the CWA and Rivers and Harbors Act, the USACE maintains permitting authority over excavation activities in waterways. Depending on the size, scope and location of the project, excavation has the potential to impact each of the essential features of Atlantic sturgeon critical habitat. In the past ten years, the USACE has consulted on 12 excavation-related activities that would have involved Atlantic sturgeon critical habitat had it been listed at the time.

3.2.2.1.6 Channel reconstruction

In this context, channel reconstruction generally involves improving navigation channels, through widening or deepening, in conjunction with a dredging project. Similar to dredging, channel reconstruction projects are overseen and permitted by the USACE, and have the potential to impact each essential feature of Atlantic sturgeon critical habitat.

In the past ten years, the USACE has consulted on two projects related to channel reconstruction that would have involved Atlantic sturgeon critical habitat had it been designated at the time.

3.2.2.1.7 Flood Control/Shoreline Stabilization

USACE responsibilities include flood control and damage reduction efforts that range from small, local protection projects, such as construction of levees and non-structural flood control measures, to major dams. Erosion control and bank stabilization activities are typically associated with dredging and marsh creation. Shoreline protection efforts may involve construction of jetties, seawalls, and other hard structures, as well as beach nourishment.
Private parties may request permits to undertake small localized shoreline stabilization, beach nourishment, and restoration projects. Larger-scale industrial sites and local governments may also require USACE permits for bulk heading and shoreline stabilization projects.

Depending on type, size and scope, flood control projects have the potential to impact each essential feature of Atlantic sturgeon critical habitat. Shoreline stabilization projects could potentially impact each essential feature with the exception of salinity.

In the past ten years, there were 19 shoreline stabilization or flood control projects that likely would have resulted in Section 7 consultation on Atlantic sturgeon critical habitat, had it been designated at the time. In addition to the USACE, FEMA, the US Coast Guard, USDA, and the US Navy have engaged in Section 7 consultation related to shoreline stabilization in the past ten years.

3.2.2.1.8 Port/terminal/harbor/marina

Port, terminal, harbor or marina construction can be either public or private projects. Federal navigation projects that are permitted and overseen by the Corps fall into this category, as do projects that fall under the auspices of state port authorities. Additionally, any private entity interested in developing a marina, or similar in-water project, would need to apply to the USACE for a permit. Depending on the location, size, and scope of a project involving port, terminal, harbor or marina construction, there is potential to impact each of the essential features of Atlantic sturgeon critical habitat.

There have been 14 Section 7 consultations on this type of in-water construction in the past ten years that likely would have occurred due to potential Atlantic sturgeon critical habitat impacts, had it been designated at the time. In addition to the USACE, the USFWS and the NPS have also consulted on this type of construction in the northeast. Port, terminal, harbor, or marina construction has the potential to impact each of the essential features of Atlantic sturgeon critical habitat.

3.2.2.1.9 Aquaculture

The USACE is authorized to permit aquaculture activities under Section 10 of the Rivers and Harbors Act and under Section 404 of the CWA. Aquaculture activities related to Section 10 of the Rivers and Harbors Act include the placement of structures and equipment in navigable waters, such as piles, cages, trays, racks, ropes/line, buoys and floats. Aquaculture activities related to Section 404 of the CWA include placement of dredged or fill material to prepare the substrate of a water body so that it is suitable for larval attachment, and placing fill in waters to construct impoundments.

In the past ten years, there have been two artificial propagation projects that likely would have required Section 7 consultation for Atlantic sturgeon critical habitat. Depending on the size and scope of the project, aquaculture projects have the potential to modify critical habitat through impacts to water quality.

3.2.2.1.10 Restoration

Restoration is one of the primary missions of the USACE Civil Works program. The purpose of restoration is to restore lost or degraded ecosystem function, structure, and processes. Restoration projects occur in a variety of ecosystems, including estuaries, marshes, rivers, and waterways.

In some cases, dredged material may be used for wetland habitat creation, as well as other ecosystem restoration projects. These projects are undertaken with the goal of maintaining or re-establishing natural functioning and self-regulating wetland systems.

Depending on the location, size, and scope of a given project, restoration has the potential to impact each of the proposed essential features of Atlantic sturgeon critical habitat.

In the past ten years in the northeast, 24 river, estuary, waterway and fish passage restoration projects likely would have required Section 7 consultation for Atlantic sturgeon critical habitat if it had been designated at the time. In addition to the USACE, the EPA has consulted on estuary and waterway restoration projects, the FHWA has consulted on a fish passage project, and NMFS, the US Navy, the US Coast Guard, and NOAA have consulted on either riverine or waterway restoration projects.

3.2.2.2 Environmental Protection Agency

3.2.2.2.1 NPDES

As authorized by Section 402 of the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. NPDES permits, issued by either EPA or an authorized state/tribe contain industry-specific, technology-based and/or water-quality-based limits, and establish pollutant monitoring and reporting requirements. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. A permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent. The permit will then set forth the conditions and effluent limitations under which a facility may make a discharge.

The state NPDES programs in Maine, Connecticut, New Jersey, Delaware, Maryland, and Virginia are fully authorized. In New York and Pennsylvania, the state NPDES programs are partially authorized. In both states, there is no approved state pretreatment or biosolids program. New Hampshire, Massachusetts, and Washington, DC are unauthorized.

In the northeast in the past ten years, 66 NPDES projects would likely have required Section 7 consultation for Atlantic sturgeon critical habitat, had it been designated at the time. In addition to the EPA, USACE also consulted on NPDES-related activities. NPDES projects have the potential to modify critical habitat through impacts to water quality.

3.2.2.2.2 Aquatic Criteria

Aquatic criteria, in this context, refer to water quality standards. Water quality standards are fundamental to the water quality-based pollution control program mandated by the Clean Water Act. Section 303(c) of the CWA stipulates that water quality standards, developed by each state, determine designated uses of the navigable waters involved, and the water quality criteria for each use. The standards set criteria to protect designated uses, including use as public water supply, fish and wildlife habitat, recreational areas, and for navigation. When a state revises or adopts new water quality standards, Section 7 consultation may be required to ensure protection of endangered species and their habitats.

In the northeast in the past ten years, 19 projects involving aquatic criteria would likely have required Section 7 consultation for Atlantic sturgeon critical habitat, had it been designated at the time. Aquatic criteria projects have the potential to modify critical habitat through impacts to water quality.

3.2.2.2.3 TMDLs

A Total Maximum Daily Load (TMDL) is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards. Under section 303(d) of the CWA, states, territories, and authorized tribes are required to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters. TMDLs may be developed for nutrients, sediment, metals, mercury, pathogens, etc. When TMDLs are set for a water body, Section 7 consultation may be required to ensure protection of endangered species and their habitats.

In the northeast in the past ten years, 14 projects involving TMDLs would likely have required Section 7 consultation for Atlantic sturgeon critical habitat, had it been designated at the time. Projects affecting TMDLs have the potential to modify critical habitat through impacts to water quality.

3.2.2.3 Federal Highway Administration

3.2.2.3.1 Bridges and Roads/highways

The Federal Highway Administration (FHWA) consults with NMFS when it provides funding to state Departments of Transportation (DOTs) for bridge replacement or expansion projects, or road construction projects in or over critical habitat. The USACE also permits bridge or roadwork projects that require permitting under Section 404 of the CWA.

In the northeast in the past ten years, 27 bridge and 6 road projects would likely have required Section 7 consultation for Atlantic sturgeon critical habitat, had it been designated at the time. Bridge and road/highway projects have the potential to impact each essential feature of Atlantic sturgeon critical habitat with the exception of salinity.

3.2.2.4 Federal Aviation Administration

3.2.2.4.1 Airports

The Federal Aviation Administration (FAA) is responsible for permitting airport construction and improvement. In the northeast in the past ten years, 8 airport projects would likely have required Section 7 consultation for Atlantic sturgeon critical habitat, had it been designated at the time. Depending on the location and scale of the project, airport construction or improvement has the potential to impact each essential feature of Atlantic sturgeon critical habitat with the exception of salinity.

3.2.2.5 Federal Energy Regulatory Commission

3.2.2.5.1 Hydropower

The Federal Energy Regulatory Commission (FERC) is responsible for issuing licenses for the construction of new hydropower projects, relicensing the continuance of an existing project, and oversight on all ongoing project operations, including environmental monitoring. Dams and water diversions for the purposes of hydropower have the potential to affect each of the essential features of Atlantic sturgeon critical habitat. In particular, fish passage may be affected on rivers with hydropower-related dams or other water diversions.

In the past ten years in the northeast, 15 hydropower projects likely would have required Section 7 consultation for Atlantic sturgeon critical habitat if it had been designated at the time.

3.2.2.5.2 Pipelines and Oil and Gas Activities

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

pipelines and storage facilities, and the operation of proposed and operating liquefied natural gas (LNG) terminals. FERC does not provide oversight for the construction of oil pipelines, or local natural gas distribution pipelines. USACE regulates oil and gas pipelines and installations out to the three mile limit (in state waters), as well as oil and gas structures that cross rivers.

Pipeline projects have the potential to impact each of the essential features of Atlantic sturgeon critical habitat, with the exception of salinity. In the past ten years, there were ten consultations related to pipeline activities that would have involved Atlantic sturgeon critical habitat, had it been designated at the time. All were initiated by FERC. FERC, USACE and the US Navy have consulted on projects related to pipelines in the past ten years.

3.2.2.6 Nuclear Regulatory Commission

3.2.2.6.1 Power Plants

The Nuclear Regulatory Commission (NRC) is responsible for the issuance and renewal of licenses for nuclear power plant construction and operation. Hydroelectric power plants are under the authority of FERC (see *Section 3.3.2.5.1*). Each of the essential features of Atlantic sturgeon critical habitat has the potential to be affected by power plant construction and operation. In the past ten years, there have been 11 power-plant-related projects that would likely have resulted in consultation for Atlantic sturgeon critical habitat, had it been designated at the time. In addition to NRC, the USACE and US Department of Energy (DOE) has entered into Section 7 consultation related to power plant activity in the northeast and mid-Atlantic regions in the past ten years.

3.2.2.7 National Marine Fisheries Service/US Fish and Wildlife Service

3.2.2.7.1 Fish Monitoring

NMFS approves and implements Fisheries Management Plans (FMPs), which contain conservation and management measures designed to prevent overfishing and rebuild overfished stock, and to protect, restore, and promote the long-term health and stability of each fishery. Fishing methods and gear types can differ significantly among fisheries and are regulated in different ways within FMPs. The designated critical habitat areas for Atlantic sturgeon are in rivers where salinity is too low for most commercially targeted fish species and related fishing activity to occur. Commercial fishing that may occur in these areas consists mostly of hook and line fishing, net and weir fishing, or spear fishing which may jeopardize sturgeon, but are not likely to have adverse impacts on sturgeon habitat.

Fish monitoring activities have the potential to obstruct fish passage, but are not expected to impact any other essential features of Atlantic sturgeon critical habitat. In the past ten years in the northeast, 11 fish monitoring projects likely would have required Section 7 consultation for Atlantic sturgeon critical habitat if it had been designated at the time. In addition to NMFS, EPA and USGS also consulted on fish monitoring projects.

3.2.2.7.2 Fishery Research

NMFS and USFWS periodically issue permits for scientific collection and surveys, as well as research permits to study listed species, such as the shortnose sturgeon. This research has the potential to impact suitable substrate and fish passage, but is unlikely to impact other essential features of Atlantic sturgeon critical habitat.

In the past ten years in the northeast, 15 fishery research projects likely would have required Section 7 consultation for Atlantic sturgeon critical habitat if it had been designated at the time. In addition to NMFS, EPA and USFWS also consulted on fishery research projects.

3.2.2.8 Department of Defense (DOD)

3.2.2.8.1 Military Activities

DOD operates a number of military installations in and near critical habitat areas, particularly in the Chesapeake Bay DPS, including Indian Head Naval Surface Warfare Center on the Potomac River in Maryland, the Dahlgren Naval Surface Warfare Center on the Potomac River in Virginia, and Naval Air Station Norfolk on the James River in Virginia. The development and maintenance of these installations may involve construction activities including pier repairs (i.e., in-water construction), and the military may also conduct ship, vessel, and aircraft operations and training exercises at these installations that could affect critical habitat areas. In the past ten years, the US Coast Guard has participated in 10 Section 7 consultations with NMFS. The US Navy has participated in 7 Section 7 consultations, the US Army has participated in 5 consultations, and the US Air Force has participated in 1.

It is anticipated that each base will update its Integrated Natural Resources Management Plan to include Atlantic sturgeon following the designation of critical habitat for the species. See *Section 3.3.3* below for projections of the number of Section 7 consultations for each relevant branch of the military.

In the past ten years, the US Navy and the US Army have initiated Section 7 consultation for 4 military activities that likely would have required consultation for Atlantic sturgeon critical habitat, had it been designated at the time. Military activities such as pier repairs and training exercises have the potential to impact substrate, water quality, and fish passage. Salinity and water depth are not expected to be impacted by these activities. Likewise, ship, vessel or aircraft operation may impact water quality and fish passage.

3.2.3 Projections of Future Section 7 Consultations

Projecting future Section 7 impacts in the case of the three northern DPSs of Atlantic sturgeon is unusually complex because of the relatively large number of critical habitat units, their sizes, and the many water-based and land-based activities that could have relevant impacts on essential habitat features. There is also a great deal of uncertainty about the scope and location of projected future Federal actions that could trigger Section 7 consultation. In some cases, for example, site-specific pre-consultation surveys may be necessary to determine where essential features exist within a proposed project area before action agencies can determine whether any consultation is required.

The effect of all this uncertainty on economic impact projections based on numbers of Section 7 consultations, however, is mitigated to a significant extent by the fact that many activities that could trigger Section 7 consultation because of this designation are already subject to other federal and state laws and regulations described in *Section 2.2* of this report. These baseline regulatory conditions indicate that most activities that could result in consultations because of this designation will not require consultation or will only require informal consultation. Regulatory baseline conditions and the prior listing of the species, in other words, significantly reduce the importance of errors in predicted numbers of future Section 7 consultations because the numbers of likely consultations will be relatively small.

The following sections describe how records of past Section 7 consultation in proposed critical habitat units, interviews and correspondence with federal and state agencies that have initiated consultation with NMFS, and guidance from NMFS staff involved in those consultations were used to project the number of Section 7 consultations that will result from this designation. Because many consultations predicted to result from the designation using this approach would probably have occurred in the absence of the designation (e.g., because of the listing of the species or because of other listed species), the projected number of consultations estimated this way tend to overestimate incremental impacts of the designation.

3.2.3.1 The NMFS Public Consultation Tracking System

The NMFS PCTS database was described in *Section 3.3.2*. A query of the most recent ten years (January 2003 to September 2013) of NMFS' PCTS data for each of the 15 proposed critical habitat units was used

to identify past activities that required ESA Section 7 consultation. NMFS staff then determined which of these activities, if proposed in the future, would trigger consultation because they may affect Atlantic sturgeon or its critical habitat, or both. Based on the resulting PCTS database and subsequent correspondence and discussions with personnel at relevant federal agencies, the 41 activities listed in Table 3.1 were determined to have the potential to result in Section 7 consultation if they occur in the proposed critical habitat units.

Using a technique that has been employed consistently in the past as a basis for projecting future Federal actions that may require consultation and estimating Section 7 impacts, the past ten years of PCTS data on Section 7 consultation in each of the 15 critical habitat units was used as a basis for making preliminary projections about the likely number of Section 7 consultations in each unit that will result from this designation during the next ten years. Tables 3.2 through 3.4 list, by type of activity, the number of Section 7 consultations that took place during the past ten years in each critical habitat that NMFS determined would have involved Atlantic sturgeon had the species been listed and its critical habitat designated at the time.

Table 3-2. Number of consultations per activity type in each Critical Habitat Unit in the Gulf of Maine DPS of Atlantic sturgeon over the ten-year period January 2003 through September 2013[1]

Category	Activity	Penobscot	Kennebec	Androscoggin	Piscataqua	Merrimack	Activity Total
Artificial Propagation	Aquaculture		1				**1**
Military	Drydock operations				1		**1**
Research	Fish monitoring	3	4			1	**8**
	Fishery	5	3	3			**11**
Restoration	Fish passage	1					**1**
	Waterway	1	2	1	1		**5**
Transportation	Bridge	2	3		1	7	**13**
	Culvert	1	1				**2**
	Port/terminal/harbor/marina		1		1		**2**
	Road/highway					1	**1**
Utility	Hydropower	4	3	3			**10**
	Pipeline	1	1				**2**
	Power plant					1	**1**
	Tidal power	1	1		1		**3**
	Transmission line	1					**1**
Water quality	NPDES				3	18	**21**
	Wastewater	1					**1**
Waterway	Boat/dock/pier	5	1				**6**
	Dam	1					**1**
	Dredging	6	12	2	2	3	**25**
	Excavation		2				**2**
	Fill	6	1				**7**
	Shoreline stabilization	2	2		1		**5**
	Special event		1			3	**4**
	Streambank stabilization	3	6			1	**10**
Unit Total		**44**	**45**	**9**	**11**	**35**	

[1] Note that some consultations involved multiple activities. Therefore the sum of the columns here does not necessarily represent the total number of consultations per critical habitat unit over the past ten years.

Table 3-3. Number of consultations per activity type in each Critical Habitat Unit in the New York Bight DPS of Atlantic sturgeon over the ten-year period January 2003 through September 2013[1]

Category	Activity	Connecticut	Housatonic	Hudson	Delaware	Activity Total
Artificial Propagation	Aquaculture			1		**1**
Military	Pier repairs			1		**1**
Ocean	Disposal	1				**1**
Research	Fish monitoring	1			2	**3**
	Fishery			1		**1**
Restoration	Estuary				1	**1**
	Riverine	2			1	**3**
	Waterway	1		6	2	**9**
Transportation	Airport			1	4	**5**
	Bridge	3		3	3	**9**
	Moorage			3		**3**
	Port/terminal/harbor/ marina			7	4	**11**
	Railroad			1		**1**
	Right-of-way				1	**1**
	Road/highway			3	2	**5**
	Ship/vessel/aircraft operation				1	**1**
Utility	Hydropower	1		3		**4**
	Pipeline			4	3	**7**
	Power plant	1		5	3	**9**
	Transmission line	1		6	1	**8**
Water quality	Aquatic criteria	1		3	4	**8**
	NPDES	30				**30**
	TMDLs			1	5	**6**
	Wastewater				1	**1**
Waterway	Boat/dock/pier	2		47	14	**63**
	Channel reconstruction	2				**2**
	Dredging	8		39	13	**60**
	Excavation			7	2	**9**
	Fill			1		**1**
	Geotechnical exploration			1		**1**
	Shoreline stabilization	1		8	1	**10**
	Special event			1		**1**
	Streambank stabilization	3		1	1	**5**
	Unit Total	**58**	**0**	**154**	**69**	

[1] Note that some consultations involved multiple activities. Therefore the sum of the columns here does not necessarily represent the total number of consultations per critical habitat unit over the past ten years.

Table 3-4. Number of consultations per activity type in each Critical Habitat Unit in the Chesapeake Bay DPS of Atlantic sturgeon over the ten-year period January 2003 through September 2013[1]

Category	Activity	Nanticoke	Potomac	Rappahannock	York	James	Activity Total
Military	Acoustic testing		1				**1**
Ocean	Beach renourishment				1		**1**
Research	Fishery		3				**3**
Restoration	Riverine	1	1				**2**
	Waterway		3				**3**
Transportation	Airport		3				**3**
	Bridge		4				**4**
	Port/terminal/harbor/marina		1				**1**
	Right-of-way			1			**1**
Utility	Hydropower						**0**
	Pipeline				1		**1**
	Power plant		1				**1**
Water quality	Aquatic criteria		3	2	2	2	**9**
	NPDES		15				**15**
	TMDLs		3	1	1	1	**6**
Waterway	Boat/dock/pier	1	4			2	**7**
	Dredging	1	9	2	2	11	**25**
	Fill			1	1	1	**3**
	Flood control		1				**1**
	Shoreline stabilization		2			1	**3**
	Special event					1	**1**
Unit Total		**3**	**54**	**7**	**8**	**19**	

[1] Note that some consultations involved multiple activities. Therefore the sum of the columns here does not necessarily represent the total number of consultations per critical habitat unit over the past ten years.

3.2.3.2 Surveys of Federal Action Agencies

During November 2013 through February 2014, personnel at relevant federal agencies were contacted to review and comment on preliminary projections of Section 7 consultations that were based on the ten year Section 7 consultation history. Each office was provided with a table that listed the number of Section 7 consultations that their agency had initiated per unit over the past ten years that would have involved Atlantic sturgeon critical habitat, had it been designated at the time, as well as a listing of the types of activities on which they had consulted. Each office was asked to answer questions regarding: 1) whether similar numbers of consultations on projects that may involve Atlantic sturgeon critical habitat should be expected over the next ten years and, if not, why not; 2) how many and what type of project modifications resulted from past consultations and what were their approximate costs; and 3) what are their expectations regarding current, planned or proposed projects in each river unit that may require consultation on Atlantic sturgeon critical habitat, what project modifications are likely to result, and what are their likely costs.

3.2.3.3 Estimated Number of Incremental Section 7 Consultations

Table 3.5 is based on the data and agency information provided by the federal agencies in response to the three questions described above and summarizes the numbers of future federal activities that are projected to result in Section 7 consultation over the next ten years related to sturgeon habitat in each proposed critical habitat unit.

Table 3-5. Projected number of Section 7 consultations per federal action agency per Atlantic sturgeon Critical Habitat Unit

DPS	Critical Habitat Unit	Total Projected Consultations	USACE	EPA	FHWA, DOT, State DOTs	FERC	NMFS	Navy, Army	FAA	USCG	NRC	USFWS	FEMA	USDA	Other Agencies[2]
Gulf of Maine	Penobscot	41	18		5	5	9					1		2	1
	Kennebec	45	28	5	5	4	3								
	Androscoggin	9	2			3	4								
	Piscataqua	11	3	3	1	1	1	2							
	Merrimack	29	4	19	2					4					
	TOTAL	**140 [1]**	**58**	**27**	**13**	**13**	**18**	**2**	**0**	**4**	**0**	**1**	**0**	**2**	**2**
New York Bight	Connecticut	57	21	32	3	1									
	Housatonic	3	2		1										
	Hudson	150	120	7	4	6		1	1	1	3	2	2		3
	Delaware	68	35	11	3	4	2	3	4	2	3		1		
	TOTAL	**275 [1]**	**176**	**50**	**10**	**11**	**2**	**4**	**5**	**3**	**6**	**2**	**3**	**0**	**3**
Chesapeake Bay	Nanticoke	3	2												1
	Potomac	54	10	21	4		3	9	4						3
	Rappahannock	7	3	3						1					
	York	8	4	3				1							
	James	18	15	3											
	TOTAL	**97 [1]**	**35**	**34**	**5**	**2**	**3**	**10**	**4**	**1**	**0**	**0**	**0**	**0**	**3**

[1] Consultations involving activities in more than one river system are listed for each river system that was involved.

[2] Includes DOE, NOAA, NPS, USGS, and consultations for which no agency was listed

3.3 Potential Project Modifications

This section provides a description of the modifications to various types of projects that NMFS may recommend, through Section 7 consultation, to avoid destruction or adverse modification of critical habitat. All of the project modifications identified for projects within a category may not be necessary for an individual project within that category. For example, if a shoreline stabilization project were altered to include alternative stabilization methods, relocating the project would not be necessary; however, monitoring conditions to ensure the project does not have adverse effects on essential habitat features may be necessary. Conversely, it is possible that multiple modifications could be necessary for an individual project if it has potential to adversely affect more than one essential feature in ways that cannot be avoided by implementing just one project modification.

In general, project modifications and related costs are associated with voluntary or legally mandated actions that take place as a result of Section 7 consultation. However, some project proponents or permit seekers may design projects in order to avoid the need for a formal consultation or to minimize any required project modifications that may result from Section 7 consultation. Project design decisions made with Section 7 consultation in mind may result in incremental project costs and/or benefits. However, it is not possible to determine if or how the designation will affect future project design decisions or related costs and benefits, so these potential impacts are not addressed here.

The following subsections provide descriptions of potential project modifications and when and why they may be required as a result of incremental Section 7 consultation. These descriptions of potential project modifications were drawn from the economic analysis of the critical habitat designation for seven West Coast salmon and steelhead evolutionary significant units (ESUs) (NOAA 2005) and are provided here for context. Discussions with federal action agencies identified no instances of past project modifications that would have been necessary as a result of Atlantic sturgeon critical habitat having been designated. Further, these discussions and correspondence with federal agencies yielded no suggestions that project modifications are likely to result from this designation in the future. The project modifications listed below may not ever be required as a result of Section 7 consultation on Atlantic sturgeon critical habitat, and should not be viewed as the likely universe of potential project modifications that could result from the designation.

Unlike numbers of Section 7 consultations which were projected to result from the designation in the previous section, no attempt is made here to project the number of project modifications that will result from those consultations. Preliminary interviews and correspondence with federal agencies that have initiated Section 7 consultation in the past regarding the types of projects listed in Table 3.1 indicate that the number of project modifications that should be expected to result from the designation is near zero.

3.3.1 In-water Construction Project Modifications

Modifications to boat dock, pier, or breakwater construction or repair projects may be required because of increases in turbidity, including suspension of toxins in the sediment, removal or disturbance of suitable spawning substrate, and potential obstruction of fish passage. A variety of project modifications may be implemented, depending on the type of project. For boat docks, typical project modifications include date restrictions, use of silt fences, upland disposal of excavated material, maintenance of all heavy equipment to minimize pollutant release, and use of a bubble curtain to minimize sound effects from pile driving. Typical project modifications for boat launches include date restrictions, implementation of erosion and pollution control measures, measures to minimize impacts on riparian or instream habitat, restoration or mitigation of temporary or permanent impacts to riparian or instream habitat. Bulkhead construction projects may be modified through in-water work restrictions, date restrictions, restrictions on the use of heavy equipment, pollution and erosion control, site restoration, minimization of disturbance and contamination to riverine habitat, and post-construction monitoring. Projects involving bank stabilization

may be required to implement erosion control, restore disturbed areas to pre-work conditions, and upland placement of excavated materials,

3.3.2 Dredging Modifications

Dredging projects vary greatly in size and scope, but have the potential to disturb suitable substrates and impact water quality through increased turbidity and suspension of toxins in the sediment. Typical project modifications associated with dredging projects include work window constraints, the requirement of additional survey work to determine the presence and/or location of essential habitat features, and limitations on dredged material disposal

3.3.3 Modifications to Road, Bridge, and Culvert Projects

Projects involving road, bridge, or culvert construction or repair have varying levels of in-water activity. Typical modifications to these types of projects include limitations on the time of in-water work to avoid sensitive life stages, isolation of the in-water work area (e.g., coffer dams, etc.), implementation of effective erosion and pollution control measures, implementation of stormwater management measures, post-work restoration of the construction site, and on-going post-construction conditions monitoring.

3.3.4 Hydropower Modifications

Section 7 consultation and any project modifications would begin with the expiration of an existing FERC license. There are three categories of Reasonable and Prudent Alternatives (RPAs) with respect to hydropower projects: operational, capital, and programmatic. Operational project modifications have to do with changes in hydropower production or flow regime, and costs associated with this type of modification stem from foregone power revenues. Capital project modifications deal with investments in new or improved infrastructure, additional investment in operations and maintenance, or dam removal. Programmatic project modifications involve all other types of modifications, including monitoring, mitigation, research, etc.

3.3.5 Modifications to Utility Lines

In this context, utility lines refer to both pipelines and outfall structures at wastewater treatment plants or power plants. These types of activities could impact Atlantic sturgeon habitat through excavation, placement of excavated material, and filling of trenches post-construction. For pipeline projects, typical project modifications include the use of direction drilling (as opposed to open-cut construction), maintenance of pre-construction contours, the stockpiling of soil from excavation for eventual replacement in the trench, minimization of roads associated with construction, restoration of banklines to original slope and vegetation, and implementation of erosion control measures. For outfall structures, typical project modifications include limiting construction access to barges via the waterway, effluent restrictions, complete site restoration, restrictions on in-water work period, isolation of in-water work area, and restriction on blasting to dewatered area behind a coffer dam.

3.3.6 Sand and Gravel Mining Modifications

Sand and gravel is mined for use in construction aggregate. Potential impacts from sand and gravel mining projects to Atlantic sturgeon critical habitat are highly dependent on the location and size of the project, as well as the mining technique that would be employed. Different gravel removal methods have different potential impacts on essential features, including the removal of suitable substrate, increased turbidity, increased suspended sediment and siltation, and destabilization of banks. Project modifications to sand and gravel mining would depend on the location of the material to be mined (i.e., whether essential features are present), the type of mining planned, the timing of the mining, and what types of mitigation measures are already in place. The typical project modification required for this type of activity would be a reduction in the amount of material permitted for removal.

3.3.7 NPDES Modifications

In this context, project modifications refer solely to temperature criteria for effluent discharge, and would only apply in those states that do not have a state-delegated NPDES program (e.g., Massachusetts, New Hampshire, and Washington, DC). NPDES-permitted facilities are already subject to temperature guidelines, but for Atlantic sturgeon, the existing criteria may not be strict enough for certain life stages. Some modifications require capital expenditures, while others only require changes in operations and maintenance. Modifications that may be employed to control the temperature of effluent include process optimization (i.e., identifying procedures that could be changed to reduce temperatures in wastewater), reducing the volume of discharge by reusing effluent, storage of heated wastewater, off-stream cooling ponds, and the installation of treatment technologies to reduce temperature.

3.4 Estimated Section 7 Costs

As described above and in more detail in *Section 2.2*, the costs associated with the critical habitat designation have two main components: administrative Section 7 consultation costs, and project modification costs that are required as a result of those consultations. Below, *Section 3.5.1* describes and estimates administrative consultation costs that can be expected to result from this designation. *Section 3.5.2* describes and estimates a range of project modification costs that may result from those consultations.

3.4.1 Administrative Section 7 Costs

Estimated unit costs of technical assistance and informal and formal Section 7consultations related to this critical habitat designation are presented in Table 3.6. These are updated versions of consultation costs estimated as part of previous economic impact studies prepared for NMFS and USFWS to support earlier critical habitat designations for Gulf sturgeon (IEc 2003), American green sturgeon (IEc 2009a), Atlantic salmon (IEc 2009b), and North Atlantic loggerhead turtle (IEc 2013). As described in those studies, these unit cost estimates were" based on an average level of effort for consultations of low or high complexity (based on NMFS and other Federal agency information), multiplied by the appropriate labor rates for NMFS and other Federal agency staff and similar labor rates applied to time committed by third party private sector participants." Costs to conduct surveys of the project area to determine the presence and extent of essential features are included in these estimates. For purposes of this analysis, all costs were updated to 2013 dollars using consumer price indices (CPI).

Table 3-6. Projected unit costs of Section 7 consultation for Atlantic sturgeon (2013 dollars)

Consultation Type	NMFS	Federal Agency	Third Party	Biological Assessment	Total Costs
New consultation resulting entirely from critical habitat designation (Total cost of a consultation considering both Jeopardy and Adverse Modification)					
Technical Assistance	$570	n/a	$1,100	n/a	$1,600
Informal	$2,500	$3,100	$2,100	$2,000	$9,600
Formal	$5,500	$6,200	$3,500	$4,800	$20,000
Programmatic	$17,000	$14,000	n/a	$5,600	$36,000
New consultation considering only Adverse Modification (Unoccupied habitat)					
Technical Assistance	$430	n/a	$790	n/a	$1,200
Informal	$1,900	$2,300	$1,500	$1,500	$7,200
Formal	$4,100	$4,700	$2,600	$3,600	$15,000
Programmatic	$12,000	$10,000	n/a	$4,200	$27,000
Re-initiation of consultation to address Adverse Modification					
Technical Assistance	$280	n/a	$530	n/a	$810
Informal	$1,200	$1,600	$1,000	$1,000	$4,800

Formal	$2,800	$3,100	$1,800	$2,400	$10,000
Programmatic	$8,300	$6,900	n/a	$2,800	$18,000
Additional effort to address Adverse Modification in a new consultation (Additive with baseline costs, shown above, of considering Jeopardy)					
Technical Assistance	$140	n/a	$260	n/a	$400
Informal	$620	$780	$510	$500	$2,400
Formal	$1,400	$1,600	$880	$1,200	$5,000
Programmatic	$4,200	$3,500	n/a	$1,400	$9,000

Source: IEc (2013) The costs shown here are incremental administrative costs. Original cost estimates by IEc were based on data from the Federal Government Schedule Rates, Office of Personnel Management, 2013, and a review of consultation records from several USFWS field offices across the country conducted in 2002.
Explanatory Note from IEc, (2013) The levels of effort per consultation represent approximate averages based on the best available cost information. The cost estimates in this report are accordingly rounded to two significant digits to reflect this imprecision. The cost estimates presented in this table may therefore not sum to the total costs reported due to rounding. Estimates reflect average hourly time required by staff.

Table 3.7 provides estimates of overall administrative Section 7 costs in each critical habitat unit. These are based on the projected number of Section 7 consultations presented in Table 3.5 and the estimates of administrative costs per consultancy presented in Table 3.6. Because of the significant amount of uncertainty, low, medium, and high administrative Section 7 costs are presented based on the following assumptions:

Low administrative Section 7 cost estimates are based on the assumption that the numbers of informal and formal consultations in the future will be the same as they were in the past (approximately 81% informal across the study area), and that half of the consultations will be co-extensive (i.e., initiated as a result of listing and critical habitat designation) and half will be incremental (i.e., initiated as a result of the critical habitat designation).

Medium administrative Section 7 cost estimates are based on the assumption that the numbers of informal and formal consultations in the future will be the same as they were in the past, and that they will all be incremental.

High administrative Section 7 cost estimates are based on the assumption that all consultations in the next ten years will be formal and incremental.

3.4.1.1 Sensitivity of Section 7 Cost Projections to Discounting

Ten year total cost estimates presented in Table 3.6 assume the average annual number of consultations will be constant throughout the ten year period and that costs per consultation will be constant throughout the period. Discounting future costs using the OMB recommended nominal discount rate of 2% would reduce average annual and ten year costs presented in Table 3.6 by about 10%. Assuming cost inflation, and discounting future costs at the OMB recommended real discount rate of -2% would increase these cost estimates by about 11%.

Table 3-7. Projected 10 year and average annual number of Section 7 consultations and administrative costs per Critical Habitat Unit

		Projected Number of Section 7 Consultations[1]						Section 7 Consultation Costs[2]					
		Over Ten Years			Annual Average			Ten year Costs			Annualized Costs		
	Unit	Informal	Formal	Total	Informal	Formal	Total	Low[3]	Medium	High[4]	Low	Medium	High
Gulf of Maine	Penobscot	31	10	41	3.1	1	4.1	$250,274.84	$499,074.84	$821,474.84	$25,027.48	$49,907.48	$82,147.48
	Kennebec	28	17	45	2.8	1.7	4.5	$305,874.84	$610,274.84	$901,474.84	$30,587.48	$61,027.48	$90,147.48
	Androscoggin	6	3	9	0.6	0.3	0.9	$60,274.84	$119,074.84	$181,474.84	$6,027.48	$11,907.48	$18,147.48
	Piscataqua	11	0	11	1.1	0	1.1	$54,274.84	$107,074.84	$221,474.84	$5,427.48	$10, 707.48	$22,147.48
	Merrimack	28	1	29	2.8	0.1	2.9	$145,874.84	$290,274.84	$581,474.84	$14,587.48	$29,027.48	$58,147.48
	DPS TOTAL	**104**	**31**	**135**	**10.4**	**3.1**	**13.5**	**$816,574.20**	**$1,625,774.20**	**$2,707,374.20**	**$81,657.40**	**$162,577.40**	**$270,737.40**
New York Bight	Connecticut	55	2	57	5.5	0.2	5.7	$285,474.84	$569,474.84	$1,141,474.84	$28,547.48	$56,947.48	$114,147.48
	Housatonic	0	3	3	0	0.3	0.3	$31,474.84	$61,474.84	$61,474.84	$3,147.48	$6,147.48	$6,147.48
	Hudson	144	6	150	14.4	0.6	15	$752,674.84	$1,503,874.84	$3,001,474.84	$75,267.48	$150,387.48	$300,147.48
	Delaware	64	4	68	6.4	0.4	6.8	$348,674.84	$695,874.84	$1,361,474.84	$34,867.48	$69,587.48	$136,147.48
	DPS TOTAL	**263**	**12**	**275**	**26.3**	**1.2**	**27.5**	**$1,418,299.36**	**$2,830,699.36**	**$5,565,899.36**	**$141,829.94**	**$283,069.94**	**$556,589.94**
Chesapeake Bay	Nanticoke	0	3	3	0	0.3	0.3	$31,474.84	$61,474.84	$61,474.84	$3,147.48	$6,147.48	$6,147.48
	Potomac	51	3	54	5.1	0.3	5.4	$276,274.84	$551,074.84	$1,081,474.84	$27,627.48	$55,107.48	$108,147.48
	Rappahannock	5	2	7	0.5	0.2	0.7	$45,474.84	$89,474.84	$141,474.84	$4,547.48	$8,947.48	$14,147.48
	York	6	2	8	0.6	0.2	0.8	$50,274.84	$99,074.84	$161,474.84	$5,027.48	$9,907.48	$16,147.48
	James	16	2	18	1.6	0.2	1.8	$98,274.84	$195,074.84	$361,474.84	$9,827.48	$19,507.48	$36,147.48
	DPS TOTAL	**78**	**12**	**90**	**7.8**	**1.2**	**9**	**$501,774.20**	**$996,174.20**	**$2,405,600**	**$50,177.40**	**$99,617.40**	**$180,737.40**

[1] Projected number of Section 7 consultations from the critical habitat designation over the ten year forecasting period; based on past ten year Section 7 consultation records in each critical habitat area and discussions with federal action agencies.

[2] Average costs are projected to be $9,600 for informal consultations and $20,000 for formal consultations. (See Table 3.6).

[3] Low cost projections are based on the assumption that the same ratio of informal and formal consultations will occur in the next ten years as occurred in the past ten years, and that 50% of the consultations will be incremental (i.e., entire cost of consultation is due to this critical habitat designation).

[4] Medium cost projections are based on the assumption that the same ratio of informal and formal consultations will occur in the next ten years as occurred in the past ten years, and that 100% of the consultations will be incremental (i.e., entire cost of consultation is due to this critical habitat designation).

[4] High cost projections are based on the assumption that all future consultations will be formal (cost of $20,000 per consultation) and incremental (i.e., entire cost is due to this critical habitat designation).

(Note – Nine nationwide consultations with EPA are also expected to occur within the next 10 years. These consultations will involve all listed species and designated critical habitat under NMFS's jurisdiction, and thus costs attributable solely to this proposed rule are expected to be very small. To be conservative, we added nine consultations to each critical habitat unit, and nine to each DPS's total number of consultations. We spread the costs of these consultations ($5,080 each) evenly across all critical habitat units included in this proposed rule and the companion proposed rule to designate critical habitat for the Carolina and South Atlantic DPSs. This results in an additional total cost of $1,474.84 per critical habitat unit).

3.4.2 Project Modification Costs

Table 3.8 presents low, medium and high cost estimates of project modifications that may need to be made to specific projects in various project categories described in *Section 3.4* as a result of Section 7 consultation. These are updated versions of project modification costs estimated for use in a previous impact study prepared by NMFS to support the critical habitat designation for "Seven West Coast Salmon and Steelhead ESUs" (NOAA 2005). For purposes of this analysis, the ranges of cost estimates provided in that report were updated to 2013 dollars using CPI indices.

As described above in *Section 3.4* we have received no information from NMFS or other federal or state agencies indicating that any of the Section 7 consultations expected to result from this designation will result in project modifications. However, there is most certainly potential that Section 7 consultation stemming from this designation may, sometime in the future, result in project modifications and associated costs. The values presented in Table 3.8 are intended to be illustrative of the typical costs of these potential project modifications. The project modifications listed in Table 3.8 do not represent the universe of potential project modifications and the unit cost listed do not represent the full potential range of costs which could vary widely based on project and site conditions.

Table 3-8. Estimates of potential project modification costs

	Project Modification Cost Estimate		
Activity Type	**Low**	**Medium**	**High**
In-water construction	$29,835	$65,040	$100,245
Dredging[1]	$396,205	$979,773	$1,551,407
Bridges and culverts[1]	$48,929	$87,117	$125,306
Roads[1]	$42,962	$79,360	$115,759
Hydropower (unknown capacity)	$1,670,746	$8,986,224	$16,230,099
Utility lines	$119,339	$120,532	$121,726
Sand and gravel mining[2]	$1,208,307	$1,611,076	$2,013,845
NPDES - Major projects	$568,053	$751,835	$935,617
NPDES - Minor projects[2]	$64,443	$85,924	$107,405

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

4 IMPACTS ON SMALL BUSINESSES

4.1 Introduction

The Regulatory Flexibility Act (RFA) establishes a principle that agencies shall endeavor, consistent with the objectives of the rule and applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions that are subject to regulation. An RFA analysis does not contain any decision criteria, but informs the agency, as well as the public, of the expected economic impacts of the proposed action, and to ensure that regulatory agencies consider alternatives that minimize the expected impacts while meeting the goals and objectives of the proposed action and applicable statutes.

4.2 Description and estimate of the potential number of small entities impacted

This proposed critical habitat designation may affect small businesses, small nonprofit organizations, and small governmental jurisdictions that engage in activities that may affect the essential features identified

in this designation, if they receive funding or authorization for such activity from a federal agency. Such activities would require Section 7 consultations that would cost these entities time and money, and could potentially result in requirements that they modify proposed activities to avoid destroying or adversely modifying the critical habitat which may also cost them time and money.

For example, impacted small entities may include marine contractors involved in construction activities such as breakwater, dock, pier, jetty, seawall and harbor construction that can only be undertaken if they obtain U.S. Army Corps of Engineers (USACE) permits. Such firms are classified in the Heavy and Civil Engineering Construction subsector (NAICS Code 237990) and, according to the Small Business Administration (SBA), must have average annual receipts of no more than $33.5 million to qualify as a small business. The SBA has similar standards for classifying small business entities in other land-based and water-based construction and demolition activities, power generation, and agricultural and manufacturing activities based on average annual receipts or number of employees.

The PCTS database of past Section 7 consultations described in *Section 3.3.2* does not identify non-government entities involved in past Section 7 consultation as small or large. However, the record of consultations include dock/pier construction and repair, water control structure installation or repair, bridge repair and construction, dredging, cable installation, and shoreline stabilization and other activities that may involve entities that would be considered small businesses using SBA standards. If some of the grantees or permittees associated with these projects were small business entities, they would have incurred administrative Section 7 consultation costs and, possibly, additional costs associated with project modification that resulted from those consultations. Other small businesses may have been impacted indirectly by Section 7 consultation and any resulting project modifications even if grantees or permittees were not small entities, if small entities were contracted by those grantees or permittees to assist in project implementation. Such consultations, for example, could result in project delays that adversely impact small businesses. On the other hand, they could also result in project modifications that increase the amount of work contracted to small businesses, in which case impacts on small businesses could be positive.

There is no indication that the designation would place small entities at a competitive disadvantage compared to large entities. However, because the number and type of Section 7 consultations that will result from this designation and the extent of any related project modifications cannot be predicted with any accuracy at this time, it is not possible to determine the numbers of small entities that may be affected, either directly or indirectly, by this designation. It is also not possible at this time to determine the combination of industrial sectors that may be affected by this designation in order to use SBA's sector-specific definitions of small businesses to estimate potential small business impacts of the designation. However, SBA standards include a rule of thumb that small businesses in manufacturing are those with 500 or fewer employees, and small businesses in service sectors are those with average annual business sales ranging from $750,000 to $28.5 million. Using the number of employees as the criteria for determining whether or not an establishment is a small business, SBA data indicate that an extremely high percent of business entities located in the counties that include one or more of the critical habitat units, an average of 99.8% across all units, are small businesses. This suggests that small businesses may experience a significant share of private sector impacts associated with Section 7 consultations that result from this designation.

4.3 Estimated Small Business impacts of Section 7 Consultation

Data are available to identify the number of small businesses located in counties that contain proposed critical habitat areas. Data are not available to determine the location of these small business entities within each county to determine how many are located in or near areas proposed as critical habitat. However, data are available by census block group to determine the number of people residing in various parts of each county. An analysis was performed to determine the number of small entities within and near proposed critical habitat areas by assuming that business locations in each county are distributed

geographically in the same way as the county population is distributed. That is, more densely populated areas of a county were assumed to contain proportionally more businesses than less populated areas. Initially, the number of potential small business entities impacted was estimated by multiplying the number of small business entities in each county by the ratio of the county population within each critical habitat area to the total county population. However, further analysis indicated that impacts on small business entities are likely to occur throughout these counties, rather than being concentrated in or near critical habitat units. As a result, the cost impacts of the designation on small businesses are assessed here at the county scale rather than at the sub-county scale.

Table 4.1 lists the total number of all businesses, the total number of small businesses, and the percentage of businesses that are small in counties that include each of the proposed critical habitat units. On average, over 99% of businesses located in these areas are classified as small businesses. For purposes of projecting the impacts of administrative Section 7 costs on small businesses in each critical habitat unit, it was assumed that the percent of private entities that are involved in those consultations that are small businesses is the same as the percent of businesses that are small businesses in counties that include critical habitat units. To test the sensitivity of results to this assumption a similar analysis was performed assuming the percent of businesses that are impacted by the designation in each critical habitat unit is the same as the percent of businesses that are small businesses in the states that include each critical habitat area.

Table 3.6 presented estimates of private, public, and total unit costs for informal and formal Section 7 consultations. Private sector Section 7 cost estimates presented in Table 3.6 are approximately $2,100 per informal consultation and $3,500 per formal consultation. In this section, these estimates of private sector Section 7 consultation costs are used with projected numbers of consultations to estimate total private sector costs. The amount of private sector costs incurred by small businesses in each critical habitat unit is then estimated by multiplying estimated private sector costs for each critical habitat unit by the portion of businesses that are small businesses in the counties that include those critical habitat areas.

The same approach that was used in *Section 3* to estimate low, medium, and high overall Section 7 administrative costs are used here as a basis for developing low, medium, and high estimates of Section 7 impacts on small business. First, private sector cost estimates per consultation are used with projected numbers and types of consultations to estimate low, medium and high private sector Section 7 costs in each critical habitat area (Table 4.2). Because using the SBA rule of thumb results in nearly 100% of establishments in these areas being considered small businesses, the estimated private sector costs presented in Table 4.2 are treated here as reasonable approximations of potential small business costs. Based on this analysis, private sector and small business administrative Section 7 costs associated with the designation range from about $16,000 to $47,000 annually in the Gulf of Maine DPS, about $30,000 to $97,000 annually in the New York Bight DPS, and about $10,000 to $32,000 annually in the Chesapeake Bay DPS.

Estimates of future administrative Section 7 costs paid by small businesses presented in Table 4.2 are likely to be high for two reasons. First, they are based on projected numbers of future Section 7 consultations that are assumed to be the same as all past Section 7 consultations that are likely to have involved sturgeon if sturgeon and its critical habitat were being protected at the time. Many of these past consultations would have resulted from the sturgeon listing and would have been co-extensive with the critical habitat designation. Second, about 90% of these past consultations were informal and involved private sector costs that averaged $2,100 per consultation, whereas the high range estimates of small business impacts assume all future consultations will be formal and involve private sector costs of $3,500 per consultation.

Table 4-1. Small businesses per Critical Habitat Unit

DPS	Critical Habitat Unit	Total Establishments	Small Businesses	Percent Small Businesses
Gulf of Maine	Penobscot	7,248	7,239	99.9%
	Kennebec	7,648	7,638	99.9%
	Androscoggin	14,381	14,356	99.8%
	Piscataqua	17,228	17,199	99.8%
	Merrimack	27,196	27,143	99.8%
New York Bight	Connecticut	44,334	44,224	99.8%
	Housatonic	50,895	50,797	99.8%
	Hudson	369,957	368,965	99.7%
	Delaware	127,341	127,011	99.7%
Chesapeake Bay	Nanticoke	10,349[1]	Not available	
	Potomac	124,749	124,366	99.7%
	Rappahannock	8,098	8,088	99.9%
	York	7,677	7,662	99.8%
	James	43,125	43,001	99.7%

[1] U.S Census Bureau information for Dorchester and Wicomico counties

Table 4-2. Estimated private sector and small business Section 7 consultation costs by DPS

		Average Annual Number of Section 7 Consultations[1]			Annualized Private Sector Section 7 Consultation Costs[2]		
	Unit	Informal	Formal	Total	Low[3]	Medium[4]	High[5]
Gulf of Maine	Penobscot	3.1	1	4.1	$5,005	$10,010	$14,350
	Kennebec	2.8	1.7	4.5	$5,915	$11,830	$15,750
	Androscoggin	0.6	0.3	0.9	$1,155	$2,310	$3,150
	Piscataqua	1.1	0	1.1	$1,155	$2,310	$3,850
	Merrimack	2.8	0.1	2.9	$3,115	$6,230	$10,150
	DPS TOTAL	**10.4**	**3.1**	**13.5**	**$16,385**	**$32,690**	**$47,250**
New York Bight	Connecticut	5.5	0.2	5.7	$6,125	$12,250	$19,950
	Housatonic	0	0.3	0.3	$525	$1,050	$1,050
	Hudson	14.4	0.6	15	$16,170	$32,340	$52,500
	Delaware	6.4	0.4	6.8	$7,420	$14,840	$23,800
	DPS TOTAL	**26.3**	**1.2**	**27.5**	**$30,240**	**$60,480**	**$97,300**
Chesapeake Bay	Nanticoke	0	0.3	0.3	$525	$1,050	$1,050
	Potomac	5.1	0.3	5.4	$5,880	$11,760	$18,900
	Rappahannock	0.5	0.2	0.7	$875	$1,750	$2,450
	York	0.6	0.2	0.8	$980	$1,960	$2,800
	James	1.6	0.2	1.8	$2,030	$4,060	$6,300
	DPS TOTAL	**7.8**	**1.2**	**9**	**$10,290**	**$20,580**	**$31,500**

[1] Projected number of Section 7 consultations from the critical habitat designation over the ten-year forecasting period; based on past ten year Section 7 consultation records in each critical habitat area and discussions with federal action agencies

[2] Average costs are projected to be $2,100 for informal consultations and $3,500 for formal consultations (See Table 3.6).

[3] Low costs projections are based on the assumption that the same ratio of informal and formal consultations will occur in the next ten years as occurred in the past ten years, and that 50% of the consultations will be incremental (i.e., entire cost of consultation is due to this critical habitat designation).
[4] Medium cost projections are based on the assumption that the same ratio of informal and formal consultations will occur in the next ten years as occurred in the past ten years, and that 100% of the consultations will be incremental (i.e., entire cost of consultation is due to this critical habitat designation).
[4] High cost projections are based on the assumption that all future consultations will be formal and incremental (i.e., entire cost is due to this critical habitat designation).

4.4 Small Business Impacts of Project Modifications

Section 3.5.2 described the typical costs of project modifications that may be a result of Section 7 consultation, and explained why there is too much uncertainty about the number, type, and extent of project modifications that may result from this designation to project their costs. For the same reason it is not possible at this time to estimate whether this critical habitat designation will require project modifications that will have direct small business impacts, or may require large businesses to modify projects in ways that will translate into small business impacts.

It has been determined that the costs of potential project modifications that may be required to avoid adverse modification of critical habitat are often linearly related to the size of the project (e.g., constant cost per mile or per linear foot or per acre). This means that project modification costs are likely to be proportional to the size of the project, and that since larger entities are likely to be involved in implementing larger projects, they are likely to incur project modification costs that are proportionately higher than those incurred by small entities.

It has also been determined that project modifications that impose higher costs on larger businesses may involve subcontracting more project implementation work to small businesses. As a result, any project modifications associated with Section 7 consultations may increase small business revenues and have positive economic impacts on small businesses even though they impose costs and have overall private sector impacts that may be negative. Any positive or negative impacts associated with project modifications resulting from this designation would be too project-specific and site-specific to assess in advance.

5 OTHER RELEVANT IMPACTS

5.1 Introduction

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

Baseline regulatory conditions described in *Section 2* indicate that existing federal and state laws and regulations already provide significant protection for essential habitat features included in this designation. As a result, the incremental impacts of Section 7 consultation, including project modifications, were estimated in *Section 3* to be relatively small. For the same reason, the relatively few project modifications that may result from Section 7 consultation initiated as a result of the designation will result in other relevant impacts that are very small. However, the critical habitat designation itself may result in other relevant impacts if and when project design decisions are made by action agencies or permit-seekers to eliminate the need for Section 7 consultation, or to assure that any future consultations do not result in any required project modifications.

Other relevant impacts associated with increased education and public awareness and changes in existing state and local resource management plans can result from the critical habitat designation independently of the listing of the species, and independently of Section 7 consultation or project modifications.

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

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

5.2 Conservation Benefits

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

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

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

5.2.1 Types of Conservation Benefits

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

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

It is possible, however, to describe the logical pathway of ancillary conservation benefits that will result from this designation. For example, benefits from Section 7 consultation that results in project modifications to protect water quality, substrate, and other essential habitat features for Atlantic sturgeon can be expected to result in ancillary conservation benefits associated with other fish and water-dependent species, and related ecosystem services that rely on those same protected features. More specifically, tidal river fish, such as river herring, provide forage for important commercial fish species and benefit from protecting habitat essential to sturgeon; shad, white perch, and catfish are important recreational fish that rely on the same hard substrate that is an essential feature of sturgeon habitat; and shortnose sturgeon, another endangered sturgeon species with no specific critical habitat designation, relies on the same substrate characteristics as Atlantic sturgeon. Similarly, water quality that is protected for sturgeon can be expected to positively influence all ichthyofauna; and sturgeon habitat protection that results in higher dissolved oxygen, fewer toxins, and less turbidity in river water can benefit many other fish species directly, and also generate indirect benefits associated with fish, bird and terrestrial species that forage on them.

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

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

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

5.2.2 Measuring Conservation Benefits

Economists apply a variety of methods to estimate use and non- use values for species and for habitat improvements. These are usually classified as being either revealed preference methods or stated preference methods. These two general categories of non-use valuation methods are described below. Table 5.1 lists the most common methods of estimating conservation benefits and provides web links to sites that describe and illustrate them.

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

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

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

Method	Description
Market Price Method	Estimates economic values for ecosystem products or services that are bought and sold in commercial markets.
Productivity Method	Estimates economic values for ecosystem products or services that contribute to the production of commercially marketed goods.
Hedonic Pricing Method	Estimates economic values for ecosystem or environmental services that directly affect market prices of some other good. Most commonly applied to variations in housing prices that reflect the value of local environmental attributes.
Travel Cost Method	Estimates economic values associated with ecosystems or sites that are used for recreation. Assumes that the value of a site is reflected in how much people are willing to pay to travel to visit the site.
Damage Cost Avoided, Replacement Cost, and Substitute Cost Methods	Estimates economic values based on costs of avoided damages resulting from lost ecosystem services, costs of replacing ecosystem services, or costs of providing substitute services.
Contingent Valuation Method	Estimates economic values for virtually any ecosystem or environmental service. The most widely used method for estimating non-use, or "passive use" values. Asks people to directly state their willingness to pay for specific environmental services, based on a hypothetical scenario.
Contingent Choice Method	Estimates economic values for virtually any ecosystem or environmental service. Based on asking people to make tradeoffs among sets of ecosystem or environmental services or characteristics. Does not directly ask for willingness to pay—this is inferred from tradeoffs that include cost as an attribute.
Benefit Transfer Method	Estimates economic values by transferring existing benefit estimates from studies already completed for another location or issue.

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

5.2.3 Studies of Conservation Benefits

The economics literature includes many published studies that attempt to estimate individual and collective willingness to pay to protect endangered species and/or conserve various use and non-use values associated with ecosystem features and functions that depend on their critical habitat. In the absence of any primary research related to the benefits of conserving critical habitat for Atlantic sturgeon,

or of the necessary data and models to undertake such research, a benefit transfer was considered for putting the conservation benefits of this designation in perspective.

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

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

A review of literature to identify relevant research that could be used in a benefit transfer application related to conserving Atlantic sturgeon habitat in the U.S. identified two studies that involved stated preference surveys related to other sturgeon species (Kotchen and Reiling 2000; Syring 2003) and one related more generally to anadromous fish. The review also identified two more general studies with results that are useful for putting the nonuse values associated with Atlantic sturgeon and its habitat in perspective (Richardson and Looming 2009; Wallmo and Lew 2012). The results of these studies are summarized below and in Table 5.2.

- The 2000 study by Kotchen and Reiling used contingent valuation/willingness to pay (WTP) surveys to estimate the value that Maine residents with various environmental attitudes and motivations place on shortnose sturgeon. The study concluded that in 1999, Maine residents' WTP in the form of a "onetime payment to increase populations to a level that ensures continued survival of the species in Maine" was approximately $23 or about $32 in current terms. The study addressed only the WTP of Maine residents to protect habitat for this species of sturgeon in Maine. The study did not address how much Maine residents or residents outside of Maine would pay to ensure the continued survival of the species.
- The 2003 study by Syring used three separate contingent valuation surveys to estimate the value that wildlife viewers in Wisconsin place on the opportunity to view Lake sturgeon. The results "indicated a mean, annual individual willingness-to-pay of $101.44 for a sturgeon population stabilized at its current level," which was aggregated across the entire sturgeon viewing population to show an aggregated mean annual willingness to pay of $322,173. This is equivalent to a mean individual value and aggregate value of $128 and $408,000, respectively, in current dollars. While these numbers do not provide a basis for estimating the public's willingness to pay

to protect Atlantic sturgeon habitat, they do reflect a monetized value associated with one pathway of conservation benefits, wildlife viewing, associated with another sturgeon species.

- The 2009 study by Richardson and Loomis estimates a model (i.e., a WTP function) to value threatened or endangered species based on estimates from multiple studies, which is referred to as a "meta-analysis." In this case, the meta-analysis of WTP estimates is based on 31 studies with 67 separate WTP observations published from 1985 to 2005 that addressed economic values of endangered, threatened or rare species. Nearly all of the studies involved contingent valuation surveys where the primary focus was on recreational use and non-use values, but some of the studies focused solely on non-use values. The species addressed in these studies were primarily marine and riverine species (whales, dolphins, seals, otters, sea lions, salmon and other listed fish species), but included some avian and other species. Results were grouped based on whether the study estimated annual or one-time lump sum payments. Based on the 67 separate willingness to pay surveys that were reviewed in this meta-analysis, the average value of threatened or endangered species in 2006 dollars ranged in annual WTP from $10 to $130 for individual species and from $147 to $311 for "Washington state anadromous fish populations"; and in WTP lump sum payments from about $20 (wolf) and around $240 (Humpback whale) to the highest estimated one time WTP of $350 (Bald eagle).

- Wallmo and Lew (2012) evaluated people's preferences to downlist eight threatened and endangered marine species. The focus of the study was to determine if some marine taxa are more valuable than others to the public in the United States. Simply stated, respondents to the stated preference choice experiment were asked about their willingness-to-pay for different additional protection actions for a variety of species with the understanding that the protection actions would achieve specified downlisting objectives (i.e., downlisting from endangered to threatened or recovered). The analysts found a positive WTP to improve the status of all species, and identified significant differences in the relative WTP estimates. Values range from mean WTP for recovery of $40.49 to $71.62 U.S dollars (2011 dollars) per household every year for ten years.

Monetary values of threatened and endangered species from Richardson and Loomis (2009) are presented in Table 5.2. These are useful for putting nonuse benefits of protecting sturgeon habitat in perspective, but there are at least three reasons why it is not possible at this time to follow OMB guidelines for using these study results to conduct a benefit transfer analysis that will generate credible estimates of the benefits of this proposed designation. First, information about the effects of critical habitat protection on the size or survivability of Atlantic sturgeon populations is insufficient to identify what improvements in sturgeon survivability should be the focus of a benefit transfer application. Second, appropriately assigning transferred benefits to the designation, as opposed to the listing or other baseline conservation efforts, would require projecting incremental changes in the probability or timing of sturgeon recovery that will result specifically from the critical habitat designation. However, the timing and extent to which Atlantic sturgeon DPSs can be expected to recover, and the extent to which this recovery would be associated with the critical habitat-related conservation efforts, are unknown. Third, the valuation studies related to other sturgeon were specific to their existence in particular regions, not their overall survival. WTP estimates related to the survival or downlisting of other species provide only the most general indications of what might be expected if similar studies were focused on Atlantic sturgeon.

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

Type of Study	Species	Low Value	High Value	Average of All Studies
Studies reporting annual WTP	Bald eagle	$21	$45	$39
	Bighorn sheep			$17

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

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

[1] Derived from Syring (2003); adjusted to 2013 dollars using CPI

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

5.2.4 Ecosystem Health Benefits Resulting from the Designation

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

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

5.2.5 Ecosystem Service Benefits

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

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

5.2.6 Use Benefits Associated with Species Recovery

5.2.6.1 Commercial Fishing Benefits

Atlantic sturgeon populations supported a commercial fishery in the early twentieth century, providing eggs for caviar, flesh for smoked fish, and swim bladders for isinglass, a gelatin used in food products and glues. Combined with the jeopardy provisions of the Atlantic sturgeon listing, protecting critical habitat could result in the full recovery and eventual delisting the species, which could eventually yield economic benefits derived from an allowable commercial sturgeon harvest. However, the sturgeon is a long-lived, late-maturing animal that may require numerous generations to achieve long-term population stability at levels that could support a commercial fishery. Therefore, the likelihood of the sturgeon population being sufficiently large to yield significant commercial fishing benefits within a ten-year period or even in the foreseeable future is extremely low. Because of uncertainties regarding how much the critical habitat designation might contribute to the possibility of an allowable commercial sturgeon harvest, and because this is only likely to take place in the relatively distant future, any potential commercial fishing benefits derived from the critical habitat designation cannot be assessed at this time.

5.2.6.2 Recreational Fishing Benefits

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

5.2.6.3 Use Benefits Associated with Habitat Protection

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

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

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

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

5.4 Impact on Natural Resource Agencies with Existing Management Plans

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

USFWS has considered the impacts of previous designation on private entities that have entered into Habitat Conservation Plan agreements under the ESA, and federal, state, or local conservation plans implemented under a variety of legal authorities (e.g., 72 FR 33808, June 19, 2007, Proposed Revised Critical Habitat for the San Bernardino Kangaroo Rat *[Dipodomys merriami parvus]*; 72 FR 30279, May 31, 2008, Clarification of the Economic and Non-Economic Exclusions for the Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants in California and Southern Oregon). One court held that this type of impact is a permissible interpretation of "other relevant impacts" under Section 4(b)(2) (*Center for Biological Diversity et al., v. Dept of the Interior,* 240 F. Supp. 2d 1090, 1105 [D. Ariz. 2003]): "It is certainly reasonable to consider a positive working relationship relevant, particularly when that relationship results in the implementation of beneficial natural resource programs, including species preservation."

Impacts on entities responsible for natural resource management, conservation plans, or the functioning of those plans depend on the type and number of Section 7 consultations that may result from the

designation in the areas covered by those plans, as well as any potential project modifications recommended by these consultations. While these impacts cannot be predicted at this time for reasons mentioned above, there are several federal, state, and local resource management areas that overlap with the final designation of Atlantic sturgeon critical habitat (see *Section 2.2.3*). It is reasonable to assume that any Section 7 impacts that would result from state or local resource management agency actions would be included in predicted future permitting actions by the USACE or other federal action agencies.

6 REFERENCES

Atlantic States Marine Fisheries Commission. http://www.asmfc.org/

Atlantic Sturgeon Status Review Team (ASSRT). 2007. Status Review of the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*). Report to National Marine Fisheries Service, Northeast Regional Office. February 23, 2007. 174 pp.

Bain, M.B., N. Haley, D. Peterson, J.R. Waldman, and K. Arend. 2000. Harvest and habitats of Atlantic sturgeon *Acipenser oxyrinchus* Mitchill, 1815, in the Hudson River Estuary: Lessons for Sturgeon Conservation. Instituto Espanol de Oceanografia. Boletin 16:43-53.

Borodin, N. 1925. Biological observations on the Atlantic Sturgeon, *Acipenser sturio*. Transactions of the American Fisheries Society 55: 184-190.

Champ, P.A., K.J. Boyle, and T.C. Brown (eds). 2003. The Economics of Non-market Goods and Services. Springer Press, New York. 576 pages.

Crance, J. H. 1987. Habitat suitability index curves for anadromous fishes. In: Common Strategies of Anadromous and Catadromous Fishes, ed. M.J. Dadswell. Bethesda, Maryland, American Fisheries Society. Symposium 1: 554.

Dovel, W. L. and T. J. Berggren. 1983. Atlantic sturgeon of the Hudson River estuary, New York. New York Fish and Game Journal 30: 140-172.

Elliott D. Pollack and Company. 1999. The Economic and Fiscal Impact of Designation of 60.060 Acres of Privately Owned Land in Pima County, Arizona as Critical Habitat for the Cactus Ferruginous Pygmy-Owl, prepared for Southern Arizona Homebuilders Association.

Freeman, M.A. 2003. The Measurement of Environmental and Resource Values: Theory and Methods, Second Edition. Resources for the Future, Washington, DC.

Gilbert, C.R. 1989. Atlantic and shortnose sturgeons. United States Department of Interior Biological Report 82: 28 pp.

Haab, T.C. and K.E. McConnell. 2002. Valuing environmental and natural resources: The econometrics of non-market valuation. New Horizons in Environmental Economics. Edward Elgar Publishers, UK.

Holland, B.F. and G.F. Yelverton. 1973. Distribution and biological studies of anadromous fishes offshore North Carolina. Division of Commercial and Sports Fisheries, North Carolina Dept. of Natural and Economic Resources, Raleigh, NC.

Industrial Economics, Incorporated (IEc). 2003. Economic Analysis of Critical Habitat Designation for the Gulf Sturgeon. Prepared for the Division of Economics, U.S. Fish & Wildlife Service. January 2003.

IEc. 2009a. Economic Analysis of the Impacts of Designating Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Prepared for National Marine Fisheries Service, Southwest Region. September 28, 2009.

IEc. 2009b. Economic Analysis of Critical Habitat Designation for the Gulf of Maine Distinct Population Segment of Atlantic Salmon. Prepared for National Marine Fisheries Service. May 2009.

IEc. 2013. Economic Analysis of Terrestrial Critical Habitat Designation for the Northwest Atlantic Ocean Distinct Population Segment of the Loggerhead Sea Turtle. Prepared for U.S. Fish and Wildlife Service, Arlington, VA. Draft Report. June 5, 2013.

Kotchen, M.J. and S.D. Reiling. 2000. Environmental attitudes, motivations, and contingent valuation of nonuse values: a case study involving endangered species. Ecological Economics 32: 93-107.

Kynard, B. and M. Horgan. 2002. Ontogenetic behavior and migration of Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*, and shortnose sturgeon, *A. brevirostrum*, with notes on social behavior. Environmental Behavior of Fishes 63: 137-150.

Leland. J.G., III. 1968. A survey of the sturgeon fishery of South Carolina. Contributed by Bears Bluff Labs. No 47:27 pp.

Loomis, J.B. and D.S. White. 1996. Economic benefits of rare and endangered species: summary and meta-analysis. Ecological Economics 18: 197-206.

Mohler, J. W. 2003. Culture manual for the Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*. U.S. fish and Wildlife Service, Hadley, Massachusetts. 70 pp.

Murawski, S.A. and A.L. Pacheco. 1977. Biological and fisheries data on Atlantic sturgeon, *Acipenser oxyrhynchus* (Mitchill). National Marine Fisheries Service Technical Series Report 10: 1-69.

National Oceanic and Atmospheric Administration (NOAA). 2005. Final Economic Analysis of Critical Habitat Designation for Seven West Coast Salmon and Steelhead ESUs. NOAA National Marine Fisheries Service. August 2005.

NOAA Ocean and Coastal Resource Management (OCRM). 2014. National Estuarine Research Reserve System. Available online at: http://www.nerrs.noaa.gov/Default.aspx

NY DEC. 2014. State Land Classifications: Unique Areas Available online at: http://www.dec.ny.gov/lands/7811.html#C_Unique_Areas

Richardson L. and J. Loomis. 2009. The total economic value of threatened, endangered, and rare species: an updated meta-analysis. Ecological Economics 68:1535-1548.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada Bulletin 184: 966 pp.

Smith, T.I.J. and J.P. Clugston. 1997. Status and management of Atlantic sturgeon, *Acipenser oxyrhinchus*, in North America. Environmental Biology of Fishes 48: 335-346.

Smith, T.I.J, E. K. Dingley, and E.E. Marchette. 1980. Induced spawning and culture of Atlantic sturgeon. Progressive Fish Culturist 42: 147-151.

Syring. M.E. 2003. Economic Value Associated with Viewing Lake Sturgeon (*Acipenser fulvescens*) in Wisconsin. Master's thesis. University of Wisconsin, Green Bay.

U.S. Census Bureau, County Business Patterns. Department of Commerce, Washington D.C. http://factfinder2.census.gov. Accessed 2013.

Van den Avyle, M. J. 1983. Species profiles: life histories and environmental requirements (South Atlantic) - Atlantic sturgeon. U.S. Fish and Wildlife Service, Division of Biological Services FWS/OBS-82/11. U.S. Army Corps Eng. TREL-82-4. 38 pp.

Waldman, J. R., J. T. Hart, and I. I. Wirgin. 1996a. Stock composition of the New York Bight Atlantic sturgeon fishery based on analysis of mitochondrial DNA. Transactions of the American Fisheries Society 125: 364-371.

Wallmo, K. and D.K. Lew. 2012. Public Willingness to Pay for Recovering and Downlisting Threatened and Endangered Marine Species. Conservation Biology 26: 830-839.

Appendix C

Correspondence to the Department of the Navy, Department of the Army, and Department of the Air Force for Areas Not Included in the Critical Habitat Designations Based on the Conservation Benefit of an INRMP to an Atlantic Sturgeon DPS and its Habitat

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

OCT 12 2016

The Honorable Miranda A. A. Ballentine
Assistant Secretary of the Air Force
Installations, Environment and Energy
1670 Air Force Pentagon
Washington, DC 20330

Dear Assistant Secretary Ballentine:

On June 3, 2016, we announced publication of a proposed rule in the *Federal Register* to designate critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments (DPSs) of Atlantic sturgeon under the Endangered Species Act (ESA). The proposed critical habitat occurs in tidally-affected riverine waters of a coastal estuary within the geographic area occupied by each DPS. Each critical habitat area is a specific part of the named river, bank to bank, between the upriver and downriver boundaries identified in the proposed rule. Proposed critical habitat does not include any tributary of the named river unless the tributary is also specifically named and listed in the regulatory text of the proposed rule. We propose to designate critical habitat in the Penobscot, Kennebec, Androscoggin, Piscataqua, and Merrimack rivers for the Gulf of Maine DPS; the Connecticut, Housatonic, Hudson, and Delaware rivers for the New York Bight DPS; and the Potomac, Susquehanna, Rappahannock, York, Pamunkey, Mattaponi, and James rivers for the Chesapeake Bay DPS.

A key conservation objective for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs is to increase the abundance of each DPS by facilitating increased successful reproduction and recruitment to the marine environment. The physical features for successful reproduction and recruitment are:

- Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand range) for settlement of fertilized eggs, refuge, growth, and development of early life stages;
- Aquatic habitat with a gradual downstream salinity gradient of 0.5-30 parts per thousand and soft substrate (e.g., sand, mud) downstream of spawning sites for juvenile foraging and physiological development;
- Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: (1) unimpeded movements of adults to and from spawning sites; (2) seasonal and physiologically-dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary, and; (3) staging, resting, or holding of subadults or spawning condition adults. Water depths in the main river channels must also be deep enough (e.g., $\geq$1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river, and;

- Water, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support: (1) spawning; (2) annual and interannual adult, subadult, larval, and juvenile survival; and (3) larval, juvenile, and subadult growth, development, and recruitment (e.g., 13° C to 26° C for spawning habitat and no more than 30° C for juvenile rearing habitat, and 6 mg/L dissolved oxygen for juvenile rearing habitat).

Section 4(a)(3)(B) of the ESA prohibits designating as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense or designated for its use, that are subject to an Integrated Natural Resources Management Plan (INRMP) prepared under section 101 of the Sikes Act (16 U.S.C. 670a) if we, acting on behalf of the Secretary of Commerce, determine in writing that such plan provides a conservation benefit to the species and its habitat for which critical habitat is proposed for designation. To inform our determinations, on February 14, 2014, we requested information for which Department of the Air Force facilities and operations warrant special consideration in our critical habitat assessment for Atlantic sturgeon. The March 18, 2014, letter from Principal Deputy Assistant Secretary Ferguson identifies the Air National Guard, 193 Special Operations Wing, Harrisburg International Airport, Pennsylvania, and Joint Base Langley-Eustis, Virginia as facilities within the proposed critical habitat for the Chesapeake Bay DPS.

Based on the information provided, the Air National Guard, 193 Special Operations Wing, Harrisburg International Airport, Pennsylvania does not occur within proposed critical habitat. Subsequent to the March 18, 2014, letter we changed the boundaries of the critical habitat areas to better reflect the in-water habitat in which the physical features requiring special management or protection occur. Based on the information provided and the revised boundaries for the critical habitat areas, Fort Eustis occurs within the proposed critical habitat area in the James River. We have reviewed the INRMP for Joint Base Langley-Eustis and concluded that the INRMP provides a conservation benefit to the Chesapeake Bay DPS of Atlantic sturgeon and its habitat.

INRMP Determination

We used the information in the INRMP to inform what lands or other geographical areas are owned or controlled by the Department of Defense or designated for its use, and that are subject to the INRMP. The factors that help us determine whether an INRMP provides a benefit are: (1) the extent of the area and features present; (2) the type and frequency of use of the area by the species; (3) the relevant elements of the INRMP in terms of management objectives, activities covered, and best management practices, and the certainty that the relevant elements will be implemented; and (4) the degree to which the relevant elements of the INRMP will protect the habitat from the types of effects that would be addressed through a destruction-or-adverse-modification analysis. We addressed each of these four elements using information provided in the INRMP.

The boundaries of Fort Eustis are described in Chapter 3 of the INRMP. As described there, there are nearly 8,000 acres of lands or other geographical areas owned or controlled by the Department of Defense or designated for its use, subject to an INRMP at Fort Eustis. The lands are comprised of the Main Installation (cantonment area) and Mulberry Island, bordered on the west and south by the James River. The cantonment area includes Third Port, a 1,000-ft pier on

the James River that serves as a major force deployment facility and deepwater port for the US Army and the 7th Sustainment Brigade, as well as the watercraft training platform for the Transportation School and the fixed base for the 7th Sustainment Brigade.

Fort Eustis is located downriver of areas believed to be used by Atlantic sturgeon for spawning. The critical habitat features present near Fort Eustis are water of appropriate depth and absent physical barriers to passage, salinity within the transitional salinity gradient and soft substrate, and water quality, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support adult, subadult, and juvenile survival, growth, and development. We, therefore, expect Atlantic sturgeon to use these waters for passage to and from upriver spawning grounds, staging, holding, and resting of adults and subadults, and as part of the juvenile rearing area.

The INRMP is a comprehensive plan that addresses best practices for use of land and water resources on and adjacent to Fort Eustis. These include: maintaining vegetated riparian buffers to stabilize stream banks and shorelines to reduce erosion and sedimentation rates; limiting the use of pollutants in the surrounding watershed; establishing 100-ft. upland buffers at tidal creeks, streams and wetlands; and, participation in the Department of Defense Chesapeake Bay Program Steering Committee for sharing ideas, pursuing funding and joint projects to benefit the Chesapeake Bay. Controlling activities that would result in erosion reduces sedimentation in the river, and protects unimpeded passage of Atlantic sturgeon through the area. Maintaining best practices for nutrient discharge (e.g., proper treatment of wastewater discharge), complying with requirements for judicious use of chemical plant controls supports dissolved oxygen levels for water quality essential to adult, subadult, and juvenile survival, growth, and development. These relevant elements of the INRMP will protect the features of the proposed Atlantic sturgeon critical habitat. We, therefore, determined, that the INRMP provides a conservation benefit to the Chesapeake Bay DPS of Atlantic sturgeon and its habitat, for which critical habitat is proposed for designation. Therefore, as proposed, critical habitat for the Chesapeake Bay DPS will not include the specific lands or other geographic areas of Fort Eustis, and consultation under section 7(a)(2) of the ESA is not required for any Federal agency action that would affect the features of Atlantic sturgeon critical habitat occurring within the specific lands or other geographic areas of Fort Eustis. Consultation under section 7(a)(2) or the ESA is nevertheless required for Federal agency actions if the proposed action may affect any ESA-listed species.

If you have any questions about our determination, please contact Julie Crocker at (978) 282-8480 or by e-mail (Julie.Crocker@noaa.gov).

Sincerely,

for John K. Bullard
Regional Administrator

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

OCT 12 2016

The Honorable Katherine Hammack
Office of the Assistant Secretary of the Army
Installations, Energy, & Environment
110 Army Pentagon, Room 3E464
Washington, D.C. 20310 -0110

Dear Assistant Secretary Hammack:

On June 3, 2016, we announced publication of a proposed rule in the *Federal Register* to designate critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments (DPSs) of Atlantic sturgeon under the Endangered Species Act (ESA). The proposed critical habitat occurs in tidally-affected riverine waters of a coastal estuary within the geographic area occupied by each DPS. Each critical habitat area is a specific part of the named river, bank to bank, between the upriver and downriver boundaries as described in the proposed rule. Proposed critical habitat does not include any tributary of the named river unless the tributary is also specifically named and listed in the regulatory text of the proposed rule. We propose to designate critical habitat in the Penobscot, Kennebec, Androscoggin, Piscataqua, and Merrimack rivers for the Gulf of Maine DPS; the Connecticut, Housatonic, Hudson, and Delaware rivers for the New York Bight DPS; and the Potomac, Susquehanna, Rappahannock, York, Pamunkey, Mattaponi, and James rivers for the Chesapeake Bay DPS.

A key conservation objective for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs is to increase the abundance of each DPS by facilitating increased successful reproduction and recruitment to the marine environment. The physical features for successful reproduction and recruitment are:

- Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand range) for settlement of fertilized eggs, refuge, growth, and development of early life stages;
- Aquatic habitat with a gradual downstream salinity gradient of 0.5-30 parts per thousand and soft substrate (e.g., sand, mud) downstream of spawning sites for juvenile foraging and physiological development;
- Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: (1) unimpeded movements of adults to and from spawning sites; (2) seasonal and physiologically-dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary, and; (3) staging, resting, or holding of subadults or spawning condition adults. Water depths in the main river channels must also be deep enough (e.g., $\geq$1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river, and;

- Water, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support: (1) spawning; (2) annual and interannual adult, subadult, larval, and juvenile survival; and (3) larval, juvenile, and subadult growth, development, and recruitment (e.g., 13° C to 26° C for spawning habitat and no more than 30° C for juvenile rearing habitat, and 6 mg/L dissolved oxygen for juvenile rearing habitat).

As described in section 4(a)(3)(B) of the ESA, we cannot designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense or designated for its use, that are subject to an Integrated Natural Resources Management Plan (INRMP) prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a conservation benefit to the species, and its habitat, for which critical habitat is proposed for designation. To inform our determinations, on February 14, 2014, we requested information for which Department of the Army facilities and operations warrant special consideration in our critical habitat assessment for Atlantic sturgeon, and the INRMP's that are available for those facilities.

The March 25, 2014, letter from former Deputy Assistant Secretary Wolfe identified the U.S. Military Academy-West Point, NY (West Point) and Aberdeen Proving Ground, MD as Army controlled areas overlapping the critical habitat designations for the New York Bight and Chesapeake Bay DPSs, respectively. During the drafting of the proposed rule, we subsequently changed the boundaries of the critical habitat areas to better reflect the in-water habitat in which the physical features requiring special management or protection occur. As a result, Aberdeen Proving Ground, MD does not occur within the proposed critical habitat for the Chesapeake Bay DPS. Based on information provided in the INRMP for West Point, the facility does own or control for its use areas of the Hudson River that overlap with proposed critical habitat. We, therefore, considered whether the INRMP for West Point provides a conservation benefit to New York Bight DPS of Atlantic sturgeon, and concluded that it does. The rationale for our decision is provided below.

INRMP Determination

We used the information in the INRMP to inform what lands or other geographical areas are owned or controlled by the Department of Defense or designated for its use, and that are subject to the INRMP. The factors that help us determine whether an INRMP provides a benefit are: (1) the extent of the area and features present; (2) the type and frequency of use of the area by the species; (3) the relevant elements of the INRMP in terms of management objectives, activities covered, and best management practices, and the certainty that the relevant elements will be implemented; and (4) the degree to which the relevant elements of the INRMP will protect the habitat from the types of effects that would be addressed through a destruction-or-adverse-modification analysis. We addressed each of these four elements using information provided in the INRMP.

Based on the information provided, the only geographic areas used, controlled by, or designated for use at West Point within the proposed critical habitat are the Main Post marina and the

seasonal dock at Constitution Island, both occurring within the Hudson River. The general characteristics of the Hudson within that part of the river (approximately river kilometer 83) are salinity of 0.5 to 5.0 parts-per-thousand, water depth up to 18 meters, and rocky substrate. The critical habitat features present are water of appropriate depth and absent physical barriers to passage, and water quality, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support adult, subadult, and juvenile survival, growth, and development. Fine silty-clay substrate, such as that found along the west shore of the Hudson near the dock areas, and offshore of Constitution Island, suggests the area may also be part of the foraging feature (i.e., aquatic habitat with a gradual downstream salinity gradient of 0.5-30 parts per thousand and soft substrate downstream of spawning sites for juvenile foraging and physiological development). However, as noted in the INRMP, invertebrate density in the silty-clay substrate is relatively low.

This area of the Hudson is used by adult Atlantic sturgeon as passage to and from spawning grounds that occur upriver, for example, near river kilometer 112 and river kilometer 132. Males in spawning condition may also use the area, moving upriver and downriver of spawning sites, while searching for females in spawning condition. Juvenile and subadult Atlantic sturgeon are captured in the area of the Hudson River adjacent to West Point during annual fall surveys for the Hudson River Biological Monitoring Program (ESA Permit No. 17095-01). Given the daily and seasonal changes in the position of the salt front, as well as the strong current and rocky substrate characterizing this area, subadult and juvenile Atlantic sturgeon use the area as passage to access foraging and rearing areas (e.g., to and from Newburgh Bay, approximately river kilometers 88 to 100, and Haverstraw Bay, approximately river kilometers 55 to 65). Some juvenile or subadult foraging may also occur in the area depending on prey availability.

The INRMP is a comprehensive plan that addresses best practices for use of land and water resources on and adjacent to West Point. These include measures for minimizing erosion, discharging wastewater, restricting visitor use of lands waters, and controlling or eradicating invasive species. These relevant elements of the INRMP will protect the features of the proposed Atlantic sturgeon critical habitat. Complying with all requirements, and maintaining best practices, for nutrient discharge (e.g., proper treatment of wastewater discharge, judicious use of chemical plant controls, reduction of invasive plants where possible) helps to maintain dissolved oxygen levels in this area of the Hudson River. Controlling activities that would result in erosion of riverbanks and other West Point lands (e.g., controlled visitor use of dock areas, prohibitions on cutting live vegetation, refilling and leveling ditches constructed for training activities) reduces sedimentation in the river from West Point activities, and protects unimpeded passage of Atlantic sturgeon through the area. We, therefore, determined, that the INRMP provides a conservation benefit to the New York Bight DPS of Atlantic sturgeon and its habitat, for which critical habitat is proposed for designation. Therefore, as proposed, critical habitat for the New York Bight DPS will not include the specific lands or other geographic areas of the U.S. Military Academy-West Point, and consultation under section 7(a)(2) of the ESA is not required for any Federal agency action that would affect the features of Atlantic sturgeon critical habitat occurring within the lands or other geographic areas of the U.S. Military Academy-West Point. Consultation under section 7(a)(2) or the ESA is nevertheless required for Federal agency actions if the proposed action may affect any ESA-listed species.

If you have any questions about the proposed rule, please contact Julie Crocker at (978) 282-8480 or by e-mail (Julie.Crocker@noaa.gov).

Sincerely,

for John K. Bullard
Regional Administrator

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

OCT 12 2016

The Honorable Karnig Ohannessian
Deputy Assistant Secretary of the Navy for Environment
1000 Navy Pentagon
Room 4A674
Washington, DC 20350

Dear Assistant Secretary Ohannessian:

On June 3, 2016, we announced publication of a proposed rule in the *Federal Register* to designate critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments (DPSs) of Atlantic sturgeon under the Endangered Species Act (ESA). The proposed critical habitat occurs in tidally-affected riverine waters of a coastal estuary within the geographic area occupied by each DPS. Each critical habitat area is a specific part of the named river, bank to bank, between the upriver and downriver boundaries identified in the proposed rule. Proposed critical habitat does not include any tributary of the named river unless the tributary is also specifically named and listed in the regulatory text of the proposed rule. We propose to designate critical habitat in the Penobscot, Kennebec, Androscoggin, Piscataqua, and Merrimack rivers for the Gulf of Maine DPS; the Connecticut, Housatonic, Hudson, and Delaware rivers for the New York Bight DPS; and the Potomac, Susquehanna, Rappahannock, York, Pamunkey, Mattaponi, and James rivers for the Chesapeake Bay DPS.

A key conservation objective for the Gulf of Maine, New York Bight, and Chesapeake Bay DPSs is to increase the abundance of each DPS by facilitating increased successful reproduction and recruitment to the marine environment. The physical features for successful reproduction and recruitment are:

- Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand range) for settlement of fertilized eggs, refuge, growth, and development of early life stages;
- Aquatic habitat with a gradual downstream salinity gradient of 0.5-30 parts per thousand and soft substrate (e.g., sand, mud) downstream of spawning sites for juvenile foraging and physiological development;
- Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: (1) unimpeded movements of adults to and from spawning sites; (2) seasonal and physiologically-dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary, and; (3) staging, resting, or holding of subadults or spawning condition adults. Water depths in the main river channels must also be deep enough (e.g., $\geq$1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river, and;

- Water, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support: (1) spawning; (2) annual and interannual adult, subadult, larval, and juvenile survival; and (3) larval, juvenile, and subadult growth, development, and recruitment (e.g., 13° C to 26° C for spawning habitat and no more than 30° C for juvenile rearing habitat, and 6 mg/L dissolved oxygen for juvenile rearing habitat).

Section 4(a)(3)(B) of the ESA prohibits designating as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense or designated for its use, that are subject to an Integrated Natural Resources Management Plan (INRMP) prepared under section 101 of the Sikes Act (16 U.S.C. 670a) if we, acting on behalf of the Secretary of Commerce, determine in writing that such plan provides a conservation benefit to the species and its habitat for which critical habitat is proposed for designation. To inform our determinations, on February 14, 2014, we requested information for which Department of the Navy facilities and operations warrant special consideration in our critical habitat assessment for Atlantic sturgeon. The April 3, 2014, letter from former Deputy Assistant Secretary Shregardus identified several naval facilities and training areas.

Subsequent to the April 3, 2014, letter we changed the boundaries of the critical habitat areas to better reflect the in-water habitat in which the physical features requiring special management or protection occur. As a result, Naval Weapons Station Earle, Naval Support Facility Indian Head, Naval Support Facility Carderock, Joint Base Anacostia Bolling, Armed Forces Experimental Training Activity Camp Peary, NAS Norfolk, and the Forces Surveillance Support Center, Relocatable Over the-Horizon Radar do not occur within the proposed critical habitat for the New York Bight or Chesapeake Bay DPSs. Based on the information provided by the Department of the Navy and the revised boundaries for the critical habitat areas, Marine Corps Base Quantico, Naval Support Facility Dahlgren, and Naval Weapons Station Yorktown (i.e., a complex comprised of the Weapons Station, Cheatham Annex, and Yorktown Fuel Terminal) occur in some part within one of the proposed critical habitat areas. We have reviewed the INRMPs for each of these facilities and concluded that each INRMP provides a conservation benefit to the Chesapeake Bay DPS of Atlantic sturgeon and its habitat.

INRMP Determination

We used the information in each INRMP to inform what lands or other geographical areas are owned or controlled by the Department of Defense or designated for its use, and that are subject to the INRMP. The factors that help us determine whether an INRMP provides a benefit are: (1) the extent of the area and features present; (2) the type and frequency of use of the area by the species; (3) the relevant elements of the INRMP in terms of management objectives, activities covered, and best management practices, and the certainty that the relevant elements will be implemented; and (4) the degree to which the relevant elements of the INRMP will protect the habitat from the types of effects that would be addressed through a destruction-or-adverse-modification analysis. We addressed each of these four elements using information provided in the INRMP.

Marine Corps Base Quantico

The boundaries of Marine Corps Base Quantico are described in Chapter 2 of the INRMP. There are nearly 59,000 acres of lands or other geographical areas owned or controlled by the Department of Defense or designated for its use, subject to an INRMP at Marine Corps Base Quantico. About four miles of shoreline along the Potomac River comprise the eastern boundary, and it includes boat ramps for recreational fishing access and a 500 meter restricted area of the Potomac at the Marine Corps Air Facility.

Seasonal variations in freshwater flow affect the downriver extent of freshwater in the tidal Potomac, and salinity of waters adjacent to Marine Corps Base Quantico. The base is located at the transition point from freshwater to the freshwater-saltwater mixing zone. The bottom topography of the River in the vicinity of Marine Corps Base Quantico is a wide, shallow shelf on either side of a deep channel (USGS Water Supply Paper 2233).

The critical habitat features present are water of appropriate depth and absent physical barriers to passage, salinity within the transitional salinity gradient and soft substrate, and water quality, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support adult, subadult, and juvenile survival, growth, and development. We, therefore, expect Atlantic sturgeon to use these waters for passage to and from upriver spawning grounds, staging, holding, and resting of adults and subadults, and as part of the juvenile rearing area.

The INRMP includes measures addressing forest management, fish and wildlife management, waste disposal, and water quality. Recreational facilities for camping and boating promote conservation and environmental stewardship. Forest and land use management programs as well as monitoring and remediation of three former disposal sites address pollutant abatement and erosion that could impact water quality of the Potomac River. Other measures that address water quality include: (1) water quality monitoring stations measure flow and pollutant levels in Base watersheds; (2) shoreline and riparian area protection from land disturbances to control erosion and sedimentation; and, (3) designation of wetlands whose waters flow into the Potomac River, as Special Natural Areas. These relevant elements of the INRMP will protect the features of the proposed Atlantic sturgeon critical habitat. We, therefore, determined that the INRMP provides a conservation benefit to the Chesapeake Bay DPS of Atlantic sturgeon.

Naval Support Facility Dahlgren

The boundaries of Naval Support Facility Dahlgren are described in Section 2 of the INRMP. Based on the description, the lands or other geographical areas owned or controlled by the Department of Defense or designated for its use, that are subject to an INRMP at Naval Support Facility Dahlgren are the two land areas named Mainside and Pumpkin Neck, and the 18 small range stations located along the Potomac River Test Range (PRTR). The PRTR is waters of the Potomac River, described as 51 nautical miles long and covering 169 square nautical miles. The PRTR danger zones are designated on nautical charts and access to the danger zones are controlled during test events. However, the lands and waters of the Potomac River that are the PRTR are not owned or leased by the Department of Defense or designated for its use other than access restrictions to certain waters during testing activities in order to ensure public safety. These fall outside of the scope of the INRMP.

Naval Support Facility Dahlgren has approximately four miles of Potomac River shoreline. Approximately 368 acres (8.5 percent of the installation) are tidal wetlands. The river's salinity regime in the vicinity of the installation is typically in the range of 5 to 12 parts per thousand. River velocity is higher in this area than downstream given the restriction of river bed upriver. The INRMP identifies Atlantic sturgeon as a federally-listed species that may occur on or adjacent to Naval Support Facility Dahlgren.

The critical habitat features present are water of appropriate depth and absent physical barriers to passage, salinity within the transitional salinity gradient and soft substrate, and water quality, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support adult, subadult, and juvenile survival, growth, and development. We, therefore, expect Atlantic sturgeon to use these waters for passage to and from upriver spawning grounds, staging, holding, and resting of adults and subadults, and as part of the juvenile rearing area.

The INRMP is a comprehensive plan that addresses best practices for use of land and water resources on and adjacent to Naval Support Facility Dahlgren. These include measures for minimizing erosion, discharging wastewater, and controlling or eradicating invasive species. Controlling activities that would result in erosion reduces sedimentation in the river, and protects unimpeded passage of Atlantic sturgeon through the area. Maintaining best practices for nutrient discharge (e.g., proper treatment of wastewater discharge), complying with requirements for judicious use of chemical plant controls supports dissolved oxygen levels for water quality essential to adult, subadult, and juvenile survival, growth, and development. These relevant elements of the INRMP will protect the features of the proposed Atlantic sturgeon critical habitat. We, therefore, determined, that the INRMP provides a conservation benefit to the Chesapeake Bay DPS of Atlantic sturgeon.

Naval Weapons Station Yorktown

The boundaries of each of the three facilities comprising Naval Weapons Station Yorktown (Station) are described in Section 1 of the INRMP. Based on the description, the lands or other geographical areas owned or controlled by the Department of Defense or designated for its use, that are subject to an INRMP at the Station are the Weapons Station, Cheatham Annex, and Yorktown Fuel Terminal. All three parcels are located on Virginia's Lower Peninsula between the York and James rivers. However, only the Weapons Station and Cheatham Annex include lands or other geographical areas that overlap with the proposed critical habitat for the Chesapeake Bay DPS of Atlantic sturgeon, including a 600-foot (183-meter) standoff zone around the piers at the Weapons Station.

The INRMP identifies potential spawning habitats of Atlantic sturgeon located upriver of the Station, in the Mattaponi and Pamunkey rivers. Recent evidence confirms spawning is occurring in the Pamunkey River. Salinity levels in the York River are too high to support spawning. Atlantic sturgeon use waters of the York River in the vicinity of the Station for passage to and from upriver spawning grounds, staging, holding, and resting of adults and subadults, and as part

of the juvenile rearing area. The critical habitat features present are water of appropriate depth and absent physical barriers to passage, salinity within the transitional salinity gradient and soft substrate, and water quality, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support adult, subadult, and juvenile survival, growth, and development.

As noted in the INRMP, erosion and sedimentation are major threats to water quality at the Station due to areas of steep terrain and high erodibility of many of the soils. Steps taken to minimize erosion include establishing riparian forest buffers, implementing dune restoration and shoreline stabilization measures, and training for the Station's Natural Resource Manager as a Combined Administrator for Erosion and Sediment Control Programs. In addition to minimizing erosion, measures for restoring and protecting water quality and wetlands have included partnerships to establish an oyster reef at the mouth of Felgates Creek, a tributary of the York River. The Station's management practices that benefit the coastal zone and nearshore environment also include storm water controls, riparian buffer restoration, and submerged aquatic vegetation plantings. A plan is in place and teams available to address oil spills at the Station and the impact of spills on the natural resources, including the York River. The Station's Environmental Restoration Program includes staff inspection and maintenance of former landfills, erosion monitoring, drainage, and invasive species monitoring and control, as necessary. Minimizing erosion, wetland and water protection at the Station help to ensure good water quality, substrate, and depth that are essential features of Atlantic sturgeon critical habitat in the vicinity of the Station. Based on information provided in the INRMP and the critical habitat features present at the Station, we determined the INRMP provides a conservation benefit to the Chesapeake Bay DPS of Atlantic sturgeon and its habitat, for which critical habitat is proposed for designation.

Critical habitat for the Chesapeake Bay DPS, as proposed, will not include the specific lands or other geographic areas of Marine Corps Base Quantico, Naval Support Facility Dahlgren, and Naval Weapons Station Yorktown that occur within the critical habitat, and consultation under section 7(a)(2) of the ESA is not required for any Federal agency action that would affect the features of Atlantic sturgeon critical habitat occurring within the specific lands or other geographic areas of these Department of the Navy facilities. Consultation under section 7(a)(2) of the ESA is nevertheless required for Federal agency actions if the proposed action may affect any ESA-listed species.

If you have any questions about any of our determinations, please contact Julie Crocker at (978) 282-8480 or by e-mail (Julie.Crocker@noaa.gov).

Sincerely,

for John K. Bullard
Regional Administrator