US Army Corps of Engineers®
New York District

NEW YORK AND NEW JERSEY HARBOR AND TRIBUTARIES COASTAL STORM RISK MANAGEMENT STUDY

Tier 1 EIS

INTEGRATED FEASIBILITY REPORT & TIER 1 ENVIRONMENTAL IMPACT STATEMENT

APPENDIX A2: ENDANGERED SPECIES ACT

Draft Tier 1 Biological Assessment for NOAA NMFS Species

September 2022

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1 Introduction

1.1 Authority and Purpose

The U.S. Army Corps of Engineers (USACE), New York District, has prepared this Draft Tier 1 Biological Assessment to facilitate informal consultation with the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act (ESA), as amended November 10, 1978.

The purpose of this document is to evaluate the potential impacts associated with the Tentatively Selected Plan (TSP) as identified by the New York and New Jersey Harbor and Tributaries Coastal Storm Risk Management Study (NYNJHAT Study) on threatened and endangered species and in support of the Tier 1 Environmental Impact Statement (EIS) prepared for the NYNJHAT Study. The non-structural and natural and nature-based features component of the TSP will be incorporated into the Final Integrated Feasibility Report/Tier 1 EIS. This draft document focuses on the structural measures of the TSP. Project structural measures include combinations of levees, storm surge barriers (SSBs), seawalls, elevated promenades, elevating structures and non-structural measures including preservation. It is important to note, that the TSP may have associated impacts and benefits from nonstructural and natural and nature-based features (NNBFs). At this time, nonstructural and NNBFs are still be evaluated and locations are being determined. Potential impacts and benefits to nonstructural and NNBFs in the Final Integrated FR/Tier 1 EIS.

1.1.1 Tier 1 Impact Analysis

The National Environmental Policy Act (NEPA) of 1969, as amended, requires Federal agencies, including USACE, to consider the potential environmental impacts of their proposed actions and any reasonable alternatives before undertaking a major Federal action, as defined by 40 Code of Federal Regulations (CFR) 1508.18.

To evaluate potential environmental impacts, USACE has prepared an Integrated FR/Tier 1 EIS. An EIS is a supporting document that is the most thorough and comprehensive level of NEPA documentation used to assist in making a decision. The EIS will be conducted in two stages or tiers. Tiering, which is defined in 40 CFR 1508.28, is a means of making the environmental review process more efficient by allowing parties to “eliminate repetitive discussions of the same issues and to focus on the actual issues suitable for decision at each level of environmental review” (40 CFR 1502.20).

The Tier 1 EIS involves technical analysis completed on a broad scale and is therefore an effective method for identifying existing and future conditions and understanding the comprehensive effects of the project. It provides the groundwork for future project-level environmental and technical studies and modeling and agency consultation.

1.1.2 Modeling of Impacts for Final Integrated Feasibility Report/Tier 1 Analysis

USACE Engineer Research and Development Center (ERDC) has developed the New York Bight Ecological Model (NYBEM) of the NYNJHAT Study Area. The model is presented in this Integrated FR/Tier 1 EIS for Agency and public review of the model development and the preliminary modeling results of the NYNJHAT Study Alternatives. Feedback received on the NYBEM will inform the final version of the model and the results of its application to the NYNJHAT Study Area will be presented in the Final Integrated FR/Tier 1 EIS.

The NYBEM focuses on tidally influenced ecosystems within the project boundary to quantify and evaluate potential Project impacts on aquatic resources. The USACE ERDC is also developing an Adaptive Hydraulics Model (AdH Model) to evaluate potential physical changes to flow, tidal range, and water elevations in both storm and non-storm conditions, as well as sediment budget. Currently, the Draft AdH Model has been incorporated into the Draft Integrated FR/Tier 1 EIS; however, the Final Integrated Feasibility Report/Tier 1 EIS will utilize the information gained from the NYBEM and AdH modeling efforts, as well as project design, to determine potential impacts from the SSB (open and closed), including, but not limited to, the following physical and biological resources:

- Bathymetry
- Sediment and Soil Quality and Type
- Tides
- Currents and Circulation
- Salinity
- Dissolved Oxygen
- Turbidity
- Sea Level Change/Climate Change
- Flooding
- Wetlands and water resources

Based on additional analysis to be included in the Tier 2 EIS, additional, more detailed-biological assessments may be completed, as necessary, for the proposed action.

1.2 Project Background

Storms have historically severely impacted the NY/NJ Harbor region, including Hurricane Sandy most recently, causing loss of life and extensive economic damages. In 2012, Hurricane Sandy caused considerable loss of life, extensive damage to property, and massive disruption to the North

Atlantic Coast. The effects of this storm were particularly severe because of its tremendous size and the timing of its landfall during high tide. Twenty-six states were impacted by Hurricane Sandy, and disaster declarations were issued in 13 states. New York (NY) and New Jersey (NJ) were the most severely impacted states, with the greatest damage and most fatalities in the NY Metropolitan Area. For example, a storm surge of 12.65 feet above normal high tide was reported at Kings Point on the western end of Long Island Sound and 9.4 feet at the Battery on the southern tip of Manhattan. Flood depths due to the storm tide were as much as nine feet in Manhattan, Staten Island, and other low-lying areas within the NY Metropolitan Area. The storm exposed vulnerabilities associated with inadequate coastal storm risk management (CSRM) measures and lack of defense to critical transportation and energy infrastructure.

The January 2015, USACE North Atlantic Coast Comprehensive Study (NACCS) identified high-risk areas on the Atlantic Coast for warranting further investigation of flood risk management solutions. In February 2019, a NYNJHAT Feasibility Study Interim Report was completed to document existing information and assumptions about the future conditions, and to identify knowledge gaps that warranted further investigation because of their potential to affect plan selection. The Interim Report states the impacts from Hurricane Sandy highlighted the national need for a comprehensive and collaborative evaluation to reduce risk to vulnerable populations within the North Atlantic region. To address the impacts and concerns associated with devastating storms, the USACE New York District has proposed measures to manage coastal storm risk in the NY/NJ Harbor and its tributaries

In response, the USACE New York District is investigating measures to manage future flood and coastal storm risk in ways that support the long-term resilience and sustainability of the coastal ecosystem and surrounding communities, and reduce the economic costs and risks associated with flood and storm events for the NYNJHAT Study Area (USACE 2019). The alternative concepts proposed would help the region manage flood risk that is expected to be exacerbated by relative sea level rise.

1.3 Coordination and Consultation History

Coordination with stakeholders has been a critical component of the NYNJHAT Study. Since early 2017 the USACE New York District has held many workshops and meetings with Cooperating Agencies and other stakeholders to share information on the study scope and purpose and formulation of alternatives, and to exchange ideas and information on natural and marine resources within the Study Area.

USACE announced the preparation of an Integrated Feasibility Report/Tiered EIS for the NYNJHAT Study feasibility in the February 13, 2018 Federal Register pursuant to the requirements of Section 102(2)(C) of NEPA. The NEPA scoping period initially spanned 45 days from July 6 – August 20, 2018 but was extended to 120 days due to numerous requests from the public. USACE held a total of nine public scoping meetings during the public scoping period. On November 26, 2018, the NMFS provided a scoping comment letter highlighting a number of key considerations within the NYNJHAT Study Areas for endangered and threatened species (refer to Appendix A).

In February 2020, the NYNJHAT Project paused until October 2021 due to a lack of Federal funding. Following Study resumption, the USACE New York District held several Cooperating Agency meetings to facilitate open communication, share Study progress, status updates, and data as it became available, including an Engineering presentation on the Study Alternatives, a presentation on the Tentatively Selected Plan, and a presentation on the NYBEM results. These meetings took place on February 17, June 9, August 3, and August 11, 2022. Additionally, the USACE New York District provided e-mail Study status updates on January 31, May 6, July 14, and August 8, 2022 between Agency coordination meetings.

As part of the continuing coordination for the Study, on April 7, 2022, the USACE New York District provided NMFS with alignments of the NYNJHAT Alternatives, including the Tentatively Selected Plan – Alternative 3b in preparation for future consultation and preparation of the Biological Opinion. Revised NYNJHAT Alternative alignments were provided on July 21, 2022.

2 Study Area

The Study Area is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Proposed Action and not merely the immediate area involved in the action." The Study Area for this consultation includes the NY Metropolitan Area, including New York City (NYC) which is the most populous and densely populated city in the United States, and five of the six largest cities in NJ by population. The shorelines of some of the NYNJHAT Study Area is characterized by low elevation areas, developed with residential and commercial infrastructure, and is subject to tidal flooding during storms. The Study Area covers more than 2,150 square miles and comprises parts of 25 counties in NJ and NY, including Bergen, Passaic, Morris, Essex, Hudson, Union, Somerset, Middlesex, and Monmouth Counties in NJ; and Rensselaer, Albany, Columbia, Greene, Dutchess, Ulster, Putnam, Orange, Westchester, Rockland, Bronx, New York, Queens, Kings, Richmond, and Nassau Counties in NY.

The NYNJHAT Study Area for the Tier 1 EIS includes NY and NJ Harbor and tidally affected tributaries encompassing all of NYC, the Hudson River (HR) to Troy, NY; the lower Passaic, Hackensack, Rahway, and Raritan Rivers; and the Upper and Lower Bays of NY Harbor, Newark, Jamaica, Raritan and Sandy Hook Bays; the Kill Van Kull, Arthur Kill and East River tidal straits; and western Long Island Sound (Figure 2-1).

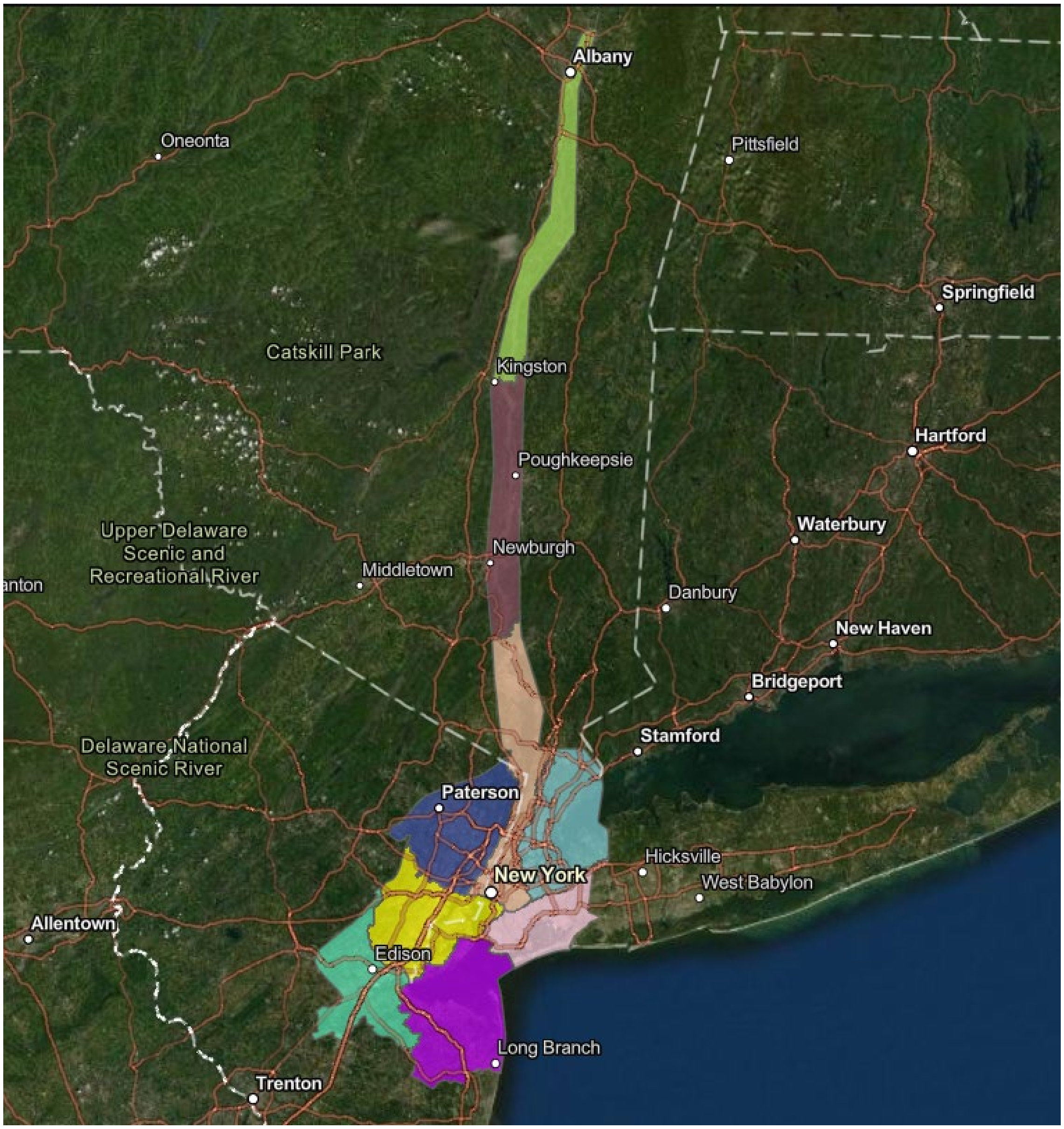

Figure 2-1. Overview of USACE New York-New Jersey Harbor and Tributaries Study Area

Proposed Action

The Tier I EIS describes all alternatives evaluated for this NEPA study. This appendix evaluates only the project measures incorporated into the TSP, which is Alternative 3B.

2.1 Tentatively Selected Plan

The TSP is Alternative 3B – Multi-basin SSBs With Shore-Based Measures. The TSP includes a combination of coastal storm risk management (CSRM) measures that function as a system to manage the risk of coastal storm damage in the New York Metropolitan Area, including a combination of shore-based and in-water measures. These measures are located within the Hackensack/Passaic, Upper Bay/Arthur Kill, Lower Hudson/East River, Long Island Sound and Jamaica Bay Planning Regions. The TSP measures include storm surge barriers (SSBs), Shore-Based Measures (SBMs), complementary Induced Flooding-Mitigation Features (IFFs) and Risk Reduction Features (RRFs) as well as nonstructural measures and natural and nature-based features described in more detail as follows:

The TSP includes SSBs and complementary SBMs at Jamaica Bay, Arthur Kill, Kill Van Kull, Gowanus Canal, Newtown Creek, Flushing Creek, Sheepshead Bay, Gerritsen Creek, Hackensack River, Head of Bay, Old Howard Beach East, and Old Howard Beach West. The SBMs would provide land-based CSRM and include floodwalls, levees, elevated promenades, buried seawalls/dunes, revetments, berms, bulkheads, pedestrian/vehicular gates, and road raisings. Ringwalls and SBMs will also be considered under the TSP, to be further refined for the Final Integrated FR/Tier 1 EIS.

RRFs would provide CSRM in areas behind SSBs that may experience high frequency flooding when the barriers are not operated.

IFFs would provide CSRM in areas in front of SSBs that may experience induced flooding due to operation of the SSBs.

Nonstructural measures to be included in the TSP may include structure elevations and floodproofing. Currently, conceptual nonstructural measure locations are located throughout the Study area; however, nonstructural measures and locations will be further refined for the Final Integrated FR/Tier 1 EIS.

Natural and nature-based features (NNBF) to be included in the TSP consist primarily of natural features such as wetlands and living shorelines that may provide both CSRM and ecological enhancement. Specific NNBF types and locations will be further refined for the Final Integrated FR/Tier 1 EIS. At this time, it is anticipated they will be located in areas that experience high frequency coastal flooding.

While the TSP will improve coastal flood risks in the project area, it will not totally eliminate flood risks; therefore, residual risk for flooding still remains a threat to life and property. It is essential that flood risk be proactively communicated to residents in accessible and thoughtful ways.

This assessment only includes structural measures of the TSP. Structural measures included in the TSP are show in Table 1 by Planning Region, and on Figures 2-2 and 2-3.

Figure 3-2. NYNJHAT Study Tentatively Selected Plan

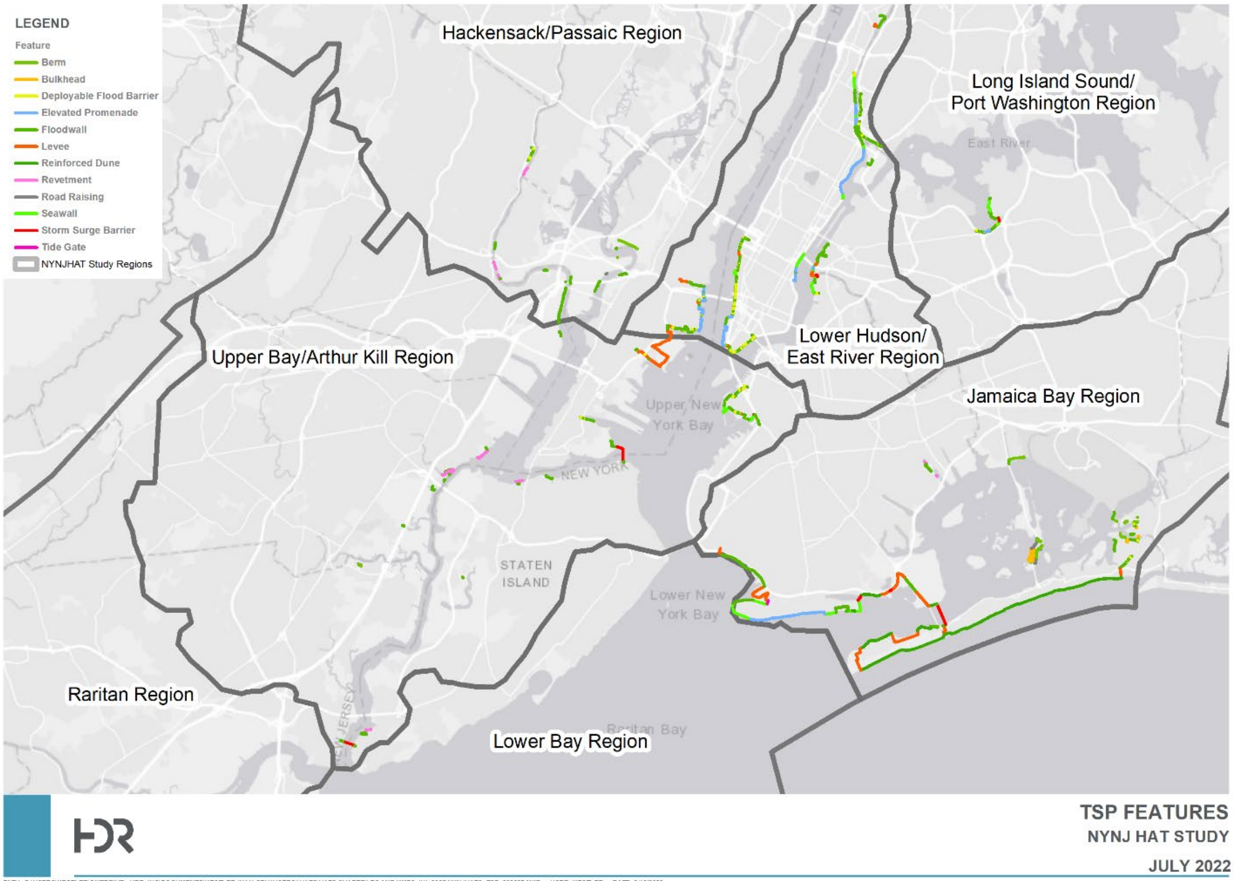

Figure 3-3. Overview of NYNJHAT Study Measures Included in the TSP

Table 3.1: Structural measures included in the TSP, by Planning Region.

Planning Region	Storm Surge Barriers	Tide Gates	Floodwalls	Levees	Elevated Promenades	Buried Seawalls/Sand Dunes	Seawalls	Revetments	Berms	Bulkheads	Pedestrian/Vehicular Gates	Road Raising
Capital District												
Mid-Hudson												
Lower Hudson/East River	●		●	●	●		●				●	
Upper Bay/Arthur Kill	●	●	●	●			●	●	●		●	
Lower Bay												
Hackensack/Passaic			●					●	●		●	●
Raritan Region												
Long Island Sound	●		●		●		●					
Jamaica Bay	●	●	●	●	●	●	●	●	●	●	●	●

● = Included in the Planning Region

3 Threatened and Endangered Listed Species in the Project Area

The federally listed species under NMFS jurisdiction that may occur in the NYNJHAT Study Area are listed in Table 4-1, with their status, listing and recovery plan citations, and the Planning Regions where they may occur. The species list is based on the NOAA ESA mapper as well as a 2018 scoping letter from NMFS as potentially occurring in the Study Area. In addition, marine mammals that are listed under ESA in addition to the Marine Mammal Protection Act (MMPA) are also included.

Table 5-1. NMFS Trust species in the NYNJHAT Study Area

Common Name	Scientific Name	Listing / Recovery Plan Citation	Region(s) Where Species May Occur[1]
Fish			
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	77 FR 5880 and 77 FR 5914	UB, MH, LIS, ER, RAR, HP, JB, LB, CD
Shortnose sturgeon	*Acipenser brevirostrum*	32 FR 4001; Recovery plan: NFMS 1998	UB, MH, LIS, ER, HP, CD
Reptiles			
Green sea turtle	*Chelonia mydas*	81 FR 20057; Recovery plan: NMFS & USFWS 1991	UB, LIS, ER, JB, LB
Kemp's ridley turtle	*Lepidochelys kempii*	35 FR 18319; Recovery plan: NMFS et al. 2011	UB, LIS, ER, JB, LB
Leatherback turtle	*Dermochelys coriacea*	35 FR 8491; Recovery plan: NMFS & USFWS 1992	UB, LIS, ER, JB, LB
Loggerhead turtle	*Caretta caretta*	76 FR 58868; Recovery plan: NMFS & USFWS 2008	UB, LIS, ER, JB, LB
Mammals			
Fin Whale	*Balaenoptera physalus*	35 FR 18319; Recovery plan: NMFS 2010	LB
North Atlantic Right Whale	*Eubalaena glacialis*	73 FR 12024; Recovery plan: NMFS 2005	LB

Notes: [1] Region Abbreviations - Upper Bay/Arthur Kill Region (UB), Mid-Hudson Region (MH), Long Island Sound Region (LIS), Lower Hudson/East River Region (ER), Raritan Region (RAR), Hackensack-Passaic Region (HP), Jamaica Bay Region (JB), Lower Bay Region (LB), Capital District Region (CD)

3.1 ESA-listed Species Distribution and Abundance

3.1.1 Sturgeon

3.1.1.1 Atlantic Sturgeon

There is designated critical habitat for Atlantic sturgeon in the NYNJHAT Study Area (82 FR 39160) and there are Five Distinct Population Segments (DPS) of Atlantic sturgeon occur in the action area:

- Gulf of Maine DPS - Threatened
- New York Bight DPS - Endangered
- Chesapeake Bay DPS - Endangered
- South Atlantic DPS - Endangered
- Carolina DPS - Endangered

The first observations of sturgeon in the HR date back to accounts of human settlement in the area. Fishery landings were recorded starting in 1880 and the large gear size in the fishery indicates that most of the harvest was Atlantic sturgeon (Bain et al. 2000). Scientific observations of the HR population were first recorded in the 1930s and include documentation of sturgeon distributions by size and age (Bain 1997). Approximately 40 years elapsed before concern over potential impacts from electrical power plants initiated long-term monitoring programs in the 1969s that resulted in reports of sturgeon distributions and life history characteristics (Young et al. 1988). Due to a collapse in the fishery, the Atlantic sturgeon attracted little commercial interest in the HR from 1900 through 1979 (Bain et al. 2000). However, the population exhibited a recovery in the 1980s and fishing for Atlantic sturgeon became a significant activity in the system in the 1990s, attracting the attention of fishery management agencies (Bain et al. 2000).

The HR and estuary system is oriented in a north-south direction from NY-NJ Harbor (southern tip of Manhattan Island = km 0) with Atlantic sturgeon distributed within the tidal portion ranging as far north as the Troy Dam (km 246). Adult Atlantic sturgeon (> 150 cm TL) marked in the HR have been recaptured in coastal areas from North Carolina to Massachusetts (Bain 1997). Adult females migrate to spawning grounds, which are deep, channel or off-channel habitats within the HR Estuary starting in April through July (Breece 2021) and return to marine habitats the following fall (Dovel and Berggren 1983, Van Eenennaam et al. 1996). Mature males are present in the HR for a longer time than mature females, extending from April to November (Dovel and Berggren 1983) and appear at spawning sites in association with females, suggesting they search for females while moving about in the River (Van Eenennaam et al. 1996). In April 2014, NMFS received information from researchers working in the HR which, through detection of tagged individuals on a receiver array, confirmed the presence of adult Atlantic sturgeon upstream of RKM 193 from late April to late July (Dewayne Fox, DSU and Kathy Hattala, NYDEC, personal communication April 2014). At this time, the available data are limited to three fish comprised of two males in spawning condition and an assumed male. However, given the time of year, the reproductive conditions of the fish and the known presence of suitable spawning substrate upstream of RKM 193, this strongly suggests that Atlantic sturgeon are spawning further upstream than previously suspected.

The HR population of Atlantic sturgeon is one of two US populations for which there is an abundance estimate (Kazyak et al 2020), with approximately 870 spawning adults/year, 600 males, and 270 females (Kahnle et al. 2007). It is considered one of the healthiest populations in the U.S. (ASSRT 2007). The NY State Department of Environmental Conservation (DEC) conducted a tagging study in collaboration with the HR Estuary Program, US Fish and Wildlife Service, Pew Institute, HR Foundation, and National Fish and Wildlife Foundation. In this study, Atlantic sturgeon are captured in the lower river and tagged with sonic tags. Preliminary results indicate that adults are attracted to muddy substrates, followed by sand, with lowest observations over gravel (http://www.dec.ny.gov/animals/37121.html).

As part of project specific biological monitoring conducted by the USACE New York District, there have been several sightings of sturgeon in Upper, Lower and Raritan Bays. From 1998 through 2010, bottom trawl surveys were conducted as part of the Harbor Deepening Project (HDP). A primary goal of the Aquatic Biological Survey (ABS) was to collect data on finfish, shellfish, macroinvertebrates, and water quality, with a focus on fish community structure, distribution, and seasonal patterns of habitat use in NY-NJ Harbor. ABS sampling occurred from December to June throughout the Harbor, with stations in Newark Bay, Arthur Kill, Upper Bay, and Lower Bay. These station locations included channel stations and stations near past and future dredging sites. Throughout the 12-year sampling period, two Atlantic sturgeon were captured in bottom trawls (Table 1). The first Atlantic sturgeon was captured in June 2005 at a non-channel station in the Upper Bay. It measured 790 mm total length and presumably was a subadult. The other Atlantic sturgeon was captured in December 2009 at a channel station in the Lower Bay. It measured 638 mm total length.

Bottom trawl surveys were also conducted in the fall of 2008 for a few days in Lower Bay as part of investigations of navigational hazards. Two Atlantic sturgeon were captured in October 2008. The first measured 1,220 mm and the second measured 1,180 mm.

Additional sightings and captures of sturgeon occurred during other monitoring activities by the USACE New York District and are summarized in Table 1. Although the USACE New York District conducted migratory finfish surveys in the HDP area in 2006 (USACE 2007) and reinitiated the study in 2011, no Atlantic sturgeon observations were reported. Most of the data in Table 1 was collected as part of long-term and rigorous efforts in the NY-NJ Harbor. Excluding the 1995 observation, only 6 possible Atlantic sturgeon were observed over 14 years (1998- 2011).

Table 5-2. Atlantic Sturgeon Observation In and Around the HDP Area

Species	Date	Location	Length	Data Source/Comments
Atlantic sturgeon	June 2005	Port Jersey (east of Liberty Golf Course)	790 mm	HDP ABS program
Atlantic sturgeon	1995	borrow area (BBA-5), between Belmar and Manasquan	Not recorded	Biological Monitoring program, Atlantic Coast of NJ: Asbury Park to Manasquan
Sturgeon (species not identified)	October 1998	Port Jersey (adjacent and east of Global Marine Terminal)	Not recorded	HDP ABS program
Atlantic sturgeon	October 2008	Lower Bay near approach to Ambrose Channel (between 40.457833, -73.89633 and 40.46117, -73.90267	1220 mm	Investigations near navigational obstructions
Atlantic sturgeon	October 2008	Lower Bay near approach to Ambrose Channel (between 40.457833, -73.89633 and 40.46117, -73.90267	1180 mm	Investigations near navigational obstructions
Sturgeon (species not identified)	October 2008	East of Sandy Hook between coordinates: 40.41087, -73.88474 to 40.41080, -73.88464	Not recorded	Found in turtle cage during dredged material inspection. Noted on disposal log sheets from Dredged Material Inspectors, who accompany all vessels disposing dredged material at the HARS.
Atlantic sturgeon	December 2009	Lower Bay (chapel hill south channel)	638 mm	HDP ABS program
Sturgeon (species not identified)	September 2010	1 1/2 miles south of the Verrazano Bridge and 1/2 mile east of Hoffman Island near coordinate 40.57917, -74.04017	42"- 48" long (estimate)	Injured sturgeon (head injury) spotted by USACE vessel while conducting routine drift patrol

In the HR estuary, spawning, rearing, and overwintering habitats were reported to be intact by Bain (1997), supporting the largest remaining Atlantic sturgeon stock in the US. However, a population decline from overfishing has also been observed in the HR estuary (Bain 1997, Bain 2001, Peterson et al. 2000). Several life history characteristics make Atlantic sturgeon susceptible to overfishing, including their delayed age at maturity, vulnerability to capture, and long periods of non-spawning (Boreman 1997). Commercial landing data for Atlantic sturgeon are available for NY State from 1880 through 1995. Until about 1980, most of the landings came from the HR and the highest annual landings occurred in 1898. Landings dropped through the early 1980s and in 1990, when the Atlantic States Marine Fisheries Commission (ASMFC) adopted an interstate fishery management plan for Atlantic sturgeon. States with open fisheries began to monitor harvest and population modeling was conducted to determine acceptable levels of harvest from the HR stock. From 1993 through 1995, NY regulated the Atlantic sturgeon fishery with size limits, seasons, and area closures, determining that the HR stock was being overfished. A harvest moratorium was implemented in 1996 and NJ followed with a zero quota in the same year.

Conservation of the Atlantic sturgeon population in the HR has benefitted from an intensive research program in the mid-1990s funded by the HR Foundation for Science and Environmental Research, which covered reproductive physiology, genetics, age structure, habitat use, behavior, and fishery attributes (Bain et al. 2000). Peterson et al. (2000) conducted a mark-recapture study to estimate the age-1 juvenile cohort size in the HR and found an 80% decline in cohort size had occurred since a similarly conducted population estimate was made in 1976. Dovel and Berggren (1983) marked immature fish from 1976-1978 and calculated a year class age-1 cohort as approximately 25,000 fish, whereas the estimate by Peterson et al. (2000) from their 1994 study indicated 4,314 fish were in the age-1 cohort for that year.

Although the HR subpopulation is believed to be the largest remaining Atlantic sturgeon subpopulation (NRDC 2009), bycatch mortality exceeds those levels needed to provide for a stable population (ASMFC 1990). Haley et al. (1996) cites Hoff et al. (1988) and Geoghegan et al. (1992) as reporting collections of Atlantic sturgeon as bycatch in trawl surveys conducted in the HR by utility companies (April through December) between the Tarrytown, NY and Coxsackie, NY.

Sediment contamination in NY-NJ Harbor includes synthetic compounds used in herbicide and pesticide production, metals, and petroleum hydrocarbons. Sources of contamination include combined sewer discharges, urban runoff, stormwater runoff, industrial discharges, and maritime and industrial accidents. Sediment contamination and silt/clay content are negatively correlated with the density and diversity of benthic organisms throughout the Harbor (Cerrato and Bokuniewicz 1986) which may in turn affect prey availability for Atlantic sturgeon.

Atlantic sturgeon are exposed to variations in dissolved oxygen because of their life history characteristics of benthic feeding and bottom dwelling and because they occur in areas with industrial pollution and temperature changes. Kieffer et al. (2011) found that Atlantic sturgeon were moderately tolerant of exposure to short-term severe hypoxia and that their biological responses may be influenced by temperature. Since there is no spawning habitat in the action area and the water is saline, NMFS does not expect any spawning or early life stages to occur in the action area.

3.1.1.2 Shortnose Sturgeon

Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. They feed on a variety of benthic and epibenthic invertebrates including mollusks, crustaceans (amphipods and isopods), insects, and oligochaete worms (Vladykov and Greeley 1963; Dadswell 1979 in NMFS 1998a). Shortnose sturgeon have similar lengths at maturity (45-55 cm fork length) throughout their range, but, because shortnose sturgeon in southern rivers grow faster than those in northern rivers, southern shortnose sturgeon mature at younger ages (Dadswell et al. 1984). Shortnose sturgeon are long-lived (30-40 years) and, particularly in the northern extent of their range, mature at late ages. In the north, males reach maturity at 5 to 10 years, while females mature between 7 and 13 years. Based on limited data, females spawn every three to five years while males spawn approximately every two years. The spawning period is estimated to last from a few days to several weeks. Spawning begins from late winter/early spring (southern rivers) to mid to late spring (northern rivers) when the freshwater temperatures increase to 8-9ºC.

Several published reports have presented the problems facing long-lived species that delay sexual maturity (Crouse et al. 1987; Crowder et al. 1994; Crouse 1999). These reports concluded that animals that delay sexual maturity and reproduction must have high annual survival as juveniles through adults to ensure that enough juveniles survive to reproductive maturity and then reproduce enough times to maintain stable population sizes.

Total instantaneous mortality rates are available for shortnose sturgeon in the Saint John River (0.12 – 0.15; ages 14-55; Dadswell 1979), Upper Connecticut River (0.12; Taubert 1980b), and Pee Dee-Winyah River (0.08-0.12; Dadswell et al. 1984). Total instantaneous natural mortality (M) for shortnose sturgeon in the lower Connecticut River was estimated to be 0.13 (T. Savoy, Connecticut Department of Environmental Protection, personal communication). There is no recruitment information available for shortnose sturgeon because there are no commercial fisheries for the species. Estimates of annual egg production for this species are difficult to calculate because females do not spawn every year (Dadswell et al. 1984). Further, females may abort spawning attempts, possibly due to interrupted migrations or unsuitable environmental conditions (NMFS 1998). Thus, annual egg production varies significantly in this species. Fecundity estimates have been made and range from 27,000 to 208,000 eggs/female and a mean of 11,568 eggs/kg body weight (Dadswell et al. 1984).

At hatching, shortnose sturgeon are blackish-colored, 7-11mm long and resemble tadpoles (Buckley and Kynard 1981). In 9-12 days, the yolk sac is absorbed, and the sturgeon develops into larvae which are about 15mm total length (TL; Buckley and Kynard 1981). Sturgeon larvae are believed to begin downstream migrations at about 20mm TL. Dispersal rates differ at least regionally. Laboratory studies on Connecticut River larvae indicated dispersal peaked 7-12 days after hatching in comparison to Savannah River larvae that had longer dispersal rates with multiple, prolonged peaks, and a low level of downstream movement that continued throughout the entire larval and early juvenile period (Parker 2007). Parker (2007) considered individuals to be juvenile when they reached 57mm TL. Laboratory studies demonstrated that larvae from the Connecticut River made this transformation on day 40 while Savannah River fish made this transition on day 41 and 42 (Parker 2007).

The juvenile phase can be subdivided into young of the year (YOY) and immature/sub-adults. YOY and sub-adult habitat use differs and is believed to be a function of differences in salinity tolerances. Little is known about YOY behavior and habitat use, though it is believed that they are typically found in channel areas within freshwater habitats upstream of the salt wedge for about one year (Dadswell et al. 1984, Kynard 1997). One study on the stomach contents of YOY revealed that the prey items found corresponded to organisms that would be found in the channel environment (amphipods) (Carlson and Simpson 1987). Sub-adults are typically described as age one or older and occupy similar spatio-temporal patterns and habitat-use as adults (Kynard 1997). However, there is evidence from the Delaware River that sub-adults may overwinter in different areas than adults and do not form dense aggregations like adults (ERC Inc. 2007). Sub-adults feed indiscriminately. Typical prey items found in stomach contents include aquatic insects, isopods, and amphipods along with large amounts of mud, stones, and plant material (Dadswell 1979, Carlson and Simpson 1987, Bain 1997).

In populations that have free access to the total length of a river (e.g., no dams within the species' range in a river like Saint John, Kennebec, Altamaha, Savannah, Delaware, and Merrimack Rivers), spawning areas are located at the farthest upstream reach of the river (NMFS 1998b). In the northern extent of their range, shortnose sturgeon exhibit three distinct movement patterns. These migratory movements are associated with spawning, feeding, and overwintering activities.

In spring, as water temperatures reach between 7-9.7ºC (44.6-49.5°F), pre-spawning shortnose sturgeon move from overwintering grounds to spawning areas. Spawning occurs from mid/late March to mid/late May depending upon location and water temperature. Shortnose sturgeon spawn in upper, freshwater areas and feed and overwinter in both fresh and saline habitats. Their spawning migrations are characterized by rapid, directed, and often extensive upstream movement (NMFS 1998b).

Shortnose sturgeon are believed to spawn at discrete sites within their natal river (Kieffer and Kynard 1996). In the Merrimack River, males returned to only one reach during a four-year telemetry study (Kieffer and Kynard 1996). Squires (1982) found that during the three years of a study in the Androscoggin River, adults returned to a 1-km reach below the Brunswick Dam. Kieffer and Kynard (1996) found that adults spawned within a 2-km reach in the Connecticut River for three consecutive years. Spawning occurs over channel habitats containing gravel, rubble, or rock-cobble substrates (Dadswell et al. 1984; NMFS 1998). Additional environmental conditions associated with spawning activity include decreasing river discharge following the peak spring freshet, water temperatures ranging from 8 - 15º (46.4-59°F), and bottom water velocities of 0.4

to 0.8 m/sec (Dadswell et al. 1984; Hall et al. 1991; Kieffer and Kynard 1996; NMFS 1998). For northern shortnose sturgeon, the temperature range for spawning is 6.5-18.0ºC (Kynard et al. 2012). Eggs are separate when spawned but become adhesive within approximately 20 minutes of fertilization (Dadswell et al. 1984). Between 8° (46.4°F) and 12°C (53.6°F) eggs hatch after approximately 13 days. The larvae are photonegative and remain on the bottom for several days. Buckley and Kynard (1981) found week-old larvae to be photonegative and to form aggregations with other larvae in concealment.

Adult shortnose sturgeon typically leave the spawning grounds soon after spawning. Non-spawning movements include rapid, directed post-spawning movements to downstream feeding areas in spring and localized, wandering movements in summer and winter (Dadswell et al. 1984; Buckley and Kynard 1985; O'Herron et al. 1993). Kieffer and Kynard (1993) reported that post-spawning migrations were correlated with increasing spring water temperature and river discharge. Young-of-the-year shortnose sturgeon are believed to move downstream after hatching (Dovel 1981) but remain within freshwater habitats. Older juveniles or sub-adults tend to move downstream in fall and winter as water temperatures decline and the salt wedge recedes and move upstream in spring and feed mostly in freshwater reaches during summer.

Juvenile shortnose sturgeon typically move upstream in spring and summer and move back downstream in fall and winter; however, these movements usually occur in the region above the saltwater/freshwater interface (Dadswell et al. 1984; Hall et al. 1991). Non-spawning movements include wandering movements in summer and winter (Dadswell et al. 1984; Buckley and Kynard 1985; O'Herron et al. 1993). Kieffer and Kynard (1993) reported that post-spawning migrations were correlated with increasing spring water temperature and river discharge. Adult sturgeon occurring in freshwater or freshwater/tidal reaches of rivers in summer and winter often occupy only a few short reaches of the total length (Buckley and Kynard 1985). Summer concentration areas in southern rivers are cool, deep, thermal refugia, where adult and juvenile shortnose sturgeon congregate (Flourney et al. 1992; Rogers et al. 1994; Rogers and Weber 1995; Weber 1996).

While shortnose sturgeon do not undertake the significant marine migrations seen in Atlantic sturgeon, telemetry data indicates that shortnose sturgeon do make localized coastal migrations. This is particularly true within certain areas such as the Gulf of Maine (GOM) and among rivers in the Southeast. Interbasin movements have been documented among rivers within the GOM and between the GOM and the Merrimack, between the Connecticut and HRs, the Delaware River and Chesapeake Bay, and among the rivers in the Southeast.

The temperature preference for shortnose sturgeon is not known (Dadswell et al. 1984) but shortnose sturgeon have been found in waters with temperatures as low as 2 to 3ºC (35.6-37.4°F) (Dadswell et al. 1984) and as high as 34ºC (93.2°F) (Heidt and Gilbert 1978). However, water temperatures above 28ºC (82.4°F) are thought to adversely affect shortnose sturgeon. In the

Altamaha River, water temperatures of 28-30ºC (82.4-86°F) during summer months create unsuitable conditions and shortnose sturgeon are found in deep cool water refuges. Dissolved oxygen (DO) also plays a role in temperature tolerance, with increased stress levels at higher temperatures with low DO versus the ability to withstand higher temperatures with elevated DO (Niklitchek 2001).

Shortnose sturgeon are known to occur at a wide range of depths. A minimum depth of 0.6m (approximately 2 feet) is necessary for the unimpeded swimming by adults. Shortnose sturgeon are known to occur at depths of up to 30m (98.4 ft) but are typically found in waters less than 20m (65.5 ft) (Dadswell et al. 1984; Dadswell 1979). Shortnose sturgeon have also demonstrated tolerance to a wide range of salinities. Shortnose sturgeon have been documented in freshwater (Taubert 1980; Taubert and Dadswell 1980) and in waters with salinity of 30 parts-per-thousand (ppt) (Holland and Yeverton 1973). Mcleave et al. (1977) reported adults moving freely through a wide range of salinities, crossing waters with differences of up to 10ppt within a two-hour period. The tolerance of shortnose sturgeon to increasing salinity is thought to increase with age (Kynard 1996). Shortnose sturgeon typically occur in the deepest parts of rivers or estuaries where suitable oxygen and salinity values are present (Gilbert 1989); however, shortnose sturgeon forage on vegetated mudflats and over shellfish beds in shallower waters when suitable forage is present.

Additional sightings and captures of sturgeon occurred during other monitoring activities by the USACE New York District and are summarized in Table 2. Although the USACE New York District conducted migratory finfish surveys in the HDP area in 2006 (USACE 2007) and reinitiated the study in 2011, no shortnose sturgeon observations were reported. Most of the data in Table 2 was collected as part of long-term and rigorous efforts in the NY-NJ Harbor. Excluding the 1995 observation, only 9 possible shortnose sturgeon were observed over 14 years (1998-2011).

Table 5-3. Shortnose Sturgeon Observation In and Around the HDP Area

Species	Date	Location	Length	Data Source/Comments
Sturgeon (species not identified)	October 1998	Port Jersey (adjacent and east of Global Marine Terminal)	not recorded	HDP ABS program
Shortnose sturgeon	June 2003	Upper Bay (near Statue of Liberty)	780 mm	HDP ABS program
Shortnose sturgeon	June 2003	Upper Bay (near Statue of Liberty)	690 mm	HDP ABS program
Shortnose sturgeon	June 2005	Port Jersey (east of Liberty Golf Course)	1250 mm	HDP ABS program
Shortnose sturgeon	June 2005	Port Jersey (east of Liberty Golf Course)	840 mm	HDP ABS program

Species	Date	Location	Length	Data Source/Comments
Shortnose sturgeon	May 2008	Port Jersey (east of Liberty Golf Course)	900 mm	HDP ABS program
Sturgeon (species not identified)	October 2008	East of Sandy Hook between coordinates: 40.41087, -73.88474 to 40.41080, -73.88464	not recorded	Found in turtle cage during dredged material inspection. Noted on disposal log sheets from Dredged Material Inspectors, who accompany all vessels disposing dredged material at the HARS.
Shortnose sturgeon	May 2009	Port Jersey (east of Liberty Golf Course)	910 mm	HDP ABS program
Sturgeon (species not identified)	September 2010	1 1/2 miles south of the Verrazano Bridge and 1/2 mile east of Hoffman Island near coordinate 40.57917, -74.04017	42"- 48" long (estimate)	Injured sturgeon (head injury) spotted by USACE vessel while conducting routine drift patrol

3.1.1.3 Status and Trends of Shortnose Sturgeon Rangewide

Shortnose sturgeon were listed as endangered on March 11, 1967 (32 FR 4001), and the species remained on the endangered species list with the enactment of the ESA in 1973. Although the original listing notice did not cite reasons for listing the species, a 1973 Resource Publication, issued by the US Department of the Interior, stated that shortnose sturgeon were “in peril…gone in most of the rivers of its former range [but] probably not as yet extinct” (USDOI 1973). Pollution and overfishing, including bycatch in the shad fishery, were listed as principal reasons for the species’ decline. In the late nineteenth and early twentieth centuries, shortnose sturgeon commonly were taken in a commercial fishery for the closely related and commercially valuable Atlantic sturgeon (Acipenser oxyrinchus). More than a century of extensive fishing for sturgeon contributed to the decline of shortnose sturgeon along the east coast. Heavy industrial development during the twentieth century in rivers inhabited by sturgeon impaired water quality and impeded these species’ recovery; resulting in a reduced abundance of shortnose sturgeon populations within portions of the species’ ranges (e.g., southernmost rivers of the species range: Santilla, St. Marys, and St. Johns Rivers). A shortnose sturgeon recovery plan was published in December 1998 to promote the conservation and recovery of the species (see NMFS 1998). Shortnose sturgeon are listed as “vulnerable” on the IUCN Red List.

Although shortnose sturgeon are listed as endangered range-wide, in the final recovery plan NMFS recognized 19 separate populations occurring throughout the range of the species. These populations are in New Brunswick Canada (1); Maine (2); Massachusetts (1); Connecticut (1); NY (1); NJ/Delaware (1); Maryland and Virginia (1); North Carolina (1); South Carolina (4); Georgia (4); and Florida (2). NMFS has not formally recognized distinct population segments (DPS) of shortnose sturgeon under the ESA. Although genetic information within and among shortnose sturgeon occurring in different river systems is unknown, life history studies indicate that shortnose sturgeon populations from different river systems are substantially reproductively isolated (Kynard 1997) and, therefore, should be considered discrete. The 1998 Recovery Plan indicates that while genetic information may reveal that interbreeding does not occur between rivers that drain into a common estuary, at this time, such river systems are considered a single population compromised of breeding subpopulations (NMFS 1998).

Studies conducted since the issuance of the Recovery Plan have provided evidence that suggests that years of isolation between populations of shortnose sturgeon have led to morphological and genetic variation. Walsh et al. (2001) examined morphological and genetic variation of shortnose sturgeon in three rivers (Kennebec, Androscoggin, and Hudson). The study found that the HR shortnose sturgeon population differed markedly from the other two rivers for most morphological features (total length, fork length, head and snout length, mouth width, interorbital width and dorsal scute count, left lateral scute count, right ventral scute count). Significant differences were found between fish from Androscoggin and Kennebec rivers for interorbital width and lateral scute counts which suggests that even though the Androscoggin and Kennebec rivers drain into a common estuary, these rivers support discrete populations of shortnose sturgeon. The study also found significant genetic differences among all three populations indicating substantial reproductive isolation among them and that the observed morphological differences may be partly or wholly genetic.

Grunwald et al. (2002) examined mitochondrial DNA (mtDNA) from shortnose sturgeon in eleven river populations. The analysis demonstrated that all shortnose sturgeon populations examined showed moderate to high levels of genetic diversity as measured by haplotypic diversity indices. The limited sharing of haplotypes and the high number of private haplotypes are indicative of high homing fidelity and low gene flow. The researchers determined that glaciation in the Pleistocene Era was likely the most significant factor in shaping the phylogeographic pattern of mtDNA diversity and population structure of shortnose sturgeon. The Northern glaciated region extended south to the HR while the southern non-glaciated region begins with the Delaware River. There is a high prevalence of haplotypes restricted to either of these two regions and relatively few are shared; this represents a historical subdivision that is tied to an important geological phenomenon that reflects historical isolation. Analyses of haplotype frequencies at the level of individual rivers showed significant differences among all systems in which reproduction is known to occur. This implies that although higher level genetic stock relationships exist (i.e., southern vs. northern and other regional subdivisions), shortnose sturgeon appear to be discrete stocks, and low gene flow exists between the majority of populations.

Waldman et al. (2002) also conducted mtDNA analysis on shortnose sturgeon from 11 river systems and identified 29 haplotypes. Of these haplotypes, 11 were unique to northern, glaciated systems and 13 were unique to the southern non-glaciated systems. Only 5 were shared between them. This analysis suggests that shortnose sturgeon show high structuring and discreteness and that low gene flow rates indicated strong homing fidelity.

Wirgin et al. (2005) also conducted mtDNA analysis on shortnose sturgeon from 12 rivers (St. John, Kennebec, Androscoggin, Upper Connecticut, Lower Connecticut, Hudson, Delaware, Chesapeake Bay, Cooper, Peedee, Savannah, Ogeechee, and Altamaha). This analysis suggested that most population segments are independent and that genetic variation among groups was high.

The best available information demonstrates differences in life history and habitat preferences between northern and southern river systems and given the species' anadromous breeding habits, the rare occurrence of migration between river systems, and the documented genetic differences between river populations, it is unlikely that populations in adjacent river systems interbreed with any regularity. This likely accounts for the failure of shortnose sturgeon to repopulate river systems from which they have been extirpated, despite the geographic closeness of persisting populations. This characteristic of shortnose sturgeon also complicates recovery and persistence of this species in the future because, if a river population is extirpated in the future, it is unlikely that this river will be recolonized. Consequently, this Opinion will treat the nineteen separate populations of shortnose sturgeon as subpopulations (one of which occurs in the action area) for the purposes of this analysis.

Historically, shortnose sturgeon are believed to have inhabited nearly all major rivers and estuaries along nearly the entire east coast of North America. The range extended from the St John River in New Brunswick, Canada to the Indian River in Florida. Today, only 19 populations remain ranging from the St. Johns River, Florida (possibly extirpated from this system) to the Saint John River in New Brunswick, Canada. Shortnose sturgeon are large, long lived fish species. The present range of shortnose sturgeon is disjunct, with northern populations separated from southern populations by approximately 400 km. Population sizes vary across the species' range. From available estimates, the smallest populations occur in the Cape Fear (~8 adults; Moser and Ross 1995) in the south and Merrimack and Penobscot rivers in the north (~ several hundred to several thousand adults depending on population estimates used; M. Kieffer, United States Geological Survey, personal communication; Dionne 2010), while the largest populations are found in the Saint John (~18, 000; Dadswell 1979) and HRs (~61,000; Bain et al. 1998). As indicated in Kynard 1996, adult abundance is less than the minimum estimated viable population abundance of 1000 adults for 5 of 11 surveyed northern populations and all natural southern populations. Kynard 1996 indicates that all aspects of the species' life history indicate that shortnose sturgeon should be abundant in most rivers. As such, the expected abundance of adults in northern and north-central populations should be thousands to tens of thousands of adults. Expected abundance in southern rivers is uncertain, but large rivers should have thousands of adults. The only river systems supporting populations of these sizes are the St John, Hudson and possibly the Delaware and the Kennebec, making the continued success of shortnose sturgeon in these rivers critical to the species. While no reliable estimate of the size of either the total species population rangewide, or the shortnose sturgeon population in the Northeastern United States exists, it is clearly below the size that could be supported if the threats to shortnose sturgeon were removed.

3.1.1.4 Threats to shortnose sturgeon recovery rangewide

The Shortnose Sturgeon Recovery Plan (NMFS 1998) identifies habitat degradation or loss (resulting, for example, from dams, bridge construction, channel dredging, and pollutant discharges) and mortality (resulting, for example, from impingement on cooling water intake screens, dredging and incidental capture in other fisheries) as principal threats to the species' survival. Several natural and anthropogenic factors continue to threaten the recovery of shortnose sturgeon. Shortnose sturgeon continue to be taken incidentally in fisheries along the east coast and are targeted by poachers throughout their range (Dadswell 1979; Dovel et al. 1992; Collins et al. 1996). In-water or nearshore construction and demolition projects may interfere with normal shortnose sturgeon migratory movements and disturb sturgeon concentration areas.

Unless appropriate precautions are made, internal damage and/or death may result from blasting projects with powerful explosives. Hydroelectric dams may affect shortnose sturgeon by restricting habitat, altering river flows or temperatures necessary for successful spawning and/or migration and causing mortalities to fish that become entrained in turbines. Maintenance dredging of Federal navigation channels and other areas can adversely affect or jeopardize shortnose sturgeon populations. Hydraulic dredges can lethally take sturgeon by entraining sturgeon in dredge dragarms and impeller pumps. Mechanical dredges have also been documented to lethally take shortnose sturgeon. In addition to direct effects, dredging operations may also impact shortnose sturgeon by destroying benthic feeding areas, disrupting spawning migrations, and filling spawning habitat with resuspended fine sediments. Shortnose sturgeon are susceptible to impingement on cooling water intake screens at power plants. Electric power and nuclear power generating plants can affect sturgeon by impinging larger fish on cooling water intake screens and entraining larval fish. The operation of power plants can have unforeseen and extremely detrimental impacts to riverine habitat which can affect shortnose sturgeon. For example, the St. Stephen Power Plant near Lake Moultrie, South Carolina was shut down for several days in June 1991 when large mats of aquatic plants entered the plant's intake canal and clogged the cooling water intake gates. Decomposing plant material in the tailrace canal coupled with the turbine shut down (allowing no flow of water) triggered a low dissolved oxygen water condition downstream and a subsequent fish kill. The South Carolina Wildlife and Marine Resources Department reported that twenty shortnose sturgeon were killed during this low dissolved oxygen event.

Contaminants, including toxic metals, polychlorinated aromatic hydrocarbons (PAHs), pesticides, and polychlorinated biphenyls (PCBs) can have substantial deleterious effects on aquatic life including production of acute lesions, growth retardation, and reproductive impairment (Cooper 1989; Sinderman 1994). Toxins introduced to the water column become associated with the benthos and can be particularly harmful to benthic organisms (Varanasi 1992) like sturgeon. Heavy metals and organochlorine compounds are known to accumulate in fat tissues of sturgeon, but their long-term effects are not yet known (Ruelle and Henry 1994; Ruelle and Kennlyne 1993). Available data suggests that early life stages of fish are more susceptible to environmental and pollutant stress than older life stages (Rosenthal and Alderdice 1976).

Although there is scant information available on the levels of contaminants in shortnose sturgeon tissues, some research on other related species indicates that concern about the effects of contaminants on the health of sturgeon populations is warranted. Detectible levels of chlordane, DDE (1,1-dichloro-2, 2-bis(p-chlorophenyl)ethylene), DDT (dichlorodiphenyl-trichloroethane), and dieldrin, and elevated levels of PCBs, cadmium, mercury, and selenium were found in pallid sturgeon tissue from the Missouri River (Ruelle and Henry 1994). These compounds were found in high enough levels to suggest they may be causing reproductive failure and/or increased physiological stress (Ruelle and Henry 1994). In addition to compiling data on contaminant levels, Ruelle and Henry also determined that heavy metals and organochlorine compounds (i.e., PCBs) accumulate in fat tissues. Although the long-term effects of the accumulation of contaminants in fat tissues is not yet known, some speculate that lipophilic toxins could be transferred to eggs and potentially inhibit egg viability. In other fish species, reproductive impairment, reduced egg viability, and reduced survival of larval fish are associated with elevated levels of environmental contaminants including chlorinated hydrocarbons. A strong correlation that has been made between fish weight, fish fork length, and DDE concentration in pallid sturgeon livers indicates that DDE increases proportionally with fish size (NMFS 1998).

Contaminant analysis was conducted on two shortnose sturgeon from the Delaware River in the fall of 2002. Muscle, liver, and gonad tissue were analyzed for contaminants (ERC 2002). Sixteen metals, two semi-volatile compounds, three organochlorine pesticides, one PCB Aroclor, as well as polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs) were detected in one or more of the tissue samples. Levels of aluminum, cadmium, PCDDs, PCDFs, PCBs, DDE (an organochlorine pesticide) were detected in the "adverse effect" range. It is of particular concern that of the above chemicals, PCDDs, DDE, PCBs and admium, were detected as these have been identified as endocrine disrupting chemicals. Contaminant analysis conducted in 2003 on tissues from a shortnose sturgeon from the Kennebec River revealed the presence of fourteen metals, one semi-volatile compound, one PCB Aroclor, Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) in one or more of the tissue samples. Of these chemicals, cadmium and zinc were detected at concentrations above an adverse effect concentration reported for fish in the literature (ERC 2002). While no directed studies of chemical contamination in shortnose sturgeon have been undertaken, it is evident that the heavy industrialization of the rivers where shortnose sturgeon are found is likely adversely affecting this species.

During summer months, especially in southern areas, shortnose sturgeon must cope with the physiological stress of water temperatures that may exceed 28ºC. Flourney et al. (1992) suspected that, during these periods, shortnose sturgeon congregate in river regions which support conditions that relieve physiological stress (i.e., in cool deep thermal refuges). In southern rivers where sturgeon movements have been tracked, sturgeon refrain from moving during warm water conditions and are often captured at release locations during these periods (Flourney et al.1992; Rogers and Weber 1994; Weber 1996). The loss and/or manipulation of these discrete refuge habitats may limit or be limiting population survival, especially in southern river systems.

Pulp mill, silvicultural, agricultural, and sewer discharges, as well as a combination of non-point source discharges, which contain elevated temperatures or high biological demand, can reduce dissolved oxygen levels. Shortnose sturgeon are known to be adversely affected by dissolved oxygen levels below 5 mg/L. Shortnose sturgeon may be less tolerant of low dissolved oxygen levels in high ambient water temperatures and show signs of stress in water temperatures higher than 28ºC (82.4°F) (Flourney et al. 1992). At these temperatures, concomitant low levels of dissolved oxygen may be lethal.

3.1.2 Sea Turtles

The federally listed turtle species that may occur in the NYNJHAT Study Area are: the threatened Northwest Atlantic Ocean DPS of the loggerhead turtle (Caretta caretta); the endangered Kemp's ridley turtle (Lepidochelys kempi); the threatened North Atlantic DPS of green turtle (Chelonia mydas); and the endangered leatherback turtle (Dermochelys coriacea).

In general, listed sea turtles are seasonally distributed in coastal US Atlantic waters, migrating to and from habitats extending from Florida to New England, with overwintering concentrations in southern waters. As water temperatures rise in the spring, these turtles begin to move northward and reside in relatively shallow inshore waters of the northeast to take advantage of abundant forage. As temperatures begin to decline rapidly in the fall, turtles in the northeast Atlantic begin to migrate back to southern waters. Sea turtles can be expected to be migrating and opportunistically foraging in the vicinity of coastal waters when the water temperature surpasses 15° C (60° F) which typically coincides with June 1. However, the window of residence for the 4 listed species is May 1 through November 30 with the highest concentration of sea turtles present from June-October (Morreale 1999; Morreale and Standora 2005; Shoop and Kenney 1992). Southern migration begins when the water drops below 15° C. Turtles are migrating out of the NYB apex and coastal areas by the beginning of November.

Future warming ocean trends may cause this window to be expanded. Per the NMFS 2012 BO for the HDP, Ruben and Morreale (1999) completed an analysis/model of habitat suitability of the NY and NJ Harbor complex (NY-NJ Harbor) to assess the impacts of the NY-NJ Harbor Deepening Project. As described above, the NY-NJ Harbor is comprised of the Upper Bay, the Lower Bay, Raritan Bay, and Newark Bay, which all the channels under consideration for deepening were located. The model evaluated habitat suitability based on several environmental variables considered to be important for sea turtle foraging: depth, current velocity, prey density (crab and mollusks). It is thought that the availability of appropriate food and suitable nesting beaches are the two most important controlling factors of sea turtle distribution and abundance (Shoop and Kenney 1992). In the model, the likelihood a sea turtle would forage in a particular habitat dictated the designated suitability of the environmental variables. During the warmer months, most turtles in the Northeast appear to spend most of the time in waters between 16 and 49 feet. This depth was interpreted not to be as much an upper physiological depth limit for turtles, as a natural limiting depth where light and food are most suitable for foraging turtles (Morreale and Standora 1994). As the channels within the NY-NJ Harbor are proposed to be deepened to depths between 50-53 feet, the harbor channels proposed for dredging are likely too deep to be considered suitable for sea turtle foraging. Turtles usually spend most their summer foraging time in slow moving or still waters. Most of the channels in the action area are subject to strong currents (> 1 knot) and are unsuitable for foraging juvenile turtles. The deeper main channels, such as the Kill van Kull, Anchorage Channel, and Ambrose Channel, were classified as unsuitable for turtles based on their swiftly moving velocities exceeding 2.0 knots in many areas. The model also evaluated densities of crab and mollusks, the preferred prey of loggerheads and Kemp's ridleys. The Ambrose Channel was the only location within the action area that contained a high density of crabs, while several small pockets of high and/or low mollusk densities were found in the upper Newark Bay (out of the proposed dredging area) portions of the Ambrose Channel, and the Upper NY Bay.

Most of the proposed project area contained sandy substrate which is optimal for young foraging sea turtles. Considering the results of the above model, Ruben and Morreale (1999) concluded that approximately 35% of the available habitat in the NY-NJ Harbor was found to be marginally to highly suitable for sea turtles, with this percentage found in the Lower Bay of the NY-NJ Harbor. The model did not categorize any of the upper portions of the Upper Bay or Newark Bay (e.g., Kill van Kull, Arthur Kill) as optimal or suitable habitat for turtles.

This finding is consistent with no documented occurrences of sea turtles within portions of the NY-NJ Harbor located in Newark Bay, Arthur Kill, and the KVK, and the rare sightings of sea turtles in portions of the NY-NJ Harbor located in the Upper NY Harbor. Based on this information, sea turtles are not expected to be present in the portions of the action area located in Newark Bay and KVK, and thus, the effects to sea turtles in those areas will not be considered further. However, based on the model predictions of suitable habitat, the Lower Bay of the NY-NJ Harbor is the only portion of the action area in which marginal to suitable sea turtle foraging habitat may be present. As the Ambrose Channel is located within this portion of the NY-NJ Harbor, effects to foraging sea turtles may occur within this portion of the action area and are considered below.

It is unlikely that turtles are found in the majority of the NY-NJ Harbor, especially in the highly congested and trafficked channels of the Newark Bay complex. Additionally, the physical habitat characteristics in the project area do not suggest that it would represent a concentration area of or for sea turtles.

An assessment of the effects in the Anchorage Channel, Ambrose Channel, and Upper and Lower Bay (Port Jersey Channel) is included, since this is the only part of the action area likely to see turtle utilization.

3.1.3 Whales

North Atlantic right and fin whales are seasonally present in the waters off NY and NJ. These species use the nearshore, coastal waters of the Atlantic Ocean as they migrate to and from calving and foraging grounds.

Right whales in the NYB are primarily transiting the area on their way to more northerly feeding and concentration areas. During late winter and early spring, they begin moving north along the coast past Cape Hatteras and near the Long Island Coast. Individuals have been sighted along the south shore of Long Island, Block Island Sound, Gardiners Bay and south shore inlets and bays. They could be present in the southern portion of the action area year-round.

Fin whales occupy both deep and shallow waters and are one of the most abundant large cetacean in NY waters. They are most abundant in spring, summer, and fall, but do have some presence during the winter months. Therefore, fin whales could be present in the southern portion of the action area year-round.

An assessment of effects to whales in the Lower Bay (Ambrose Channel) is included since this is the only part of the action area likely to see whale utilization.

4 Existing Conditions

Environmental baselines for biological assessments refer to the condition of the listed species or its designated critical habitat in the Study Area, without the consequences to the listed species or designated critical habitat caused by the Proposed Action. The environmental baseline includes the past and present impacts of all state, federal or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR § 402.02). The environmental baseline for this project includes the consequences of several activities that may affect the survival and recovery of the listed species in the action area. The activities that shape the environmental baseline in the action area of this consultation typically include: dredging operations; vessel and fishery operations; water quality/pollution; conversion of habitat; and recovery activities associated with reducing those impacts.

4.1 Federal Actions That Have Undergone Formal or Informal Section 7 Consultation

NMFS has undertaken several ESA section 7 consultations to address the effects of actions authorized, funded, or carried out by Federal agencies. Each of those consultations sought to develop ways of reducing the probability of adverse impacts of the action on listed species. Consultations are detailed below.

4.1.1 New York and New Jersey Harbor Deepening Project (HDP)

An Opinion regarding the HDP was issued by NMFS to the USACE on October 13, 2000. The Opinion included an Incidental Take Statement (ITS) exempting the incidental taking of two (2) loggerhead, one (1) green, one (1), Kemp's ridley, or one (1) leatherback for the duration (i.e., 3 years) of the deepening, via a hopper dredge, of the Ambrose Channel. Consultation was reinitiated in 2012 and an Opinion was issued on October 25, 2012. The Opinion included an ITS exempting the incidental taking of (1), Kemp's ridley, or one (1) leatherback, and (1) Atlantic sturgeon (any DPS) for the duration of the deepening, via a hopper dredge, of the Ambrose Channel. Construction for the HDP was completed in 2016. One take of Atlantic sturgeon occurred at the Ambrose Channel under the HDP over the 12-year construction period of the project.

4.1.2 Amboy Aggregate Mining of Ambrose Channel

On October 11, 2002, NMFS issued an Opinion that considered the effects of the USACE's proposed issuance of a permit to Amboy Aggregates, Inc. for sand mining activities in the Ambrose

Channel, New Jersey. The permit authorizes sand mining activities every year for a period of ten years. NMFS concluded that the Proposed Action may adversely affect but would not likely jeopardize the continued existence of listed species of sea turtles. The 2002 Opinion included an ITS which exempted the take, via injury or mortality, of two (2) loggerhead, one (1) green, one (1) Kemp's ridley, or one (1) leatherback sea for the ten-year duration of the permit. On July 23, 2012, the USACE started coordination to reinitiate this consultation to re-authorize the project for another 10 years. On May 20, 2013, NMFS concluded that the re-authorization of the project was not likely to adversely affect ESA-listed species. Therefore, this project currently no longer has an ITS.

4.1.3 Tappan Zee Bridge Replacement

An Opinion regarding the Tappan Zee Bridge Replacement was issued by NMFS to the Federal Highway Administration (FHWA) on January 4, 2017. The Opinion included an Incidental Take Statement (ITS) exempting the incidental taking of six (6) sturgeon (combination of shortnose and Atlantic sturgeon; New York Bight (NYB) DPS and no more than one from Chesapeake Bay DPS or Gulf of Maine (GOM) DPS) will be struck and killed by a project vessel over the remaining years of the project (2017 to 2019). NMFS expected five of these sturgeon to be killed in the vessel impact area (two in 2017, two in 2018 and one in 2019), and one to be killed by a disposal vessel operating in the Hudson River either upstream or downstream of the vessel impact area. In addition, this Opinion authorized injury due to exposure to pile driving noise to three (3) shortnose sturgeon (juvenile or adult) and up to three (3) Atlantic sturgeon. These three Atlantic sturgeons are expected to be either three NYB DPS (juvenile, subadult, or adult) or two NYB DPS (juvenile, subadult, or adult) and one GOM DPS (subadult or adult) or one Chesapeake Bay DPS (subadult or adult).

4.1.4 Federally Authorized Fisheries Through Fishery Management Plans

NMFS authorizes the operation of several fisheries in the action area under the authority of the Magnuson-Stevens Fishery Conservation Act and through Fishery Management Plans (FMP) and their implementing regulations. Fisheries that operate in the action area that may affect ESA listed species include: American lobster, Atlantic bluefish, Atlantic herring, Atlantic mackerel/squid/butterfish, Atlantic sea scallop, monkfish, northeast multispecies, spiny dogfish, surf clam/ocean quahog, and summer flounder/scup/black sea bass. Section 7 consultations have been completed on these fisheries to consider effects to ESA listed species.

In the Northwest Atlantic, NMFS Greater Atlantic Regional Fisheries Office (GARFO) manages federal fisheries from Maine to Cape Hatteras, North Carolina; however, the management areas for some of these fisheries range from Maine through Virginia, while others extend as far south as Key West, Florida. The NMFS Southeast Regional Office (SERO) manages federal fisheries from Cape Hatteras, North Carolina to Texas, including Puerto Rico and the U.S. Virgin Islands.

Fisheries managed by NMFS GARFO and SERO overlap in some parts of the NYNJHAT Study Area.

Both regions have conducted ESA section 7 consultation on all federal fisheries authorized under an FMP or ISFMP. NMFS SERO has formally consulted on the following fisheries that could potentially occur in the action area: (1) coastal migratory pelagics (NMFS 2015, NMFS 2017a); and (2) pelagic longline Atlantic highly migratory species (NMFS 2020b). NMFS GARFO has formally consulted on the following fisheries that could potentially occur in the action area: American lobster, northeast multispecies, monkfish, spiny dogfish, Atlantic bluefish, Atlantic mackerel/squid/butterfish, and summer flounder/scup/black sea bass fisheries (inclusive of the NEFMC Omnibus EFH Amendment 2) (GARFO batched fisheries; NMFS 2021c) and Atlantic sea scallop fishery (NMFS 2021b). In these past Opinions, only those on the GARFO batched fisheries and Atlantic sea scallop fisheries (NMFS 2021c, b) concluded that there was a potential for collisions between fishing vessels and an ESA-listed species (specifically, sea turtles). Any consequences to their prey and/or habitat were found to be insignificant and discountable. NMFS determined that the GARFO Atlantic herring and Atlantic surfclam and ocean quahog fisheries are not likely to adversely affect any ESA-listed species or designated critical habitats.

Impacts to Sea Turtles Each of the most recent GARFO and SERO fishery consultations noted above have considered adverse consequences to loggerhead, Kemp's ridley, green, and leatherback sea turtles. In each of the fishery Opinions, NMFS concluded that the ongoing actions were likely to adversely affect but was not likely to jeopardize the continued existence of any sea turtle species. Each of these Opinions included an ITS exempting a certain amount of lethal or non-lethal take resulting from interactions with the fisheries. These ITSs are summarized below (Table 4-1). Unless specifically noted, all numbers denote an annual number of captures that may be lethal or non-lethal. The NEFSC has estimated the take of sea turtles in scallop dredge, bottom trawl, and sink gillnet gear in the Greater Atlantic Region (Table 4-2). Each of these estimates was used in developing the ITS for the two current GARFO fishery Opinions (Atlantic sea scallop and batched fisheries).

Table 4-1. Most recent Opinions prepared by NMFS GARFO and SERO for federally managed fisheries in the action area and their respective ITSs for sea turtles

Fishery Management Plan	Date	Loggerhead (NWA DPS)	Kemp's ridley	Green (North Atlantic DPS)	Leatherback
GARFO					
Atlantic sea scallop	June 17, 2021	1,095 (385 lethal) over a 5-year period in dredge gear; 13 (6 lethal)	28 (11 lethal) over a 5-year period in dredge	1 (1 lethal) over a 5-year period in dredge gear; 1 (1	1 (1 lethal) over a 5-year period in dredge gear; 1 (1 lethal) over

		over a 5-year period in bottom trawl gear; up to 2 (2 lethal) over a 5-year period due to vessel strikes	gear; 2 (1 lethal) over a 5-year period in bottom trawl gear; up to 2 (2 lethal) over a 5-year period due to vessel strikes	lethal) over a 5-year period in bottom trawl gear; up to 2 (2 lethal) over a 5-year period due to vessel strikes	a 5-year period in bottom trawl gear; up to 2 (2 lethal) over a 5-year period due to vessel strikes
American Lobster, Atlantic Bluefish, Atlantic DeepSea Red Crab, Mackerel/Squid/Butterfish, Monkfish, Northeast Multispecies, Northeast Skate Complex, Spiny Dogfish, Summer Flounder/Scup/Black Sea Bass, and Jonah Crab Fisheries and Omnibus EFH Amendment 2 (Batched Fisheries)	May 27, 2021	1,995 (1,289 lethal) over a 5-year period in trawl, gillnet, and pot/trap gear; up to 3 (3 lethal) over a 5-year period due to vessel strikes	292 (214 lethal) over a 5-year period in trawl and gillnet gear; up to 3 (3 lethal) over a 5-year period due to vessel strikes	42 (24 lethal) over a 5-year period in trawl and gillnet gear; up to 3 (3 lethal) over a 5-year period due to vessel strikes	142 (93 lethal) over a 5-year period in trawl, gillnet, and pot/trap gear; up to 3 (3 lethal) over a 5-year period due to vessel strikes
SERO					
Coastal migratory pelagics*	June 18, 2015, later amended 2017	27 over 3 years (7 lethal)	8 over 3 years (2 lethal)	31 over 3 years (9 lethal)	1 over 3 years (1 lethal)
HMS, pelagic longline	May 15, 2020	1080 (280 lethal) over 3 years	21 (8 lethal) combination of Kemp's ridley, green (includes NA and SA DPS), hawksbill, or olive ridley over 3 years		996 (275 lethal) over 3 years
* The coastal migratory pelagic consultation states a total of 31 green sea turtle takes of both DPSs combined is expected, but no more than 30 from the North Atlantic DPS and no more than two from the South Atlantic DPS.					

Table 4-2. Estimates of average annual turtle interactions in in scallop dredge, bottom trawl, and sink gillnet fishing gear. Numbers in parentheses are adult equivalents.

Gear	Years	Area	Estimated Interactions (Adult Equivalents)	Mortalities (Adult Equivalents)	Source
Sea Scallop Dredge	2015-2019	Mid-Atlantic	Loggerhead: 155 (31)	Loggerhead: 52 (11)	Murray (2021)
Bottom Trawl	2014-2018	Mid-Atlantic and Georges Bank	Loggerhead: 116.6 (36.4) Kemp's ridley:9.2 Green: 3.2 Leatherbacks: 5.2	Loggerhead: 54.4 (17.4) Kemp's ridley: 4.6 Green: 1.6 Leatherbacks:2.6	Murray (2020)
Sink Gillnet	2012-2016	Mid-Atlantic	Loggerhead: 141 (3.8) Kemp's ridley: 29 Leatherbacks: 5.4 Unid. hardshell: 22.4	Loggerhead: 111.4 Kemp's ridley: 23 Leatherbacks: 4.2 Unid. hardshell: 17.6	Murray (2018)

The anticipated take of sea turtles for the two GARFO Opinions in Table 4-1 includes gear interactions in federal waters by federally-permitted vessels, as well as vessel collision interactions in federal and state waters. It should be noted that the distribution and likelihood of observed sea turtle takes are highly variable such that interactions in some years could be higher if greater fishing effort is expended (due to less travel time and ease of access to a wider range of vessels) or sea turtles are present in greater numbers in those waters. The amount of observer coverage allocated to different areas may also be a factor in how many sea turtle interactions are documented in certain waters for these fisheries.

Impacts to Atlantic sturgeon

Commercial fisheries that operate in the action area for this consultation capture and kill Atlantic sturgeon originating from each of the five listed DPSs. Given this, consultations on fisheries in the Greater Atlantic and Southeast Regions consider the take of Atlantic sturgeon (Table 4-3). In a review of bycatch rates on fishing trips from 1989 to 2000, Atlantic sturgeon were recorded in both gillnet and trawl gears, and bycatch rates varied by gear type and target species. Bycatch was highest for sink gillnets in specific areas of the coast. Mortality was higher in sink gillnets than trawls (Stein et al. 2004a). More recent analyses were completed in 2011 and 2016. In 2011, the NEFSC prepared a bycatch estimate for Atlantic sturgeon captured in federally managed commercial sink gillnet and otter trawl fisheries from Maine through Virginia. This estimate indicated that from 2006-2010, an annual average of 3,118 Atlantic sturgeon were captured in these fisheries with 1,569 in sink gillnet and 1,548 in otter trawls. The mortality rate in sink gillnets was estimated at approximately 20 percent and the mortality rate in otter trawls was estimated at five percent. Based on this estimate, 391 Atlantic sturgeon were estimated to be killed annually in federal fisheries in the Greater Atlantic Region (Miller and Shepard 2011). An updated, although unpublished, Atlantic sturgeon bycatch estimate in Northeast sink gillnet and otter trawl fisheries for 2011-2015 was prepared by the NEFSC in 2016. Using this information, the authors of the recent Atlantic Sturgeon Benchmark Stock Assessment (ASMFC 2017) estimated that 1,139 fish (295 lethal; 25 percent) were caught in gillnet fisheries and 1,062 fish (41 lethal; 4 percent) were caught in otter trawl fisheries each year from 2000-2015. Atlantic sturgeon bycatch estimates for Northeast gillnet and trawl gear from 2011-2015 (approximately 761 fish per year for gillnets, 777 for trawls) are substantially lower than those from 2006-2010 (approximately 1,074 fish per year for gillnets, 1,016 for trawls) (ASMFC 2017). It should be noted that the models used in 2011 and 2016 differed. The 2011 analysis used a generalized linear model. In this model, the species mix considered comprises those species currently managed under a federal FMP. In the model used in the 2017 ASMFC stock assessment, the species considered as covariates were those species caught most on observed hauls encountering Atlantic sturgeon (ASMFC 2017).

Table 4-3. Most recent Opinions prepared by NMFS GARFO and SERO for federally managed fisheries in the action area that result in takes of the five DPSs of Atlantic sturgeon and their respective ITSs.

Fishery Management Plan	Date	Gulf of Maine DPS	New York Bight DPS	Chesapeake Bay DPS	Carolina DPS	South Atlantic DPS
GARFO						
American Lobster, Atlantic Bluefish, Atlantic Deep-Sea Red Crab, Mackerel/Squid/Butterfish, Monkfish, Northeast Multispecies, Northeast Skate Complex, Spiny Dogfish, Summer Flounder/Scup/Black Sea Bass, and Jonah Crab Fisheries and Omnibus EFH Amendment 2 (Batched Fisheries)	May 27, 2021	615 (75 lethal) over a 5-year period in trawl and gillnet gear	5,020 (590 lethal) over a 5-year period in trawl and gillnet gear	755 (85 lethal) over a 5-year period in trawl and gillnet gear	180 (20 lethal) over a 5-year period in trawl and gillnet gear	395 (45 lethal) over a 5-year period in trawl and gillnet gear
Atlantic sea scallop	June 17, 2021	5 takes over a 5-year period in scallop dredge or trawl gear from any of the five DPSs (one lethal take every 20 years from any of the five DPSs)				
SERO						
Coastal migratory pelagics	June 18, 2015	2 (12)* every 3 years; 0 lethal	4 (12)* every 3 years; 0 lethal	3 (12)* every 3 years; 0 lethal	4 (12)* every 3 years; 0 lethal	10 (12)* every 3 years; 0 lethal
* The coastal migratory pelagics Opinion estimates a total take of 12 Atlantic sturgeon across all five DPSs. The Opinion considered the percent each DPS, presented as a range, is expected to be in the action area. To be conservative, the Opinion considered the high end of the range in apportioning take between DPSs, which is the number before each parenthesis (i.e., the number before the parenthesis is the maximum number of individuals per						

DPS that may be taken that would not trigger reinitiation). However, in total, no more than 12 Atlantic sturgeon are anticipated to be taken in the fishery every three years (NMFS 2015, 2017a).

At this time, fisheries regulated by NMFS SERO for which a bycatch estimate is available for Atlantic sturgeon and could overlap in the action area is coastal migratory pelagic fishery. In their 2015 Opinion, NMFS SERO estimated a total of 12 non-lethal interactions every three years as a result of the fishery. The level of interactions and mortality were expected to be greatest within the SA DPS, followed by the Carolina and NYB, CB, and GOM DPSs. Other fisheries in the Southeast Region that operate with sink gillnets or otter trawls are also likely to interact with Atlantic sturgeon and be an additional source of mortality in the action area.

4.1.5 Research and Other Permitted Activities

NMFS Northeast Fisheries Science Center In June 2016, NMFS completed a programmatic Opinion (NMFS 2016a) on all fisheries and ecosystem research activities to be conducted and funded by the NEFSC from June 2016 to June 2021. Based on the information presented in the Opinion, NMFS anticipated that these fisheries and ecosystem research projects, over the five-year period, would result in the capture of:

- up to 85 NWA DPS of loggerhead sea turtles (ten lethal);
- up to 95 Kemp's ridley sea turtles (15 lethal);
- up to 10 North Atlantic DPS of green sea turtles (non-lethal);
- up to 10 leatherback sea turtles (five lethal);
- up to 10 shortnose sturgeon (one lethal);
- up to 595 Atlantic sturgeon (30 lethal) o up to 308 from the NYB DPS (15 lethal),
    - up to 130 from the SA DPS (seven lethal),
    - up to 70 from the CB DPS (four lethal),
    - up to 60 from the GOM DPS (three lethal),
    - up to 14 from the Carolina DPS (one lethal), and
    - o up to 13 Canadian origin (non-listed); and
- up to five Gulf of Maine DPS Atlantic salmon (two lethal).

That Opinion has recently been replaced with a programmatic Opinion (completed in October 2021) (NMFS 2021a) on all fisheries and ecosystem research activities to be conducted or funded by the NEFSC over a five-year period from October 2021 through October 2026. Based on the information presented in the Opinion, NMFS anticipated that these fisheries and ecosystem research projects, over the five-year period, would result in the capture of:

- up to 85 NWA DPS loggerhead sea turtles (up to ten lethal);
- up to 95 Kemp's ridley sea turtles (up to 15 lethal);
- up to ten North Atlantic DPS green sea turtles (up to one lethal);
- up to ten leatherback sea turtles (up to five lethal);
- up to ten shortnose sturgeon (up to one lethal);
- up to 595 Atlantic sturgeon (up to 30 lethal)
    - up to 425 from the New York Bight DPS (up to 21 lethal),
    - up to 130 from the Chesapeake Bay DPS (up to three lethal),
    - up to 52 from the Gulf of Maine DPS (up to three lethal),
    - up to 33 from the South Atlantic DPS (up to two lethal),
    - up to 15 from the Carolina DPS (up to one lethal),
    - up to 6 Canadian origin (non-listed);
- up to six Gulf of Maine DPS Atlantic salmon (up to two lethal).

U.S. FWS Funded State Fisheries Surveys

Under the Dingell-Johnson Sport Fish Restoration Grant program and State Wildlife Grant programs, the U.S. FWS Region 5 provides an annual apportionment of funds to 13 Northeast states and the District of Columbia. Vermont and West Virginia are the only two Northeast states that do not use these funds to conduct surveys in marine, estuarine, or riverine waters where ESA-listed species under NMFS jurisdiction are present. The 11 other states (Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia) and the District of Columbia are anticipated to carry out a total of 113 studies, mostly on an annual basis, under these grant programs. There are several broad categories of fisheries surveys including: hook and line; long line; beach seine; haul seine; bottom trawl; surface trawl; fishway trap; fish lift; boat, backpack, and/or barge electrofishing; fyke net; dip net; gill net; push net; hoop net; trap net; cast net; plankton net; pound net; and fish and/or eel pot/trap. These surveys occur in rivers, bays, estuaries, and nearshore ocean waters of those 11 states and the District of Columbia.

NMFS completed an Opinion on this grant program in October 2018 (NMFS 2018c). It bundled together twelve independent actions carried out by the U.S. FWS (i.e., awarding of each grant fund to each state or district is an independent action) and provided an ITS by activity and a summary by state. Overall, NMFS anticipates that the surveys described in the Opinion, which will be carried out by the states from 2018 to 2022 will result in the capture of:

- Up to 37 sea turtles;
- Up to 55 shortnose sturgeon (including eight in beach/haul seine studies, one in the Westfield River fish passage facility, ten in bottom trawl studies, two in gill net studies, and 34 interactions during electrofishing activities); and
- Up to 427 Atlantic sturgeon (including two in beach/haul seine studies, 266 in bottom trawl studies, 158 in gill net studies, and one interaction during electrofishing activities).

The only mortalities that NMFS anticipate to occur are six Atlantic sturgeon (originating from any of the five DPSs) during gillnet surveys carried out by New York, New Jersey, Maryland, and Virginia.

Section 10(a)(1)(A) Permits

NMFS has issued research permits under section 10(a)(1)(A) of the ESA, which authorizes activities for scientific purposes or to enhance the propagation or survival of the affected species. The permitted activities do not operate to the disadvantage of the species and are consistent with the purposes of the ESA, as outlined in section 2 of the Act. Active section 10(a)(1)(A) permits for sea turtles (Table 4-4) and sturgeon (Table 4-5) that are occurring in the action area are provided below. NMFS searched for research permits on the NMFS online application system for Authorization and Permits for Protected Species. The search criteria used confined our search to active permits that include take of sea turtles and sturgeon in New York and New Jersey waters. However, many research activities include a larger area of the Atlantic Ocean, and the requested take did not always specify the waters where take would occur. Thus, some of the requested take in the tables below include take for activities outside of the action area (i.e., mid-Atlantic coastal waters in general)The requested take reported in Table 4-4 and Table 4-5 only includes take authorized under section 10(a)(1)(A) of the ESA. Permits relating to stranding and salvage programs are described in that section. In addition, research projects may include take authorized under other authorities (e.g., under section 7 of the ESA). These takes are presented elsewhere in this Opinion and, therefore, are not included here to avoid double counting of take provided under the ESA.

Table 4-4. Active section 10(a)(1)(A) permits within the action area that authorize take of sea turtles for scientific research.

Permittee	File Number	Project	Area	Sea Turtle Takes	Research Timeframe
NMFS Northeast Fisheries Science Center	17225	Conservation engineering to reduce sea turtle and Atlantic sturgeon bycatch in fisheries in the Northeast Region	U.S. locations including offshore waters	Over the course of the permit: Northern area (NH to NC): 8 green, 8 Kemp's, 8 leatherbacks, 26 loggerheads; no lethal (capture covered under other authorities) over the course of the permit Southern area (SC to GA): 10 green, 8 hawksbill, 62 Kemp's, 8 leatherback, 148 loggerhead. Unintentional (incidental) mortality: 6 unidentified	5 years, 01/01/2017 to 12/31/2021
NMFS Northeast Fisheries Science Center	20197	Biological sampling of incidentally caught sea turtles, during commercial fishing operations, by Northeast Fisheries Science Center (NEFSC) certified observers	US Locations including offshore waters	Totals for all fisheries and gear types: Loggerhead - 1,025 Leatherback - 49 Kemp's ridley - 14 Green - 25	6 years, 01/10/2017 to 01/15/2022
Robert DiGiovanni Jr, Atlantic Marine Conservation Society	20294	Marine mammal and sea turtle surveys to assess seasonal abundance and distribution in the Mid-Atlantic region.	Atlantic Ocean / Focal area: New York Bight and surrounding waters; Research can occur off MA, RI, CT, NY, NJ, DE, MD, VA and NC	Aerial Surveys: 125 Kemp's ridley, leatherback 85, 450 loggerhead, 450 unidentified.	5 years, 06/02/2017 to 06/01/2022
NMFS Southeast Fisheries Center (SEFSC)	20339	Application for a scientific research and enhancement permit under the ESA; development and testing of gear aboard commercial fishing vessels.	Project A: Turtle Excluder Device (TED) Evaluations in Atlantic and Gulf of Mexico Trawl Fisheries Project B research will occur solely within longline commercial fisheries where the incidental capture is already authorized by an existing ESA Section 7	Project A, annual take numbers: 220 (70 of these to include capture) loggerheads, 105 (25 of these captures) Kemp's ridleys, 85 (20 of these captures) leatherbacks, 50 (15 of these captures) greens, 30 (10 of these captures) hawksbills, 30 (10 of these captures) olive ridleys, and 75 (25 of these captures) unidentified/hybrid turtles. A subset of these animals will be captured during trawl research authorized under this permit as noted in the parentheses; the rest of the turtles will be captured within fisheries managed by	5 years, 05/23/2017 to 05/31/2022

			biological opinion.	federal authority. Project B, annual take numbers: 30 loggerheads, 10 Kemp's ridleys, 30 leatherbacks, 10 greens, 10 hawksbills, 10 olive ridleys, and 10 unidentified/hybrid turtles. Total over 5 yrs., unintentional mortality: 2 green, 1 hawksbill, 2 Kemp's, 1 leatherback, 3 loggerhead, and 1 olive.	
Virginia Aquarium and Marine Science Center	20561	2018 Renewal Request for Virginia Aquarium Sea Turtle Research Permit	Atlantic Ocean, Long Island Sound, Delaware Bay, Chesapeake Bay, North Carolina Sounds / Estuarine and ocean waters from shore to the continental shelf off of NY, NJ, DE, MD, VA and northern NC including inshore brackish waters of bays, sounds and river mouths	Up to 72 turtles annually (25 green, 22 Kemp's ridley, 25 loggerhead) would be captured, sampled, and tagged. Up to one leatherback sea turtle may be opportunistically captured, sampled, and tagged. 18 turtles will be captured under other authority annually (5 green, 8 Kemp's, and 5 loggerhead)	10 years, 08/24/2018 to 09/30/2027
New England Aquarium	21301	Distribution, movements, behavior, physiology, genetics, health and habitat use of leatherback sea turtles in the NW Atlantic	US Locations including offshore waters	Annual take for Project 1: capture, measure, weigh, flipper/PIT tag, tissue biopsy, blood sample, opportunistic fecal and urine sample, attach instrument (satellite/acoustic transmitter), release, recapture (for gear removal if necessary), and photograph/video up to 10 leatherbacks. Annual take for Project 2: attach instrument (camera/TDR/VHF/acoustic transmitter/AUV transponder), tracking (with AUV or vessel), recapture (for gear removal if necessary), and photograph/video up to 20 leatherbacks. Annual take for Unmanned Aerial System (UAS) work: observe, photograph/video up to 50 turtles (based on known aggregation sizes of this species in our study region)	10 years, 03/09/2018 to 09/30/2027

Coonamessett Farm Foundation, Inc.	23639	Coonamessett Farm Foundation Sea Turtle Ecology Program	US Locations including offshore waters	Annually, capture, sample, and tag 30 loggerhead, 30 leatherback, 15 Kemp's ridley, and 15 green sea turtles; document observations in-water of 60 loggerheads, 60 leatherbacks, 45 Kemp's ridley, and 45 green sea turtles using techniques including videography, aerial surveys, and PIT scans; and harass (i.e., through failed capture attempts) 60 loggerheads, 60 leatherbacks, 45 Kemp's ridey, and 45 green sea turtles. For unidentified turtles, 10 annual harass takes for pursuit and unsuccessful capture attempts and 20 annual in-water observation harass takes (i.e., videography and aerial survey).	10 years, 09/25/2020 to 09/30/2030
NMFS Southeast Fisheries Center (SEFSC)	24368	SEFSC Observer Program Sea Turtle Research from Specimens taken in Commercial Fisheries in the Gulf of Mexico and off the East Coast of the United States, and Oil / Gas Platform Removal Programs in the Gulf of Mexico	US Locations including offshore waters International waters Foreign Countries including territorial waters	A maximum of 111 green, 490 loggerhead, 260 Kemp's ridley, 31 hawksbill, 117 leatherback, 20 olive ridley, and 23 combined species/unidentified/hybrid live turtles will be sampled annually, as distributed per fishery in the take tables. Additional samples from incidental mortalities also will be collected (20 green, 56 loggerhead, 18 Kemp's ridley, 9 hawksbill, 25 leatherback, 2 olive ridley, and 59 combined species/unidentified/hybrid	10 years, 09/22/2021 to 09/30/2031

Table 4-5. Active section 10(a)(1)(A) permits within the action area that authorize take of Atlantic sturgeon for scientific research.

Permittee	File Number	Project	Area	Atlantic Sturgeon Takes	Research Timeframe
NMFS Northeast Fisheries Science Center	17225	Conservation engineering to reduce sea turtle and Atlantic sturgeon bycatch in fisheries in the Northeast Region	Western Atlantic waters (Massachusetts through Georgia, including inside COLREGs lines).	Northern area (NH to NC): Non-lethal – 223 sub-adult/adult (capture under other authority) over the course of the permit Southern area (SC to GA): Non-lethal: 204 juvenile/sub-adult/adult over the course of the study Unintentional (incidental) mortality: 6 juvenile/sub-	5 years, 01/01/2017 to 12/31/2021

				adult/adult over the course of the permit	
Stony Brook University	20351	Atlantic and Shortnose Sturgeon Population Dynamics and Life History in New York and Coastal Marine and Riverine Waters	New York (Long Island Sound), New Jersey, Delaware	685 (up to 30 lethal) juveniles, sub-adults, adults annually	10 years, 02/27/2016-03/31/2027
Delaware State University	20548	Reproduction, habitat use, and inter-basin exchange of Atlantic and Shortnose Sturgeons in the mid-Atlantic	Coastal New York, New Jersey, Delaware	600 (up to 1 lethal) juvenile, sub-adult, and adult annually	10 years, 03/31/2017-03/31/2027
NMFS Headquarters	24016	Chesapeake Bay Atlantic and shortnose sturgeon population dynamics, metapopulation analysis, and phenological assessment of reproductive ecology	US Locations including offshore waters	Year-round sampling (i.e., handle, measure, mark, sample, telemeter and release) of 50 adult and sub-adult and 50 juvenile Atlantic sturgeon incidentally captured in other permits or authorized projects.	10 years, 01/28/2021 to 01/31/2031

Section 10(a)(1)(B) Permits Section

10(a)(1)(B) of the ESA authorizes NMFS, under some circumstances, to permit nonfederal parties to take otherwise prohibited fish and wildlife if such taking is "incidental to, and not the purpose of carrying out otherwise lawful activities" (50 CFR 217-222). As a condition for issuance of a permit, the permit applicant must develop a conservation plan that minimizes negative impacts to the species. Active permits and permit applications are posted online for all species as they become available at https://www.fisheries.noaa.gov/national/endangered-species-conservation/incidental-takepermits. Most coastal Atlantic states are either in the process of applying for permits or considering applications for state fisheries. NMFS is actively working with several states and other parties on section 10(a)(1)(B) permits; however to date no section 10(a)(1)(B) permits have been authorized for New York or New Jersey state fisheries.

4.1.6 Operations of Vessels Carrying out Federal Actions

Potential sources of adverse consequences to sea turtles and Atlantic sturgeon from federal vessel operations in the action area include operations of the US Navy (USN), the U.S. Coast Guard (USCG), Bureau of Ocean Energy Management (BOEM), Maritime Administration (MARAD), Environmental Protection Agency (EPA), NOAA, and USACE vessels. NMFS has previously conducted formal consultations with the Navy and USCG on their vessel-based operations. NMFS has also conducted section 7 consultations with BOEM and MARAD on vessel traffic related to energy projects and has implemented conservation measures. Through the section 7 process, where applicable, NMFS has and will continue to establish conservation measures for federal vessel operations to avoid adverse consequences to listed species.

4.1.7 Military Operations

NMFS has completed consultations on individual Navy and USCG activities (see https://www.fisheries.noaa.gov/national/endangered-species-conservation/biological-opinions). In the U.S. Atlantic, the operation of USCG boats and cutters are estimated to take no more than one individual sea turtle, of any species, per year (NMFS 1995, 1998b).

In 2018, NMFS issued an Opinion on the U.S. Navy Atlantic Fleet's military readiness training and testing activities and the promulgation of regulations for incidental take of marine mammals (NMFS 2018a). The action area includes the Gulf of Mexico and the western Atlantic. NMFS concluded that the action is not likely to jeopardize the continued existence of NWA DPS loggerhead, leatherback, Kemp's ridley, or North Atlantic DPS green sea turtles and Atlantic sturgeon (Gulf of Maine, New York, Chesapeake Bay, Carolina, and South Atlantic DPSs). For this Opinion, NMFS anticipated the following takes from harm due to exposure to impulsive and non-impulsive acoustic stressors annually: 97 NWA DPS loggerhead, 24 leatherback, five Kemp's ridley, and six North Atlantic DPS green sea turtles. In addition, two lethal takes of loggerhead sea turtles were anticipated. Other sea turtle takes from these stressors are expected to be in the form of harassment. Takes from vessel strikes were anticipated to include the lethal take annually of 75 loggerhead, five leatherback 20 Kemp's ridley, and 55 green sea turtles. Eleven loggerhead, three leatherback, five Kemp's ridley, and four green sea turtles were anticipated to have non-lethal injuries. For vessel strikes, the Opinion also anticipates the take of no more than six Atlantic sturgeon (up to one from the Gulf of Maine DPS, one from the New York Bight DPS, six from the Chesapeake Bay DPS, six from the Carolina DPS, and one from the South Atlantic DPS) combined from all DPSs over a five-year period. The ITS did not specify the amount or extent of take from acoustic stressors of ESA-listed fish, but rather used a surrogate expressed as a distance to reach consequences in the water column with injury and sub-injury from acoustic stresses. In addition to takes due to acoustic stressors and vessel strikes, take was estimated to occur as a result of small and large ship shock trials. Forty-one (41) NWA DPS loggerhead, 17 leatherback, four Kemp's ridley, and two North Atlantic DPS green sea turtles are anticipated to be harmed over the course of the action. In addition, two lethal takes of loggerheads were estimated.

4.1.8 Offshore Oil and Gas

BOEM oversees leasing of Outer Continental Shelf (OCS) energy and mineral resources; this includes administering the leasing program for OCS oil and gas resources. Currently, BOEM is working under the 2017-2022 National OCS Program, but has initiated a process to develop a program for 2019-2024. No lease sales are scheduled for the Atlan20ctic OCS under the current plan. Under the proposed plan, BOEM has divided the Atlantic OCS into four planning areas: North Atlantic, Mid Atlantic, South Atlantic, and Straits of Florida Planning Areas. The action area overlaps with one of the four Planning Areas (North Atlantic). The draft proposed program for leasing, published in 2018, calls for leasing in the North Atlantic Planning Area in 2021, 2023 and 2025. At this time, the proposed program has not been approved or finalized.

4.1.9 Offshore Disposal at the HARS Site

Over the past century, dredged material from the Port of New York and New Jersey was routinely disposed of at the Mud Dump Site (MDS), which is located within the current HARS site (i.e., located 5.6 km (3.5 miles) east of Sandy Hook, New Jersey). The EPA formally designated the MDS as an "interim" ocean dredged material disposal site in 1973 and gave it final designation in 1984. On September 29, 1997, EPA under 40 CFR §228, closed MDS and simultaneously re-designated the site and surrounding areas that were used historically as disposal sites for contaminated dredged material as the HARS and proposed that the site be managed to reduce impacts to acceptable levels (in accordance with 40 CFR §228.1(c)) (62 FR 46142) through remediation with uncontaminated dredged material (Remediation Material). EPA published final rule 67 FR 62659 on March 17, 2003, to modify the designation of the HARS to establish a HARS-specific worm tissue polychlorinated biphenyl (PCB) criterion of 113 parts per billion (ppb) for use in determining the suitability of proposed dredged material for use as Remediation Material. This amendment to the HARS designation established a pass/fail criterion for evaluating PCBs in worm tissue from bioaccumulation tests performed on dredged material proposed for use at HARS as Remediation Material (USACE and EPA 2010). Pursuant to NEPA, EPA Region 2 prepared a Supplement to the Environmental Impact Statement (SEIS) on the Dredged Material Disposal Site Designation for the Designation of the HARS in 1997 (EPA 1997). EPA prepared a BA that concluded that the closure of the Mud Dump Site and designation of the HARS was not likely to adversely affect loggerhead and kemps ridley sea turtles and humpback and fin whales (EPA 1997). Special conditions are included in USACE Section 103 permits for placement of Remediation Material at HARS that requires the presence of NMFS approved Endangered Species Observer(s) on disposal scows during their trips to the HARS. The role of these observers is to prevent adverse impacts to endangered or threatened species transiting the area between the proposed dredge site and the HARS. In a letter dated July 30, 1997, NMFS concurred with the EPA's determination and noted that while the BA did not consider right whales, our conclusions also applied to right whales. On August 21, 2012, EPA requested re-initiation of consultation pursuant to Section 7 of the ESA of 1973, as amended, on the continued usage of the HARS, because of the listing of a new species (five distinct population segments (DPSs) of Atlantic sturgeon) on February 6, 2012. On September 21, 2012, NMFS issued a letter to the EPA concurring with their determination that continued disposal operations, including transport of material from dredge sites to the HARS site, were not likely to adversely affect any listed species under our jurisdiction (i.e., NMFS listed species of sea turtles, Atlantic sturgeon, and whales). As

Section 7 consultation has previously been conducted on HARS disposal operations and no new information is available which changes the previous conclusion, no further consultation regarding the disposal of material at the HARS is necessary and will not be considered further in this document.

4.1.10 Artificial Reefs

Existing reefs are already permitted and are covered by ESA Section 7 consultations to receive rock from Federal Navigation projects. One of the most recent ESA consultations was completed on April 30, 2021, which determined that the consequences of the continued use, expansion, and creation of the Rockaway, McAllister Grounds, Fire Island, Moriches, Shinnecock, Atlantic Beach, Hempstead, Sixteen Fathom, Twelve Mile, Yellowbar, Kismet, Matinecock, Huntington/Oyster Bay, Smithtown, Port Jefferson/Mount Sinai, and Mattituck artificial reefs are not likely to adversely affect ESA-listed species. Therefore, the consequences of artificial reef placement will not be considered further. If new reefs are proposed for use by the states, they will be similarly permitted, including all necessary compliance with all environmental federal statutes including initiating an ESA consultation, in order to receive any rock from the proposed federal action.

4.2 State or Private Activities in the NYNJHAT Study Area

4.2.1 Non-Federally Regulated Fishery Operations

State fisheries do operate in the state waters of New York and New Jersey. Little is known about the level of interactions with listed species in fisheries that operate strictly in state waters. Impacts on ESA listed species from state fisheries may be greater than those from federal activities in certain areas due to the distribution of these species in these waters. Depending on the fishery in question, however, many state permit holders also hold federal licenses; therefore, section 7 consultations on federal actions in those fisheries address some state-water activity.

NMFS is actively participating in a cooperative effort with the Atlantic States Marine Fisheries Commission (ASMFC) and member states to standardize and/or implement programs to collect information on level of effort and bycatch of protected species in state fisheries. When this information becomes available, it can be used to refine take reduction plan measures in state waters.

4.3 Other Activities

4.3.1 Contaminants, Pollution, and Water Quality

Anthropogenic sources of marine pollution, while difficult to attribute to a specific federal, state, local, or private action, may affect ESA-listed species in the action area. Dredging and point source discharges (i.e., municipal wastewater, industrial or power plant cooling water or waste water) and compounds associated with discharges or released from the sediments during dredging operations (i.e., metals, dioxins, dissolved solids, phenols, and hydrocarbons) contribute to poor water quality and may also impact the health of sturgeon populations. The compounds associated with discharges can alter the pH or dissolved oxygen levels of receiving waters, which may lead to mortality, changes in fish behavior, deformations, and reduced egg production and survival.

Sediment contamination in NY/NJ Harbor has included: polycyclic aromatic hydrocarbons (PAHs), pesticides, polychlorinated biphenyl (PCB) congeners, metals, and dioxin/furans (USACE 2020c). Sources of contamination include combined sewer discharges, urban runoff, stormwater runoff, industrial discharges, and maritime and industrial accidents. Chemical contaminants may also have a consequence on sea turtle reproduction and survival. Pollution may make sea turtles more susceptible to disease by weakening their immune systems.

Excessive turbidity due to coastal development and/or construction sites could influence sea turtle and Atlantic sturgeon foraging ability; however, based on the best available information, turtle and Atlantic sturgeon foraging ability is not very easily affected by changes in increased suspended sediments unless these alterations make habitat less suitable for listed species and hinder their capability to forage and/or for their foraging items to exist. If the latter occurs, eventually these species will tend to leave or avoid these less desirable areas (Ruben and Morreale 1999). As the action area is entirely in saline waters, no early life stages of sturgeon species are expected to be in the action area. Thus, the consequences to Atlantic sturgeon would only be limited to adults and subadults.

Marine debris (e.g., discarded fishing line, boat lines, and plastics) can directly or indirectly affect listed species. Discarded line (fishing or boat) can entangle sea turtles or sturgeon causing injury or mortality. Sea turtles may ingest plastic or other marine debris, which they could mistake for food. For instance, jellyfish are a preferred prey for leatherbacks, and plastic bags, which may look like jellyfish to the turtles, are often found in the turtles' stomach contents (NRC 1990, Mrosovsky et al. 2009, Schuyler et al. 2014, Nelms et al. 2015). While marine debris is known to affect these species, the consequences have not been quantified and impacts at the population level are not well understood.

Sources of contamination in the action area include atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, industrial development, and debris. While the consequences of contaminants on Atlantic sturgeon and turtles are relatively unclear, pollutants may make Atlantic sturgeon and sea turtles more susceptible to disease by weakening their immune systems or may have a consequence on Atlantic sturgeon and sea turtle reproduction and survival.

The noise level in the ocean is thought to be increasing at a substantial rate due to increases in shipping and other activities, including seismic exploration, offshore drilling and sonar used by military and research vessels (Southall and Scholik-Schlomer 2007). Because under some conditions, low frequency sound travels very well through water, few oceans are free of the threat of human noise. Concerns about noise in the action area of this consultation include increasing noise due to increasing commercial shipping and recreational vessels. Although noise pollution has been identified as a concern for marine mammals, these elevated levels of underwater noise may also be of concern for sea turtles and Atlantic sturgeon. Until additional studies are undertaken, it is difficult to determine the consequences these elevated levels of noise will have on sea turtles and Atlantic sturgeon and to what degree these levels of noise may be altering the behavior or physiology of these species.

As noted above, private and commercial vessels, including fishing vessels, operating in the action area of this consultation also have the potential to interact with sea turtles and Atlantic sturgeon. The consequences of fishing vessels, recreational vessels, or other types of commercial vessels on listed species may involve disturbance or injury/mortality due to collisions or entanglement in anchor lines. It is important to note that minor vessel collisions may not kill an animal directly but may weaken or otherwise affect it so it is more likely to become vulnerable to consequences such as entanglements. Listed species may also be affected by fuel oil spills resulting from vessel accidents. Fuel oil spills could affect animals directly or indirectly through the food chain. Fuel spills involving fishing vessels are common events. However, these spills typically involve small amounts of material that are unlikely to adversely affect listed species.

4.3.2 Private and Commercial Vessel Operations

The NY Bight, NY-NJ Harbor and Hudson River is a major shipping port and center of commerce, there are numerous private and commercial vessels (*e.g.*, container ships, commuter ferries) that operate in the action area that have the potential to interact with listed species. On an annual basis more than 5,124 commercial vessels and approximately 5,292,020 container vessels, as well as numerous recreational vessels transit the NY-NJ Harbor.

Data shows that vessel traffic is a substantial cause of sea turtle mortality. Fifty to 500 loggerheads and five to 50 Kemp's ridley turtles are estimated to be killed by vessel traffic per year in the U.S. (NRC 1990). The report indicates that this estimate is highly uncertain and could be a large overestimate or underestimate. As described in the Recovery Plan for loggerhead sea turtles (NMFS and USFWS 2008), propeller and collision injuries from boats and ships are common in sea turtles. From 1997 to 2005, 14.9 percent of all stranded loggerheads in the U.S. Atlantic and Gulf of Mexico were documented as having sustained some type of propeller or collision injuries although it is not known what proportion of these injuries were post or ante- mortem. As noted from the National Research Council (1990), the regions of greatest concern for vessel strike are outside the action area and include areas with high concentrations of recreational-boat traffic such as the eastern Florida coast, the Florida Keys, and the shallow coastal bays in the Gulf of Mexico. In general, the risk of strike for sea turtles is greatest in areas with high densities of sea turtles and small, fast-moving vessels such as recreational vessels or speed boats (NRC 1990).

In certain geographic areas, vessel strikes have been identified as a threat to Atlantic sturgeon. Although the exact number of Atlantic sturgeon killed as a result of being struck by vessels is unknown, records of these interactions have been documented (Balazik 2018, Balazik et al. 2012, Brown and Murphy 2010). Other commercial and private activities, therefore, have the potential to result in lethal (boat strike) or non-lethal (through harassment) takes of listed species that could prevent or slow a species' recovery. As sea turtles and Atlantic sturgeon may be in the area where high vessel traffic occurs, the potential exists for collisions with vessels transiting from within and out of the action area.

An unknown number of private recreational boaters frequent coastal waters; some of these are engaged in whale watching or sport fishing activities. These activities have the potential to result in lethal (through entanglement or boat strike) or non-lethal (through harassment) takes of listed species. Effects of harassment or disturbance which may be caused by such vessel activities are currently unknown; however, no conclusive detrimental effects have been recorded.

5 Environmental Effects and Consequences

The following sections describe the potential effects and consequences from the construction, operation and maintenance of the Tentatively Selected Plan (TSP) per this Tier 1 level of analysis. Potential impact producing factors to NMFS ESA regulated species by implementation of the NYNJHAT TSP include: water quality (e.g. dissolved oxygen, salinity , turbidity and temperature), vessel interaction (vessel strikes and hopper intake-related injury or mortality), underwater noise, physical seabed disturbance, vibration, and habitat conversion. Impacts to NMFS Trust species associated with the NYNJHAT Study TSP have been described at a broad-level to be comparable to the level of detail provided in the Tier 1 EIS.

As measures and construction methods become more refined for some TSP measures to be included in the Tier 1 Final EIS (with the remainder of measures to be further analyzed in the Tier 2 EIS), that ongoing analyses will be included in this Tier 1 draft BA and coordinated with NMFS. At such time NMFS has determined that USACE has provided sufficient information upon which to issue a Biological Opinion, USACE will request to initiate formal consultation under Section 7.

5.1 Consequences of the Action

Table 6-1 summarizes the potential affects the TSP may have on NFMS trust species (see Subsections 5.1.1 – 5.2.5 for discussion). As proposed project measures and construction methods become more defined, site specific analyses for ESA-listed species may be performed and included in the Tier 1 Final EIS for those measures for which sufficient information exists, with the remainder of measures to be further analyzed in the Tier 2 EIS. .

Table 6-1. Effects Summary Table (Stressors by Species)

Stressor	Sturgeon	Sea Turtles	Whales
Water Quality	NLAA	NLAA	NLAA
Vessel Interaction	LAA	LAA	NLAA
Underwater Noise and Vibration	LAA	LAA	LAA
Physical Seabed Disturbance	NLAA	NLAA	N/A

NLAA- (Not Likely to Adversely Affect) is the appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. LAA (Likely to Adversely Affect) means the appropriate conclusion when effects on listed species are expected to be measurable and significant to the species.

N/A (Not Applicable) means the effects will not be considered further.

Best Management Practices (BMP) may be implemented to reduce impacts to NMFS Trust species. Depending on the source and magnitude, noise and vibration could result in injuries to sturgeon, sea turtles and whales. Interactions with mechanical equipment could also result in injury and mortality to sturgeon and sea turtles. BMPs such as the following could be implemented to avoid and minimize impacts on sturgeon, sea turtle and whales:

- Develop a protected marine species monitoring and mitigation plan
- Use of a mechanical dredge versus a hydraulic dredge, where conditions permit.
- Piling installation: use of a vibratory hammer instead of an impact hammer, to the maximum extent practicable. If vibratory is not a possibility due to construction methodologies and existing geology, then use of other noise abatement measures.
- Use of protected species observers.

To minimize potential protected species and vessel interactions and collisions USACE-NYD will implement NMFS vessel operation BMPs to the maximum extent practicable to avoid and minimize potential impacts. These include the following:

- Shallow draft vessels that maximize the navigational clearance between the vessel and the water body bottom should be used where possible.
- Vessels should operate at speeds of less than 10 knots whenever operating in areas where protected species are present
- Protected species observers will be used during specific construction activities (i.e. dredging and pile installation). Measures will be taken to slow down and avoid any sturgeon, whales or sea turtles observed.

To minimize potential impacts to water quality that could affect NMFS Trust species, as required by state agencies and in coordination with the Clean Water Act, BMPs will be implemented, including:

- A sediment/erosion control plan that includes silt fencing and physical runoff control.

5.1.1 Water Quality

The water quality discussion provided in this section addresses dissolved oxygen, salinity, temperature, water discharge/release and withdrawals stressors listed in Table 6-1.

Construction of the in-water features of the TSP including SSBs, tide gates and seawalls would result in direct impacts on water quality, which provide habitat for foraging species. These impacts would result from temporary localized increases in turbidity and total suspended solids during construction. Minor and temporary increases in turbidity are expected during construction from activities such as dredging, the installation and removal temporary cofferdams, temporary excavations, fill and rock placement, concrete work, and vibrations during the pile driving (cylindrical and sheet piles). Other activities such as earth disturbances from coastal or on shore features resulting from construction access activities, staging/storage areas and upland excavations and soil stockpiles have the potential to generate turbidity as a non-point source.

As required by state agencies and in coordination with the Clean Water Act, a sediment/erosion control plan will be submitted for review and approval. Other best management practices to avoid stormwater runoff from the construction sites, such as rock entrances, silt fencing, and physical runoff control, will be in the plan. Compliance with an approved sediment/erosion control plan/earth disturbance permit will result in negligible impacts in water quality as a result of sedimentation/turbidity. Areas disturbed during construction would be subsequently stabilized upon completion of construction activities and the potential for turbidity is expected to return to existing conditions. BMPs will be employed to avoid discharge/release and withdrawals in the Study Area and no impacts to NMFS Trust species are anticipated.

The operation of barriers and closures has the potential for significant indirect impacts on water quality within the Study Area based on their potential for altering flow, circulation patterns, flushing, and residence time. These impacts are inherently based on the design of the barriers and closures such as the number of openings and widths of the openings, which could significantly alter the flow patterns by constricting flows and affecting current velocities. A number of design components make up these barriers and closures, which include navigable sector gates, auxiliary flow lift gates, impermeable barriers, levees and seawalls.

It is expected that there may be water flow pattern changes which will result in changes in circulation and increased residence times especially in those areas that are already poorly flushed. Restrictions in tidal flows and increases in residence times could affect salinity levels, nutrients, chlorophyll A and dissolved oxygen concentrations. These effects could be exacerbated at times when the gates are closed during a significant storm event when increased freshwater inputs, nutrients, bacteria and other pollutants discharged from tributaries and point and non-point sources are held in the bays for a longer period.

The TSP will produce temporary localized water quality impacts from the construction equipment working at the various project locations. The localized impacts from the equipment will last only during the project’s construction period in each location and then end when the project phase is complete at each location, thus any potential impacts will be temporary in nature and geographically dispersed over the project duration therefore, sturgeon, turtles, and whales are not likely to be adversely affected by water quality.

5.1.1.1 Species Assessment

Direct and indirect effects to water quality caused by construction, such as turbidity and the resuspension of sediments, are primarily expected to affect early life stage sea turtles and sturgeon as they are located in nearshore habitats. Sturgeon eggs and larvae are not expected to occur in the Study Area, however, so adverse effects are not anticipated. The Study Area consists of highly energetic near shore areas, as well as urbanized estuaries. The increase in suspended sediments is expected to be in the range of normal variability which these marine species would regularly experience. While the increase in suspended sediments may cause sea turtles and juvenile and adult sturgeon to alter their normal movements, these minor movements will be too small to be meaningfully measured or detected; therefore, no adverse effects are expected. Juvenile and Adult life stages of sea turtles and marine mammals are generally expected to occur offshore and are not likely to be adversely affected. These marine protected species are highly mobile and are expected to avoid the effects of turbidity, if necessary. Resuspension of sediments is not anticipated to be a barrier to movement of migration.

During storm surge barrier and tidal gate closure, there is a risk that species would be caught behind the closure and would be susceptible to lower water quality depending on the period of closure. It is assumed that water quality impacts will be localized and not impact the larger water body so species would move to areas with better water quality. Hydrodynamic and water quality modeling for closed structures may be conducted as part of Tier 2 assessments and consultation to better understand the potential for direct and indirect impacts.

Fin whales, right whales, and Atlantic sturgeon typically occur in deeper offshore waters and are not expected to be affected by turbidity associated with the construction of features within the action area. Shortnose sturgeon typically occur in areas north of the Statue of Liberty and up the HR estuary and are not expected to be affected by turbidity associated with the construction of features within the action area.

5.1.2 Vessel Interaction

Because there are thousands of vessel trips occurring in the action area each year within highly trafficked NY/NJ Harbor and remaining portions of the action area, the increase in vessel traffic from periodically used project vessels is extremely small. Additionally, these vessels are slow moving, and shallow draft vessels. Non- construction-related vessel speed will remain the same throughout the action area. There is a low risk for direct impacts such as vessel strikes and interactions with a propeller during construction and operations and maintenance. However, vessel strikes have occurred within the action area for threatened and endangered species. Vessel strikes are based on vessel size, speed, navigational clearance (i.e., draft versus water depth) and behavior of the species (i.e., migrating). Indirect impacts to threatened and endangered species is not anticipated. In addition, it is anticipated, as required by permit conditions, that a protected species observer will be on dredges and/or vessels to monitor for protected species in the area to mitigate potential impacts.

The TSP may produce vessel traffic interactions from the construction equipment working at the various project locations. Vessel interactions with sturgeon and turtles are reasonably anticipated to occur and likely to be adversely affected by vessel traffic where whales are not likely to be adversely affected by vessel interactions.

5.1.2.1 Species Assessment

Vessel strikes are not anticipated for marine mammals as they are found offshore migrating and not typically in areas where construction and operation and maintenance activities will occur. There is a low risk of vessel strikes for sea turtles and sturgeon during construction and operations and maintenance activities.

Although sturgeon may be found foraging in the action area, Atlantic sturgeon are likely to be primarily using the action area as a migration path to and from spawning, overwintering, and/or foraging sites along the eastern coastline. Based on available information, it is believed that when migrating, Atlantic sturgeon are found primarily at mid-water depths and while foraging, within the bottom meter of the water column. Shortnose sturgeon are likely to be foraging within the UB and HR areas near Project construction, similar to Atlantic sturgeon, shortnose sturgeon are primarily benthic feeders and would be away from project vessels. Therefore, there will be sufficient room for sturgeon to avoid construction areas and sufficient clearance between the keel of vessels and dredges and sturgeon to avoid strikes. In addition, the vessels will be moving slowly, and sturgeon will have the ability to avoid collision and injury from vessel strikes. However as noted above vessel interactions in the NYNJHAT Study Area with Atlantic sturgeon and shortnose sturgeon have been documented and are likely to occur during construction.

Data on the response of sea turtles to vessel noise and disturbance is very limited. Hazel et al. (2007) reported that sea turtles reacted to approaching vessels in several ways. Turtles lying on the seabed launched upwards at a shallow angle and began swimming when vessels approached. The majority of the turtles swam away from the vessel while some swam along the vessel's track. Others crossed in front of the vessel's track before swimming away. Sea turtle reaction time was greatly dependent on the speed of the vessel; sea turtles were able to react faster to slower moving vessels than to faster moving vessels. All of these responses were short-term responses that did not seem to have adverse long-term consequences for the individual sea turtles.

Although sea turtles have been observed to avoid surface vessels, Hazel et al. (2007) argued that it was the vessel's movement, not the vessel's noise, which caused the avoidance behavior. Therefore, surface vessel noise is expected to cause minimal behavioral avoidance and displacement to sea turtles. If a sea turtle detects a surface vessel and avoids it or has a temporary stress response from the noise disturbance, these responses are expected to be temporary and short-term while the vessel passes through the construction area.

Sea turtles spend at least 20 to 30 percent of their time at the ocean surface (Lutcavage *et al*. 1997) during which they would be vulnerable to being struck by vessels or struck by vessel propellers. Sea turtles are able to avoid collisions with slow-moving (<5 knots) vessels. The most informative study of the relationship between ship speed and collision risk was conducted on green sea turtles (Hazel et al. 2007). In that study green turtles avoided approaching vessels at distances of 39 ft (12 m); the proportion of turtles that avoided those vessels decreased as vessel speeds increased. Turtles fled frequently in encounters with vessels moving at speeds of 2.2 knots (4 km/hr), infrequently in encounters with vessels moving at moderate speeds (5.9 knots or 11 km/hr), and rarely in encounters with a fast vessel (10.3 knots or 19 km/hr; Hazel et al. 2007). It's important to note that these speeds are based on the sea turtle behavior in relatively warm water; cold water temperatures would decrease their ability to avoid vessels moving at even slow speeds. The risk for sea turtle collision is low once mitigation measures are implemented.

5.1.3 Underwater Noise and Vibration

As the action area is comprised of an urbanized estuary, a noisy underwater environment is typical as there are ongoing dredging activities, shoreline stabilization projects, construction of new wharves and rehabilitation projects and construction and maintenance of bridges and tunnels. In addition, there is vessel traffic noise from large vessels entering and exiting the NY/NJ Harbor and HR port facilities as well as recreational and commercial vessels off of the coast, Long Island Sound and the HR. Noise and vibration are part of the ambient conditions.

Direct impacts due to underwater noise and vibration are limited to sound producing components associated with pile and or sheet pile installation, dredging, and construction of SSBs and tide gates. Noise and vibration reduction measures would be necessary where noise and vibration levels exceed desired thresholds. Once the project measures become more defined, sound propagation modeling for anticipated construction activities could be conducted, as required. Site-specific impacts as a result of construction underwater noise would be further evaluated as the required information becomes available for the Final Tier 1 EIS, and for the remainder of measures are assessed during the Tier 2 EIS.

Sounds and vibration associated with construction could cause injury or behavioral disturbance to protected marine species and are likely to adversely affect sturgeon, sea turtles, and whales.

5.1.3.1 Species Assessment

In water noise and vibration impacts are not anticipated in the Atlantic Ocean and open waters, therefore whales in the Atlantic ocean are not expected to be adversely affected by underwater noise. Sea turtles and sturgeon who are seasonally nearshore and within the action area are less sensitive to noise and vibration impacts.

Sea turtles and sturgeon may display behavior avoidance and displacement in response to elevated levels of underwater noise and vibration. Due to increased underwater noise and vibration levels, sea turtles and sturgeon may be spatially displaced and move away from the construction area. Sea turtles and sturgeon are anticipated to return to the area following construction completion. If protected marine species do enter the action area during underwater noise and vibration producing activities, it is anticipated that it will have a behavioral avoidance response which is expected to be temporary and but has the potential for permanent or lethal impacts; therefore, underwater noise and vibration is expected to adversely affect sea turtles and sturgeon

Marine mammals display behavior avoidance and displacement in response to elevated levels of underwater noise and vibration. This avoidance behavior or flight responses into deeper waters from acoustic disturbances can cause barotrauma to marine mammals. Due to increased underwater noise and vibration levels, marine mammals may be spatially displaced and move away from the construction area. Cetaceans are most likely to avoid the sound field produced by construction equipment use. If whales enter the action area when construction activities are being conducted, it is likely that they will actively avoid or evade exposure. Avoidance behavior is expected to be a direct temporary impact and marine mammals are anticipated to return to the area once construction operations are complete.

5.1.4 Physical Seabed Disturbance

Direct impacts from the construction of in-water structures can disturb benthic habitat that is utilized by sturgeon and sea turtles and are likely to be adversely affect listed ESA species. Impacts that are associated with benthic habitat disturbance include temporary loss of foraging habitat and indirect effects such as forage species displacement. Migratory routes may temporarily be impacted by the storm surge barrier closures.

5.1.4.1 Species Assessment

The primary indirect impact to ESA-listed species from the TSP is the effect of construction activities on benthic communities in the Project area. Sturgeon and sea turtles in the area are demersal, or benthic feeders, which can be adversely affected by indirect impacts from in-water construction of the SSBs and tide gates. Sturgeon and sea turtles may experience a reduction in feeding efficiency for some period during and immediately following construction activities that disturb benthic habitat. Indirect impacts associated with construction activities would include bottom habitat disturbance and the potential loss of forage organisms in the immediate vicinity of the placement of new structures or bottom disturbance.

Impacts to fish species may occur due to the effects of construction activities on benthic communities including forage species displacement, temporary loss of forage species habitat and/or temporary loss of forage species individuals. Based on previous studies, the reestablishment of benthic communities varies between six months to a year after the project's completion depending on substrate type (USACE 2007 Wilber and Clarke 2007). Thus, no long-term indirect impacts are expected on benthic communities as a result of construction and the overall area that would be impacted is a small percentage of the habitat that is available. Fish species will be able to forage in adjacent areas.

Operation of tide gates or SSBs would present potential barrier to migration for Atlantic sturgeon from the Atlantic Ocean into the HR or vice versa. Closures would be expected to be short in duration and would not present long-term barriers to migrations that could impact natural sturgeon movements in the estuary. Shortnose sturgeon do not typically migrate from their natal rivers and therefore gate closures should not impact their behavior. Sea turtles may be temporarily prevented from entering or exiting the NY/NJ Harbor while foraging however, as noted above, the closure of gates is anticipated to be temporary and should not result in long term impacts to sea turtle movements. If a closure occurs while Atlantic sturgeon or sea turtles are trying to move into or from the NY/NJ Harbor those individuals would likely have adequate habitat for foraging and movement rather than becoming impounded in an inadequate habitat. Whales rarely venture into the NY/NJ Harbor by typically remaining outside of the Lower Bay. Therefore, closures would be unlikely to directly impact a whale's ability to migrate and forage. Therefore, the impacts during operation are anticipated to be discountable to protected species.

5.1.5 Habitat Conversion

Construction of in-water structures could cause changes to community composition and attraction of structure-oriented invertebrates. The foundation and structure installations can produce the artificial "reef effect," attracting numerous species of algae, shellfish, and other invertebrates. The direct loss of soft substrate benthic habitat is expected to be offset by the introduction of new, hard-bottom substrate that will support new benthic communities. Biofouling of underwater structures could also occur, causing a long-term permanent benefit. Direct impacts to protected species are associated with habitat loss and change. Indirect impacts are associated with impacts to foraging habitat. Therefore, sturgeon and sea turtles are likely to be adversely affected by physical habitat conversion.

5.1.5.1 Species Assessment

The loss of benthic habitat caused by the placement of foundations and structure installations is expected to be offset by the creation of new habitat and the artificial "reef effect"; however, adverse effects to sea turtles and sturgeon are expected. Whales occur offshore in the Atlantic and are not anticipated to be impacted by construction activities associated with the TSP.

5.2 Cumulative Impacts

Cumulative effects are defined in 50 CFR § 402.02 as those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Proposed Action subject to consultation.

Future Federal actions that are unrelated to the Proposed Action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Sources of human-induced mortality, injury, and/or harassment of sea turtles and Atlantic sturgeon in the action area that are reasonably certain to occur in the future include interactions in state-regulated and recreational fishing activities, vessel collisions, ingestion of plastic debris, pollution, global climate change, coastal development, and catastrophic events. Actions carried out or regulated within the action area also include the regulation of dredged material discharges through CWA Section 401-certification and point and non-point source pollution through the National Pollutant Discharge Elimination System. USACE are not aware of any local or private actions that are reasonably certain to occur in the action area that may affect listed species. It is important to note that the definition of "cumulative effects" in the section 7 regulations is not the same as the NEPA definition of cumulative effects[1]. While the combination of these activities may affect sea turtles and Atlantic sturgeon, preventing or slowing a species' recovery, the full magnitude of these consequences is not completely known. However, USACE have considered the best information available in our assessment of both effects from the Proposed Action as well as cumulative effects.

5.2.1 State Water Fisheries

Fishing activities are considered one of the most significant causes of serious injury or death for sea turtles. Finkbeiner *et al.* (2011) compiled cumulative sea turtle bycatch information in U.S. fisheries from 1990 through 2007, before and after implementation of bycatch mitigation measures. In the Atlantic, a mean estimate of 137,700 bycatch interactions, of which 4,500 were mortalities, occurred annually (since implementation of bycatch mitigation measures). Kemp's ridleys interacted with fisheries most frequently, with the highest level of mean annual mortality (2,700), followed by loggerheads (1,400), greens (300), and leatherbacks (40). The Southeast/Gulf of Mexico shrimp trawl fishery was responsible for the vast majority of U.S. interactions (up to 98%) and mortalities (more than 80%). Fishing gear in state waters, including bottom trawls, gillnets, trap/pot gear, and pound nets, interacts with sea turtles each year. NMFS is working with state agencies to address the bycatch of sea turtles in state water fisheries within the action area of

[1] Cumulative effects are defined for NEPA as "the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

this consultation where information exists to show that these fisheries capture sea turtles. Action has been taken by some states to reduce or remove the likelihood of sea turtle bycatch and/or the likelihood of serious injury or mortality in one or more gear types. However, given that state managed commercial and recreational fisheries along the U.S. Atlantic coast are reasonably certain to occur within the action area in the foreseeable future, additional interactions of sea turtles with these fisheries are anticipated. There is insufficient information to quantify the number of sea turtle interactions with state water fisheries as well as the number of sea turtles injured or killed as a result of these interactions. While actions have been taken to reduce sea turtle bycatch in some state water fisheries, the overall effect of these actions is not fully known, and the future effects of state water fisheries on sea turtles are presently difficult to quantify due to data and monitoring limitations.

Information on interactions with shortnose and Atlantic sturgeon with state fisheries operating in the action area is not available, and it is not clear to what extent these future activities will affect listed species differently than the current activities.

5.2.2 Vessel Interactions

NMFS's Sea Turtle Stranding and Salvage Network (STSSN) data indicate that vessel interactions are responsible for a number of sea turtle strandings within the action area each year. In the U.S. Atlantic from 1997-2005, 14.9% of all stranded loggerheads were documented as having sustained some type of propeller or collision injuries (NMFS and USFWS 2007). The incidence of propeller wounds rose from approximately 10% in the late 1980s to a record high of 20.5% in 2004 (STSSN database). Such collisions are reasonably certain to continue. Collisions with boats can stun, injure, or kill sea turtles, and many live-captured and stranded sea turtles have obvious propeller or collision marks. However, it is not always clear whether the collision occurred pre-or postmortem. NMFS believes that vessel interactions with sea turtles will continue in the future.

An estimate of the number of sea turtles that will likely be killed by vessels is not available at this time. Similarly, USACE are unable at this time to assess the risk that vessel operations in the action area pose to Atlantic sturgeon. While vessel strikes have been documented in several rivers, the extent that interactions occur in the marine environment is not fully known.

5.2.3 Pollution and Contaminants

Human activities in the action area causing pollution are reasonably certain to continue in the future, as are impacts from them on sea turtles and Atlantic sturgeon. However, the level of impacts cannot be projected. Sources of contamination in the action area include atmospheric loading of pollutants, stormwater runoff from coastal development, groundwater discharges, and industrial development. Chemical contamination may have effects on listed species' reproduction and survival. Excessive turbidity due to coastal development and/or construction sites could influence sea turtle or sturgeon foraging ability. Marine debris (*e.g.*, discarded fishing line or lines from boats, plastics) also has the potential to entangle ESA-listed species in the water or to be fed upon by them. Sea turtles commonly ingest plastic or mistake debris for food and sometimes this may lead to asphyxiation.

5.2.4 State NPDES Permits

NY has been delegated authority to issue NPDES permits by the US Environmental Projection Agency (EPA). These permits authorize the discharge of pollutants in the action area. Permittees include municipalities for sewage treatment plants and other industrial users. NY will continue to authorize the discharge of pollutants through the state issued permits. State standards are devised using EPA's techniques, which NMFS anticipates being insignificant and/or discountable to all listed species, so effects of discharges should also be insignificant and discountable.

5.2.5 Global Climate Change

Global climate change is expected to continue and may impact listed species and their habitats in the action area. Given the rate of change associated with climate impacts (i.e., on a decadal to century scale), it is likely that climate related impacts will have an effect on the status of any listed species over the temporal scale of the Proposed Action (i.e., over the next 50 years) or that the abundance, distribution, or behavior of the species in the action area will significantly change as a result of climate change impacts.

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