Endangered Species Act
Supporting Biological Impact Assessment

For the

U.S. Environmental Protection Agency's reissuance of the
National Pollutant Discharge Elimination System (NPDES) Permit Authorizing
Discharges of Non-Contact Cooling Water in Massachusetts and New Hampshire
(The Non-Contact Cooling Water General Permit, NCCW GP)
NPDES Permit No.s MAG250000 and NHG250000

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List of Acronyms and Abbreviations

ACE	Ashepoo, Combahee and Edisto Rivers
ASMFC	Atlantic States Marine Fisheries Commission
BMPs	Best Management Practices
CAFOs	Concentrated Animal Feeding Operations
CB	Chesapeake Bay
CCB	Cape Cod Bay
CCL	Curved Carapace Length (CCL)
CGP	General Permit for Storm water Discharges from Construction Activities
CI	Confidence Interval
CSO	Combined Sewer Overflow
CWA	Clean Water Act
CWIS	Cooling water intake structure
DCA	Deerfield Concentration Area
DCIA	Directly Connected Impervious Area
DO	Dissolved Oxygen
DPSs	Distinct Population Segments
E.coli	Escherichia coli
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EMCs	Event Mean Concentrations
ESA	Endangered Species Act
ESCA	Endangered Species Conservation Act
FR	Federal Register
FMPs	Fisheries Management Plans
GOM	Gulf of Maine
GSC	Great South Channel
INBS	Index Nesting Beach Survey
IWC	International Whaling Commission
LID	Low Impact Design
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	MA Department of Transportation
mg	Milligram
ug	Microgram
MMPA	Marine Mammal Protection Act
mep	maximum extent practicable
MEP	Massachusetts Estuaries Program
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSGP	Multi-Sector General Permit
MS4	Municipal Separate Storm Sewer Systems
NCCR	National Coastal Condition Report
NCCW	Non-contact cooling water
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System

NRC	National Research Council
NRDC	Natural Resources Defense Council
NWA	Northwest Atlantic
NYB	New York Blight
PAH	Polychlorinated aromatic hydrocarbons
PCB	Polychlorinated biphenyls
rKm	River Kilometer
SEUS	Southeast US
SMAST	School of Marine Science and Technology
SNBS	Statewide Nesting Beach Survey
SWMP	Storm Water Management Program
SWQS	Surface Water Quality Standards
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
TEDs	Turtle Excluder Devices
U.S.C.	United States Code
USDOI	US Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WWF	Warm Water Fishery

I. Background and History

As mandated by Section 7 of the Endangered Species Act (ESA) of 1973, Federal agencies must consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) --- jointly known as "the Services" --- to ensure that any action authorized is not likely to jeopardize the continued existence of any ESA-listed species or result in the destruction or adverse modification of critical habitat required by a listed species (16 United States Code [U.S.C.] §1532 et seq.).

This biological impact document summarizes the results of an analysis of the potential effects to endangered, threatened, and proposed listed species and their critical habitats as a result of the U.S. Environmental Protection Agency, Region 1 (EPA)'s reissuance of the NPDES Permit no.s MAG250000 and NHG250000, which will be referred to jointly as "the permit". The draft permit is available online at http://www.epa.gov/region1/npdes/nccwgp.html . The NCCW general permit was first issued in April of 2000 and was reissued in July 2008. The 2008 reissuance of the permit expired on July 31, 2013 (the "expired permit") but was administratively continued for permittees until the permit is reissued.

In a letter dated August 15, 2007, NMFS concurred with EPA's determination that the issuance of the NCCW general permit in 2008 was not likely to adversely affect any species listed by NMFS. The 2014 permit reissuance is not significantly different from the expired permit; changes from the expired permit may be found in the Fact Sheet of the draft permit. Any changes which EPA has deemed relevant to ESA listed species protection will be included in this assessment.

The permit regulates the discharge of small amounts (historically less than 1 million gallons per day [MGD]) of non-contact cooling water (NCCW) from a range of facilities in Massachusetts and New Hampshire. Discharges greater than 1 MGD will be considered on a case-by-case basis for permit coverage. The Massachusetts Department of Environmental Protection (MassDEP) and the New Hampshire Department of Environmental Services (NHDES) will review the protectiveness of the permit and provide water quality certification. In addition, EPA expects MassDEP to issue the NCCW GP as a state permit in Massachusetts.

Non-contact cooling water is water used for cooling that does not come into contact with any raw material, intermediate product, final product, or waste product, other than heat; the only expected pollutant in the discharges covered under the permit is heat. Chlorine and metals may be constituents of source water (municipal drinking water supply and groundwater, respectively) for cooling and thus pollutants in the NCCW discharge.

The permit generally allows for the intake of less than 1 MGD of surface water for non-contact cooling. Eligibility for permit coverage for facilities with NCCW intakes or discharges greater than 1 MGD will be determined on a case-by-case basis by EPA and the appropriate state agency. The permit includes best technology available (BTA) requirements for the cooling water intake structures (CWIS) at these facilities in order to protect local aquatic life, including any ESA species or forage species, to prevent entrainment and impingement. The BTA requirements include:

- A reduction in surface water intakes whenever possible
- Maintain an exclusion technology with a maximum through-screen velocity of 0.5 ft/sec
- Conduct and document a program to monitor for impinged organisms
- Return live impinged organisms to the water body and report unusual impingement events to EPA
- Ensure no chlorinated water is sprayed on impinged organisms, if applicable
- Facility-specific requirements related to CWIS design and source waterbody characterization

Six facilities covered under the administratively continued expired permit use surface water for non-contact cooling and were subject to these requirements under the expired permit. EPA expects the BTA requirements will apply to a similarly small number of facilities following the reissuance of the permit.

II. Description of the Action and Action Area

A. Federal Action and Legal Authority/Agency Discretion

Section 301(a) of the Clean Water Act (the Act) provides that the discharge of pollutants is unlawful except in accordance with a NPDES permit unless such a discharge is otherwise authorized by the Act. The NPDES permit program must regulate the discharge of point sources of pollutants to waters of the United States under 40 CFR § 122.1(b)(1). The NCCW General Permit seeks to regulate the discharges of non-contact cooling water containing excess heat (identified in 40 CFR §122.2 as a pollutant) in non-contact cooling water from a variety of commercial, industrial, and large residential facilities in Massachusetts and New Hampshire.

NPDES permits are often issued to individual discharges, however, EPA's regulations authorize the issuance of "general permits" to multiple similar discharges within a geographic area (see 40 CFR § 122.28). Violations of a condition of a general permit constitute a violation of the Clean Water Act and subject the discharger to the penalties in § 309 of the Act. EPA has determined that the draft NCCW General Permit meets the criteria for issuing a general permit found in 40 CFR § 122.28(a)(2)(ii). EPA believes that discharges from the various facilities allowed under the permit are similar in composition (i.e., they contain only thermal pollution) and require similar controls. Therefore, EPA believes that sources that discharge only NCCW warrant coverage under a general permit. Further discussion can be found in the permit Fact Sheet Section I.B.

B. Activities to be Authorized by the Federal Action Agency

Under the permit, facilities are permitted to discharge non-contact cooling water used for various purposes (most commonly in manufacturing processes and air conditioning, as indicated by the facilities covered under the expired permit) to surface waters in Massachusetts and New Hampshire. Discharges to certain receiving waters, such as Class A waters in New Hampshire; Ocean Sanctuaries in Massachusetts; and Outstanding Resource Waters and Wild and Scenic River reaches in both states, are not authorized under the permit (see Part 3 of the draft permit for complete eligibility requirements and coverage exclusions).

Monitoring and reporting are required under the permit for all facilities in order to ensure compliance with state (MA: 314 CMR 4.00; NH: Env-Wq 1700) and federal surface water quality standards to ensure that the water quality of the receiving water is protected. The temperature, pH, and flow rate of a facility's effluent must be monitored and reported in accordance with the permit; pH limits set in the permit are based on applicable surface water quality standards in Massachusetts (314 CMR 4.05(3)(a)3, 4.05(3)(b)3, 4.05(4)(a)3, 4.05(4)(b)3) and New Hampshire (Env-Wq 1703.18). The maximum allowable temperature discharges and receiving water temperature changes are based on the numeric criteria in 314 CMR 4.05(3)(a)2, 4.05(3)(b)2, 4.05(4)(a)2, and 4.05(4)(b)2 and will be protective of narrative temperature criteria in New Hampshire (Env-Wq 1703.13 and RSA 485-A:8,II and VII). The maximum NCCW flow rate from a facility covered under the permit is limited to the maximum daily flow reported in the facility's Notice of Intent (NOI) to discharge under the permit.

For facilities using municipal drinking water for non-contact cooling, total residual chlorine (TRC) discharge limits are calculated by EPA using the effluent dilutions in the receiving waters and EPA's ambient water quality criteria for TRC. For facilities using groundwater as a source of NCCW, an analysis of metal concentrations in the discharge must be provided with the NOI in order to determine whether the discharge is likely to cause water quality violations for metals in the receiving water. The permit also allows for EPA to request whole effluent toxicity (WET) testing of a facility's discharge, if necessary, to determine potential toxic effects.

For facilities that withdraw surface water for cooling, additional information is required in the facility's NOI in addition to general and facility-specific BTA requirements for CWIS, including:

Additionally, facilities may need to initiate construction activity to install or alter their CWIS, as well as O&M activities for the CWIS, in order to meet the BTA requirements in the permit.

The activities authorized under this permit have differed slightly from the expired NCCW GP: facilities discharging over 1 MGD of NCCW may now apply for coverage under the NCCW GP in both Massachusetts and New Hampshire with EPA and state approval. EPA will evaluate facilities seeking to discharge over 1 MGD of NCCW to determine suitability for coverage under this general permit. In this evaluation, EPA will take into consideration ESA-listed species and critical habitat within the vicinity of the discharge. .

C. Geographical Action Area Defined

The entire universe of facilities that will apply for and obtain coverage under the NCCW GP is unknown at the time the draft permit is published for public comment. The Project Area of the permit could include any surface water in Massachusetts and New Hampshire, excluding those waterbodies to which discharges are not authorized (see Section 3.3 of the permit). Permittees are not authorized to discharge to: Class A waters in New Hampshire; Ocean Sanctuaries in Massachusetts; and Outstanding Resource Waters and Wild and Scenic River reaches in both states.

Although the project area could encompass all surface waters in Massachusetts and New Hampshire, for the purposes of this biological impact assessment, the Action Area of the permit will be restricted to those waters where there is a known presence of ESA species or designated critical habitat. Current permittees that discharge to these waterbodies will be considered in evaluating the effects of EPA's reissuance of the NCCW GP on listed species and critical habitat. Currently, there are several waterbodies where ESA species could be impacted by permitted discharges: 1.) the Connecticut River downstream of Turner's Falls; 2.) the Merrimack River below the Essex Dam (Merrimack River Dam) in Lawrence; 3.) Cape Cod Bay; 4.) Massachusetts Bay, 5.) the Taunton River, and 6.) the Piscataqua River/Great Bay Estuary.

D. Ongoing Project Activities in the Action Area:

In July 2013, EPA administratively continued the expired 2008 NCCW GP for existing permittees that indicated interest in remaining covered under the permit. EPA expects that most of these facilities will reapply for coverage when the NCCW GP is reissued. EPA believes that it is appropriate to use discharge data from current and recently covered permittees to predict the effect of future discharges on ESA species and critical habitat: discharges from the facilities are sufficiently similar to warrant coverage under a general permit (see Section I.B. of the fact sheet) and are considered representative in determining impacts to aquatic species.

Facilities that have maintained coverage under the administratively continued expired (2008) permit, as of February 2014, are considered in this assessment. The action area of the NCCW GP includes facility discharges to the following waterbodies:

1. Connecticut River

The lower Connecticut River (including waters in Massachusetts downstream of Turner Falls) is inhabited by the endangered Shortnose Sturgeon. There have also been sightings of Atlantic Sturgeon in the Connecticut River, but usually further downstream in Connecticut, beyond the action area of this permit. There are two facilities covered under the expired permit that discharge directly to the Connecticut River downstream of Turner's Falls. Currently, there are no other permittees in Massachusetts or New Hampshire that discharge directly to the main stem of the Connecticut River. EPA did not evaluate facilities covered under the expired permit that discharge to tributaries of the Connecticut River in this assessment. EPA assumes that tributary discharges will cause negligible water quality impacts to the Connecticut River due to dilution and mixing in the receiving water tributaries. Discharges from those facilities are not considered in this assessment. A summary of the two facilities is shown below:

Identifier	Location	Number of outfalls	Total max. allowed discharge (MGD)	CWIS?	Source water
Facility A	Holyoke, MA	2	1.0 MGD	No	Groundwater
Facility B	Chicopee, MA	1	0.3 MGD	No	Municipal

See section V.C. for EPA's effects determination in the Merrimack River.

2. Merrimack River

A population of endangered shortnose sturgeon is known to seasonally inhabit the Merrimack River below the Essex (also known as the Lawrence or Merrimack) Dam in Lawrence. Atlantic Sturgeon have been documented in the Merrimack River, but no spawning population has been observed in the river according to the 2007 report by the Atlantic Sturgeon Status Review Team (ASSRT). Currently, there are two facilities that discharge to the Merrimack that are covered under the expired permit and are expected to apply for coverage under the new permit when it is issued. Both facilities discharge small amounts of NCCW from one outfall to the main stem of the Merrimack River in Merrimack, NH. A summary of the two facilities is shown below:

Identifier	Distance from Action Area	Max. allowed Discharge (MGD)	CWIS?	Source water
Facility C	31 miles	0.288	No	Groundwater
Facility D	36 miles	0.020	No	Municipal

See section V.C. for EPA's effects determination in the Merrimack River.

3. Cape Cod Bay

There is one facility covered under the expired permit that discharges to Plymouth Harbor in Cape Cod Bay. Cape Cod Bay provides seasonal habitat and feeding grounds for the endangered North Atlantic Right Whale, Humpback Whale, Fin Whale, Green Sea Turtle, Kemp's Ridley Sea Turtle, Loggerhead Sea Turtle, and Leatherback Sea Turtle. Cape Cod Bay is also a designated critical habitat for the North Atlantic Right Whale. See Section V.E. for EPA's effects determination in Cape Cod Bay.

4. Massachusetts Bay

There are currently two facilities covered under the expired permit that discharge to Boston Inner Harbor in Massachusetts Bay. Massachusetts Bay provides seasonal habitat and feeding grounds for the endangered North Atlantic Right Whale, Humpback Whale, Fin Whale, Green Sea Turtle, Kemp's Ridley Sea Turtle, Loggerhead Sea Turtle, and Leatherback Sea Turtle. Stellwagen Bank, located approximately 5 miles offshore, is a designated critical habitat for the North Atlantic Right Whale. EPA has determined that this distance precludes any potential impacts from small coastal discharges presently or in the future. See Section V.D. for EPA's effects determination in Massachusetts Bay.

III. Status of Species and Critical Habitat

A. Species List from the Services

According to information obtained from the NMFS website, as well as information provided via a September 3, 2013 electronic correspondence between NMFS and EPA regarding general permits, nine ESA listed species are present within the Action Area, namely Massachusetts state waters.

These include two species of listed fish: the endangered shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus).* NOAA's Fisheries Service announced a final decision to list five Distinct Population Segments (DPSs) of Atlantic sturgeon in 2012. Only three DPSs fall under the jurisdiction of the Northeast Region of NOAA Fisheries; these are the Gulf of Maine DPS (threatened) and the New York Bight and Chesapeake Bay DPSs which are both listed as endangered ((77 FR 5880, 2012). However since the range of all five DPSs overlaps and extends from Canada through Cape Canaveral, FL, the other two DPS of Atlantic sturgeon, namely the endangered Carolina and South Atlantic DPSs , have also been included in this document (77 FR 5914, 2012).

Three species of federally endangered whales and four species of ESA listed sea turtles are found seasonally in New England waters, including those off the coast of Massachusetts. These include the North Atlantic right whale (*Eubalaena glacialis*), the humpback whale (*Megaptera novaeangliae*), the fin whale (*Balaenoptera physalus),* the endangered Kemp's ridley sea turtle *(Lepidochelys kempii),* the threatened Northwest Atlantic Distinct Population Segment (DPS) of the Loggerhead sea turtle (*Caretta caretta*), the endangered Leatherback sea turtle (*Dermochelys* coriacea), and the Green Turtle *(Chelonia mydas).*

The Cape Cod Bay Critical Habitat Area for North Atlantic Right Whales (*Eubalaena glacialis*) does fall within a portion of the Action Area. The aforementioned critical habitat is part of the broader Northeast Atlantic critical habitat, which was designated in 1994. This critical habitat will be discussed in more detail in Section 3.4.3.2.

The endangered Blue Whale (*Balaenoptera musculus musculus*), the endangered Sei Whale (*Balaenoptera borealis),* and the endangered Sperm Whale (*Physeter macrocephalus*) are also ESA-listed marine mammals. However, these whales are typically located in deeper waters which are farther offshore. The distribution of the Western North Atlantic Stock of the blue whale extends from the Arctic to at least mid-latitude waters, with sightings most frequently observed off eastern Canada and only an occasional sighting in US Atlantic Exclusive Economic Zone (EEZ) waters (Sears, 1987); (NMFS, 2010). The Nova Scotia (formerly the Western North Atlantic) stock of the sei whale is generally found in the deeper waters of the continental shelf edge region of the northeastern U.S, up to Cape Breton, Nova Scotia, and then east to longitude 42°W (Hain, et al., 1985); (NMFS, 2013c) . Sperm whales are located throughout the world's oceans in deep waters (water depths of 600 meter or more) between approximately 60°N and 60°S latitudes, and are uncommon in waters less than 300 meters deep (NMFS, 2013b)

Based upon the above information regarding these whales' distributions and EPA's determination that cooling water intakes and discharges are located near-shore, these whales will not be present in the Action Area. Therefore any effects to these three endangered whales are extremely unlikely to occur.

B. Shortnose Sturgeon (*Acipenser brevirostrum*) – Endangered

1. Life History

Shortnose sturgeons are large benthic fish that mainly occupy the deep channel sections of large coastal rivers in eastern North America (Shortnose Sturgeon Status Review Team, 2010). Throughout their lifecycle, they feed on a variety of benthic insects, crustaceans, mollusks, and polychaetes (Dadswell, et al., 1984).

Like other sturgeon, the shortnose sturgeon is relatively slow going, late maturing and long-lived (Shortnose Sturgeon Status Review Team, 2010). Shortnose sturgeon have similar lengths at maturity (45-55 cm fork length) throughout their range, but, because sturgeon in southern rivers grow faster than those in northern rivers, southern sturgeon mature at younger ages (Dadswell, et al., 1984) . In the north, males reach maturity at 5 to 10 years, while females mature between 7 and 13 years (Shortnose Sturgeon Status Review Team, 2010).

Spawning is not typically a yearly event for shortnose sturgeon in northern rivers. Based on limited data, females spawn every three to five years while males spawn approximately every two years (Dadswell, et al., 1984). The spawning period is estimated to last from a few days to several weeks. According to the 2010 Biological Assessment, shortnose sturgeon in northern rivers are known to migrate from overwintering locations upstream to spawning grounds during the spring when the freshwater temperatures increase to 7-9^{o}C (Shortnose Sturgeon Status Review Team, 2010). Sturgeon spawn in upper, freshwater areas and feed and overwinter in both fresh and saline habitats. As noted in the 2010 Biological Assessment, shortnose sturgeon is often considered “anadromous,” however a more accurate term is “amphidromous.” This means that the fish move between fresh and salt water during some part of their lifecycle, but not for breeding purposes (Shortnose Sturgeon Status Review Team, 2010).

2. Status

Shortnose sturgeon were originally listed as an endangered species by the USFWS on March 11, 1967 under the Endangered Species Preservation Act (32 FR 4001, 1967). After a government reorganization plan was implemented in the early 1970’s, NMFS assumed jurisdiction for shortnose sturgeon from the USFWS. Although the original listing notice did not document specific reasons for listing the shortnose sturgeon as endangered, a 1973 Resource Publication, issued by the US Department of the Interior, indicated that shortnose sturgeon were in peril in most of the rivers of its former range but probably not as yet extinct (United States Department of Interior, 1973) The U.S. Fish and Wildlife Service also identified pollution and overharvest in commercial fisheries as principal reasons for the species decline (United States Department of Interior, 1973) . Shortnose sturgeon remains listed as an endangered species throughout all of its range along the U.S. East Coast. NOAA Fisheries is currently conducting a status review for shortnose sturgeon to ensure that the original classification as an endangered species is still appropriate.

3. Distribution and population trends

The Shortnose Sturgeon Recovery Plan, which was finalized in 1998, identified 19 distinct populations based on the fish’s strong ties to their natal river systems (Shortnose Sturgeon Status Review Team, 2010). These river systems range from the Saint John River in New Brunswick, Canada to the St. Johns River in Florida. Two populations of Shortnose Sturgeon have been documented in Massachusetts waters, specifically in the following areas:

- Merrimack River (main stem) below the Essex Dam in Lawrence, MA to the Merrimack River's mouth (Essex County);
- Connecticut River (main stem) downstream of Turner's Falls, MA (Franklin, Hampshire, and Hampden Counties) to the Connecticut River's mouth in the state of CT (Hartford Middlesex and New London Counties).

The state of Massachusetts encompasses 27 watersheds (MassDEP, 2013) . However the Action Area for the permit, as it relates to shortnose sturgeon, consists of the two watersheds within Massachusetts where the species is actually located. This includes portions of the Merrimack River Watershed and the Connecticut River Watershed. The Action Area has been narrowed further to include only the mainstems of the Merrimack and Connecticut River.

a. Shortnose Sturgeon in the Merrimack River

According to a letter dated November 4, 2013 in which NMFS responded to EPA's request for ESA section 7 consultation regarding NPDES discharges from Lawrence Hydroelectric Project (NMFS, 2013f) ,

> There is a small population of the federally endangered shortnose sturgeon (*Acipenser brevirostrum*) in the Merrimack River. The size of this population has been estimated by tag and release studies (conducted in 1988-1990) to be 33 adults with an unknown number of juveniles and sub-adults…. Shortnose sturgeon in the Merrimack River are not known to exist upstream of the Essex Dam (Lawrence), which represents the first significant impediment to the upstream migration of shortnose sturgeon in this system. Sexually mature fish begin to move upriver from freshwater overwintering areas (located in the Amesbury reach) to the spawning site near Haverill…Spawning is concentrated within a 2-km reach at river kilometers 30-32 (measured from the mouth) near Haverhill…Following spawning in late April-early May, fish move downriver. Some fish remain in a freshwater reach near Amesbury (Rocks Village to Artichoke River) for the remainder of the year while others move into a saline reach near the lower islands for about 6 weeks prior to returning to the freshwater reach.

Since those earlier tag and release studies, more recent sampling efforts have occurred. NMFS' 2010 Shortnose Sturgeon Biological Assessment indicated that a gill net-sampling took place in the winter of 2009 in which researchers captured a total of 170 adults (Shortnose Sturgeon Status Review Team, 2010).

b. Shortnose Sturgeon in the Connecticut River

Shortnose sturgeons inhabit the Connecticut River from the Turners Falls Dam, at rkm 198 in Turners Falls, MA, down to Long Island Sound. The Connecticut River population is separated by the Holyoke Dam, at the South Hadley Falls near rkm 140, into an upriver group (above

Holyoke Dam) and a lower river group (below Holyoke Dam). Although earlier reports indicated that the shortnose sturgeon were separated with the construction of the Holyoke Dam, the 2010 Shortnose Sturgeon Biological Assessment reported that more recent "behavioral and genetic information indicates shortnose sturgeon in the Connecticut River are of a single population impeded, but not isolated, by the dam" (Shortnose Sturgeon Status Review Team, 2010).

Several areas of the Connecticut River have been identified as concentration areas for the shortnose sturgeon. In the downriver segment, there is a 9 km stretch near Agawam, MA (rkm 120-112) which is thought to provide summer feeding and over wintering habitat. A concentration of shortnose sturgeon may also be found in a 2 km segment immediately below the Holyoke Dam during the spring, summer, and fall. Above the dam, there is the Deerfield Concentration Area (DCA), a 49km stretch near Deerfield, MA, where shortnose sturgeon can forage and overwinter (Shortnose Sturgeon Status Review Team, 2010). A 2-km spawning site has been identified near Montague, MA and this is thought to be the primary spawning site for shortnose sturgeon in the Connecticut River (Kynard, et al., 2012) .

Population estimates have been completed for shortnose sturgeon in the Connecticut River, occurring both above and below the Holyoke Dam. According to the 2010 Biological Assessment, Taubert (1980) conducted the earliest population estimate for the sturgeon upstream of the dam which resulted in an estimate of 370-714 adults. More recent studies, including a 1994 mark-recapture estimate during the summer-fall foraging period of 1994 and an annual spring study of pre-spawning adults near Montague between 1994-2001 yielded estimates of 328 adults (CI of 188-1,264 adults) and a mean of 142.5 spawning adults (CI of 14-360 adults), respectively (Shortnose Sturgeon Status Review Team, 2010) . Downstream of the Holyoke Dam, researchers conducted annual estimates of foraging and wintering adults during 1989-2002. Savoy (2004) estimated that the lower river population may be as high as 1000 individuals, based on his studies that used mark-recapture techniques.

4. Population Risks & Stressors

According to a Shortnose Sturgeon Recovery plan that was published in December 1998 to promote the conservation and recovery of the species, principal threats to the species' survival included habitat degradation or loss (resulting from dams, bridge construction, channel dredging, and pollutant discharges) and mortality (from impingement on cooling water intake screens, dredging, and bycatch from other fisheries) (NMFS, 1998) . Several natural and human-induced factors, including those originally highlighted in the recovery plan, continue to threaten the recovery of shortnose sturgeon. As described in the 2010 Shortnose Sturgeon Biological Assessment, these stressors include:

- **Dams & Diversions**: These structures can fragment populations, eliminate or impede access to spawning habitat, and alter downstream flows and water temperatures; Physical injury or mortality can occur to fish that attempt to migrate through turbines of hydropower facilities or during attempts to move upstream using fish passages;

- **Dredging, Blasting and Pile Driving**: Such activities can result in noise/disturbance; the removal/burial of organisms; increased turbidity/siltation effects which can severely damage spawning habitat; and destruction of actual habitat of the sturgeon

- **Water Quality and Contaminants:** Non-point source pollution and/or point-source discharges from municipal wastewater, industrial activities, power plant cooling water or wastewater, and agricultural practices can discharge pollutants (including nutrients, chemicals and/or metals) and lead to poor water quality (NMFS, 1998) ; Coastal and riparian areas can be particularly impacted by development and urbanization which can lead to erosion, stormwater discharges, and non-point source pollution (Shortnose Sturgeon Status Review Team, 2010) ; Compounds associated with point-source discharges, which can include metals, dioxin, dissolved solids, phenols, and hydrocarbons, lead to changes in fish behavior, deformations, reduced egg production and survival, or mortality (Health, 1987) ; Such chemicals can also alter the physical properties of the receiving waterbody by reducing DO or changing the water's temperature and/or pH (Shortnose Sturgeon Status Review Team, 2010)

- **Climate Change**: An increase in temperature, reduction in water availability, and altered frequency of extreme events and severe storms could severely stress ecosystems (and hence sturgeons), in part by altering the salinity, oxygen levels, and circulation of water bodies (Intergovernmental Panel on Climate Change, 2007a) ;

- **Bycatch**: Although the direct harvest of shortnose sturgeon has been prohibited since 1967, commercial gillnet and recreational shad fisheries still remain a source of bycatch

According to the most recent Biological Assessment for the shortnose sturgeon, the viability of sturgeon populations were most negatively influenced by dams, dredging, poor water quality, and bycatch (Shortnose Sturgeon Status Review Team, 2010). As a whole, the greatest single threat to shortnose sturgeon was habitat degradation (Shortnose Sturgeon Status Review Team, 2010). There is no reliable estimate exists for the shortnose sturgeon population in the Northeastern U.S, nor is there an estimate for the total species population as a whole (NMFS, 2013e). However the population size is obviously lower than what could be supported because of the aforementioned threats (NMFS, 2013e).

C. Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) :
Gulf of Maine DPS: Threatened
New York Bight DPS: Endangered
Chesapeake Bay DPS: Endangered
Carolina DPS: Endangered
South Atlantic DPS: Endangered

1. Life History

Atlantic sturgeon are a long-lived, late maturing, estuarine-dependent, anadromous species, feeding primarily on benthic invertebrates such as crustaceans, worms, and mollusks. Although adults spend most of their lives in marine environments, they migrate upriver to spawn in freshwater in the spring and early summer (Atlantic Sturgeon Status Review Team, 2007). According to NMFS's website, Atlantic sturgeon spawn in moderately flowing water in deep parts of large rivers. The spawning interval for males ranges from 1 to 5 years and 2 to 5 years for females. Sturgeon eggs are highly adhesive and are deposited on hard benthic substrate, such as cobble. Once eggs hatch, the larvae eventually migrate downstream using structures, like gravel matrices, as refuges. Juvenile Atlantic sturgeon continue to move further downstream into brackish waters. Adults live in coastal waters and estuaries, particularly in shallow areas with sand and gravel substrates (NMFS, 19 Nov 2013).

2. Status

All five DPSs of Atlantic sturgeon, including the GOM, New York Bight, and Chesapeake Bay DPSs in the Northeast Region of the United States and the South Atlantic and Carolina DPSs in the Southeast Region, received a final listing under the ESA on February 6, 2012 (77 FR 5880, 2012); (77 FR 5914, 2012). The GOM distinct population segment is listed as threatened while the other four DPSs are listed as endangered. Although an earlier petition to list the Atlantic sturgeon was submitted in 1997, the status review determined that the species did not meet the requirements under the ESA at that time. However in 1998, the Atlantic States Marine Fisheries Commission (ASMFC) did amend the 1990 Atlantic Sturgeon Fishery management Plan to impose a 20-40 year moratorium on Atlantic sturgeon fisheries (Atlantic Sturgeon Status Review Team, 2007). NMFS completed a second status review in 2007 and the Natural Resources Defense Council (NRDC) petitioned NMFS to list the Atlantic sturgeon under ESA in 2009. This led to the current listing (NMFS, 19 Nov 2013).

3. Distribution and Population Trends

a. Distribution Trends

Distinct Population Segment (DPS)	**Range** (According to 77 FR 5580 & 77 FR 5914; Includes watersheds (rivers and tributaries) “as well as wherever these fish occur in coastal bays and estuaries and the marine environment”)	**Current Spawning Location(s) –** (NMFS, 2013b)
Gulf of Maine DPS	Those spawned in watersheds from Maine/Canadian border – extending southward to all watersheds draining into Gulf of Maine as far south as Chatham, MA	Kennebec River; possibly Penobscot River
New York Bight DPS	Those spawned in the watersheds that drain into coastal waters, including Long Island Sound, the New York Bight, and Delaware Bay, from Chatham, MA to the Delaware-Maryland border of Fenwick Island.	Hudson River & Delaware River
Chesapeake Bay DPS	Spawned in watersheds that drain into the Chesapeake Bay and into coastal waters from the Delaware-Maryland border on Fenwick Island to Cape Henry, VA	James River; possibly York River (NMFS, n.d.)(NMFS CB Fact Sheet)
Carolina DPS	Spawned in watersheds from	Roanoke, Tar-Pamlico, Cape

	Albemarle Sound southward along the southern Virginia, North Carolina, and South Carolina coastal areas to Charleston Harbor	Fear, Waccamaw, and Pee Dee Rivers**;** Possibly in Neuse, Santee and Cooper Rivers
South Atlantic DPS	Spawned in watersheds of the ACE (Ashepoo, Combahee, and Edisto) Basin southward along the South Carolina, Georgia, and Florida coastal areas to the St. Johns River, Florida	ACE (Ashepoo, Combahee and Edisto Rivers) Basin, Savannah River, Ogeechee River, Altamaha River, and Satilla River

Atlantic sturgeon were historically present in approximately 38 rivers in the United States ranging from St. Croix, ME to Saint Johns River, FL; a historical spawning population was confirmed for 35 of those rivers. Currently, Atlantic sturgeon are present in 35 rivers, and spawning occurs in at least 20 of these rivers (Atlantic Sturgeon Status Review Team, 2007). The species has been documented in several New England rivers, including the Penobscot, Kennebec, Androscoggin, and Sheepscot Rivers in Maine; the Piscataqua River in New Hampshire; the Merrimack River in NH and MA; the Taunton River in MA & RI; and the Connecticut River in MA and CT (ASSRT 2007). Of these, a spawning population has only been identified in the Kennebec River, although there is possible spawning in the Penobscot. Atlantic sturgeon from all of those rivers, with the exception of the Taunton River and Connecticut River, fall under the Gulf of Maine (GOM) DPS. Sturgeon from the Taunton and Connecticut River would fall under the New York Blight (NYB) DPS.

As previously mentioned, the action area for this permit includes all Massachusetts waters. The action area, as it relates to Atlantic sturgeon, can been further narrowed to the waterways where the sturgeon exists. These include the following Massachusetts' rivers:

- **Merrimack River** (part of the Merrimack River Watershed – same communities as listed in **Table 1**); According to the most recent status review, there was no evidence of a spawning population of Atlantic sturgeon in the Merrimack River, although it seems that the estuary is used as a nursery area (Atlantic Sturgeon Status Review Team, 2007).

- **Connecticut River** (part of the Connecticut River Watershed - same communities as listed in **Table 2**); Research efforts have not specifically investigated the occurrence of Atlantic sturgeon in the upper Connecticut River, which would include the MA-portion of the river (Atlantic Sturgeon Status Review Team, 2007). According to Savoy (1996), occasional reports, sightings, and capture of large Atlantic Sturgeon (150-300 cm) are made, but most are captured within tidal waters or freshwater in the lower part of the Connecticut (Savoy, 1996).

- **Taunton River –** According to the ASSRT, Atlantic sturgeon did spawn in the Taunton River at the turn of the century (1900's); A gill net survey was conducted in the River during 1991 and 1992 to document the use of the system by sturgeon.

Burkett and Kynard (1993) determined that the system is used as a nursery area for Atlantic sturgeon (Burkett & Kynard, 1993).

Subadults are known to travel widely and enter estuaries of non-natal rivers (77 FR 5880, 2012). Therefore there is substantial mixing throughout the marine range of Atlantic sturgeon and coastal migration is common. Nonetheless according to 77 FR 5880, mixed stock analysis of Atlantic sturgeon collected along the U.S. coast indicates that Atlantic sturgeon occur most prominently in the vicinity of their natal river(s). Fish from the Gulf of Maine DPS are not commonly taken as bycatch in areas south of Chatham, MA. Additional tagging results also indicate that GOM DPS fish tend to remain within the waters of the Gulf of Maine and only occasionally venture to points south. Based on this information, EPA believes that Atlantic sturgeon from the Gulf of Maine (GOM) and the New York Bight (NYB) DPSs would most frequently fall within the Action Area of this permit. However EPA cannot exclude the possibility that Atlantic sturgeon from any of the five DPSs may be present in MA waters. Therefore, all DPSs will be considered. This reasoning follows a similar conclusion reached by NMFS as stated in a March 22, 2013 letter from NMFS Assistant Regional Administrator Mary Colligan to EPA Water Permits Branch Chief Dave Webster regarding the New Hampshire MS4 NPDES permit (NMFS, 2013a).

b. Population trends

As discussed in the status review, a number of studies throughout the years have consistently found Atlantic sturgeon populations to be genetically diverse (Atlantic Sturgeon Status Review Team, 2007). Results indicate that there are between 7 and 10 populations that can be statistically differentiated. However, there is some disagreement among the studies and samples for the studies were not taken in all rivers that are inhabited by Atlantic sturgeon.

Historically, each of the DPSs likely supported more than 10,000 spawning adults (Atlantic Sturgeon Status Review Team, 2007). However according to the most recent status review, the best available data support that current numbers of spawning adults for each DPS are one to two orders of magnitude smaller than historical levels (Atlantic Sturgeon Status Review Team, 2007); 77 FR 5880). As only two abundance estimates are presently available for Atlantic sturgeon riverine populations (Atlantic Sturgeon Status Review Team, 2007). The Hudson River population in New York, which is part of the NYB DPS, was estimated to have 870 spawning adult Atlantic sturgeon per year (Kahnle, et al., 2007). The Altamaha River population in Georgia, which falls under the South Atlantic DPS, has 343 spawning adults per year (Schuller & Peterson, 2006). Other spawning populations within the U.S are likely to have less than 300 adults spawning per year (Atlantic Sturgeon Status Review Team, 2007).

According to 77 FR 5880, the Hudson is presumably the largest reproducing Atlantic sturgeon population. However the final ruling indicated that all riverine populations of Atlantic sturgeon, including those in the Northeast Region, are at reduced levels from those reported historically, and are being exposed to significant threats that are ongoing and not being adequately addressed. This is why the DPSs are listed under ESA. It should be highlighted that the GOM DPS is listed as threatened (and not endangered). The final ruling by NMFS stated that there *are* indications of increasing abundance of Atlantic sturgeon belonging to the GOM DPS, particularly in the following rivers in Maine: the Kennebec River, Penobscot River, and more recently the Saco and Presumpscot Rivers (77 FR 5880, 2012). This indicates that recolonization to rivers historically suitable for spawning may be occurring (78 FR 69310, 2013). Also, as will be described in Section 3.3.4, threats to the GOM DPS are lower than those of the other DPSs of Atlantic sturgeon.

4. Population Risks & Stressors

Historically, commercial fishing and overharvesting of Atlantic sturgeon was the primary factor that led to a wide-spread decline of their numbers. The Atlantic sturgeon is now managed under a Fishery Management Plan, which is implemented by the Atlantic States Marine Fisheries Commission (Atlantic States Marine Fisheries Commission, 1990). In 1998, the ASFMC also instituted a coast-wide 20-40 year moratorium on the harvest of Atlantic sturgeon. This will remain in effect until there are at least 20 protected age classes in each spawning stock of Atlantic sturgeon (Atlantic Sturgeon Status Review Team, 2007).

According to the final rulings for the Atlantic sturgeon, the following threats continue to adversely impact their abundance:

- **Continued bycatch in state and federally-managed fisheries:** Commercial fishing which utilizes sink gillnet gear have a much higher mortality rate for Atlantic sturgeon than other methods, like using trawl gear (77 FR 5880, 2012).

- **Vessel strikes:** These can either cause physical harm or kill Atlantic sturgeon

- **Persistent, degraded water quality**

- **Habitat impacts from dredging**

- **Habitat impediments including Dams**

- **Global climate change**

Several of these threats for the Atlantic sturgeon coincide with those listed for the shortnose sturgeon. Therefore, the explanations previously provided for each of the stressors are still applicable. However since the Atlantic sturgeon is listed as five distinct population segments, not all of the threats are necessarily present in the same area at the same time. The section below highlights some of the difference in stressors or risks to each of the five DPSs.

Gulf of Maine DPS

All of the threats apply to the GOM DPS. According to status review, poor water quality, dredging and dams, and commercial bycatch were identified as some of the key risks (Atlantic Sturgeon Status Review Team, 2007) .

- Many rivers in the Gulf of Maine, including the Kennebec, have navigation channels that are maintained by dredging (NMFS, 2013b). Dredging can either displace sturgeon or adversely impact its habitat.

- Access to historical habitat has been restricted by dams within the Northeast. According to the status review, this is most acutely observed at the Essex Dam (at river kilometer 49) on the Merrimac River which blocks access to 58% of the historically available habitat for Atlantic sturgeon (Atlantic Sturgeon Status Review Team, 2007). As previously mentioned, the accessible portions of the Merrimack are still deemed suitable as nursery habitat. Dams are also present on the Saco and Piscataqua Rivers, as well as the Veazie Dam on the Penosbscot River.

- Many rivers in Maine, including the Androscoggin River, were heavily polluted in the past from industrial discharges from pulp and paper mills (NMFS, 2013b). However as stated in 77 FR 5880, water quality improvements have been made in the range of the GOM DPS since the passage of the Clean Water Act. According to the most recent (fourth) edition of the National Coastal Condition Report, the water quality index was listed as good to fair for waters in the Arcadian province of the Northeast; these are the waters north of Cape Cod, MA (EPA, 2012).

- Although bycatch is a threat for the GOM DPS, it is not as significant as for the other DPSs. The reason is that a significant amount of fishing in the Gulf of Maine is conducted using trawl gear, which has a much lower mortality rate for Atlantic sturgeon. Nonetheless, about 15-19% of observed Atlantic sturgeon bycatch in sink gillnet and otter trawl gear from 2001 – 2006 occurred in coastal marine waters north of Chatham, MA (77 FR 5880, 2012). However, there is the concern that sink gillnet fishing efforts will increase in the Gulf of Maine as fish stocks are rebuilt (77 FR 5880, 2012).

New York Bight DPS

Persistent, degraded water quality, habitat impacts from dredging, continued bycatch, and vessel strikes continue to pose risks to the NYB DPS (77 FR 5880, 2012).

- Although the Clean Water Act has led to improvements in water quality, rivers in the NYB region, including the Hudson and Delaware rivers, were heavily polluted from past industrial discharges and sanitary sewer discharges (77 FR 5880, 2012).
  The most recent (fourth) edition of the National Coastal Condition Report identified that water quality was fair overall for waters in the Virginian province of the Northeast; this consists of waters south of Cape Cod through the Chesapeake Bay (EPA, 2012). These waters are quite vulnerable to the impacts of a highly populated and industrialized region. There are pockets of poor water, particularly in areas including Great Bay, NH; Narragansett Bay, RI; Long Island Sound; NY/NJ Harbor; the Delaware Estuary; and the western tributaries of Chesapeake Bay (EPA, 2012). Various issues exist including reports of low DO concentration in the summer and high ammonia-nitrogen levels in the Taunton River, impacts from coal tar leachate in the Connecticut River, and lasting PCB pollution in the Hudson River (77 FR 5880, 2012).

- Dredging occurs throughout the NYB DPS range, including the southern portion of the Connecticut River and the Delaware River.

- About 39% - 55% of observed Atantic sturgeon bycatch in sink gillnet and otter trawl gear from 2001-2006 occurred in the NYB DPS range, which includes the coastal marine waters south of Chatham, MA and north of the Delaware-Maryland border (77 FR 5880, 2012).

- Vessel strikes, especially in the Delaware River, have been reported. Between 2004-2008 alone, 29 Atlantic sturgeon (including 13 large adults) in the Delaware River were killed from suspected vessel strikes (NMFS, n.d).

Chesapeake Bay DPS

Similar to the NYB DPS, degraded water quality, habitat impacts from dredging, continued bycatch, and vessel strikes continue to be key threats to the Chesapeake Bay DPS of Atlantic sturgeon (77 FR 5880, 2012).

- Decreased water quality is a significant threat because the Chesapeake Bay system is particularly vulnerable to the effects of nutrient enrichment and sedimentation from point and non-point sources. A Total Maximum Daily Load for Nitrogen, Phosphorus, and Sediments has been established, and a number of other efforts including NOAA's 2010 Chesapeake Bay Protection and Restoration Final Strategy have also been initiated (77 FR 5880, 2012). According to the final listing for the CB DPS, water quality concerns include especially low dissolved oxygen (as a result of the nutrient loadings) and a decrease in the availability of clean, hard substrate for Atlantic sturgeon spawning habitat (77 FR 5880, 2012).

- Past removal of granite outcroppings and dredging of the James River are believed to have adversely impacted the spawning habitat of the CB DPS (Atlantic Sturgeon Status Review Team, 2007). Continued dredging, which is done to maintain the navigation channel, is likely to further such impact.

- ASMFC reported that coastal waters south of the Chesapeake Bay to Cape Hatteras, NC had the second highest number of observed Atlantic sturgeon captures in sink gillnet gear from 2001- 2006 (Atlantic States Marine Fisheries Commission, 2007).

Vessel strikes are known to take place in the James River. From 2005 – 2007, 11 Atlantic sturgeon have been struck by vessels (NMFS, n.d.)

Carolina DPS

Threats to the Carolina DPS include a combination of habitat modification impacts (including degraded water quality, dams and dredging), as well as the adverse impacts of climate change and bycatch (NMFS, 2013b).

- The presence of dams has prevented the Atlantic sturgeon from spawning and developing in historical sturgeon habitat. According to NMFS' factsheet for the Carolina DPS of Atlantic sturgeon, dams in the Cape Fear and Santee-Cooper River systems have blocked over 60% of the historical habitat upstream of the dams (NMFS, n.d.). Also, the accessible habitat is of a lower quality than the historical areas.

- Throughout the range of this DPS, both water quality and water quantity issues exist. Excessive nutrient loading exists in the Pamlico and Cape Fear systems, partly because of concentrated animal feeding operations (CAFOs) (77 FR 5914, 2012). This leads to low dissolved oxygen levels to which sturgeon are quite sensitive. Heavy industrial development in the Cape Fear River has also led to degraded water quality (NMFS, 2013b). According to 77 FR 5914, the third edition of the National Coastal Condition Report downgraded water quality in the Southeast from a 4 to a 3, ranking it as "fair" rather than "good to fair." The most recent (fourth) edition of the NCCR maintained the water quality ranking as fair (EPA, 2012).

- Interbasin water transfers and climate change can exacerbate the water quality problems that already exist in the Carolina DPS range by altering water flow, water temperature, and DO levels (NMFS, 2013b).

- Dredging occurs throughout the DPS range, particularly in the lower Cape Fear River and the Cooper River, which once again can adversely impact Atlantic sturgeon habitat (NMFS, n.d.).

- Continued overutilization of Atlantic sturgeon as bycatch in commercial fisheries is an ongoing impact to the Carolina DPS (77 FR 5914, 2012).

South Atlantic DPS

Many of the key threats to the South Atlantic DPS are similar to those of the Carolina DPS. These include a combination of habitat modification impacts (including degraded water quality, dams and dredging), overutilization (i.e, being taken as bycatch) and climate change (NMFS, n.d.).

- As previously mentioned for the Carolina DPS, the water quality in the Southeast was only ranked as "fair" under EPA's NCCR III and this ranking was maintained under the fourth edition of the NCCR (EPA, 2012). Runoff from agricultural activities, silviculture, and industry (including paper mills) have all negatively impacted the water quality, as has the transfer of water between river basins for commercial or municipal use (NMFS, n.d.). This has led to nutrient loading, pollution inputs, and low DO in multiple rivers within the South Atlantic DPS range.

- The construction of Kirkpatrick Dam (originally known as Rodman Dam) at rkm 153 of the St. Johns River has restricted migration to potential spawning habitat. According to the status review, about 63% of historical sturgeon habitat is believed to be blocked due to this dam (Atlantic Sturgeon Status Review Team, 2007). As a result, there is no longer a spawning population in the St. Johns River (Atlantic Sturgeon Status Review Team, 2007).

- Dredging occurs throughout the range of the South Atlantic DPS, including in the Savannah River and the St. Johns River. This has impacted the quality and availability of Atlantic sturgeon nursing and/or foraging habitat (NMFS, n.d.); (NMFS, 2013b)..

- According to 77 FR 5914 (or the final ruling that listed this DPS as endangered), bycatch is known to occur in several fisheries in the Southeast although it is widely accepted that such bycatch is underreported in that region. As a result, NFMS stated in the final ruling that there is great uncertainty regarding the implementation and effectiveness of the ASMFC's Fish Management Plan conservation effort for the Carolina and South Atlantic DPSs of Atlantic sturgeon (77 FR 5914, 2012).

- Once again, climate change is expected to exacerbate the water quality and quantity issues that already occur within the Southeast region.

D. North Atlantic Right Whales (*Eubalaena glacialis*), Western Stock – Endangered

Right whales are known to be the rarest of all large whale species, as well as the rarest of all marine mammal species. As such, North Atlantic right whales have a species' recovery priority number of One (1) based on the criteria in the Recovery Priority Guidelines (NOAA Fisheries, 2012). Three species of right whales exist: The North Atlantic right whale (*Eubalaena glacialis)*, the North Pacific right whale (*Eubalaena japonica)*, and the southern right whale (*Eubalaena australis)* (NMFS, n.d.). The North Atlantic right whale is the only species applicable to this permit.

1. Life History

North Atlantic Right whales are large baleen whales which feed on zooplankton, especially copepods. Unlike other baleen whales, right whales are skimmers. This means that they feed by continuously filtering prey through their baleen as they move through a patch of zooplankton with their mouth open (NMFS, 2005). In the western North Atlantic, calving occurs between December and March in the shallow, coastal waters of southeastern U.S. Females, in both the northern and southern hemisphere, give birth to their first calf at the average age of nine years; gestation lasts approximately 12 – 13 months (NMFS, 2005).

Feeding and nursery grounds, where nursing females feed and suckle, occur in New England waters and north to the Bay of Fundy and Scotian Shelf (NMFS, 2005). Right whales are most abundant in the coastal waters off Massachusetts, particularly Cape Cod Bay, between February and April where they have been observed feeding predominantly on dense patches of copepods (NMFS, n.d.); (NMFS, 2012).Much of the population is found in the Canadian waters in the summer through fall (NMFS, 2005).

The location of some portion of the population during the winter months remains unknown, as does any breeding area(s) for the whales (NMFS, 2005). Also although there is little data on the longevity of these whales, it is believed that they live for at least 50 years (NMFS, n.d.).

2. Status

In June of 1970, the "northern right whale" (*Eubalaena spp.*) was originally listed under the Endangered Species Conservation Act, the precursor to the ESA (35 FR 18319, 1970). Since the Endangered Species Act was established in 1973, it has remained listed. In 2008, after NMFS conducted a comprehensive review of the status of right whales in the North Atlantic and North Pacific Oceans, they concluded that the right whales in the northern hemisphere were actually two species: North Atlantic right whale *(Eubalaena glacialis)* and North Pacific right whale *(Eubalaena japonica*) (73 FR 12021, 2008). The species is also designate as depleted under the Marine Mammal Protection Act (MMPA).

NMFS approved a Final Recovery Plan for the Northern Right Whale, which included both the North Atlantic and North Pacific right whales) in December of 1991. This identified actual and potential factors that were impacting the northern right whale and provided recommendations to reduce and/or eliminate threats to the species' recovery. A revised recovery plan for the North Atlantic Right Whale (*Eubalaena glacialis*) was published in 2005 (NMFS, 2005).

Critical Habitat was originally designated for the Northern Right Whale in 1994 (59 FR 28805, 1994).

3. Distribution and Population Trends

   a. Distribution

As previously mentioned, Western North Atlantic right whales generally range from their calving grounds in the coastal waters of southeastern United States to their feeding and nursery grounds in New England waters and the Canadian Bay of Fundy. According to the 2005 Recovery Plan, the distribution of whales seems to be tied to the distribution of their prey (NMFS, 2005). In addition to the coastal waters of the southeast, research indicates that there five other major habitats, or congregations, where Western North Atlantic right whales frequently exist. These include: the Great South Channel; Georges Bank/Gulf of Maine; Cape Cod and Massachusetts Bays; The Bay of Fundy; and the Scotian Shelf (NMFS, 2012).

   b. Designated Critical Habitat

Designated habitat for the Northern Right Whale includes two defined areas, namely Cape Cod/Massachusetts Bays and The Great South Channel (GSC) in the Northeast and waters adjacent to the coasts of George and the east coast of Florida in the Southeast US (SEUS) (59 FR 28805, 1994). The two designated areas in the Northeast serve as foraging habitats for the whales while the designated area in the Southeast is known as a winter calving ground and nursery.

The following excerpt from the final rule of Designated Habitat describes the Great South Channel (GSC):

> The GSC is a large funnel-shaped bathymetric feature at the southern extreme of the Gulf of Maine between Georges Bank and Cape Cod, MA. The GSC is one of the most used cetacean habitats off the northeastern United States (Kenney and Winn, 1986)…The channel is generally deeper to the north and shallower to the south, where it narrows and rises to the continental shelf edge. To the north, the channel opens into several deepwater basins of the Gulf of Maine. The V-shaped 100m isobath effectively delineates the steep drop-off from Nantucket Shoals and Georges Bank to the deeper basins…It is likely that a significant proportion of the western North Atlantic right whale population uses the GSC as a feeding area each spring, aggregating to exploit exceptionally dense copepod patches (59 FR 28805, 1994).

Although the Great South Channel is off of the coast of Massachusetts, its significant distance from any coastal facilities eligible under this permit precludes any impact from NCCW discharges.

However, the Action Area for this general permit (as it relates to the North Atlantic Right Whale) can be narrowed to the Massachusetts waters of Cape Cod Bay. Stellwagen Bank, is also a designated critical habitat, which is located at the mouth of Massachusetts Bay, between Cape Cod and Cape Ann. Yet since Stellwagen Bank is located approximately 5 miles east of Gloucester, MA and 5 miles north of Provincetown, MA, EPA believes that this distance would also preclude any potential impact from discharges under this permit.

In 59 FR 28805, Cape Cod Bay (CCB) is described as:

> a large embayment on the U.S. Atlantic Ocean off of the state of Massachusetts that is bounded on three sides by Cape Cod and the Massachusetts coastline from Plymouth, MA, south. To the north, CCB opens to Massachusetts Bay and the Gulf of Maine…The general water flow is counter-clockwise, running from the Gulf of Maine south into the western half of CCB, over to eastern CCB, and back into the Gulf of Maine through the channel between the north end of Cape Cod (Race Point) and the southeast end of Stellwagen Bank, a submarine bank that lies just north of Cape Cod…The late-winter/early spring zooplantkton fauna of CCB consists primarily of copepods….The CCB may occasionally serve as a calving area, but it is more recognized for being a nursery habitat for calves that enter into the area after being born most likely in, or near, the SEUS.

A wide range of human activities may impact the designated critical habitat including vessel activities, fisheries, and possible habitat degradation through pollution, sea bed mining, and oil and gas exploration (59 FR 28805, 1994). This issue will be discussed in more detail in a subsequent section (Section 5.5) of this document.

c. Population

According to NMFS' 2012 stock assessment of the western North Atlantic Right, the population was estimated to be at least 444 individuals in 2009 (NMFS, 2012)**.** This was based on the 1990-2009 census of individual whales, identified using photo-identification techniques. The stock assessment report emphasized that this was the minimum value of the population. Various studies indicated there was a decline in the whales' survival in the early 1980s and 1990s (NMFS, 2012). However according to an analysis of the current minimum alive population index, the geometric mean growth rate for the 1990-2009 period was 2.6% and there appears to be a positive, albeit slowly, accelerating trend in population size (NMFS, 2012).

4. Population Risks & Stressors

Historically, the right whale population was brought to extremely low levels by commercial whaling (59 FR 28805, 1994). According to the most recent recovery plan, other anthropological activities, particularly ship collisions and entanglements in fishing gear are now the most common causes of mortality in North Atlantic right whales (NMFS, 2005). From 2005 to 2009, reports indicate that right whales had the greatest number of ship strike mortalities and serious injuries compared other large whales in the Northwest Atlantic (NMFS, 2013b)**.** Other potential threats include habitat degradation, contaminants, climate/ecosystem change, and noise/disturbance from industrial activities and whale-watching activities (NMFS, 2005).

a. Ship Collisions

Vessel strikes can either kill or cause serious physical injury to North Atlantic Right Whales. According to NMFS' five year review of this species, vessel speed is considered a principal factor in both the occurrence and the severity of vessel-whale collisions (NOAA Fisheries, 2012). In an attempt to decrease such incidences, NMFS did establish regulations in December of 2008 to limit the speed of vessel, measuring 65 feet or greater, to 10 knots or less in Seasonal Management Areas where whales are known to occur at particular times (73 FR 60173, 2008). In the Northeast, this regulation applies to the following four distinct areas January through July: Cape Cod Bay; the area off Race Point at the northern end of Cape Cod; the Great South Channel; and the northern Gulf of Maine (73 FR 60173, 2008). NMFS has proposed a ruling to eliminate the expiration date for this regulation (78 FR 34024, 2013).

b. Entanglement in Fishing Gear

According to 59 FR 28805, more than one-half of all of the right whales cataloged (at that time) had scars indicative of entanglements with fishing gear which results in scars, injury, and/or death. From 1990 to 2009, NMFS' entanglement records documented 94 confirmed right whale entanglements events (Waring, et al., 2012). NMFS implemented the Atlantic Large Whale Take Reduction Team to reduce such injuries and deaths of all large whales due to the incidental entanglement in fishing gear (NMFS, 2012). Although disentanglement in not always possible or successful, at least three whales were believed to have avoided serious injury or mortality by being freed from fishing gear by disentanglement teams (Waring, et al., 2012). Yet according to

NMFS' five year review, the agency plans to develop a vertical line reduction rule in 2013 because they did not believe that the current regulations were effective enough in protecting the population from entanglements (NOAA Fisheries, 2012).

c. Additional Threats

Habitat degradation, contaminants, and climate change are among additional threats.

- **Habitat Degradation:** As previously discussed, dredging, undersea exploration and development of mineral deposits, and pollution from human activities could possibly lead to habitat degradation.

- **Contaminants in Whales:** According to the 2005 recovery plan, contaminant data on right whales have only been obtained from biopsy-derived samples (NMFS, 2005). Data from only two studies are available and the data indicated a total PCB range of 80 to 1000 ng/g wet weights (in the parts per billion range) for right whales (Woodley, et al., 1991); (Moore, et al., 1998). Organic chemical contaminants are not considered to be the primary factors in slowing the recovery of any stocks of large whale species (O'Shea & Brownell, 1994).

- **Climate Change:** According to the 2005 recovery plan, the effects of climate-induced shifts in productivity and biomass of zooplankton on the foraging success of right whales has not been well studied (NMFS, 2005). It is an area of interest, especially considering the reliance the whales have on that food source.

E. Humpback Whale (*Megaptera novaengliae)* - Endangered

1. Life History

Humpback whales are large, baleen whales that feed on small fish, including herring (*clupea harengus*), sand lance (*Ammodytes americanus*), and capelin (*Mallotus villosus*), and large zooplankton, particularly krill (NMFS, 1991). These whales carry out the most diverse array of feeding behaviors known for any of the baleen whales (NMFS, 1991). Some of these hunting techniques include the use of air bubbles to herd, corral, or disorient fish. In the summer, humpbacks are found in high latitude feeding grounds, such as the Gulf of Maine in the northwestern Atlantic. Such feeding is critical to enable the whales to build up fat (blubber) which they'll live off of during the winter months. Humpbacks prefer shallow water when feeding and calving (NMFS, 2013g)

Humpback whales are known to travel long distances during their seasonal migration from their spring, summer, and fall feeding locations to their winter mating/calving locations in subtropical or tropical waters (NMFS, 1991). During winter, the whales from most of the North Atlantic feeding areas, including the Gulf of Maine, mate and calve in the West Indies (NMFS, 2012b). Gestation lasts for approximately 11 months and breeding occurs generally once every two years (NMFS, 2013g)According to the 2012 Stock Assessment for the Gulf of Maine population of humpbacks, not all whales migrate to the West Indies every winter; a significant number of the whales have been found in mid- and high-latitude regions (NMFS, 2012b). It has been suggested that the mid-Atlantic region of the U.S. might represent a supplemental winter feeding ground for humpback whales (NMFS, 2012b).

2. Status

Humpback whales were designated as "endangered" under the Endangered Species Conservation Act (ESCA) in June of 1970 (35 FR 18319, 1970). When the Endangered Species Act (ESA) was established in 1973 and replaced the ESCA, humpback whales continued to be listed as "endangered." Also, the species is designated as depleted under the Marine Mammal Protection Act (MMPA). The North Pacific population of the humpback whale is currently under review by NMFS for delisting (78 FR 53391, 2013).

3. Distribution and Population Trends

Humpback whales are known to live in all of the major oceans from the equator to sub-polar latitudes. In general, humpback whales (with the exception of those in the northern Indian Ocean population) follow a predictable migratory pattern in both hemispheres in which they feed during the summer in the higher near-polar latitudes and then migrate to lower latitudes in the winter for calving and breeding (NMFS, 2013b).

There are distinct populations of the species. According to the 1991 Recovery Plan, there was disagreement regarding the exact number and definition of existing stocks of humpback whales (NMFS, 1991). The plan highlighted the following stocks for U.S. waters: western North Atlantic; central North Pacific; and eastern North Pacific (NMFS, 1991). More recent resources now identify the following stocks for U.S. waters: Gulf of Maine (formerly Western North Atlantic) and three populations in the North Pacific (California/Oregon/Washington; Central North Pacific; Western North Pacific) (Waring, et al., 2000). Humpback whales from the western North Atlantic also inhabit and feed in the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland, however they are now considered separate/discrete subpopulations (NMFS, 2012b). The International Whaling Commission (IWC) has designated seven major breeding stocks in the Southern Hemisphere which are linked to seven major feeding areas. The stock structure of humpback whales is defined based on feeding areas because there appears to be more fidelity to feeding areas than breeding areas (Carretta, et al., 2011).

Nonetheless, since this permit is only applicable to Massachusetts' waters, only the western North Atlantic stock of humpback whales would be located in that geographic area. Therefore, only the Gulf of Maine stock is relevant for this discussion and the Massachusetts communities already listed in **Table 4** would apply to the humpback whale, as well as for the western stock of the North Atlantic Right Whale.

From mid-April to mid-November a large number of humpback whales along the U.S. East Coast occur in the western section of the Gulf of Maine, particularly the Great South Channel, Stellwagen Bank, and Jeffrey's Ledge, which is a 33-mile, relatively shallow area that stretches from the coast of Rockport, MA to almost the southeast of Cape Elizabeth, Maine (NMFS, 1991). Most of the humpbacks that forage in the Gulf of Maine visit Stellwagen Bank and the waters of Massachusetts and Cape Cod Bay because those sites typically have an abundance of the whales' prey (NMFS, 2013b).

During an intensive multi-year research study of humpback whales, known as the Years of the North Atlantic Humpback (YONAH) program, photographs for individual identification and biopsy samples for genetic analysis were taken of humpback whales throughout most of their North Atlantic range (Smith, et al., 1991). This led to an estimate of 11, 570 individuals which is regarded as the best available estimate for the entire North Atlantic population (Waring, et al., 2012). According to the 2012 NMFS Stock Assessment, the minimum population estimate for the Gulf of Maine stock is 823 whales. This was based on a photographic mark-recapture analysis conducted in 2008 (Robbins & Mattila, 2001). Also based on current data, the 2012 Stock Assessment concluded that the Gulf of Maine humpback whale stock is steadily increasing in size (NMFS, 2012b).

4. Population Risks & Stressors

According to the 1991 Recovery Plan, commercial whale hunting caused a major decline in the number of humpback whales. However, such activities ended in the North Atlantic in 1955 (NMFS, 1991). As with the North Atlantic Right Whale, the current major known sources of anthropogenic mortality and injury of humpback whales occur from ship strikes and fishing gear entanglements (NMFS, 2012b). For the period 2006 through 2010, the minimum annual rate of human-caused mortality and serious injury to the Gulf of Maine humpback whale stock averaged 7.8 animals per year (U.S. waters, 7.2; Canadian waters, 0.6) (Henry, et al., 2012). Additional threats to humpback whales include:

- W**hale watch harassment:** From late spring to early fall, the Gulf of Maine stock is the focus of whale watching in New England, particularly within the Stellwagen Bank National Marine Sanctuary. These whale watching vessels could either stress the whales or inadvertently strike them.

- **Acoustic Trauma from ship engines or industrial activity**: Such noise could potentially adversely affect humpback whales by disrupting their natural activities including resting, feeding, courtship, calving, and nursing (NMFS, 1991).

- **Habitat Degradation or Habitat Impacts (Including Reduction in Available Prey):** Contaminants from ocean dumping, offshore oil/gas development, or coastal development could negatively impact the feeding grounds of these whales. This could occur either directly or indirectly by impacting the small fish or zooplankton upon which the whales feed. For example, a mass mortality of humpback whales occurred in 1987-1988 when the whales consumed mackerel whose livers contained high levels of saxitoxin, a naturally occurring red tide toxin (Geraci, et al., 1989) Some believe that the occurrence of a red tide event may be related to an increase in freshwater runoff from coastal development (Clapham & Mead, 1999).

Although there is currently no direct evidence that the above activities are adversely affecting humpback whales, there is concern that they might (NMFS, 2013b).

F. Fin Whale (*Balaenoptera physalus*) - Endangered

1. Life History

The fin whale, another type of baleen whale, is larger and faster swimming than the humpback and right whale (NMFS, 2010b); (NMFS, 2013b). They feed intensely in the summer and fast in the winter while they migrate to warmer waters (NMFS, 2010b). The overall distribution and movements of the fin whale may be based on the availability of its prey, which itself varies depending upon the geographical location (International Whaling Commission, 1992); (NMFS, 2010b). The fin whale of the western North Atlantic preys on crustaceans (mainly euphausiids or krill) and small schooling fish, including capelin, herring, and sand lance (Wynne & Schwartz, 1999); (Overholtz & Nicolas, 1979).

Little is known about the social and mating systems of fin whales (NMFS, 2013). Male fins whales achieve sexual maturity at 6-10 years of age while females become sexually mature at 7-12 years (Jefferson, et al., 2008). However physical maturity is not attained for either sex until approximately 25 years of age (NMFS, 2013).Conception is believed to occur in tropical and subtropical areas during the winter months, and females give birth to a single calf after approximately 11-12 months of gestation (Jefferson, et al., 2008). It has been estimated that the average calving interval is about 2 years (Christensen, et al., 1992).

2. Status

The finback whale was originally listed under the Endangered Species Conservation Act of 1970 (35 FR 18319, 1970). It has maintained its listing as an endangered species when the Endangered Species Act (ESA) went into effect in 1973.

3. Distribution and Population Trends

Fin whales have a wide distribution throughout the world and can be found in the Atlantic, Pacific, and Southern Hemisphere (NMFS, 2010b). Although they inhabit a range of latitudes between 20-75ºN and 20-75 ºS (Perry, et al., 1999), they are most commonly found in the deep, offshore waters in temperate to polar latitudes (NMFS, 2013). As previously mentioned in Section 3.6.1, fin whales do migrate seasonally. Unlike the more evident north-south migration patterns of the humpback and right whales, the overall migratory pattern of fin whales is more complex and not currently well defined (NMFS, 2013).

According to the recent Recovery Plan, the population structure of fin whales has not been adequately defined and populations are often divided on an ocean basin level instead of strict biological evidence (NMFS, 2010b). Two named subspecies of the fin whale exist: *B. physalus physalus* (Linnaeus 1758) in the North Atlantic and *B. physalus quoyi* (Fischer 1829) in the Southern Hemisphere (NMFS, 2010b). It is generally believed that the populations in the North Atlantic, North Pacific, and Southern Hemisphere rarely mix, if ever (NMFS, 2010b). Within the aforementioned ocean basins, there are geographical populations of fin whales. In U.S. waters, NMFS recognizes four MMA stocks: 1) the Western North Atlantic and the 2) Hawaii, 3)

California/Oregon/ Washington, and 4) Alaska (Northeast Pacific) stocks of U.S. Pacific waters (NMFS, 2010b).

The fin whale is ubiquitous in the North Atlantic and occurs from the Gulf of Mexico and Mediterranean Sea northward to the edges of the Arctic ice pack (Reeves, et al., 1998b). They are common in waters of the U.S. Atlantic Exclusive Economic Zone, mainly from Cape Hatteras northward, up to Nova Scotia and the southeastern coast of Newfoundland (NMFS, 2013c). During aerial surveys that were conducted from 1978-1982, fin whales accounted for 46% of all large whales sighted over the continental shelf between Cape Hatteras and Nova Scotia (Waring, et al., 2012).

Although fin whales in the central and eastern North Atlantic are most abundant over the continental slope and on the shelf seaward of the 200 m isobaths (Rorvik, et al., 1976), those off the eastern United States are generally centered along the 100-m isobaths with additional sighting spread out over shallower and deeper water (Kenney & Winn, 1986); (Hain, et al., 1992). An important feeding area for this species was identified from the Great South Channel, along the 50 meter isobaths past Cape Cod, Massachusetts, over Stellwagen Bank, and past Cape Ann to Jeffrey’s Ledge (Hain, et al., 1992). Photo-identification studies in western North Atlantic feeding areas, especially in Massachusetts Bay, have indicated a high rate of annual return by fin whales to this feeding area (Seipt, et al., 1990).

Reliable and recent estimates of fin whale abundance are available for significant portions of the North Atlantic Ocean, but neither for the North Pacific Ocean nor the Southern Ocean (NMFS, 2010b). There is insufficient data to determine population trends for the fin whale (Waring, et al., 2012). Various estimates have been provided to describe the current status of fin whales in western North Atlantic waters. However, the final 2012 stock assessment report provided the best population estimate of 3,522 (CV=0.27) for the western North Atlantic stock. This is considered the best estimate because the number is derived from the Canadian Trans-North Atlantic Sighting Survey (TNASS) which covered more of the fin whale range than other surveys (NMFS, 2013c).

Although reliable estimates of current abundance for the entire Northeast Pacific (Alaska) are not available, the final 2012 stock assessment report does provide a *minimum* estimate of 5,700 (Allen & Angliss, 2011). The best available estimate for the California/Oregon/Washington stock is 3,044, which is likely to be an underestimate (Carretta, et al., 2011). Based on a 2002 line-transect survey, the best available estimate for the Hawaii stock is 174 (Carretta, et al., 2011).

4. Population Risks & Stressors

Historically, commercial whaling was the most significant threat to fin whales (NMFS, 2010b). Although commercial whaling of the fin whale ceased in the North Pacific Ocean in 1976, in the Southern Ocean in 1976, and in the North Atlantic Ocean in 1987 fin whales are still hunted today in Greenland under the IWC’s “aboriginal subsistence whaling” scheme (NMFS, 2010b). Therefore whaling is no longer the most significant threat, but the potential that illegal whaling and/or resumed legal whaling could adversely impact the fin whale population still exists today.

As with North Atlantic right and humpback whales, the most significant, known anthropologic threats to fin whales include collisions with vessels and entanglement in fishing gear (NMFS, 2010b). Out of all species of large whales, it is believed that fin whales are most commonly struck by large vessels (Laist, et al., 2001). From 2005 – 2009, a study documented 12 ship strikes (9 fatal) of North Atlantic fin whales and 14 confirmed entanglements (2 fatal and 2 serious injuries) (Henry, et al., 2011).

Other threats to the fin whale include:

- **Potential reduction in prey abundance due to overfishing or climate change:** According to the recovery plan for the fin whale, this threat was listed as unknown, but potentially high (NMFS, 2010b);
- **Acoustic trauma:** Many marine mammals, including fin whales, use sound to communicate, navigate, locate prey, and sense their environment (NMFS, 2010b); Baleen whale calls, especially fin whale calls, are predominantly at low frequencies (NMFS, 2010b); The recovery plan listed this threat as an unknown threat;
- **Habitat Degradation:** According to the Recovery Plan for the fin whale, contaminants and pollutants were listed as a low threat (NMFS, 2010b). In a study by O'Shea and Brownell (1995), concentrations of organochlorine and metal contaminants in the tissues of baleen whales were low, and lower in fact that other marine mammal species.

G. Kemp's Ridley Sea Turtle (*Lepidochelys kempi)* - Endangered

1. Life History

The general life history pattern for Kemp's ridleys is similar to that of other sea turtles, including the loggerhead (Bolten, 2003). As summarized in the Kemp's ridley's revised recovery plan, its life history can be categorized by three overall ecosystems: 1) *Terrestrial zone* – the nesting beach where females lay eggs & eggs hatch; 2) *Neritic zone* – the nearshore marine environment that includes the water surface to ocean floor, with water depths no greater than 200 meters; and 3) *Oceanic zone* – the open ocean environment, where water depths exceed 200 meters (NMFS et al., 2011). This life history is also highlighted in **Table 5** below:

Table 5: Life Stages of Sea Turtles

Life Stage	**Zone**
Adult/Egg/Hatchling	Terrestrial
Early Transitional for Hatchling/Post-Hatchling	Neritic
Juvenile	Oceanic
Juvenile	Neritic
Adult	Neritic

Female Kemp's ridleys lay their nests on ocean beaches, primarily along a stretch of beach in Rancho Nuevo, Mexico, from April through July each year (NMFS et al., 2011). The Kemp's ridleys tend to nest in large, synchronized aggregations, called *arribadas*, which may be triggered by high wind speeds, especially north winds, and changes in barometric pressure (Jimenez, et al., 2005). Females lay an average of 2-3 clutches per season (Turtle Expert Working Group, 2000) and eggs typically take 45-58 days to hatch, depending on temperatures (NMFS & USFWS, 2007)..

Once hatchlings leave the nesting beaches, they quickly enter the surf and swim offshore. According to the revised recovery plan, not much is known about this ‘early transitional neritic’ phase in which the hatchling swims offshore and are associated with boundary currents, but *before* they are transported into the open ocean. The juveniles then feed, presumably on *Sargassum* seaweed or associated infauna, and develop in the ocean (NMFS et al., 2011).

After approximately 2 years of age, Kemp’s ridleys will transition to benthic coastal habitats of the entire Gulf of Mexico and U.S. Atlantic coast and forage on benthic fauna, including a variety of crabs (NMFS & USFWS, 2007; Turtle Expert Working Group, 2000). This movement represents the beginning of a new life stage, namely the juvenile developmental neritic stage (NMFS et al., 2011). The habitat where these juvenile Kemp’s ridleys develop can be characterized as somewhat protected, temperate waters, with a depth below 50 m (NMFS et al., 2011). A variety of substrates have been documented as good foraging habitat and include seagrass beds, oyster reefs, rock outcroppings, and sandy and/or mud bottoms (NMFS & USFWS, 2007).

A large portion of the neritic juveniles resides in waters with temperatures that vary seasonally (NMFS et al., 2011). For those juveniles that forage in the Northwest Atlantic, they do migrate down the coast to more favorable (ie-warmer) overwintering sites when the water temperatures begin to decline each year (NMFS et al., 2011). The timing of this emigration depends upon the latitude of the foraging habitat, with earlier emigration in the more northern waters (NMFS et al., 2011). The offshore waters south of Cape Canaveral have been identified as an important overwintering area for seasonal migrants along the U.S. Atlantic coast (NMFS & USFWS, 2007). In the spring, Kemp’s ridleys residing in east-central Florida waters migrate northward (NMFS & USFWS, 2007). As water temperatures continue to rise even farther northward, juvenile Kemp’s ridleys and loggerheads continue their northward migration. By June, they might appear in New England waters (NMFS et al., 2011).

Although adult Kemp’s ridleys occur primarily in the Gulf of Mexico, some are occasionally found on the U.S. Atlantic coast (NMFS & USFWS, 2007). Common habitat for adults are nearshore waters of 37 m or less that are rich in crabs and have a sandy or muddy bottom (NMFS & USFWS, 2007).

2. Status

The Kemp’s ridley sea turtle was originally listed under the Endangered Species Conservation Act of 1970 (35 FR 18319, 1970). It maintained its listing as an endangered species when the Endangered Species Act (ESA) went into effect in 1973. NOAA Fisheries and USFWS, which have joint jurisdiction for marine turtles, finalized the original recovery plan for Kemp’s ridley turtles in the U.S. Caribbean, Atlantic and Gulf of Mexico in 1991 (NMFS, 2013). A revised bi-national (U.S. and Mexico) Recovery Plan was finalized in 2011. Since the largest nesting area occurs in Mexico, the Mexican government has played a critical role in the conservation of Kemp's ridley turtles. Since 1966, the Mexican government provided legal protection to the turtles. They implemented a complete ban on taking any species of sea turtle on May 28, 1990 (NMFS, 2013). NOAA Fisheries and USFWS were jointly petitioned in February of 2010 to designate critical habitat for Kemp's ridley sea turtles for nesting beaches along the coast of Texas and marine habitats in the Gulf of Mexico (WildEarth Guardians, 2010).

3. Distribution and Population Trends

The Kemp's ridley is one of the least abundant of the world's sea turtle species (NMFS, 2013b). Kemp's ridleys typically occur only in the Gulf of Mexico and the northwestern Atlantic Ocean, from Florida to New England (NMFS et al., 2011). The majority of Kemp's ridleys nest along a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico or the nearby beaches of Tepehuajes and Barra del Tordo (NMFS & USFWS, 2007); (NMFS et al., 2011). However, there is a limited amount of nesting in the U.S, particularly in South Texas (NMFS et al., 2011). It is not known what proportion of the Kemp's ridley population migrates to U.S. Atlantic coastal waters (NMFS & USFWS, 2007).

After emerging from the nest, hatchlings quickly enter the water to escape predators (NMFS et al., 2011). Although there is a brief neritic stage for hatchling/post-hatchling, not much is known of this transitional stage (NMFS et al., 2011). Post-hatchling Kemp's ridleys are believed to be carried by major oceanic currents and distributed predominantly in the Gulf of Mexico, but also in the Northwest Atlantic (NMFS & USFWS, 2007). The juveniles feed, often on *Sargassum* seaweed, and develop in the ocean (NMFS et al., 2011). After approximately 2 years of age, Kemp's ridleys will transition to benthic coastal habitats of the entire Gulf of Mexico and U.S. Atlantic coast (NMFS & USFWS, 2007); (Turtle Expert Working Group, 2000). Data indicates that developmental habitats for this life stage can occur in many coastal areas throughout the aforementioned range, and that these habitats may shift depending upon the availability of resources (Turtle Expert Working Group, 2000). Foraging areas along the U.S. coast include Charleston Harbor, Pamlico Sound, Chesapeake Bay, Delaware Bay, and Long Island Sound, North Carolina, as well as New York and New England (NMFS, 2013b). Adult Kemp's ridleys can be found in the coastal regions of the Gulf of Mexico and southeastern United States, but they are typically rare in the northeastern U.S. waters of the Atlantic (Turtle Expert Working Group, 2000).

According to the revised Recovery Plan for Kemp's ridley turtles, the nesting population is increasing exponentially, which may indicate that the population as a whole is increasing (NMFS et al., 2011). Although the number of nesting females was estimated to be 40,000 in 1947, the Kemp's ridley population declined significantly through the mid-1980's to fewer than 300 nesting females in the entire 1985 nesting season (Turtle Expert Working Group, 2000); (NMFS et al., 2011). As previously stated, egg collection was historically an extreme threat to this species' population. However the total number of nests at Rancho Nuevo and nearby beaches started to increase in the mid-1980's, with a 14-16% increase per year from 1988 – 2003 (NMFS et al., 2011). In 2009 alone, the total number of nests recorded at Rancho Nuevo and adjacent beaches exceeded 20,000, which represented approximately 8,000 nesting females (NMFS et al., 2011). Although there is limited nesting in the United States, a record 195 nests were documented in South Texas compared to only 6 in 1996 (NMFS et al., 2011). An updated population model, which is based on the assumption that current survival rates within each life stage remain constant, predicted a 19% per year population growth from 2010 – 2020 (Heppell, et al., 2005); (NMFS et al., 2011).

4. Population Risks & Stressors

Like other species of sea turtles, threats to Kemp's ridleys occur both on land (on nesting beaches) and in the marine environment (NMFS, 2013b). Historically, the exploitation of eggs in Mexico was a major factor in the decline of the Kemp's ridley sea turtle nesting population (NMFS & USFWS, 2007). Although poaching of eggs occasionally still takes place in Mexico, there was a dramatic decrease since official beach protection started in 1966/67 (NMFS et al., 2011).

The list below highlights the current and greatest threats to marine turtles, including Kemp's ridleys:

- **Incidental capture in fishing gear (from commercial and recreational fisheries):** Entanglement in fishing gear can cause abrasions, restrictions, tissue necrosis, stress, or drowning (NMFS et al., 2011). The primary threat to Kemp's ridleys sea turtles has been, and continues to be, incidental capture in fishing gear, particularly with shrimp trawlers, but also in gill nets, longlines, traps/pots, and dredges (NMFS & USFWS, 2007). In the past, the National Academy of Sciences had estimated that between 500 and 5,000 Kemp's ridleys were killed annually by the offshore shrimping fleet in the Gulf of Mexico and southeastern U.S. Atlantic (Magnuson, et al., 1990); (NMFS et al., 2011). NMFS has worked with fishing industries and required the use of turtle excluder devices (TEDs), however the Revised Recovery Plan for Kemp's ridleys emphasized the need for conservation measures to be maintained and strengthened (NMFS et al., 2011).

- **Loss or Destruction of Nesting Habitat**: The nesting habitat for sea turtles can be destroyed or altered by storm events, natural predators, beach cleaning and/or beachfront development (NMFS et al., 2011). For example, erosion can impact the quality of nesting habitat while artificial lighting (light pollution) from beach development can disorient hatchings (NMFS, 2014). This is clearly an issue of concern for sea turtles, as a whole. However it should be noted that Massachusetts' waters only provide foraging habitat, not nesting habitat, for Kemp's ridleys.

- **Cold-Stunning:** Although cold-stunning can occur throughout the range of Kemp's ridleys, it may be a greater risk for sea turtles that use the northern habitats of Cape Cod Bay and Long Island Sound (NMFS, 2013b). According to the revised Recovery Plan, Kemp's ridleys strand along the coast of Massachusetts almost every winter due to cold stunning (NMFS et al., 2011).

- **Pollution:** According to NMFS's five year review of Kemp's ridleys, exposure to heavy metals and other contaminants in the marine environment, including oil from spills or pollutants from coastal runoff, are potential threats (NMFS & USFWS, 2007). Although explicit effects on sea turtle have not been documented yet, toxins are capable of altering metabolic activities, development, and reproductive capacity (NMFS et al., 2011).

- **Climate Change:** Climate change can result in an increase in temperature, sea level rise, potential changes in ocean productivity, and increased frequency of storm events (NMFS, 2013b). Atmospheric warming could lead to increased hurricane activity which could damage nesting beaches from beach erosion, increase levels of runoff near the shores, change ocean currents, or alter the turtles' food sources. Although the revised recovery plan for Kemp's ridley sea turtles does identify climate change as a threat, no significant impacts have been documented to date (NMFS et al., 2011).

H. Loggerhead Sea Turtle (*Caretta caretta)* – Northwest Atlantic Ocean DPS - Threatened

1. Life History

As previously mentioned, the generalized life stages of loggerhead sea turtles are similar to the life stages of other turtles, including Kemp's ridley sea turtles (Heppell, et al., 2003). Therefore, the phases discussed in Section 3.6.1, including those that occur in the terrestrial, neritic, and oceanic zones summarized in **Table 5**, are applicable for this section, as well. However, recent studies have established that the loggerhead's life history is more complex than originally believed. According to a recent NMFS Biological Opinion, research is showing that both adults and most likely neritic stage juveniles continue to move between their oceanic and neritic environments rather than making discrete development shifts between the two habitats (NMFS, 2013b). Neritic refers to the inshore marine environment from the surface to the sea floor in which water depths do not exceed 200 meters.

Loggerheads nest on ocean beaches and sometimes on estuarine shorelines with suitable sand. Females appear to prefer relatively narrow, steeply sloped beaches with coarse-grained sand (NMFS & USFWS, 2008). In the Northwest Atlantic, the major nesting concentrations in the U.S. are located from North Carolina through southwest Florida (Conant, et al., 2009). **Table 6**, below, which was taken from Table 3 of the Revised Recovery Plan, highlights some of the life history parameters and key values for loggerheads that nest in the U.S. (NMFS & USFWS, 2008).

Table 6: Typical values of life history parameters for loggerheads nesting in the U.S.

Life History Parameter	**Data**
Clutch size	100 – 126 eggs (Dodd 1988)
Clutch frequency (number of nests/female/season)	3 – 5.5 nests (Murphy and Hopkins (1984); Frazer and Richardson (1985); Hawkes *et al.* 2005; Scott 2006)
Nesting season	Late April – early September
Hatching season	Late June – early November
Age at sexual maturity	32-35 years (Melissa Snover, NMFS, personal

	communication, 2005; See Table A1-6)

Immediately after the hatchlings emerge from the nest, they are known to exhibit a period of frenzied activity. They move from their nest to the surf, swim and are swept through the surf zone, and continue swimming away from land for about 20-30 hours (NMFS & USFWS, 2008). After this frenzied phases, post-hatchlings enter a transitional, neritic phrase where they inhabit waters near the shoreline for weeks to months (NMFS & USFWS, 2008). These post-hatchlings have been described as low-energy float and wait foragers that feed upon a variety of floating items, including *Sargassum* seaweed (Witherington, 2002).

Juvenile loggerheads then enter into an oceanic stage during which they spend about 75% of their time in the top 5 meters of the water column (Heppell, et al., 2003). Although the diet of these juveniles has not been studied extensively, they are known to be largely carnivorous; they primarily eat sea jellies and hydroids, and occasionally other organisms like snails, barnacles and crabs (NMFS & USFWS, 2008). After years of this phase, the juveniles transition from the oceanic to the neritic zone. According to the 2008 Recovery Plan, juvenile stage loggerheads in the North Atlantic commonly inhabit continental shelf waters from Cape Cod Bay, MA south though Florida, The Bahamas, and the Gulf of Mexico (NMFS & USFWS, 2008). North Atlantic sub-adults (as well as adults) are believed to eat a variety of organisms, including benthic invertebrates such as mollusks and benthic crabs (Burke, et al., 1993)**.** Matrix models estimate that this neritic juvenile stage can last from 14 to 24 years (Heppell, et al., 2003).

Although non-nesting adult loggerheads also inhabit the neritic zone, the habitat preference for adults differs from that of juveniles (Conant, et al., 2009). Adults prefer shallow water habitats with vast access to the open ocean, like Florida Bay, as compared to juveniles who more frequently use enclosed, shallow water estuarine habitats with limited ocean access (Conant, et al., 2009). Offshore, adults primarily inhabit continental shelf waters, from New York south through Florida, The Bahamas, Cuba, and the Gulf of Mexico (NMFS & USFWS, 2008). Loggerheads are known to make extensive seasonal migrations between foraging areas and nesting areas (NMFS & USFWS, 2008).

2. Status

On July 28, 1978, the loggerhead turtle was initially listed as a threatened species under the Endangered Species Act throughout its range (43 FR 32800, 1978). In 2007, NMFS (which is the lead agency for marine turtles) and the U.S. Fish and Wildlife Service (which is the lead authority for the terrestrial areas/nesting beaches of sea turtles) completed a five year status review of loggerheads. The results of this review, as well as the second revision of the Recovery Plan for the Northwest Atlantic Population, were published in 2009.

In September of 2011, NMFS listed 9 Distinct Population Segments (DPSs) of loggerhead sea turtles under the ESA (76 FR 58868, 2011). Five DPSs were listed as endangered (North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Northeast Atlantic Ocean, and Mediterranean Sea) while four DPSs were listed as threatened (Northwest Atlantic Ocean, South Atlantic Ocean, Southeast Indo-Pacific Ocean, and Southwest Indian Ocean) (76 FR 58868, 2011)(. It should be noted that the Northwest Atlantic DPS was one of two DPSs originally proposed as endangered; however, it was eventually listed as threatened based on population abundance and population trends (NMFS, 2013b).

In July of 2013, NMFS proposed the designation of critical habitat for the Northwest Atlantic Ocean DPS of Loggerhead Sea Turtle (78 FR 43305, 2013). 36 occupied marine areas within the Atlantic Ocean and the Gulf of Mexico, which contain "one or a combination of nearshore reproductive habitat, winter area, breeding areas, and migratory corridors," were proposed (78 FR 43305, 2013). None of the proposed marine areas are located within or near Massachusetts' waters.

3. Distribution and Population Trends

Loggerhead sea turtles are the most abundant species of sea turtle found in U.S. coastal waters (NMFS, 2013b). They occur throughout the temperate and tropic regions of the Atlantic, Pacific, and Indian Oceans (Dodd, 1988). Neritic juvenile loggerheads in the Northwest Atlantic DPS inhabit continental shelf waters from Cape Cod Bay, Massachusetts, south through Florida, The Bahamas, Cuba, and the Gulf of Mexico (76 FR 58868, 2011). However it should be noted that their presence varies with the seasons due to the changes in water temperature (NMFS, 2013b).

Although some loggerhead sea turtles occur year round in ocean waters off North Carolina, South Carolina, Georgia, and Florida, others begin to migrate to inshore waters of the Southeast United States and also move up in the U.S. Atlantic coast as coastal water temperatures warm in the spring (NMFS, 2013b). Loggerheads can appear in Virginia foraging areas as early as April/May and on the most northern foraging grounds in the Gulf of Maine in June (Shoop & Kenney, 1992). The trend is reversed in the fall as water temperatures cool (NMFS, 2013b).

According to the revised recovery plan, five recovery units were identified for the NWA DPS of loggerheads (NMFS & USFWS, 2008). These recovery units, which are based on nesting assemblages of the Northwest Atlantic DPS, are summarized in **Table 7,** below (NMFS & USFWS, 2008). Nest counts can be used to estimate the number of reproductively mature females nesting annually (NMFS, 2013b). In addition to listing the recovery units, **Table 7** also provides the population status/trend for each recovery unit (NMFS & USFWS, 2008).

Table 7: Description of Recovery Units of Northwest Atlantic DPS of Loggerheads & Population Status/Trends

Recovery Unit	**Geographic Location**	**Population Status/Trends**
Northern Recovery Unit (Represents northern-most range)	Loggerheads originating from nesting beaches from Florida-Georgia border through southern Virginia	From 1989-2008, total annual nest averaged 5,215 nests with approximately 1,272 females nesting per year (NMFS & USFWS, 2008) ;
Peninsular Florida Recovery Unit (Largest nesting assemblage for NWA DPS)	Loggerheads originating from nesting beaches from the Florida-Georgia border through Pinellas County of West coast of FLR (excludes islands west of Key West)	From 1989-2007, total annual nest averaged 64,513 nests with about 15,735 females nesting per year (NMFS & USFWS, 2008). From 1989-2008, overall declining nesting

		trend of 26%
Dry Tortugas Recovery Unit	Loggerheads originating from nesting beaches throughout islands located west of Key West, FL	From 1995-2004 (excluding 2002), total annual nest averaged 246 nests with approximately 60 females nesting per year (NMFS & USFWS, 2008).
Northern Gulf of Mexico Recovery Unit (Western Extent of U.S. nesting range)	Loggerheads originating from nesting beaches from Franklin County of Northwest Gulf coast of FL through Texas	Total annual nests from 1995-2007 averaged 906 nests with approximately 221 females nesting per year (NMFS & USFWS, 2008).
Greater Caribbean Recovery Unit	Loggerheads originating from all other nesting assemblages within the Greater Caribbean	Only available estimate is from Quintana Roo, Yucatan, Mexico: range of 903-2,331 nest per year from 1987-2001 (NMFS and USFWS 2007a **Get source)**; Nesting has declined since 2001 (NMFS & USFWS, 2008).

The 2008 Recovery Plan indicated that there had been a significant, overall nesting decline within the Northwest Atlantic DPS based on standardized data collected prior to October of 2008 (NMFS & USFWS, 2008). However, with the addition of nesting data from 2008-2010, the trend line has changed; although there is now a slight negative trend, the rate of decline is not statistically different from zero (76 FR 58868, 2011).

In the summer of 2010, line transect aerial abundance surveys (from Cape Canaveral, FL to the Gulf of St. Lawrence, Canada) and turtle telemetry studies were conducted along the Atlantic coast as part of the Atlantic Marine Assessment Program for Protected Species (AMAPPS) (NMFS NEFSC, 2011). The 2010 survey found a preliminary total surface abundance estimate within the study area of about 60,000 loggerheads (or 85,000 if a portion of unidentified hard-shelled sea turtles were included (NMFS NEFSC, 2011). The calculated preliminary regional abundance estimate is about 588,000 loggerheads along the U.S. Atlantic coast, with an inter-quartile range of 382,000 – 817,000 (NMFS NEFSC, 2011). However these estimates are considered very preliminary. It should be noted that population estimates for loggerhead sea turtles (as with other turtle species) are difficult to determine, particularly because of their life history characteristics (NMFS, 2013b).

4. Population Risks & Stressors

The threats outlined in section 3.6.4 for Kemp's ridley sea turtles are also applicable to other sea turtles, including loggerheads. Therefore they will not be repeated in detail again. It is important to note that the factors that threaten sea turtles in the terrestrial zone (ie-on nesting beaches) often differ from those that threaten the turtles in the neritic and ocean zones. The 2008 Recovery Plan emphasized that the *highest* priority threats for the Northwest Atlantic DPS of loggerheads include:

- **Bycatch from fisheries** (including bottom trawl, pelagic longline and demersal gillnet fisheries);

- **Legal and illegal harvesting:** Although illegal directed harvest of juvenile and adult logger turtles in the waters of the continental U.S. is uncommon, 45% of Caribbean countries/territories allow the harvest of loggerheads (NMFS & USFWS, 2008). Also the illegal harvest (including the taking of eggs and the killing of nesting females) of loggerheads in 26 jurisdictions surveyed in the Lesser Antilles, Caribbean, and Central and South America has been documented (NMFS & USFWS, 2008).

- **Vessel strikes:** Unfortunately, propeller and collision injuries from boats and ships are common in sea turtles. 14.9% of all stranded loggerheads in the U.S. Atlantic and Gulf of Mexico from 1997 to 2005 were documented as having some type of propeller or collision injuries (NMFS & USFWS, 2008).

- Beach erosion;

- Marine debris entanglement/ingestion;

- Oil pollution;

- Light pollution;

- Predation by native and exotic species

I. Leatherback Sea Turtle (*Dermochelys coriacea)* - Endangered

Although leatherback sea turtles are listed as endangered on the species level, existing recovery plans are based upon population and management units within ocean basins. For example, the Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed by NMFS and the USFWS in 1992, while the Recovery Plan for U.S. Pacific Populations of Leatherback Turtle was signed in 1998. The recent 5 year status review for leatherback turtles also concluded that a Distinct Population Segment policy was recommended for leatherbacks. Therefore the section below will focus on leatherback sea turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico because this includes the action area for this permit, namely Massachusetts waters.

1. Life History

Leatherbacks are the largest living turtles and the only sea turtle that doesn't have a hard bony shell; instead, a leatherback's carapace (top shell) is made of leathery, oil-saturated connective tissue that lies above loosely interlocking dermal bones (NMFS & USFWS, 1992). Also unlike other sea turtles which possess chewing plates that enable them to feed on hard-bodied prey, leatherbacks have two toothlike projections that help them eat their diet of soft-bodied and gelatinous organisms, including jellyfish and salps (Pritchard, 1971); (NMFS & USFWS, 1992);
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Courtship and mating for leatherbacks is believed to occur in coastal waters adjacent to nesting beaches and along migratory corridors (NMFS, 2013). Nesting beach habitat is generally associated with deep water and strong waves and oceanic currents; however leatherbacks will also use shallow water with mud banks (Turtle Expert Working Group, 2007). Female leatherbacks appear to prefer beaches with coarse-grained sand that are also free of rocks or other abrasive substrates (Eckert, et al., 2012); (NMFS & USFWS, 2013). In the United States and Caribbean, female leatherbacks nest from March through July (NMFS, 2013b). They nest frequently (ranging from 5 -7 nests per year) and nesting occurs about every 2-3 years (Eckert, et al., 2012); (NMFS & USFWS, 2013) . During the nesting season, females will generally stay within 100 km of the nesting beach. However they also undergo long distances between nesting events to forage in more temperate areas which support a high density of prey (Eckert, et al., 2012); (NMFS & USFWS, 2013).

Little is known about the early life history of leatherbacks from the time they are hatchlings until they reach adulthood (NMFS & USFWS, 2013). However one study found that leatherback juveniles remain in waters warmer than 26°C until their curved carapace length (CCL) exceeds 100 cm; this suggests that the first part of a leatherback's life is spent in tropical waters (Eckert, 2002).

Adult leatherbacks are highly migratory and believed to be the most pelagic of all sea turtles (NMFS & USFWS, 1992). Based on evidence from tag returns and strandings in the western Atlantic Ocean, data suggests that adult leatherback sea turtles engage in routine migrations between northern temperate and tropic waters (NMFS & USFWS, 1992). Although leatherbacks primarily eat gelatinous organisms, they also ingest other prey including crustaceans, vertebrates, and plants (Eckert, et al., 2012). It is essential that leatherbacks have access to areas of high food productivity because they must consume large amounts of such food to meet their energy demands (Heaslip, et al., 2012).

2. Status

The leatherback turtle was originally listed under the Endangered Species Conservation Act of 1970 (35 FR 8491, 1970). It maintained its listing as an endangered species when the Endangered Species Act (ESA) went into effect in 1973.

In 1988, NMFS designated critical habitat for leatherback turtles in the U.S. Virgin Islands, specifically for the coastal waters adjacent to Sandy Point, St. Croix, USVI (44 FR 17710, 1979). According to 44 FR 17710, courtship and mating for leatherbacks is believed to occur in these coastal waters which are adjacent to nesting beaches. (The USFWS had already designated a 0.2 mile wide strip of land at Sandy Point Beach as critical habitat in 1978). Additional critical habitat for endangered leatherback sea turtles was designated in 2012. This critical habitat is located along the U.S. West Coast. It includes approximately 16,910 square miles and was designated because of the abundant occurrence of prey species for leatherback sea turtles (77 FR 4170, 2012).

3. Distribution and Population Trends

Leatherback sea turtles are widely distributed throughout the world's oceans, including the Atlantic, Pacific, and Indian Oceans, as well as the Mediterranean Sea (Ernst & Barbaour, 1972). These migratory sea turtles range farther than any other sea turtles (NMFS, 2013b). They also have a distinct physiology with various thermoregulatory adaptations that allow leatherbacks to tolerate colder water temperatures than other sea turtles (NMFS & USFWS, 1992). Therefore they can be found in foraging grounds as far north as Labrador in the Western North Atlantic Ocean (NMFS & USFWS, 2013). Although leatherbacks are known as pelagic animals because they live in the open ocean, they do forage in coastal waters, including those of the U.S. continental shelf (NMFS, 2013b).

Leatherbacks nest on beaches in the tropics and sub-tropics and they forage into higher-latitude sub-polar waters (NMFS & USFWS, 2013). Although nesting sites for leatherbacks exist around the world, the largest nesting assemblages currently exist along the northern coast of South America and in Western Africa (Turtle Expert Working Group, 2007). The most significant leatherback nesting sites in the United States occur in the U.S. Virgin Islands (the aforementioned Sandy Point Beach in St. Croix), Culebra in Puerto Rico, and along the east coast of Florida (NMFS & USFWS, 2013). Tagging and satellite telemetry data indicate that the leatherback turtles from these western North Atlantic nesting beaches use the entire North Atlantic Ocean (Turtle Expert Working Group, 2007). For instance, leatherbacks that were tagged in Puerto Rico, Trinidad, and the Virgin Islands have subsequently been found on U.S. beaches of southern, mid-Atlantic, and northern states (NOAA, 2013).

According to the 5 year status review, migration patterns differ by region, depending upon the local oceanographic processes, and several migration strategies may exist within breeding populations (NMFS & USFWS, 2013). For leatherbacks in the Atlantic Ocean, some made round-trip migrations from where they started through the North Atlantic Ocean heading northwest to fertile foraging areas off the Gulf of Maine, Canada, and Gulf of Mexico; others crossed the ocean to areas off western Europe and Africa; while others spent time between northern and equatorial waters (NMFS & USFWS, 2013). Extensive research has been conducted on Canadian waters, which has one of the largest seasonal foraging population of leatherbacks in the Atlantic Ocean, as well as foraging areas off Massachusetts (particularly Cape Cod Bay) (NMFS & USFWS, 2013). According to the 1991 Recovery Plan for Leatherbacks in the U.S. Caribbean, Atlantic, and Gulf of Mexico, peak sightings for leatherbacks foraging in Cape Cod Bay, Massachusetts took place in August and September (Prescott, 1988); (NMFS & USFWS, 1992).

The 5-year review also compiled the most recent information on abundance and population trends for leatherback sea turtles in each of the ocean basins. The most recent population size estimate for the North Atlantic alone is a range of 34,000 – 94,000 adult leatherback sea turtles (Turtle Expert Working Group, 2007). However it should be noted that it is particularly difficult to monitor nesting population estimates and trends for adult female leatherbacks because they are known to frequently nest on different beaches (NMFS, 2013). **Table 8**, below, summarizes the results for only a select number of nesting assemblages, namely those nesting sites affiliated with the United States.

Table 8: Leatherback nesting Population Site Location Information

Location	Data: Nests, Females	Years	Annual Number	Trend	Reference
U.S. (Florida)	Nests	1979 - 2008	63-754	Increase	(Steward, et al., 2011)
Puerto Rico (Culebra)	Nests	1993 - 2012	395 - 32	Decrease	C. Diez, Department of Natural and Environmental Resources of Puerto Rico,, unpublished data; (Diez, et al., 2010); (Ramirez-Gallego, et al., 2013)
Puerto Rico (other)	Nests	1993 - 2012	131 – 1,291	Increase	C. Diez, Department of Natural and Environmental Resources of Puerto Rico,, unpublished data;
United States Virgin Islands (Sandy Point National Wildlife Refuge, St. Croix)	Nests	1986 - 2004	143-1,008	Increase	(Dutton, et al., 2005); (Turtle Expert Working Group, 2007)

Since overall increases were recorded for mainland Puerto Rico and St. Croix, U.S. Virgin Islands, this might indicate that the decline of nests in Culebra might not be an actual loss to the breeding population; instead, it might just represent a shift in nesting site (Diez, et al., 2010); (Ramirez-Gallego, et al., 2013).

The 5-year review did observe contrasting population trends between the Atlantic, Pacific, and Indian Oceans. For instance, leatherback nesting populations are declining dramatically in the Pacific Ocean, yet appear stable (or are increasing) in many of the nesting areas of the Atlantic Ocean and South Africa in the Indian Ocean (NMFS & USFWS, 2013). No long-term data is available for nesting areas in West Africa (Turtle Expert Working Group, 2007). Many hypotheses have been proposed to explain the disparate trend of leatherbacks in the Pacific Ocean, including the variability in resource abundance (ie- prey) and distribution (NMFS & USFWS, 2013). For example, the high reproductive output and consistent, high quality foraging area in the Atlantic Ocean have likely contributed to their stable/recovering populations while lower prey abundance and distribution in the Pacific Ocean might be leading to this population's decline (NMFS & USFWS, 2013).

4. Population Risks & Stressors

As with other sea turtles, both natural and anthropogenic threats impact the leatherback sea turtles' nesting and marine habitats. Two of the greatest threats to leatherbacks worldwide include:

- **The collection of eggs and harvesting of turtles**; and
- **Incidental capture in fishing gear in artisanal and commercial fishing**: According to NMFS' Biological Opinion, of the Atlantic sea turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear, especially trap/pot gear (NMFS, 2013b). This susceptibility might result from leatherbacks' large body size, their diving/foraging behavior, and/or their possible attraction to gelatinous organisms and algae that collect near the buoys.

According to the most recent 5-year review of leatherback, additional threats include:

- **Ingestion of & Entanglement of Marine Debris**: In the marine environment, small debris can be ingested (and reduce food intake) while large debris can entangle animals. While the impact of marine debris on leatherbacks during their pelagic life stage has not been quantified, the 5-year review suggested the impacts may be severe, especially given the increase of plastics and other debris and pollution entering the marine environment over the past 20-30 years (NMFS, 2013b).
- **Development along coastal areas**: As with other sea turtles, development could result in the loss of suitable nesting habitat or cause light pollution (which could prevent females from nesting or disorient hatchlings)
- **Climate Change**: A rise in sea level could result in the loss of nesting habitat while warmer temperatures could impact prey abundance/distribution or skew the natural sex ratios of leatherbacks (as well as other sea turtles)

J. Green Turtle (*Chelonia mydas*) – Threatened or Endangered for Most Populations

1. Life History

Similar to the Kemp's ridley, loggerhead, and leatherback sea turtles, the green turtle uses three distinct habitats throughout its lifetime. These include: 1) high-energy beaches for nesting habitat, 2) convergence zones in the open (pelagic) ocean, and 3) relatively shallow, coastal waters which serve as their benthic feeding grounds (NMFS & USFWS, 1991). According to the five year review for the green turtle, relatively recent research has started to increase the understanding of the species, particularly during its time in the marine environment, but numerous gaps still exist (NMFS & USFWS, 2007b). This is particularly true of the oceanic phase of juvenile green turtles.

Mating occurs in the water off nesting beaches (NMFS & USFWS, 1991). Although the nesting season for the green turtle depends upon the location of the nest, females from the Florida breeding population generally nest between June and September, with the peak occurring in June and July (NMFS, 2013). Florida green turtles nest approximately 3-4 times per season (Johnson, 1994) and have a mean of 136 eggs per nest (Witherington & Ehrhart, 1989). Green turtles do exhibit a strong fidelity to their natal beaches and females generally lay eggs every two to four years (NMFS & USFWS, 1991).

Hatchlings leave the beach and apparently move into convergence zones in the open ocean (Carr, 1986). Once they reach a certain size/age, they move to coastal foraging areas, which includes both open coastline and protected bays (NMFS & USFWS, 2007b). The primary diet of adult green turtles consists of marine algae and seagrass, although some populations also forage on invertebrates (NMFS & USFWS, 2007b).
Adult green turtles participate in breeding migrations between foraging grounds and nesting areas every few years (Plotkin, 2003). They migrations can be extensive, ranging from hundreds to thousands of kilometers (NMFS & USFWS, 2007b).

2. Status

The green sea turtle was originally listed under the ESA on July 28, 1978. All populations of the green sea turtle were listed as threatened, except for the Florida and Mexican Pacific coast breeding populations which were listed as endangered (43 FR 32800, 1978). The waters surrounding Culebra Island in Puerto Rico has been designated as critical habitat for the green turtle, largely in part to the extensive amount of turtle grass present (63 FR 46693, 1998). Since seagrasses, such as turtle grass, represent an important component of the diet of juvenile and adult green turtles, these coastal waters provide important green turtle developmental habitat (63 FR 46693, 1998).

3. Distribution and Population Trends

Originally, the green sea turtle was abundant in tropical and subtropical regions throughout the world (NMFS & USFWS, 2007b). Although the species have declined significantly from its high historical numbers, green turtles are still believed to inhabit the continental coastal areas of more than 140 countries (NMFS & USFWS, 2007b); (Groombridge & Luxmoore, 1989). Green turtles are known to be high mobile and they partake in complex migratory behavior throughout their lifetimes (Musick & Limpus, 1997); (Plotkin, 2003). Similar to the sea turtles mentioned earlier in this document, a notable feature of the adult green turtle's life history is the migration between nesting sites and foraging areas (NMFS & USFWS, 2007b).

Section 3.9.3.2 of this document will present information about green sea turtle nesting sites and discuss the breeding population in Florida (which is the only nesting area that occurs in the United States). Green turtles spend the majority of their lives in coastal foraging grounds which include both open coastline and protected bays and/or lagoons, where prey species like marine algae and seagrass are found (NMFS & USFWS, 2007b). So in addition to nesting sites in Florida, green turtles are also found in US waters.

In the U.S. waters of the western Atlantic Ocean, large juvenile and adult green sea turtles can be found (seasonally) in foraging and/or developmental habitats that stretch from Massachusetts to

Texas, including the Gulf of Mexico (NMFS & USFWS, 1991). Key feeding areas in the western Atlantic Ocean also include the upper west coast of Florida, the Florida Keys, the northwestern coast of the Yucatan Peninsula, and the aforementioned designated critical habitat near Culebra Island in Puerto Rico (NMFS, 2013b); (NMFS & USFWS, 1991). Foraging areas for the green turtle are also found throughout the Pacific Ocean and along the southwestern U.S. coast (NMFS, 2013b). However for the eastern North Pacific Ocean, green turtles most commonly inhabit waters from San Diego south (NMFS & USFWS, 1991). The coastal waters of northwestern Mexico are known to be a particularly important foraging region for turtles that originate from mainland Mexico (NMFS & USFWS, 1991).

As previously mentioned, there has been a tremendous decline in the number of green turtles worldwide compared to historical numbers which can largely be attributed to the overharvesting of eggs and adults (NMFS & USFWS, 2007b). After analyzing historical and recent population trends for green turtles at 32 index nesting sites around the world, the Marine Turtle Specialist Group reported a 48-65% reduction in the number of mature females that nested annually over the past 100-150 years (NMFS, 2013).

The two largest nesting populations for the green sea turtle exist outside of the United States. One nesting population where an average of 22,500 females nest per season occurs on Tortuguero, which is located on the Caribbean coast of Costa Rica (NMFS, 2013)(. This is the most important nesting concentration for green sea turtles in the western Atlantic (NMFS & USFWS, 2007b). The other nesting population, where an average of 18,000 female green turtles nest per season, can be found on Raine Island on Australia’s Great Barrier Reef (NMFS, 2013).

The most recent 5-Year review of the green turtle provided current nesting abundance for over 40 threatened and endangered nesting concentrations among 11 ocean regions throughout the world (NMFS & USFWS, 2007b). Those ocean regions included Western-, Central-, and Eastern Atlantic Ocean, Mediterranean Sea, Western-, Northern, and Eastern Indian Ocean, Southeast Asia, and Western-, Central-, and Eastern Pacific Ocean. Of the eight nesting locations in the Atlantic/Caribbean, all but one in the Eastern Atlantic Ocean, showed stable or increasing nest count/abundance data (NMFS & USFWS, 2007b). (Although the nesting site at Bioko Island in the eastern Atlantic Ocean might be decreasing, there was not sufficient data to determine a meaningful trend (NMFS & USFWS, 2007b). Similarly, eight of the nine nesting locations in the Pacific Ocean showed stable or increasing abundance trends (NMFS & USFWS, 2007b).

It should be noted that only one of the aforementioned nesting sites is located in the United States. This is the ESA-endangered breeding population in the state of Florida. Although most nesting occurs along a six county area in east central and southeast Florida, some occasional nesting has also been documented in other parts of the state (NMFS & USFWS, 1991); (Meylan, et al., 1995). According to the five year review of the green turtle, nesting data collected during the 2000-2006 Statewide Nesting Beach Survey (SNBS) indicated that a mean of approximately 5,6000 nests are laid annually in Florida (NMFS & USFWS, 2007b). According to the Index Nesting Beach Survey (INBS) program, which has determined nesting trends at a specific number of beaches since 1989 and is distinct from the SNBS initiative, there has been an overall positive nesting trend for the Florida breeding population of green turtles (NMFS & USFWS, 2007b).

The green turtle breeding population along the Pacific coast of Mexico is also listed as an endangered population (43 FR 32800, 1978). The primary nesting concentration for this population (also known as black turtles) is located at Colola – Michoacan in Pacific Mexico (NMFS & USFWS, 2007b). According to the most recent five year review, the annual mean nests for the Colola, Michoacan site from 2000-2005 was 4,326 nests (NMFS & USFWS, 2007b).

4. Population Risks & Stressors

Green sea turtles encounter many of the same natural threats to the terrestrial and marine environments as loggerhead and Kemp's ridley sea turtles (NMFS, 2013b). Therefore the explanations provided in Sections 3.6.4 and 3.7.4 still apply. Some of the threats, as outlined in the five year review of the green turtle, include:

- **The collection of eggs and harvesting of turtles (for commercial and subsistence use)**: As previously mentioned, these activities led to the historical worldwide decline in green turtle numbers; According to the five year review for green turtles, three of the current greatest threats to these turtle continue to be the taking of eggs, killing of females while they're on nesting beaches, and the directed hunting of green turtles while in their foraging areas

- **Coastal development including the construction of buildings, beach armoring, and sand extraction :** Such activities can either result in the direct loss of beach (nesting) habitat or adversely impact the natural behaviors of nesting females and/or hatchlings;

- **Contamination from anthropogenic disturbances:** Contamination from herbicides, pesticides, chemicals, and oil spills can directly threaten the coastal marine habitats, including the seagrass and marine algae, upon which green sea turtles rely (NMFS & USFWS, 2007b); (Lee Long, et al., 2000). Seagrass habitats are possibly the most susceptible of all coastal marine habitats because these areas, often defined as sheltered coasts with good water quality, are frequently at the downstream end of drainages from human development (Waycott, et al., 2005). Nutrient over-enrichment caused by nitrogen and phosphorous from urban and agricultural run-off can cause excess algal growth, which in turn can smother seagrasses and lower the oxygen content of water (63 FR 46693, 1998).

- **Fisheries bycatch, particularly in nearshore artisanal fisheries gear:** Green sea turtles are susceptible to artisanal and industrial fishing gear; This is true despite the fact that leatherback and loggerhead sea turtles receive more attention regarding the threat of bycatch

- **Climate Change:** As previously mentioned with the other sea turtles, an increase in temperature could alter the natural sex ratios of green turtle hatchlings; It could also lead to changes in the abundance of green turtles' food sources, including algae and plankton (Intergovernmental Panel on Climate Change , 2007b)

Another real threat to green sea turtles includes disease, particularly fibropapillomatosis. Although the specific cause(s) of this disease remains unknown, it causes small internal and external tumors (fibropapillomas) on the soft portion of a turtle's body (NMFS & USFWS, 2007b). Fibropapilloma tumors can impair green turtles' ability to forage, breath, swim and this could potentially lead to death (George, 1997). This disease was referenced in the Recovery Plan for the U.S. Population of Atlantic Green Turtle as a threat, particularly for immature green turtles (NMFS & USFWS, 1991). Also consistent with the risks stated above, the recovery plan for the U.S. Atlantic population indicated that significant threats were coastal development, commercial fisheries and pollution (NMFS & USFWS, 1991).

IV. Environmental Baseline

A. Prior Federal and State Actions

The NCCW GP was issued in 2000 and in 2008 and has been administratively continued until the final permit is authorized. Currently, there are 44 facilities covered under the permit that discharge to various rivers, streams, lakes, ponds, harbors, and bays within the Commonwealth of Massachusetts and the State of New Hampshire.

B. Massachusetts Surface Water Quality Standards

Section 305(b) of the Federal Clean Water Act codifies the process in which waters are evaluated with respect to their capacity to support designated uses as defined in the Surface Water Quality Standards (MassDEP, 2006). The Massachusetts Surface Water Quality Standards (SWQS) define the goals for water quality in the state of Massachusetts.

Class A waters are designated as a source of public water supply. Both Class A and Class SA (for coastal and marine waters) provide excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and second contact recreation, irrespective of whether or not such activities are allowed (MassDEP, 2006).

Class B and Class SB waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other crucial functions, and for primary and secondary contact recreation (MassDEP, 2006). The SWQS define a warm water fishery as a waterbody in which the maximum mean monthly temperature generally exceeds 68° F (20° C) during the summer months and which is not capable of sustaining a year-round population of cold water aquatic life (MassDEP, 2006).

The table below summarizes the parameters for select MA SWQS which will be referenced in subsequent sections of this document.

Table 9: Summary of Massachusetts Surface Water Quality Standards: Class SA, Class B-Warm Water Fishery (BWWF) & Class SB (MassDEP 2006)

	Class SA	**Class B, WWF**	**Class SB**
Temperature	≤ 85°F nor a maximum daily mean of 80°F and ΔT due to a discharge ≤ 1.5°F	≤ 83°F and ΔT due to a discharge ≤ 5°F in rivers	≤ 85°F nor a maximum daily mean of 80°F and ΔT due to a discharge ≤ 1.5°F between July and September and ≤ 4.0°F between October and June
pH	6.5 – 8.5 SU and Δ0.2 outside the natural background range	6.5 – 8.3 SU and Δ0.5 outside the natural background range	6.5 – 8.5 SU and Δ0.2 outside the natural background range
Total Residual Chlorine	"all surface waters shall be free from pollutants in concentrations that are toxic to humans, aquatic life or wildlife"		

As evidenced in the table, MA SWQS include turbidity, dissolved oxygen and other standards necessary to protect aquatic life and incorporate EPA's aquatic life criteria for toxic pollutants, which were designed to be protective of the most sensitive aquatic species nationwide (MassDEP, 2006).

C. New Hampshire Water Quality Standards

The New Hampshire Surface Water Quality Regulations define the goals for water quality in state of New Hampshire.

Class A waters in New Hampshire shall be of the highest quality, and there shall be no discharge of any sewage or wastes into waters of this classification. Class A waters are a potentially acceptable water supply after adequate treatment. Class B water are considered acceptable for fishing, swimming, and other recreational purposes, and, after adequate treatment, for use as water supplies. New Hampshire does not classify marine waters.

	Class A	**Class B**
Temperature	No change in temperature	Temperature change due to cooling water discharge shall not appreciably interfere with uses
pH	6.5 – 8.5 SU and Δ0.2 outside the natural background range	6.5 – 8.0 except when due to natural causes
Total Residual Chlorine	"all surface waters shall be free from toxic substances or chemical constituents in concentrations or combinations that injure or are inimical to plants, animals, humans, or	

	aquatic life”

D. Merrimack River Watershed

The Merrimack River Watershed drains approximately 5, 014 square miles in Massachusetts and New Hampshire, with 24% of this area in Massachusetts. However, the state of MA defines the Merrimack River Watershed on a smaller scale by excluding the Nashua, SuAsCo, Shawsheen River Watersheds, and all of the NH watersheds. (Executive Office of Environmental Affairs, 2001). This watershed encompasses all or parts of 24 MA communities. It also includes over 50 miles of the Merrimack River, from the New Hampshire border until it flows into the Atlantic Ocean at Newburyport and Salisbury.

As previously mentioned, the Massachusetts Surface Water Quality Standards (SWQS) assign all inland and coastal and marine waters to classes according to the intended beneficial uses of those waters (MassDEP, 2006). The Merrimack River in Massachusetts is classified as Class B, warm water fishery from the New Hampshire border to Haverhill (near the confluence of the Little River), while the 22-mile tidal section from Haverhill to the ocean is designated as Class SB (Meek & Kennedy, 2010).

According to the Massachusetts Year 2012 Integrated List of Waters, new water quality assessments were conducted for five specific watersheds and/or drainage areas, including the Merrimack River Watershed. Based on that data, the Merrimack River (from the state line to the mouth near the Atlantic Ocean) as well as other water bodies within the watershed were listed as Category 5 (MassDEP, 2013). Waters that fall under Category 5 are impaired waters that require a Total Maximum Daily Load, or TMDL, because the waterbodies are not meeting designated uses under technology-based controls. Pollutants include pathogens, such as coliform and *E.coli*, PCBs and mercury in fish tissue, and phosphorus (total). Wet weather discharges, including those from point sources, combined sewer overflow and urban runoff, are the major sources for the pathogens and nutrients. Atmospheric deposition causes the mercury in fish tissue, while the specific source of the PCBs is unknown (Executive Office of Environmental Affairs, 2001).

The Merrimack River Watershed does have a draft Pathogen TMDL (MADEP, et al., n.d.). TMDLs determine the amount of a pollutant that a waterbody can safely assimilate without violating water quality standards. The TMDL process is designed to assist states and watershed stakeholders in the implementation of water quality-based controls specifically targeted to identify source(s) of pollution in order to restore and maintain the quality of their water resources. It should also be noted that EPA approved the Northeast Regional Mercury Total Maximum Daily Load (TMDL) on December 20, 2007 (CTDEP, et al., 2007). The TMDL applies to all six New England states as well as the state of New York. It outlines a strategy for reducing mercury concentrations in fish in Northeast fresh waterbodies so that water quality standards can be met. A final addendum to this TMDL for the state of Massachusetts was finalized in September of 2012 (MassDEP, 2012).

E. Connecticut River Watershed

The Connecticut River Watershed is the largest river ecosystem in New England, encompassing approximately 11,000 square miles and spanning over four New England states, including Vermont, New Hampshire, Massachusetts, and Connecticut (Executive Office of Environmental Affairs, n.d.). From its origin near the Canadian border, the 410-mile Connecticut River flows southward to form the boundary between New Hampshire and Vermont (Carr & Kennedy, 2008) . The river then enters Massachusetts (near the Town of Northfield) and drains all or part of 45 municipalities before entering Connecticut (near the Towns of Agawam and Longmeadow) (Executive Office of Environmental Affairs, n.d.). It then empties into Long Island Sound.

The Connecticut River is also classified in the Massachusetts Surface Water Quality Standards as a Class B – warm water fishery (Carr & Kennedy, 2008). Segments MA34-01, MA34-02, MA34-03, MA34-04, and MA34-05, which cover the length of the Connecticut River from the New Hampshire/Massachusetts state line in the north to Massachusetts/Connecticut state line in the south, were listed as Category 5 – Impaired waters that requires a TMDL (MassDEP, 2013). The listed impairments included bacterial contamination from *E.coli* and nutrient enrichment from wet weather discharges, such as combined sewage outflows; high turbidity (total suspended solids or TSS); flow regime and streamside alterations from anthropologic activities including nearby hydro-electric facilities; and PCBs in fish tissue from unknown sources.

F. Pollutant Impacts on Aquatic Life

1. Temperature

Early life stages of fish, which would include sturgeon, appear to be more susceptible to environmental and pollutant stress than older life stages (Rosenthal & Alderdice, 1976). As NMFS indicated in a November 4, 2013 ESA concurrence letter to EPA regarding the Lawrence Hydroelectric Project under the NPDES HYDROGP, Shortnose sturgeon (and presumably Atlantic sturgeon) may be adversely affected by moderate to long term exposure to temperatures above 84°F and are likely to display avoidance behaviors of waters of this temperature. High ambient temperatures in combination with low dissolved oxygen levels can be detrimental to sturgeon. 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 (Flournoy, et al., 1992). At these temperatures, concomitant low levels of dissolved oxygen may actually be lethal. Scientists have also suggested that the survival of juvenile sturgeon in estuaries may be compromised when anthropogenic activities result in increased hypoxia and high temperatures in sturgeon nursery areas (Secor & Gunderson, 1998); (Collins, et al., 2001).

However, it should be noted that the permit conditions are designed to ensure that the discharges meet the relevant Massachusetts Water Quality Standards for temperature.

2. pH

As summarized in **Table 9** of Section IV.B., the pH range designated by the Massachusetts Water Quality Standards for Class B Inland, Class SA, and Class SB waters range from 6.5-8.5. According to the aforementioned November 4, 2013 ESA concurrence letter from NMFS, a pH range of 6.0 – 9.0 is harmless to most marine/aquatic organisms, including the ESA listed species of shortnose and Atlantic sturgeon.

3. Residual Chlorine

The acute and chronic water quality criteria for total residual chlorine (TRC) defined in the 2002 EPA National Recommended Water Quality Criteria for freshwater are 19 ug/L and 11 ug/L, respectively and for seawater are 13 ug/L and 7.5 ug/L, respectively. The Massachusetts Implementation Policy for the Control of Toxic Pollutants in Surface Waters stipulates that the maximum effluent concentration of chlorine to a receiving water shall not exceed 1.0 mg/L for discharges with dilution factors greater than 100.

There are a number of studies that have examined the effect of TRC (Post 1987, Buckley 1976, EPA 1986) on fish; however, no directed studies have examined the effects of TRC on listed species within the action area. The EPA has set the Criteria Maximum concentration (CMC or acute criteria; defined in 40 CFR 131.36 as equal to the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time (up to 96 hours) without deleterious effects) at 19 ug/L, based on an analysis of exposure of 33 freshwater species in 28 genera (EPA 1986) where acute effect values ranged from 28 ug/L for *Daphnia magna* to 710 ug/L for the threespine stickleback. The CMC is set well below the minimum effect values observed in any species tested. As the water quality criteria levels have been set to be protective of even the most sensitive of the 33 freshwater species tested, it is reasonable to judge that the criteria are also protective of sturgeon species.

The limits in the NCCW GP are intended to satisfy EPA’s ambient water quality criteria as well as Massachusetts Implementation Poly for Toxics, where appropriate. For this reason, discharges containing TRC under the NCCW GP are likely to have an insignificant effect on ESA species.

4. Metals

Dissolved metals in waterbodies are readily assimilated by plants and animals living in the waters and while they are considered micronutrients, increased concentrations can cause hazardous effects and toxicity effects. The current EPA recommended water quality criteria for zinc is 120 ug/l for both acute and chronic exposure assuming a hardness of 100 mg/L in the water column with lead having recommended water quality criteria of 65 ug/l(acute) and 2.5 ug/l(chronic) assuming a harness of 100 mg/L in the water column. Copper criteria are calculated using the Biotic Ligand Model due to its toxicity being linked to other water quality parameters.

V. Effects of the Action

A. Potential Effects

In examining the potential effects of the issuance of the NCCW GP on ESA listed species and critical habitat, EPA identified the potential impacts listed below for further consideration:

1. Impaired water quality: pH, TRC, metals
2. Thermal effects

3. Cooling Water Intake Structures

These potential impacts were considered for current permittees that discharge to the Connecticut and Merrimack Rivers, based on monitoring data reported by the facilities during the last six years (Jan. 2008 to Dec. 2013). As discussed previously, past facility performance will be used to determine the likelihood of adverse effects in the future under this permit.

Based on the allowed discharges under the permit, other pollutants are not expected to be present in the discharge and were not considered in this assessment.

B. Effects of the Action in the Connecticut River

EPA has determined, based on monitoring data obtained for facilities A and B, that there will be insignificant effects on listed species (Shortnose and Atlantic Sturgeon) in the Connecticut River due to discharges regulated under the NCCW GP.

Facility A has had one permit violation in the last 6 years (monthly pH minimum of 6.16 in 2012), which represents an unusual discharge based on the overall monitoring data. For both outfalls, no other samples have violated water quality standards for pH or temperature in the past six years. The table below summarizes past monitoring data and expected future discharge data for Facility A.

Summary of Monitoring Data from Facility A: Jan 2008 to Dec 2013

Outfall 1 monitoring parameters	no. samples	average	standard deviation	max value reported	Upper Expected value	Water Quality Standard
Max pH (S.U.)	72	7.87	0.19	8.18	8.3[1,3]	8.3
Min pH (S.U.)	72	7.59	0.37	**6.17**[5]	6.7[1,3,5]	6.5
Daily max. temp. (deg. F)	72	66.8	5.43	78.3	79.5[2,3,5]	83
Monthly avg. temp. (deg F)	72	64.7	9.0	76.6	79.5[2,4]	83
Outfall 2 monitoring parameters	**no. samples**	**average**	**standard deviation**	**max value reported**	**Upper Expected value**	**Water Quality Standard**
Max pH (S.U.)	72	8.02	0.20	8.27	**8.5[1,3]**	8.3
Min pH (S.U.)	72	7.85	0.277	6.9[5]	7.2[1,3,5]	6.5
Daily max. temp. (deg. F)	72	66.74	7.816	82	**85.0[2,3,5]**	83
Monthly avg. temp. (deg F)	72	64.7	6.61	80.6	75.5[2,4]	83

Notes:
[1] Based on a lognormal distribution.
[2] Based on a normal distribution.
[3] 99 percentile of expected data set; used for daily measurements.
[4] 95 percentile of expected data set; used for monthly measurements.
[5] Minimum values, lower expected values reported for Min pH parameter.

To determine future protectiveness, EPA obtained a reasonable upper value for each of the facility's discharge pollutant parameters by calculating the expected 95% and 99% values from the data by fitting sampling data to a normal or lognormal distribution (see footnotes). Based on these analyses, the highest expected pH and temperature from Outfall 2 violate water quality standards. For a worst-case scenario (i.e., maximum discharge and low river flow, zero assimilative capacity in the river), the pollutant parameters in the receiving water can be calculated using the following equation:

$$C_{\text{River,downstream}} = \frac{C_{\text{discharge}} Q_{\text{max discharge}} + C_{\text{River,upstream}} * Q_{River}}{Q_{\text{max discharge}} + Q_{River}}$$

Where:

		Temperature:	pH:
$C_{\text{discharge}}$	= max. expected discharge parameter	85.0 deg F	8.5 S.U.
$Q_{\text{max discharge}}$	= permit limited discharge * the facility has not violated this limit in the past six years of monitoring	0.4 MGD	0.4 MGD
$C_{\text{River, upstream}}$	= upstream river concentration; equal to water quality standards based on an assumed assimilative capacity of zero in the river	83 deg F	8.3 S.U.
Q_{River}	= 10% of 7Q10 for conservative mixing zone	114.7 MGD	114.7 MGD

This equation assumes rapid and complete mixing within the assumed mixing zone (this assumption is reasonable given the distance of the discharge upstream from listed species). Applying this equation for both temperature and pH, the final river quality parameters are: 83.007 deg F and 8.3007 S.U. These changes are unlikely to be measurable in the Connecticut River and are unlikely to have an adverse effect on Shortnose or Atlantic Sturgeon downstream. This analysis demonstrates that the highest expected discharge concentrations will not have a measurable impact on water quality in the Connecticut River under worst-case conditions. Furthermore, the assumed mixing zone in these calculations provides an adequate zone of passage for anadromous fish, as required in Massachusetts mixing zone requirements (314 CMR 4.03(2)). Therefore, EPA believes that pollutants regulated in the facility's discharge will have a negligible impact on ESA species in the Connecticut River.

Facility A also withdraws groundwater for use as cooling water; the facility tested for metals in its discharge in 2008. Based on analysis of one discharge sample and the high dilution factor in the Connecticut River, EPA has determined that the discharge of groundwater used for NCCW from Facility C is unlikely to cause an excursion above water quality criteria for metals in the river (see table below). All metals except for Antimony, Cadmium, Copper, Silver, and Iron were below acute and chronic water quality criteria or were non-detect and below water quality criteria. For those metals that exceeded water quality criteria, they were present in concentrations less than one order of magnitude greater than the chronic water quality criteria. EPA expects that mixing within the zone of initial dilution at the facility's outfalls will ensure that water quality is protected and maintained for these higher metals concentrations.

Discharge Metals Analysis for Facility A

Metal	Facility C discharge concentration (mg/L)	Reported Detection Limit (mg/L)	Water Quality Criteria (Total Recoverable Metals in mg/L)[1]		Connecticut River Dilution Factor[3]	Expected mixing zone Total Recoverable Concentration (mg/L)[4]
			Acute	Chronic		
Antimony	**<0.006**[2]	0.005	0.0056	NL	116	0.000052
Arsenic	<0.01	0.01[5]	0.34	0.15	116	0.000087
Cadmium	**<0.001**[2]	0.001	0.00097	0.00015	116	0.000009
Chromium Total	<0.005	0.005	0.97	0.057	116	0.000044
Chromium VI	<0.005	N/A	0.016	0.011	116	0.00004
Copper	**0.024**[2]	0.005	0.0067	0.0048	116	0.000209
Lead	Not Tested	0.04	0.0084	0.00033	116	Not Tested
Mercury	0.00073	0.0002	0.0017	0.0009	116	0.000006
Nickel	0.01	0.01	0.1	0.011	116	0.000087
Selenium	Not Tested	0.05	NL	0.005	116	Not Tested
Silver	**<0.005**[2]	0.005	0.001	NL	116	0.000044
Zinc	<0.05	0.01	0.062	0.062	116	0.00044
Iron	**0.36**[2]	N/A	NL	0.1	116	0.0031
Chloride	13	N/A	860	230	116	0.11
In-stream Hardness	46	N/A				

Notes:
NL = Not Listed
[1] Limits were calculated using a receiving water hardness of 46 mg/L based on the 2002 National Recommended Water Quality Criteria. Hardness-specific limits were not available for other parameters. There are no site-specific metals criteria for the Connecticut River.
[2] Discharge concentration is greater than water quality criteria, or water quality criteria is below reported detection limit.
[3] Dilution Factor = (7Q10*0.10 + Max. discharge)/Max. discharge; the 7Q10 for the Connecticut River was reported as 1147 MGD from MassDEP; a conservative estimate of mixing within the river was used (10%) to calculate the dilution factor.
[4] The greater of the measured concentration or the laboratory reported detection limit was used to calculate the in-stream concentration, along with the expected dilution due to complete mixing with the Connecticut River low-flow condition.

Monitoring data from the past six years from Facility B, which uses municipal water for cooling, meet discharge limits and water quality standards, except for TRC limits and criteria. The table below summarizes past monitoring data and expected future discharge data for Facility B.

Summary of Monitoring Data from Facility B: Jan 2008 to Dec 2013

Outfall 1 monitoring parameters	no. samples	average	standard deviation	max value reported	Upper Expected Value	Water Quality Criteria
Max pH (S.U.)	72	7.6	0.17	8.1	8.0[2]	8.3
Min pH (S.U.)	72	7.3	0.18	6.7[4]	6.9[2,4]	6.5
Daily max. temp. (deg. F)	72	68.3	6.8	79.0	84.2[2]	83

Monthly avg. temp. (deg F)	72	64.4	7.3	75.0	77.7[3]	83
daily max TRC (mg/L)	32	0.83	0.29	1.18	1.49[2]	1
Monthly avg. TRC (mg/L)	30	0.8	0.3	1.15	1.30[3]	1
Municipal influent monitoring	no. samples	average	standard deviation	max value reported	Upper Expected Value	Water Quality Criteria
daily max TRC (mg/L)	22	0.95	0.26	1.3	1.54[2]	1
Monthly avg. TRC (mg/L)	22	0.96	0.25	1.3	1.37[3]	1

Notes:
[1] Based on a normal distribution.
[2] 99 Percentile of expected data sets, used for daily maximum parameters.
[3] 95 Percentile of expected data sets, used for monthly average parameters.
[4] Minimum values, lower expected value reported for Min pH parameter.

The highest expected discharge concentrations based on monitoring data (see table) are within water quality standards and criteria for pH and temperature, except for maximum daily temperature. This temperature has not been observed at the facility, and may be a function of a relatively poor statistical curve fit to the data. EPA does not expect the facility to violate its temperature limitations based on historical data.

In 2012, EPA and MassDEP determined that for Facility B, the permit limit of 1 mg/L TRC should be removed because its discharge was routinely greater than the limit. In addition, the facility is required to report the influent chlorine concentration in its municipal water. The results of this reporting demonstrate that the high residual chlorine concentrations in the discharge are due to the facility's source of cooling water. Due to the high dilution factor in the Connecticut River, EPA has determined that the TRC in the discharge is not likely to cause an excursion above chlorine water quality criteria. Assuming zero assimilative capacity in the Connecticut River, the expected chlorine concentration due to the discharge into the river can be calculated based on the following equation:

$$\mathrm{C_{River,downstream}} = \frac{\mathrm{C_{discharge}Q_{max\,discharge}} + \mathrm{C_{River,upstream}} * Q_{River}}{\mathrm{Q_{max\,discharge}} + Q_{River}}$$

Where:

		TRC acute:	TRC chronic:
$C_{discharge}$	= max. expected discharge parameter	1.49 mg/L	1.30 mg/L
$Q_{max\ discharge}$	= maximum reported discharge; above permit limit of 0.3 MGD for Facility B	0.42 MGD	0.42 MGD
$C_{River,\ upstream}$	= upstream river concentration; expected to be near zero for residual chlorine, which is volatile	0 mg/L	0 mg/L
Q_{River}	= 10% of 7Q10 for conservative mixing zone	114.7 MGD	114.7 MGD

This equation assumes rapid and complete mixing within the mixing zone in the Connecticut River. The downstream mixing zone TRC concentration using this equation is 0.00505 mg/L or 5.05 ug/L, which is below the acute water quality criteria for TRC (19 ug/L). If the equation is solved using the maximum expected monthly average concentration, the final downstream TRC concentration is 0.44 ug/L, well below chronic water quality criteria of 11 ug/L. Both expected concentrations are higher than any reported discharge concentrations for Facility B. These equations demonstrate that under worst-case conditions, the discharge will not cause an exceedance of residual chlorine water quality criteria in the Connecticut River and will have an insignificant impact on water quality. Furthermore, the assumed mixing zone in these calculations provides and adequate zone of passage for anadromous fish, as required in Massachusetts mixing zone requirements (314 CMR 4.03(2)). Therefore, EPA does not expect discharges under the NCCW GP to adversely affect endangered species in the Connecticut River.

Additionally, both facilities are generally well within their discharge flow limits: these facilities are not likely to discharge excess pollutants because they are not expected to discharge above their prescribed flow limits under the NCCW GP. Discharges from Facilities A and B are expected to have a negligible effect on water quality in the Connecticut River.

Based on this information, EPA has determined that discharges to the Connecticut River under the NCCW General Permit are not likely to adversely affect Shortnose and Atlantic Sturgeon known to be present in the Connecticut River.

C. Effects of the Action in the Merrimack River

Based on monitoring data obtained for facilities C and D, EPA has determined that there will be no adverse effects on listed species in the Merrimack River due to discharges regulated under the NCCW GP. As discussed in Section II.D.2., both facilities are located more than 30 miles upstream from the area inhabited by Shortnose Sturgeon.

Monitoring data from facility C, in the table below, shows that the facility's discharge has not violated water quality standards during the past six years. The maximum expected future discharge concentrations are also within water quality standards. These maximums were calculated (see footnotes) by fitting the monitoring data to a normal distribution except for maximum daily flow, which was assumed to be lognormally distributed.

Summary of Monitoring Data from Facility C: Jan 2008 to Dec 2013

Monitoring Parameter	no. samples	max value	average	standard deviation	Upper expected value	Water Quality Standard
Max pH (S.U.)	71	8	7.7	0.132	7.98[2]	8.0
Min pH (S.U.)	71	6.7[1]	7.4	0.213	6.89[1,2]	6.5
Daily max temp. (deg. F)	71	72	64.5	3.05	71.6[2]	83
Monthly average temp. (deg. F)	71	66	60.3	2.22	64.0[3]	83
Notes:						

[1] Minimum values are reported for the min pH parameter, i.e.: min reported value, % confidence percentile above the listed value, 5% expected value, and 1% expected value. [2] 99 Percentile of expected data sets, used for daily maximum parameters. [3] 95 Percentile of expected data sets, used for monthly average parameters.

Facility C uses groundwater as a source of NCCW; the metals composition of the NCCW discharge was measured in 2008 when the facility applied for coverage under the expired permit. Based on analysis of one discharge sample and the high dilution factor in the Merrimack River, EPA has determined that the discharge of groundwater used for NCCW from Facility C is unlikely to cause an excursion above water quality criteria for metals in the Merrimack River (see table below). In addition, the assumed mixing zone used to calculate the downstream metals concentration is conservative given the high flow in the Merrimack and the distance between the discharge and areas inhabited by endangered Shortnose Sturgeon. Because Facility C is located approximately 31 miles upstream, runoff, baseflow, and confluence with the Nashua, Concord, and other rivers would lead to extensive further dilution of any discharge pollutant at the river segment seasonally occupied by the endangered Shortnose Sturgeon.

Discharge Metals Analysis for Facility C

Parameter	Facility C discharge concentration (mg/L)	Reported Detection Limit (mg/L)	Water Quality Criteria (Total Recoverable Metals in mg/L)		Merrimack River Dilution Factor[3]	Expected mixing zone Total Recoverable Concentration (mg/L)[4]
			Acute	Chronic		
Antimony	<0.00495	0.005	0.0056	NL	153	0.000033
Arsenic[1]	0.005	0.005	0.34	0.15	153	0.000033
Cadmium[1]	**<0.001**[2]	0.001	0.0003	0.00007	153	0.000007
Chromium Total[1]	<0.01	0.01	0.43	0.031	153	0.000065
Chromium VI[1]	**<0.02**[2]	N/A	0.016	0.011	153	0.00013
Copper[1]	**<0.01**[2]	0.005	0.0026	0.002	153	0.000065
Lead[1]	Not Tested	0.04	0.0084	0.00033	153	Not Tested
Mercury[1]	**<0.002**[2]	0.002	0.0017	0.0009	153	0.000013
Nickel[1]	<0.01	0.01	0.1	0.011	153	0.000065
Selenium	Not Tested	0.05	NL	0.005	153	Not Tested
Silver[1]	**<0.01**[2]	0.01	0.00017	NL	153	0.000065
Zinc[1]	0.038[2]	0.01	0.026	0.026	153	0.00025
Iron	<0.05	N/A	NL	0.1	153	0.0033
Chloride	152	N/A	860	230	153	0.99
In-stream Hardness	16.7	N/A				
Notes: NL = Not Listed [1] Limits were calculated using a receiving water hardness of 16.7 mg/L based on the 2002 National Recommended Water Quality Criteria. Hardness-specific limits were not available for other parameters. There are no site-specific metals criteria for the Merrimack River. [2] Discharge concentration is greater than water quality criteria, or water quality criteria is below reported detection limit. [3] Dilution Factor = (7Q10*0.10 + Max. discharge)/Max. discharge); the 7Q10 for the Merrimack River was reported as 683 cfs (441 MGD) from NHDES; a conservative estimate of mixing within the river was used (10%) to calculate the						

dilution factor.
[4] The greater of the measured concentration or the laboratory reported detection limit was used to calculate the in-stream concentration, along with the expected dilution due to complete mixing with the Merrimack River low-flow condition.

Monitoring data from Facility D, below, shows that the facility's discharge has generally met water quality standards during the past six years. The expected maximum discharge concentrations based on a statistical distribution of the monitoring data (see footnotes) are within water quality standards given the precision of those standards. For discharge data that do not meet water quality standards (see min reported pH of 6.29), EPA has determined that water quality will be minimally affected by the discharge due to quantity and dilution factor within the river. A conservative dilution factor of the discharge in the Merrimack River using 10% of the 7Q10 flow ((42.3 MGD+0.02 MGD)/0.02 MGD = 2116) is very high.

Additionally, since Facility D has used municipal drinking water as a NCCW supply, quarterly TRC monitoring data is available. Based on limited sample data (see footnote 4 above), it is not likely that the discharge will exceed EPA recommended water quality criteria for TRC of 1 mg/L. EPA has determined that the discharge will not cause in-stream concentrations in the Merrimack River to exceed the TRC chronic criteria of 11 ug/L based on the high dilution factor at the discharge.

Summary of Monitoring Data from Facility D: Jan 2008 to Dec 2013

Monitored Parameters	no. samples	average	standard deviation	max value reported	Upper expected value	Water Quality Standard
Max pH (S.U.)	69	7.33	0.273	7.85[1]	7.96[4]	8.0
Min pH (S.U.)	69	7.12	0.275	6.29[1,2]	6.48[2,4]	6.5
Daily max. temp. (deg. F)	69	57.0	9.57	75.2	79.2[4]	83
Monthly avg. temp. (deg F)	69	55.6	9.44	74.1	71.2[5]	83
Total residual chlorine (mg/L)	11	0.192	0.154	0.465[1]	0.884[3]	1

Notes:
[1] Statistically-determined outliers.
[2] Minimum values are reported for the min pH parameter, i.e.: min reported value, % confidence percentile above the listed value, 5% expected value, and 1% expected value.
[3] Based on the small number of TRC samples available, the 95th percentile expected value was found using EPA's Technical Support Document For Water Quality-based Toxics Control. The max. value of 0.465 was multiplied by 1.9 based on Table 3-2 (CV=0.8) to get a 95th percentile value of 0.884.
[4] 99 Percentile of expected data sets, used for daily maximum parameters.
[5] 95 Percentile of expected data sets, used for monthly average parameters.

Based on the sample data available, EPA has determined that it is not likely that the discharge from Facility C or D will cause an excursion outside of New Hampshire or Massachusetts water quality standards. Additionally, neither facility has violated the flow limitations set in the permit, which also requires monitoring of maximum daily flow and average monthly flow. Both facilities are not likely to discharge excess pollutants because they are not expected to discharge above their prescribed flow limits under the NCCW GP.

Based on this information, EPA has determined that discharges to the Merrimack River under the NCCW General Permit are not likely to adversely affect Shortnose or Atlantic Sturgeon in the Merrimack River.

D. Effects of the Action in Massachusetts Bay

EPA has determined that discharges to Massachusetts Bay under the NCCW General Permit are not likely to adversely affect the following endangered species: North Atlantic Right Whale, Humpback Whale, Fin Whale, Green Sea Turtle, Kemp's Ridley Sea Turtle, Loggerhead Sea Turtle, and Leatherback Sea Turtle.

Under the NCCW GP, these two facilities are authorized to discharge 0.86 MGD and 0.98 MGD, respectively, of NCCW. Neither facility has violated permit effluent limitations (see table below) in the past five years.

Permit limits:
Massachusetts Surface Water Quality Standards for Class SB waters

Parameter	Limit
Minimum pH	6.5 S.U.
Maximum pH	8.5 S.U.
Maximum Temperature	80 deg F

Additionally, highly mobile species, like whales and turtles, are not expected to be adversely affected by small, localized discharges. EPA believes that water quality in Boston Harbor will not be adversely affected by the facilities' discharges due to their compliance record under the permit and the expected dilution in the Harbor. Consequently, impacts to Massachusetts Bay and Stellwagen Bank are expected to be insignificant due to further dilution.
Both facilities intake water from the harbor for cooling and are subject to the CWIS requirements of the general permit. EPA believes that these requirements (see Parts 4.2-4.3 of the NCCW General Permit) will adequately protect aquatic life from impingement and entrainment. The permit includes requirements to monitor for impingement, report unusual impingement events, minimize through-screen velocity of the CWIS, and reduce the intake of cooling water whenever possible.

Discharges under this permit will be small (generally less than 1 MGD) and are not expected to affect water quality offshore, where the listed species are most often found. CWISs at these permitted facilities are not expected to adversely impact listed species or their forage species because of permit requirements and the expected distance of the discharge from the listed offshore species.

E. Effects of the Action in Cape Cod Bay

EPA has determined that discharges to Cape Cod Bay under the NCCW General Permit are not likely to adversely affect the following endangered species: North Atlantic Right Whale, Humpback Whale, Fin Whale, Green Sea Turtle, Kemp's Ridley Sea Turtle, Loggerhead Sea Turtle, and Leatherback Sea Turtle.

Under the NCCW GP, the facility's discharge must meet Massachusetts water quality standards in the table below.

Permit limits:
Massachusetts Surface Water Quality Standards for Class SA waters

Parameter	Limit
Minimum pH	6.5 S.U.
Maximum pH	8.5 S.U.
Maximum Temperature	80 deg F

The facility is allowed a total discharge of 0.5 MGD from two outfalls. The facility has not violated flow or temperature limits in the past five years. The facility's minimum pH limit was recently lowered to the federal limit of no less than 6.0 S.U. in order to comply with permit limits. EPA believes that the discharge of pH=6.0 NCCW from the facility will have a negligible effect on water quality in Plymouth Harbor due to the large amount of dilution within the harbor. EPA expects that dilution within Plymouth Harbor and beyond would protect offshore aquatic life from any impacts of the discharge. Additionally, highly mobile species, like whales and turtles, are not expected to be adversely affected by small, localized discharges.

F. Effects of the Action in the Taunton River, Piscataqua River, and Great Bay Estuary

Currently, there are no facilities covered under the NCCW GP that discharge to the Taunton River in Massachusetts or the Piscataqua River or areas of Great Bay Estuary in New Hampshire. However, it is possible that facilities along these waterways could apply for coverage in the future. The endangered Atlantic Sturgeon has been sighted in all of these waterbodies.

The following are general conditions of the facilities discussed in V. B-E, which suggest that water quality is not likely to be significantly affected by other NCCW discharges authorized under this permit:

1. Low design flow with few or no flow limit violations
2. Monitoring data within water quality standards
3. Expected maximum pollutant concentrations within water quality standards
4. High dilution within the receiving water
5. General and facility-specific BTA requirements in permit conditions

Based on the assessments above for similar discharges in similar waterbodies, EPA believes that discharges to the Taunton River, Piscataqua River, or Great Bay, although they cannot be evaluated quantitatively at this time, are not likely to adversely affect the endangered Atlantic Sturgeon.

G. Effects of the Action on Essential Elements of Critical Habitat

As discussed previously, designated critical habitat for the North Atlantic Right Whale includes Cape Cod Bay and Stellwagen Bank, off the coast of Massachusetts and New Hampshire. Based on the analysis of facilities and the conditions of the permit, EPA has determined that discharges authorized under the permit are not likely to adversely affect water quality in close proximity to the discharge (within rivers, estuaries, and coastal embayments). Therefore, based on the distance from shore and the large expected dilution of discharged water at sea, EPA has determined that activities authorized under the NCCW GP will have no adverse effects on the critical habitat of the North Atlantic Right Whale.

H. Indirect Effects

EPA's permit action requires permittees to meet state water quality standards and comply with a discharge limit. In addition, the dilution available in the Merrimack River, Connecticut River, Taunton River and the marine environment is expected to minimize or eliminate potential effects on fish, shellfish, and other aquatic life. Indirect effects to the 2 ESA-listed species of sturgeon, 4 ESA-listed sea turtles, and 3 ESA- listed whales prey or habitat as a result of EPA's reissuance of the NPDES permit are not expected to occur.

I. Effects from interdependent and related actions

Interdependent actions are defined as actions with no independent use apart from the proposed action. Interrelated actions include those that are part of a larger action and depend on the larger action for justification. No interdependent/interrelated actions are expected to result from the reissuance of the NPDES permit for small non-contact cooling water discharges within the states of Massachusetts and New Hampshire, including those in the Merrimack River Watershed, Taunton River Watershed, Connecticut River Watershed, the Cape Cod Watershed, and the Great Bay Watershed. Likewise, expected effects of ongoing activities such as CWIS operations and maintenance are not expected to affect the 2 ESA-listed species of sturgeon, 4 ESA-listed sea turtles, and 3 ESA- listed whales in the Action Area.

J. Effects Determination for Listed Species

Shortnose Sturgeon: EPA has determined that reissuance of the Massachusetts and New Hampshire NCCW GP is not likely to adversely affect the Shortnose Sturgeon.

Atlantic Sturgeon: EPA has determined that reissuance of the Massachusetts and New Hampshire NCCW GP is not likely to adversely affect the Atlantic Sturgeon.

North Atlantic Right Whale: EPA has determined that reissuance of the Massachusetts and New Hampshire NCCW GP is not likely to adversely affect the North Atlantic Right Whale or its designated critical habitat.

Humpback Whale: EPA has determined that reissuance of the Massachusetts and New Hampshire NCCW GP is not likely to adversely affect the Humpback Whale.

Fin Whale: EPA has determined that reissuance of the Massachusetts and New Hampshire NCCW GP is not likely to adversely affect the Fin Whale.

Green Sea Turtle: EPA has determined that the reissuance of the Massachusetts and New Hampshire NCCW GP is not likely to adversely affect the Green Sea Turtle.

Kemp's Ridley Sea Turtle: EPA has determined that reissuance of the Massachusetts and New Hampshire NCCW GP is not likely to adversely affect the Kemp's Ridley Sea Turtle.

Loggerhead Sea Turtle: EPA has determined that reissuance of the Massachusetts and New Hampshire NCCW GP is not likely to adversely affect the Loggerhead Sea Turtle.

Leatherback Sea Turtle: EPA has determined that reissuance of the Massachusetts and New Hampshire NCCW GP is not likely to adversely affect the Leatherback Sea Turtle.

VI. Conclusions

EPA relied on several sources of information in order to make a determination about the effect of the proposed action on listed species and critical habitat, including:

1. NCCW GP permit conditions and fact sheet
2. Applicable water quality standards in Massachusetts and New Hampshire
3. Biological Assessments of endangered species for recent EPA actions
4. Current scientific data available for relevant endangered species critical habitat
5. NMFS information available online
6. Review of current actions (permitted facilities) under the NCCW GP

In conducting this review, EPA has determined that receiving water quality for freshwater habitats of endangered species will be protected under the conditions established in the NCCW GP based on specific monitoring data obtained under the expired permit. For estuarine/marine habitats of endangered species, EPA has determined that the sizes of the discharge and the expected dilution in the receiving water will adequately protect water quality and will not affect listed species. Additionally, the compliance history of facilities under the expired general permit suggests that water quality will be maintained or negligibly impacted from discharges to marine waters. EPA also believes CWIS requirements in the permit will protect endangered species and their forage species from impingement and entrainment. Based on the above information, EPA has determined that the reissuance of the NCCW GP will not have an adverse effect on ESA listed species or critical habitat under the jurisdiction of NMFS.

Works Cited

32 FR 4001. (1967, March 11). Native Fish and Wildlife: Endangered Species Act Listing (of Shortnose Sturgeon0. *32 Federal Register 48*, 4001. Office of the Secretary of the Interior.

35 FR 18319. (1970, December 2). Conservation of Endangered Species and Other Fish or Wildlife: List of Endangered Foreign Fish and Wildlife (Including Listing for Right Whale, Humpback Whale, Kemp's ridley sea turtle). 18319-18322. US Dept. of the Interior, USFWS.

35 FR 8491. (1970, June 2). Conservation of Endangered Species and Other Fish or Wildlife (Includes Leatherback Turtle). *35 FR 106*, 8491-8498. Dept. of Interior (USFWS).

43 FR 32800. (1978, July 28). Listing and Protecting Loggerhead Sea Turtles as Threatened Species and Populations of Green and Olive Ridley Sea Turtles as Threatened Species or Endangered Species. 32800-32811. NOAA (NMFS) & Dept. of Interior (USFWS).

44 FR 17710. (1979, March 23). Final Ruling for the Determination of Critical Habitat for the Leatherback Sea Turtle. 17710-17712. NOAA (NMFS).

59 FR 28805. (1994, June 3). Final Ruling for Designated Critical Habitat for Northern Right Whale. 28805-28835. NOAA.

63 FR 46693. (1998, September 2). Final Ruling: Designated Critical Habitat; Green and Hawksbill Sea Turtles. *63 FR 170*, 46693-46701. NOAA.

73 FR 12021. (2008, March 6). Endanagered and Threatened Species; Final Ruling for Endangered Status for North Pacific and North Atlantic Right Whales. 12021-12030. NOAA.

73 FR 60173. (2008, October 10). Endangered Fish and Wildlife: Final Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic Right Whales. 60173-60191. NOAA.

76 FR 58868. (2011, September 22). Endangered and Threatened Species: Final Ruling on Determination of Nine Distinct Population Segments of Loggerhead Sea Turtles as Endangered or Threatened. *76 FR 184*, 58868-58952.

77 FR 4170. (2012, January 26). Endangered and Threatened Species: Final Rule to Revise the Critical habitat Designation for the Endangered Leatherback Sea Turtle. 4170-4201. NOAA (NMFS).

77 FR 5880. (2012, February 6). Endangered and Threatened Wildlife and Plants:; Final rule for threatened and endangered status for distinct population segments of Atlantic Sturgeon in the Northeast Region. *24*, 5880-5912. National Oceanic and Atmospheric Administration.

77 FR 5914. (2012, February 6). Endangered and Threatened Willdlife and Plants; Final Listing Determinations for Two Distinct Population Segments of Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus) in the Southeast. *24*, 5914-5982. NOAA.

78 FR 34024. (2013, June 6). Endangered Fish and Wildlife: Proposed Rule to Eliminate the Expiration Date Contained in the Final Rule to Reduce the Threat of Ship Collisions with North Atlantic Right Whales. 34024-34030. NOAA.

78 FR 43305. (2013, July 18). Endangered and Threatened Species: Designation of Critical Habitat for the Northwest Atlantic ocean Loggerhead Sea Turtle Distinct Population Segment (DPS) and Determination Regarding Critical habitat for the North Pacific Ocean Loggerhead. 43305-43054. NOAA (NMFS) & Dept. of Interior (USFWS).

78 FR 53391. (2013, August 29). Endangered and Threatened Wildlife: 90 Day Finding on a Petition to Delist the North Pacific Population of the Humpback Whale and Notice of Status Review. 53391-53397. NOAA.

78 FR 69310. (2013, November 19). Endangered and Threatened Wildlife and Plants; Protective Regulations for the Gulf of Maine Distinct Population Segment of Atlantic Sturgeon. 69310-69315. NOAA.

Allen, B., & Angliss, R. (2011). *Alaska marine mammal stock assessments, 2010.* US Dept. of Commerce, NOAA Tech Memo: NMFSAFSC-223.

Atlantic States Marine Fisheries Commission. (1990). Interstate fishery 116 management plan for Atlantic sturgeon. Washington, D.C.: Fisheries Management Report No.17 - Atlantic States Marine Fisheries Commission.

Atlantic States Marine Fisheries Commission. (2007). Estimation of Atlantic Sturgeon Bycatch in Coastal Atlantic Commercial Fisheries of New England and the Mid-Atlantic. *Special Report to the ASMFC Atlantic Sturgeon Management Board.* Woods Hole.

Atlantic Sturgeon Status Review Team. (2007, February 23). Status Review of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus). *Report to National Marine Fisheries Service*. Northeast Regional Office.

Bolten, A. (2003). Variation in Sea Turtle Life History Patterns: Neritic vs. Oceanic Developmental Stages. In P. Lutz, J. Musick, & J. Wyneken (Eds.), *The Biology of Sea Turtles, Vol. II* (pp. 243-257). Washington, DC: CRC Press.

Burke, V., Standora, E., & SJ, M. (1993). Diet of juvenile Kemp's ridley and loogerhead sea turtles from Long Island, NY. *Copeia, 4,* 1176-1180.

Burkett, C., & Kynard, B. (1993). Sturgeons of the Taunton River and Mt.Hope Bay: Distribution, habitats and movements. Boston, MA: Final Report for Project AFC-24-1: Massachusetts Division of Marine Fisheries.

Carr, A. (1986). Rips, FADS, and little loggerheads. *Bioscience, 36,* pp. 92-100.

Carr, J., & Kennedy, L. (2008). *Connecticut River Basin: 2003 Water Quality Assessment Report.* Worcester, MA: MassDEP, Division of Watershed Management, Report Number 34-AC-2. Retrieved from http://170.63.28.40/eea/docs/dep/water/resources/07v5/34wqar07.pdf

Carretta, J., Forney, K., Oleson, E., Martien, K., Muto, M., Lowry, M., . . . Hill, M. (2011). *U.S. Pacific Marine Mammal Stock Assessment: 2010.* US Department of Commerce, NOAA Technical Memo, NMFS-SWFSC-476.

Christensen, I., Haug, T., & Oien, N. (1992). A review of feeding and reproduction in large baleen whales (Mysticeti) and sperm whales (Physeter macrocephalus) in Norwegian adjacent waters. *Fauna norvegica Series A, 13*, 13-48.

Clapham, P., & Mead, J. (1999). Megaptera novaeangeliae. *Mammalian Species, 604*, 1-9.

Collins, M., Post, W., & Russ, D. (2001). *Distribution of shortnose sturgeon in the Lower Savannah River.* Final Report to the Georgia Ports Authority.

Conant, T., Dutton, P., Eguchi, T., Epperly, S., Fahy, C., Godfrey, M., . . . Witherington, B. (2009). *Loggerhead sea turtle (Caretta caretta) 2009 status review under the US Endangered Species Act.* NMFS.

CTDEP, MEDEP, MADEP, NHDEP, NYSDEC, RIDEM, . . . NEIWPCC. (2007, October 24). *Northeast Regional Mercury Total Maximum Daily Load*. Retrieved February 2014, from http://www.mass.gov/eea/docs/dept/water/resources/a-thru-m/mertmdl.pdf

Dadswell, M. J., Taubert, B. D., Squiers, T. J., Marchette, D., & Buckley, J. (1984). *Synopsis of Biological Data on Shortnose Sturgeon, Acipenser brevirostrum.* NOAA Technical Report NMFS-14, FAO Fisheries Synopsis No. 140.

Diez, C., Soler, R., Olivera, G., White, A., Tallevast, T., Young, N., & van Dam, R. (2010). Caribbean leatherbacks: results of nesting seasons from 1984-2008 at Culebra Island, Puerto Rico. *Marine Turtle Newsletter*, pp. 22-23.

Dodd, C. J. (1988). *Synopsis of the biological data on the loggerhead sea turlte Caretta caretta (linnaeus 1758).* US Fish and Wildlife Service: Biological Report 88 (14).

Dutton, D., Dutton, P., Chaloupka, M., & Boulon, R. (2005). Increase of a Caribbean leatherback turtle Dermochelys coriacea nesting population linked to long-term nest protection. *Biological Conservation*, pp. 186-194.

Eckert, K., Wallace, B., Frazier, J., Eckert, S., & Pritchard, P. (2012). *Synopsis of the biological data on the leatherback sea turtle (Dermochelys coriacea).* Washington, DC: US DOI, USFWS-Biological Technical Publication BTP-R4015-2012.

Eckert, S. (2002). Distribution of juvenile leatherback sea turlte Dermochelys coriacea sightings. *Marine Ecology Progress Series 230*, pp. 289-293.

EPA. (2012, Aoruk). National Coastal Condition Report IV. *EPA-842-R-10-003*. Washington, D.C.: US EPA Office of Research and Development/Office of Water.

Ernst, C., & Barbaour, R. (1972). *Turtles of the United States.* Lexington: University Press of Kentucky.

Executive Office of Environmental Affairs. (2001). Merrimack River: A Comprehensive Watershed Assessment Report. Boston, MA: Massachusetts Executive Office of Environmental Affairs. Retrieved from http://www.mass.gov/eea/docs/eea/water/assess-rpt-merrimack-2000.pdf

Executive Office of Environmental Affairs. (n.d.). *Connecticut River Watershed*. Retrieved January 2014, from http://www.mass.gov/eea/waste-mgmt-recycling/water-resources/preserving-water-resources/mass-watersheds/connecticut-river-watershed.html

Flournoy, P., Rogers, S., & Crawford, P. (1992). *Restoration of shortnose sturgeon in the Altamaha River, Georgia.* Atlanta, GA: Final Report to the USFWS.

George, R. (1997). Health Problems and Diseases of Sea Turtles. In P. Lutz, & J. Musick (Eds.), *The Biology of Sea Turtles* (pp. 363-386). Boca Raton, FL: CRC Press.

Geraci, J., Anderson, D., Timperi, R., St. Aubin, D., Early, G., Prescott, J., & Mayo, C. (1989). Humpback Whales (Megaptera novaeangliae) Fatally Poisoned by Dinoflagellate Toxin. *Can. J. Fish and Aquat. Sci, 46*(11), 1985-1898.

Groombridge, B., & Luxmoore, R. (1989). The green turtle and hawksbill (Reptilia: Cheloniidae): world status, exploitation and trade. Lausanne, Switzerland: Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Hain, J., Human, M., Kenney, R., & H.E.Winn. (1985). The role of cetaceans in the shelf-edge region of the northeastern United States. *Mar. Fish. Rev, 47*(1), 13-17.

Hain, J., Ratnaswamy, M., Kenney, R., & Winn, H. (1992). The fin whale (Balaenoptera physalus) in waters of the northeastern United States continental shelf. *Report of the International Whaling Commission, 42*, 653-669.

Health, A. (1987). *Water Pollution and Fish Physiology.* Boca Raton, Florida: CRC Press, Inc.

Heaslip, S., Iverson, S., & Bowen, W. J. (2012). Jellyfish support high energy intake of leatherback sea turtles (Dermochelys coariacea): video evidence from animal-bourne cameras. *7(e33259), 3*. PLoS ONE.

Henry, A., Cole, T., Garron, M., & Hall, L. (2011). *Mortality and Serious Injury Determinations for Baleen Whale Stocks along the Gulf of Mexico, United States and Canadian Eastern Seaboards, 2005-2009.* US Dept. Commerce, Northeast Fish Science Center Reference Doc. 11-18.

Henry, A., Cole, T., Garron, M., Hall, L., Ledwell, W., & Reid, A. (2012). *Mortality and serious injury determinations for baleen whale stocks along the Gulf of Mexico, United States East Coast and Atlantic Canadian Provinces, 2006-2010.* NEFSC, Reference Document 12-11.

Heppell, S., Crouse, D., Crowder, L., Epperly, S., Gabriel, W., Henwood, T., . . . Thompson, N. (2005). A population model to estimate recovery time, population size, and management impacts on Kemp's ridley sea turtles. *Chelonian Conservation and Biology, 4*(4), pp. 767-773.

Heppell, S., Crowder, L., Crouse, D., Epperly, S., & Frazer, N. (2003). Population models for Atlantic loggerheads: past, present, and future. In A. Bolten, & B. Witherington (Eds.), *Loggerhead Sea Turtles* (pp. 255-273). Washington, DC: Smithsonian Books.

Intergovernmental Panel on Climate Change . (2007b). Summary for Policymakers. In S. Solomon, D. Quin, M. Manning, Z. Chen, M. Marquis, K. Averyt, . . . H. Miller (Ed.), *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge, UK & New York, NY: Cambridge University Press.

Intergovernmental Panel on Climate Change. (2007a). Climate Change 2007: The Physical Basis ---A Summary for Policymakers. In S. Solomon, D. Qin, Z. Manning, M. Chen, K.

Marquis, T. Avery, & M. Tignor (Ed.), *Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.*

International Whaling Commission. (1992). *Report of the comprehensive assessment special meeting on North Atlantic fin whales.* Reports of the International Whaling Commission 42.

Jefferson, T., Webber, M., & Pitman, R. (2008). *Marine Mammals of the World, A Comprehensive Guide to their Identification.* Amsterdam, Elsevier.

Jimenez, M., Filonov, A., Tereshchenko, I., & Marquex, R. (2005). Time-series analyses of the relationship between nesting frequency of the Kemp's ridley sea turtle and meterological conditions. *Chelonian Conservation and Biology, 4*(4), 774-780.

Johnson, S. (1994). *Reproductive ecology of the Florida green turtle (Chelonia mydas) - Unpublished Master's Thesis.* Orlando: University of Central Florida.

Kahnle, A., Hattala, K., & McKown, K. (2007). Status fo Atlantic sturgeon of the Hudson River estuary. In J. Munro, D. Hatin, K. McKown, J. Hightower, K. Sulak, A. Kahnle, & F. Caron (Ed.), *Proceedings of the symposium on anadromous sturgeon: Status and trend, anthropogenic impact, and essential habitat.* Bethesda, Maryland: American Fisheries Society.

Kenney, R., & Winn, H. (1986). Cetacean high-use habitats of the northeast United States continental shelf. *Fish Bull., 84*, 345-357.

Kynard, B., Bronzi, P., & Rosenthal, H. (2012). Life history and behaviour of Connecticut River Shortnose and other sturgeons. *World Sturgeon Conservation Society Special Publication, No.4*, 320.

Laist, D., Knowlton, A., Mead, J., Collet, A., & Podesta, M. (2001). Collisions between ships and whales. *Marine Mammal Science, 17*(1), 35-75.

Lee Long, W., Coles, R., & McKenzie, L. (2000). Issues for seagrass conservation management in Queensland. *Pacific Conservation Biology, 5*, pp. 321-328.

MADEP, Regioni, U. N., & International, E. (n.d.). *Draft Pathogen TMDL for the Merrimack River Watershed.* Worcester, MA: Massachusetts Department of Environmental Protection, Divisiion of Watershed Management. Retrieved from http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/merimac1.pdf

Magnuson, J., Bjorndal, K., DuPaul, W., Graham, G., Owens, D., Peterson, C., . . . West, C. (1990). *Decline of the sea turtles: causes and prevention.* Washington, DC: National Research Council, National Academy Press.

MassDEP. (2006). Massachusetts Surface Water Quality Standards (Revision of 314 CMR 4.00). Boston, MA: Massachusetts Department of Environmental Protection.

MassDEP. (2012, September). *Northeast Regional Mercury Total Maximum Daily Load: Final Addendum for Massachusetts (CN 377.0).* (D. o. MassDEP, Editor) Retrieved February 2014, from http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/mertmdla.pdf

MassDEP. (2013). Massachusetts Year 2012 Integrated List of Waters. *Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the*

Clean Water Act. Boston, MA: Massachusetts Department of Environmental Protection, Bureau of Resource Protection, Division of Watershed Management. Retrieved from http://www.mass.gov/eea/docs/dep/water/resource/07v5/12list2.pdf

Meek, J., & Kennedy, L. (2010). *Merrimack River Watershed: 2004-2009 Water Quality Assessment Report.* Worcester, MA: MassDEP, Division of Watershed Management. Retrieved from http://www.mass.gov/eea/docs/dep/water/resources/71wqar09/84wqar09.pdf

Meylan, A., Schroeder, B., & Mosier, A. (1995). Sea Turtle Nesting Activity in the State of Florida, 1979-1992. *Florida Marine Research Publication*, pp. 1-51.

Moore, M., Miller, C., Weisbrod, A., Shea, D., Hamilton, P., Kraus, S., . . . Stegeman, J. (1998). Cytochrome P450 1A and chemical contaminants in dermal biopsies of northern and southern right whales. *Submitted to the IWC Workshop on the Comprehensive Assessment of Right Whales: A Worldwide Comparison, SC/M98/RW24;*. Cape Town, South Africa.

Musick, J., & Limpus, C. (1997). Habitat utilization and migration in juvenile sea turtles. In P. Lutz, & J. Musick (Eds.), *The Biology of Sea Turtles* (pp. 137-164). Boca Raton, Florida: CRC Press.

NMFS & USFWS. (1991). *Recovery Plan for US Population of Atlantic Green Turtle.* Washington, DC: National Marine Fisheries Service.

NMFS & USFWS. (1992). *Recovery Plan for Leatherback Turtles in the US Caribbean, Atlantic and Gulf of Mexico.* Washington, DC: National Marine Fisheries Service.

NMFS & USFWS. (2007). *Kemp's Ridley Sea Turtle (Lepidochelys kempii) 5 Year Review: Summary and Evaluation.* National Marine Fisheries Service, Office of Protected Resources (Silver Spring, MD) & US Fish and Wildlife Service, Southwest Region (Albuquerque, NM).

NMFS & USFWS. (2007b). *Green Sea Turtle (Chelonia Mydas) 5-Year Review: Summary and Evaluation.* National Marine Fisheries Service, Office of Protected Resources (Silver Spring, MD) & USFWS, Southeast Region (Jacksonville, Fl).

NMFS & USFWS. (2008). *Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (Caretta caretta).* Silver Spring, MD: NMFS.

NMFS & USFWS. (2013). *Leatherback Sea Trutle (Dermochelys coriacea) 5-Year Review and Evaluation.* NMFS, Office of Protected Resources (Silver Spring, MD) & USFWS, Southeast Region (Jacksonville, FL).

NMFS. (19 Nov 2013). *Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus)*. Retrieved January 2014, from http://www.nmfs.noaa.gov/pr/species/fish/atlanticsturgeon.htm

NMFS. (1991). *Recovery Plan for the Humpback Whale (Megaptera novaengliae).* Silver Spring, MD: Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service.

NMFS. (1998). *Recovery Plan for the Shortnose Sturgeon (Acipenser brevirostrum).* Silver Spring, Maryland: Prepared by the Shortnose Recovery Team for the National Marine Fisheries Service.

NMFS. (2005). *Recovery Plan for the North Atlantic Right Whale.* Silver Spring, MD: National Marine Fisheries Service.

NMFS. (2010, November). Stock Assessment Report of Blue Whale (Balaenoptera musculus musculus): Western North Atlantic Stock.

NMFS. (2010b). *Recovery Plan for the fin whale (Balaenoptera physalus).* Silver Spring, MA: National Marine Fisheries Service.

NMFS. (2012). *Stock Assessment Report of North Atlantic Right Whale (Eubalaena glacialis): Western Atlantic Stock.*

NMFS. (2012b). *Stock Assessment Report of Humpback Whale (Megaptera novaeangliae): Gulf of Maine Stock.*

NMFS. (2013, September 4). *Fin whale (Balaenoptera physalus)*. Retrieved February 2014, from http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/finwhale.htm

NMFS. (2013, June 21). *Green Turtle (Chelonia Mydas)*. Retrieved February 2014, from http://www.nmfs.noaa.gov/pr/species/turtles/green.htm

NMFS. (2013, March 4). *Kemp's Ridley Turtle (Lepidochelys kempii)*. Retrieved January 2014, from http://www.nmfs.noaa.gov/pr/species/turtles/kempsridley.htm

NMFS. (2013, November 19). *Leatherback turtle (Dermochelys coriacea)*. Retrieved January 2014, from http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.htm

NMFS. (2013a, March 22). Letter regarding the New Hampshire MS4 NPDES permit. (t. E. Webster, Ed.) NMFS Assistant Regional Administrator Mary Colligan.

NMFS. (2013b, April 10). Endangered Species Action Section 7 Consultation on the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf in MA, RI, NY, and NJ Wind Energy Areas. *Biological Opinion*.

NMFS. (2013c). *Stock Assessment Report of Fin Whale (Balaenoptera physalus): Western North Atlantic Stock.*

NMFS. (2013c, May). Stock Assessment Report of Sei Whale (Balaenoptera borealis borealis): Nova Scotia Stock.

NMFS. (2013e, September 24). Endangered Species Action Biological Opinion: Re-Initiation of Formal ESA Section 7 Consultation for the Kennebec River Fish Assemblage Study.

NMFS. (2013f, November 4). ESA Section 7 Consultation Letter on Authorization of discharges from Lawrence Hydroelectric Project under the NPDES HYDROGP. (t. U. Nagle), Compiler) Mary A. Colligan for Regional Administrator John K. Bullard.

NMFS. (2013g, September 5). *Humpback Whale*. Retrieved Feb 2014, from http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/humpbackwhale.htm

NMFS. (2014, January 23). *Threats to Marine Turtles*. Retrieved January 2014, from http://www.nmfs.noaa.gov/pr/species/turtles/threats.htm

NMFS et al. (2011). *Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (Lepidochelys kempii), Second Revision.* Silver Spring: National Marine Fisheries Service, US Fish and Wildlife & SEMARNAT.

NMFS. (n.d.). *Fact Sheet for Atlantic Sturgeon Carolina Distinct Population Segment: Endangered*. Retrieved January 2014, from http://www.nmfs.noaa.gov/pr/pdfs/species/atlanticsturgeon_carolina_dps.pdf

NMFS. (n.d.). *Fact Sheet for Atlantic Sturgeon Chesapeake Bay Distinct Population Segment: Endangered*. Retrieved January 2014, from http://www.nmfs.noaa.gov/pr/pdfs/species/atlanticsturgeon_chesapeakbay_dps.pdf

NMFS. (n.d.). *Fact Sheet for Atlantic Sturgeon South Atlantic Distinct Population Segment: Endangered*. Retrieved January 2014, from http://www.nmfs.noaa.gov/pr/species/fish/atlanticsturgeon.htm

NMFS. (n.d). *Fact Sheet for Atlantic Sturgeon New York Bight Distinct Population Segment: Endangered*. Retrieved January 2014, from http://www.nmfs.noaa.gov/pr/pdfs/species/atlanticsturgon_nybight_dps.pdf

NMFS NEFSC. (2011). *Preliminary Summer 2010 regional abundance estimate of loggerhead turtles (Caretta caretta) in northwestern Atlantic Ocean continental shelf waters.* US Dept. Commerce, Northeast Fisheries Science Center Reference Document 11-03.

NMFS. (n.d.). *North Atlantic Right Whale*. Retrieved February 2014, from http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/rightwhale_northatlantic.htm

NOAA. (2013). *Sea Turtle Stranding and Salvage Network - Southeast Fisheries Science Center*. Retrieved January 2014, from http://www.sefsc.noaa.gov/species/turtles/strandings.htm

NOAA Fisheries. (2012, August). 5-Year Review of North Atlantic Right Whale (Eubalaena glacialis): Summary and Evaluation Report. Gloucester, MA: NOAA Fisheries, Northeast Regional Office.

O'Shea, T., & Brownell, R. (1994). Organochlorine and metal contaminants in baleen whales: a review and evaluation of conservation implications. *Science of the Total Env., 154*, 179-200.

Overholtz, W., & Nicolas, J. (1979). Apparent feeding by the final whale, Balaenoptera physalus, and humpback whale, Megaptera novaeangliae, on the American sand lance, Ammodytes americanus, in the northwest Atlantic. *Fish Bull, U.S., 77*, 285-287.

Perry, S., DeMaster, D., & Silber, G. (1999). The great whales: History and status of six species listed as endangered under the U.S. Endangered Species Act of 1973. *Mar Fish Rev, 61*(1), 1-74.

Plotkin, P. (2003). *Adult migrations and habitat use* (Vol. 2). (P. Lutz, J. Musick, & J. Wyneken, Eds.) Boca Raton, Florida: CRC press.

Prescott, R. (1988). Leatherbacks in Cape Cod Bay, MA, 1977-1987. In B. Schroeder (Ed.), *Proceedings of the Eighth Annual Workshop on Sea Turtle Conservation and Biology* (pp. 83-84). NOAA Tech. Memo NMFS-SEFC-2 14.

Pritchard, P. (1971). The leatherback or leathery turtle, Dermochelys coriacea. *IUCN Monog. 1*, pp. 1-39.

Ramirez-Gallego, Diez, C., Barriento-Munoz, K., White, A., & Roman, A. (2013). Continued decline of nesting leatherback turtles at Culebra Island, Puerto Rico. In T. Tucker, L.

Belskis, A. Panagopoulou, A. Rees, M. Frick, K. Williams, . . . K. Stewart (Ed.), *Proceedings of the Thirty-Third Annual Symposium of Sea Turtle Biology and Conservation.* NOAA Tech. Memo NMFS-SEFSC 645.

Reeves, R., Silber, G., & Payne, P. (1998b). *Draft recovery plans for the fin whale (Balaenoptera physalus) and sei whale (Balaenoptera borealis).* Silver Spring, MD: National Marine Fisheries Service.

Robbins, J., & Mattila, D. (2001). *Monitoring entanglements of humpback whales (Megaptera novaeangliae) in the Gulf of Maine on the basis of caudal peduncle scarring.* Impington, Cambridge, UK: International Whaling Commission Scientific Committee.

Rorvik, C., Jonsson, J., Mathisen, O., & Jonsgard, A. (1976). Fin whales, Balaenoptera physalus (l), off the west coast of Iceland distribution, segregation by length and exploitation. *RitFish, 5,* 1-30.

Rosenthal, H., & Alderdice, D. (1976). Sublethal effects of environmental stressors, natural and pollutional, on marine fish eggs and larvae. *Journal of the Fisheries Research Board of Canada, 33,* pp. 2047-2065.

Savoy, T. (1996). Anadromous fish studies in Connecticut waters. Connecticut Department of Environmental Protections: Completion Report AFC-22-3.

Schuller, P., & Peterson, D. (2006). Population status and spawning movements of Atlantic sturgeon in the Altamaha River, Georgia. *Presetation to the 14th American Fisheries Society Southern Division Meeting.* San Antonio.

Sears, R. a. (1987). *The blue whale: a catalog of individuals from the western North Atlantic (Gulf of St. Lawrence).* St. Lambert, Quebec, Canada: Mingan Island Cetacean Study.

Secor, D., & Gunderson, T. (1998). Effects of hypoxia and temperature on survival, growth, and respiration of juvenile Atlantic sturgeon, Acipenser oxyrinchus. *Fishery Bulletin, 96,* 603-613.

Seipt, I., Clapham, P., Mayo, C., & Hawvermale, M. (1990). Population characteristics of individually identified fin whale, Balaenoptera physalus, in Massachusetts Bay. *Fish Bull., 88,* 271-278.

Shoop, C., & Kenney, R. (1992). Seasonal distributions and abundance of loggerhead and leatherback sea turtles in waters of the northeastern United States. *Herpetological Monographs 6,* pp. 43-67.

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

Smith, T., Allen, P., Clapham, P. H., Larsen, F., Lien, J., Mattila, D., . . . Stevick, P. O. (1991). An ocean-basin-wide mark-recapture study of the North Atlantic humpback whale (Megaptera novaengliae). *Mar. Mamm. Sci, 15*(1), 1-32.

Steward, K., Sims, M., Meylan, A., Witherington, B., Brost, B., & Crowder, L. (2011). Leatherback nests increasing significantly in Florida, USA; Trends assessed over 30 years using multilevel modeling. *Ecological Applications, 21*(1), pp. 263-273.

Turtle Expert Working Group. (2000). *Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic.* NOAA Technical Memo NMFS-SEFSC-444.

Turtle Expert Working Group. (2007). *An assessment of the leatherback turtle population in the Atlantic ocean.* NOAA Technical Memo NMFS-SEFSC-555.

United States Department of Interior. (1973, March). Threatened Wildlife of the United States. *Resource Publication, 114*.

Waring, G., Josephson, E., Maze-Folew, K., & Rosel, P. (2012). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments--2011*. NOAA Tech Memo; NMFS New England 221.

Waring, G., Quintal, J., & Swartz, S. (2000). *U.S. Atlantic and Gulf of Mexico marine mammal stock assessments-2000.* NOAA Tech. Memo NMFS-NE-162.

Waycott, M., Longstaff, B., & Mellors, J. (2005). Seagrass population dynamics and water quality in the Great Barrier Reef region: a review and future research directions. *Marine Pollution Bulletin, 51*, pp. 343-350.

WildEarth Guardians. (2010, February 17). Petition to Designate Critical Habitat for the Kemp's Ridley Sea Turtle (Lepidochelys kempii). Petition submitted to the US Secretary of Interior, Acting through the USFWS & the US Secretary of Commerce, Acting through NOAA, NMFS.

Witherington, B. (2002). Ecology of neonate loggerhead turtles inhabiting lines of downwelling near a Gulf Stream front. *Marine Biology, 140*, 843-853.

Witherington, B., & Ehrhart, L. (1989). Status of reproductive characteristics of green turtles (Chelonia mydas) nesting in Florida. In L. Ogren, F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, . . . R. Witham (Ed.), *Proceedings of the Second Western Atlantic Turtle Symposium* (pp. 351-352). NOAA Tech Memo NMFS-SEFSC-226.

Woodley, T., Brown, M., Kraus, S., & Gaskin, D. (1991). Organochlorine levels in North Atlantic right whale (Eubalaena glacialis) blubber. *Arch. Environ. Contam. Toxicol., 21*(1), 141-145.

Wynne, K., & Schwartz, M. (1999). *Guide to marine mammals and turtles of the U.S. Atlantic and Gulf of Mexico.* Narragansett: Rhode Island Sea Grant.