UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 1
5 Post Office Square, Suite 100
BOSTON, MA 02109-3912

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

September 7, 2016

NOAA National Marine Fisheries Service
Protected Resources Division
55 Great Republic Drive
Gloucester, MA 01930

Attn: Mrs. Kimberly Damon-Randall

Re: Re-Issuance of the National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Potable Water Treatment Facilities- The Potable Water Treatment Facility General Permit (PWTF GP); NPDES Permit MAG640000 and NHG640000

Dear Mrs. Damon-Randall,

The U.S. Environmental Protection Agency Region 1 (EPA) is proposing to reissue an NPDES general permit for discharges from potable water treatment facilities to certain waters of the United States in the Commonwealth of Massachusetts and the State of New Hampshire as described below. EPA submitted an initial request for concurrence in a letter dated August 11, 2016. This is a revised letter to request Endangered Species Act (ESA) concurrence from your office for the proposed reissuance of the PWTF GP. This letter reflects comments received from NMFS staff on our initial letter. EPA has made the determination that the proposed reissuance may affect, but is not likely to adversely affect, any listed threatened or endangered species or their critical habitat under the jurisdiction of NMFS under the ESA of 1973, as amended. EPA's supporting analysis is provided below.

Our previous letter contained a copy of the draft PWTF GP and fact sheet. The permit and fact sheet, as well as all appendices to the draft PWTF GP, can also be found at: https://www.epa.gov/region1/npdes/pwtfgp.html. The Notice of Availability of the draft PWTF GP was published in the Federal Register on Wednesday, August 10, 2016.

1. Proposed Action

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 PWTF General Permit seeks to regulate the wastewater discharges of potable water treatment facilities to certain waters of the Commonwealth of Massachusetts and the State of New Hampshire. The PWTF General Permit historically only includes facilities that discharge less than or equal to 1.0 million gallons of effluent per day (MGD). Eligibility for permit coverage for facilities with discharges greater than 1 MGD will be determined on a case-by-case basis by EPA and the appropriate state agency. The wastewater generated from these point sources are all generated by substantially similar operations, which involve the removal of solid particles and other pollutants from the source water and the disinfection of the clarified water prior to distribution for public consumption. Pollutants of concern from these discharges include total suspended solids (TSS), pH changes, and potential toxic effects from chemicals (e.g., total residual chlorine (TRC), aluminum, ammonia, arsenic, or other metals). The treatment processes covered under this general permit include clarification, coagulation, media filtration, membrane filtration (not including reverse osmosis), and disinfection.

The facilities covered under the reissued PWTF GP will be grouped into one of the following three categories: I) PWTFs that discharge only in case of emergency or on an infrequent (e.g., annual or biannual basis for maintenance); II) PWTFs that discharge intermittently or continuously and do not use aluminum in their treatment processes; and III) PWTFs that discharge intermittently or continuously and use aluminum in their treatment processes. Permittees are required to develop, implement, and maintain a Best Management Practices (BMP) plan to prevent or minimize the concentration of pollutants (biological, chemical and physical) in the wastewater discharged to surface waters. For the facilities in Category III, permittees will also be required to include an aluminum minimization plan.

Under the PWTF General Permit, facilities are permitted to discharge wastewater to surface waters in Massachusetts and New Hampshire, as long as the requirements and limits of the general permit are followed. Discharges to certain receiving waters, such as Class A waters and Outstanding Resource Waters in New Hampshire; Ocean Sanctuaries in Massachusetts; Discharges to territorial seas; or discharges which are inconsistent with the State Coastal Zone Management program are not authorized under the permit. See Section I.D. of the Fact Sheet for a complete listing of eligibility requirements and coverage exclusions.

Monitoring and reporting are required under the permit for all discharges 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 flow, TSS, pH, TRC (if applicable), Total Recoverable of Aluminum[1] (if applicable), and Total Recoverable of Arsenic (if applicable), Total Recoverable Iron (if applicable), and Total Phosphorus (if applicable) of the discharge 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). If a facility uses chlorine to disinfect the potable water, the limit

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[1] Facilities in Massachusetts will be required to report aluminum as total recoverable, in accordance with their current water quality regulations. Facilities in New Hampshire will be required to report aluminum as total recoverable with the assumption that 100% of the aluminum is acid-soluble. This is based on a July 1, 2014 letter from NHDES to EPA in which NHDES stated that the *aluminum criteria* presented in the New Hampshire water quality regulations (Env-Wq-1700) should be applied in terms of *acid-soluble aluminum*. According to *EPA's 1988 ambient water quality criteria document for aluminum,* acid-soluble aluminum is considered a better measurement of the forms that are toxic to aquatic life or that can be readily converted to toxic forms under natural conditions.

for total residual chlorine (TRC) will be calculated by EPA using the effluent dilutions in the receiving waters and EPA's ambient water quality criteria for TRC. The maximum flow rate for a facility covered under the permit is limited to the maximum daily flow of 1 MGD. For infrequent discharges seeking coverage under the PWTF General Permit, EPA may approve discharges above 1 MGD, on a case by case basis. This is a change from the expired permit. However, EPA will take into consideration any ESA-listed species and critical habitat within the vicinity of the discharge when evaluating the appropriateness of such a facility's request for coverage.

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. This is separate from the newly established requirement that all facilities with intermittent or continuous discharges must conduct annual acute AND chronic WET testing during the permit term. The results from the acute and chronic freshwater Whole Effluent Toxicity testing will provide EPA with a better understanding of any adverse synergistic/cumulative impact the discharge has on living species. That test also provides chemical data on the following parameters: hardness, total residual chlorine, alkalinity, pH, specific conductance, total solids, total dissolved solids, ammonia, total organic carbon, total recoverable cadmium, total recoverable lead, total recoverable copper, total recoverable zinc, total recoverable nickel, and total recoverable aluminum. This data will provide valuable information on potential pollutants that EPA currently does not have.

Parts 2.1.1 and 3.1.1 of the draft PWTF General Permit present the Discharge Limits and Monitoring Requirements (including frequency) for the Commonwealth of Massachusetts and State of New Hampshire, respectively. Parts 2.1.1 and 3.1.1 also indicate the type of sampling and other sampling requirements. Section III.A of the Fact Sheet provide an explanation of the effluent limitations under this General Permit.

The PWTF General Permit establishes "end of pipe" effluent limits that permittees are required to follow, as part of submitting their NOI (Notice of Intent) to request coverage under the general permit. The permit uses both technology-based effluent limits (i.e., flow, TSS), as well as water-quality based effluent limits (i.e., TRC). Although the water-quality based effluent limits do take dilution into account (See Appendix VII), the permit does *not* establish mixing zones. Therefore, the water-quality based effluent limits can also be considered "end of pipe." EPA believes that this fact further protects the aforementioned ESA listed species.

In addition to the numeric effluent limits, the draft PWTF GP also contains several non-numeric technology-based effluent limitations. For example, it retains requirements for the permittee to develop, implement, and maintain a Best Management Practices (BMP) Plan for wastewater discharges from the PWTF and to document how both the non-numeric technology-based and numeric effluent limitations are being met through the selection, design, installation, and implementation of control measures (including BMPs). The purpose of the BMP Plan is to prevent or minimize the concentration of pollutants (biological, chemical and physical) in the wastewater discharged to surface waters. The BMP Plan will ensure that not only is the drinking water produced by PWTFs safe for human consumption, but also that the wastewater produced by PWTFs is protective of the quality of the receiving water. The BMP plan, including the aluminum minimization program, is discussed in more detail in Section III.B of the Fact Sheet.

This Potable Water Treatment Facility (PWTF GP) will replace the previous PWTF GP that was signed on September 25, 2009 and published in the Federal Register on October 2, 2009. The 2009 reissuance of the PWTF GP expired in 2014 but has been administratively continued for permittees until the permit is reissued. The Notice of Availability of this draft PWTF GP will be published in the Federal Register on August 10, 2016. After a 30 day comment period, EPA will address any significant comments and make the necessary revisions. After being published in the Federal Register, the final permit will then be reissued. EPA's reissuance of this PWTFGP permit will be for a subsequent five year permit term.

EPA expects that most of these facilities will reapply for coverage when this PWTF GP is reissued. There is the potential that new facilities (which were previously excluded from the past general permit) will now apply and adhere to the requirement to implement BMPs to minimize residuals, especially aluminum. Based on the most current available data, 56 facilities in Massachusetts and 6 facilities in New Hampshire are covered under the expired PWTF General Permit. 8 of the facilities in Massachusetts discharge infrequently (i.e., once a year during annual maintenance) or only in case of emergency. The remainder of the POTWs discharge on a continuous basis.

In a letter dated May 20, 2009, NMFS concurred with EPA's determination that the issuance of the Potable Water Treatment Facility General Permit in 2009 was not likely to adversely affect any threatened or endangered species or its critical habitat. Section I.A. of the Fact Sheet of the draft permit highlights the changes that were made from the expired permit. Key changes include: Requirement for additional aluminum monitoring (of both effluent and upstream ambient water) for facilities that use aluminum-based coagulants; Additional Notice of Intent (NOI) sampling requirements for facilities that use aluminum in their water treatment process and were *not* covered under the 2009 PWTF GP; If necessary, the establishment of a Water Quality Based Effluent Limit (WQBEL) for aluminum as a written condition of permit authorization; The development and implementation of a Best Management Practices (BMP) Plan (which includes an aluminum minimization plan); New monthly monitoring for iron if a facility uses an iron-based coagulant or for phosphorus (or phosphorus-related pollutants) if a facility uses phosphorus containing chemicals; and a new permit condition that requires applicants that discharge on an intermittent or continuous basis to conduct annual acute and chronic Whole Effluent Toxicity (WET) tests.

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 PWTF GP as a state permit in Massachusetts.

2. Description of the Action Area

The Action Area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action". 50 CFR §402.02. The entire universes of facilities that will apply for and obtain coverage under the PWTF GP is unknown at the time the draft permit is published for public comment. The Action Area could include any surface water in Massachusetts and New Hampshire, excluding those waterbodies to which discharges are not authorized (See Section 1.D of the Fact Sheet). For example, discharges from the PWTF GP are not authorized to: Class A waters in Massachusetts and New Hampshire; Outstanding Resource Waters in New Hampshire; Ocean Sanctuaries; and the territorial seas.

Although the Action Area could encompass numerous surface waters in Massachusetts and New Hampshire, for the purposes of this biological impact assessment, the Action Area of the General Permit will be restricted to those waters where there is a known presence of ESA species or designated critical habitat. Existing discharges to these waterbodies will be considered in evaluating the effects of EPA's reissuance of the General Permit on listed species and critical habitat. Currently, there are several waterbodies where ESA species could be impacted by permitted discharges: 1) the Connecticut River (from Turner's Falls, downstream through Holyoke (including Holyoke Dam region); 2) the Merrimack River below the Essex Dam (Merrimack River Dam) in Lawrence and downstream (including Haverhill); 3) coastal embayments and marine waters of Massachusetts including Massachusetts Bay; 4) the Taunton River; 5) the Piscataqua River/Great Bay Estuary in New Hampshire, and 6) coastal embayments and marine waters of New Hampshire.

As previous noted above, 56 facilities in Massachusetts and 6 facilities in New Hampshire are covered under the expired PWTF, based on the most current available data. EPA expects that most of these facilities will reapply for coverage when the PWTF GP is reissued. Therefore, 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.

The action area of the PWTF GP includes facility discharges to the waterbodies described below. Baseline information for each waterbody is also provided. This aided in the analysis of any impacts that potable water treatment discharges might have on the ESA listed species or their habitat (which is discussed in Section 4 of this document).

a. 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, including near the Holyoke Dam. There are four facilities covered under the expired permit that discharge near/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 four facilities is shown below:

Identifier	Location	Infrequent or Continuous?	Total daily max. allowed discharge (MGD)	Use Aluminum coagulant?
Facility A	South Deerfield, MA	Continuous	0.1 MGD	Yes
Facility B	Amherst, MA	Continuous	0.2 MGD	No
Facility C	Northampton, MA	Continuous	0.55 MGD	Yes (Reservoir)
Facility D	Springfield, MA	Infrequent/Emergency Discharge Only	1 MGD	No

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 Upper Connecticut River, the name for the river in NH and VT, spans approximately 255 miles. In New Hampshire, the river begins in the town of Pittsburg, NH (at the outlet of Fourth Connecticut Lake), flows through 26 communities, and drains approximately 3,046 square miles (NHDES, 2008). The Connecticut River (in both NH and VT) was designated into the NH Rivers Management and Protection Program in 1992 (NHDES, 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.). The Middle Connecticut River usually refers to the stretch from Massachusetts through Central Connecticut, while the Lower Connecticut River includes the portion in southern CT which then empties into Long Island Sound.

According to NH's final 2012 303(d) list, eighteen segments of the Connecticut River were listed as impaired waters in NH that require a TMDL (NHDES, 2014). The most common impairment was pH, while lead, aluminum, and benthic-macroinvertebrate bioassessments were listed as occasional impairments under the aquatic life use category. However, the prioritization for development of TMDLs to address these concerns was categorized as "Low."

The Connecticut River is 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.

b. 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 three facilities covered under the general permit that discharge near/to the Merrimack River below the Essex Dam. These facilities are expected to apply for coverage under the new permit when it is issued. A summary of those facilities, which are all located in Massachusetts, is shown below:

Identifier	Location	Infrequent or Continuous?	Total max. allowed discharge (MGD)	Use Aluminum coagulant?
Facility E	Newburyport, MA	Continuous	0.226	Yes
Facility F	Amesbury, MA	Continuous	0.45	Yes
Facility G	Merrimac, MA	Continuous	0.45	No

The Merrimack River is the second largest river in New England and its watershed drains approximately 5,014 square miles as it travels from the White Mountain region of New Hampshire to east-central Massachusetts (NHDES, 2008). The Upper Merrimack River begins at the confluence of the Pemigewasset and Winnipesaukee Rivers (near Franklin, NH), and then flows for approximately 30 miles to the town of Bow, NH. Although the Upper Merrimack River flows through Concord, NH, almost 80% of the land within three quarter miles of the river is currently undeveloped as forest, farm, or wetland (NHDES, 2008). As such, this stretch of the river has a high level of water quality, provides valuable habitat for plants and animals, and was designated under the NH Rivers Management and Protection Program in 1990 (NHDES, 2008). A Designated River is managed and protected for its outstanding natural and cultural resources (NHDES, 2014). The Lower Merrimack River in NH was also designated under the NH Rivers Management and Protection Program (NHDES, 2008). This segment begins at the Merrimack-Bedford town line and flows approximately 15 miles through Merrimack and then Nashua, before entering the Commonwealth of Massachusetts.

According to NH's 2012 303(d) list, three sections of the Upper Merrimack River (near Concord and Bow) were listed as impaired for pH, dissolved oxygen or aluminum (NHDES, 2014). Five segments of the Lower Merrimack River, including areas near Manchester and Nashua, were also on the 303(d) list. Likewise, these segments were impaired for pH, dissolved oxygen or aluminum, under the aquatic life use category.

Approximately 24% of the Merrimack River Watershed is located in Massachusetts. However, the Commonwealth 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, Regioni, & International, Draft Pathogen TMDL for the Merrimack River Watershed). 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).

c. Taunton River

The Taunton River is used as a nursery area for Atlantic sturgeon (Burkett & Kynard, 1993). Only potable water treatment facilities in Massachusetts or New Hampshire (but not Rhode Island) are eligible for the PWTF General Permit. Currently, there are two facilities in Massachusetts that discharge to the Taunton River, as shown below:

Identifier	Location	Infrequent or Continuous Discharge?	Total max. allowed discharge (MGD)	Use Aluminum coagulant?
Facility H	Fall River	Continuous	1.0	Yes
Facility I	Dighton	Continuous	1.0	Yes

Only the portion of the Taunton River included in the action area (i.e., the Massachusetts portion of the River) will be included in the assessment.

The Taunton River Watershed, which encompasses 562 square miles, is the second largest watershed in the state of Massachusetts (Executive Office of Energy and Environmental Affairs, b). The Taunton River starts in the Town of Bridgewater and travels approximately 40 miles before ending in Rhode Island's Mount Hope Bay, which is part of Narragansett Bay. Since tidal influences reach 19.0 miles inland, this provides a unique habitat within the Taunton River Watershed for fresh and salt-water aquatic, terrestrial, and biological species (Executive Office of Energy and Environmental Affairs, b).

The uppermost segment of the mainstem Taunton River (MA62-01) is classified as a Class B, Warm Water Fishery while the lower three downstream portions (MA62-02, MA 62-03, and MA 62-04) are classified as Class SB (Estuary) with SFR/CSO as a qualifier.

Of the four segments of the mainstem Taunton River that were assessed as part of MassDEP's 2001 Water Quality Assessment of the Taunton River Watershed, all three of the lower downstream portions were listed as impaired for pollutants such as pathogens and organic enrichment/low dissolved oxygen and identified as being impacted by the discharge of CSOs (Rojko, Tamul, & Kennedy, 2005). The 20.4 miles of the uppermost portion of the Taunton River, down to the Route 24 bridge in Taunton/Raynham, was assessed as supporting aquatic life; other uses were not assessed. Massachusetts' Year 2012 Integrated List of Waters continued to list the two lower most segments (MA 62-03 and MA 62-04) of the Taunton River as impaired Category 5 waters, or "Waters Requiring a TMDL" (MassDEP, 2013). They were listed as not supporting fish or other aquatic life because of low dissolved oxygen from wet weather discharges (which includes point source and a combination of stormwater, SSO, or CSO). They also did not support shellfish harvesting because of fecal coliform. Since a Final Pathogen TMDL for the Taunton River Watershed was approved on June 16, 2011, Segment MA62-02 of the Taunton River mainstem was no longer classified as Category 5 (MassDEP, I, & International, Final Pathogen TMDL for the Taunton River Watershed, 2011); (MassDEP, 2013).

d. Cape Cod Bay

There are no facilities currently covered under the PWTF General Permit that discharge into Cape Cod Bay, nor is EPA aware of any new facility that might seek coverage under the general permit. Therefore no assessment is necessary for Cape Cod Bay.

e. 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. This reasoning also applies to discharges near any coastal embayments and marine waters of New Hampshire and Massachusetts.

There are currently three facilities covered under the expired permit that discharge to Massachusetts Bay.

Identifier	Location	Infrequent or Continuous Discharge?	Total max. allowed discharge (MGD)	Use Aluminum coagulant?
Facility J	Beverly, MA	Continuous	0.8	Yes
Facility K	Manchester-by-the-Sea, MA	Continuous	0.35	Yes (Discharges into Reservoir)
Facility L	Rockport, MA	Emergency Discharge/Infrequent	1.0[2]	N/A

f. Piscataqua River/Great Bay

Shortnose sturgeon were historically abundant in the Piscataqua River, but it is unclear whether any population currently exists (Shortnose Sturgeon Status Review Team, 2010). Although the Atlantic Sturgeon Status Review Team and NHFG biologists concluded that the Great Bay Atlantic sturgeon population is likely extirpated, individuals from other populations may forage in the Piscataqua River. For this reason, the Piscataqua River is being included in this assessment. Currently, only 1 potable water treatment facility (covered under the expired permit) discharges into the Piscataqua River/Great Bay. However, it has not reported a discharge since January of 2009.

Identifier	Location	Infrequent or Continuous Discharge?	Total max. allowed discharge (MGD)	Use Aluminum coagulant?
Facility M	Newmarket, NH	Infrequent/Emergency Discharge Only	1.0 MGD	N/A

Formed by the confluence of the Salmon Falls and Cocheco rivers, the Piscataqua River originates at the boundary of Dover, New Hampshire, and Eliot, Maine, and flows southeasterly for approximately 13 miles to Portsmouth Harbor (and the Atlantic Ocean) (USACE, 2014). The drainage basin of the river is approximately 1,495 square miles (3,870 km^2), and it encompasses the additional watersheds of the Great Works River and five rivers, namely the Bellamy, Oyster, Lamprey, Squamscott, and Winnicut, whose freshwaters all flow into the Great Bay. Since the Piscataqua River is a tidal estuary, it also brings salt water into the Great Bay with the tides (NH DES, 2014).

New Hampshire's Great Bay is one of the largest estuaries on the Atlantic Coast and it's also unique because the estuary is set apart from the coastline, approximately 10 miles inland.

[2] According to DMR, facility has not discharged since January 2011.

Although Great Bay has been designated by the U.S. EPA as one of only 28 "estuaries of national significance," there is concern about this ecosystem's health (NH DES, 2014). According to the 2013 State of Our Estuaries Report, which is compiled by the Piscataqua Region Estuaries Partnership every three years, 15 of the 22 key indicators used to assess the health of the estuaries were negative and/or had cautionary results (Piscataqua Region Estuaries Partnership, 2014). For example, concentrations of dissolved inorganic nitrogen (the most reactive form of nitrogen) have significantly increased over the long term, suspended sediment conditions have increased over the long term, and dissolved oxygen levels are frequently too low in the tidal rivers (Piscataqua Region Estuaries Partnership, 2014).

According to NH's final 2012 303d list, which highlights impaired waters that require a TMDL, various portions of both the Piscataqua River and Great Bay were listed. This included two stretches in the Upper Piscataqua River (in Dover), two stretches in the Lower Piscataqua River (one in Newington and one Portsmouth), and three areas in Great Bay (two in Newmarket and one in Newington). For these areas, the aquatic life use was impaired for estuarine bioassessments, light attenuation, total nitrogen, and pH (for the Great Bay stretches). The fish consumption use was impaired due to mercury and polychlorinated biphenyls while the shellfishing use was impaired for dioxin, mercury, and/or polychlorinated biphenyls (NHDES, 2014).

3. NMFS Listed Species and Critical Habitat in the Action Area

The following are federally protected ESA species in Massachusetts and New Hampshire:

Massachusetts (15)

Atlantic Sturgeon (*Acipenser oxyrinchus*)*
Shortnose Sturgeon (*Acipenser brevirostrum*)*

New Hampshire (12)

)
Atlantic Sturgeon (*Acipenser oxyrinchus*)*
Shortnose Sturgeon (*Acipenser brevirostrum*)*

*

This biological assessment will not discuss the effects of the action on any threatened or endangered species under the jurisdiction of the US Fish and Wildlife service and is only intended for use during informal consultation under Section 7 of the ESA with the National Marine Fisheries Service. 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 this and/or other General Permits, ESA listed species potentially present within the Action Area include two species of listed fish: 1) shortnose sturgeon (*Acipenser brevirostrum*); and 2) 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).

In addition, the following are federally protected marine species that are present in the near coastal waters of Massachusetts and New Hampshire. These species are listed under the jurisdiction of NMFS:

Marine Reptiles (4)

Loggerhead Sea Turtle *(Caretta caretta)*
Kemp's Ridley Sea Turtle *(Lepidochelys kempii)*
Leatherback Sea Turtle *(Dermochelys coriacea)*
Green Sea Turtle *(Chelonia mydas)*

Marine Mammals (3)

Humpback Whale *(Megaptera novaeangliae)*
North Atlantic Right Whale *(Eubalaena glacialis)*
Fin Whale *(Balaenoptera physalus)*

Three species of federally endangered whales 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*), and the fin whale (*Balaenoptera physalus).* The Cape Cod Bay Critical Habitat Area for North Atlantic Right Whales (*Eubalaena glacialis*) falls 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. However as previously mentioned, no potable water treatment facilities discharge into Cape Cod Bay and EPA is not aware of any such facility that would apply for coverage under the PWTF GP. In addition, PWTF GP outfalls (in general) do not extend any measurable distance from the shoreline. Based upon this information and the whales' distributions, any effects to these three endangered whales are extremely unlikely to occur.

Four species of ESA listed sea turtles are found seasonally in New England waters, including those off the coast of Massachusetts. These include 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)*.

ESA-listed species and critical habitat that are present in the action area are described below. For each species, EPA has summarized available information regarding: 1) Life stages present and listed species' activities (e.g., foraging, migrating, spawning, overwintering); 2) Status of listed species; 3) Listed species' population and distribution including critical habitat used by the listed species; and 4) Population risks and stressors.

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

(1) Life Stages and Activities

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, Taubert, Squiers, Marchette, & Buckley, 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, Taubert, Squiers, Marchette, & Buckley, 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, Taubert, Squiers, Marchette, & Buckley, 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°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) Population and Distribution

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);
- Piscataqua River in New Hampshire (historically).

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.

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).

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, Bronzi, & Rosenthal, 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.

<u>Shortnose Sturgeon in the Piscataqua River</u>

It is believed that shortnose sturgeon were historically abundant in the Piscataqua River, though there are few records of sturgeon captures (Shortnose Sturgeon Status Review Team, 2010). With few records and no current directed studies underway in this river, it is unclear whether a shortnose sturgeon population currently exists in the Piscataqua River. However several larger river systems in the vicinity of the Piscataqua River (e.g., Merrimack, Kennebec and Androscoggin Rivers) support shortnose sturgeon populations.

According to information taken directly from previous communication between NMFS and EPA,

It is clear from recent telemetry data that shortnose sturgeon tagged in the Merrimack, Kennebec, and Penobscot rivers undertake significant coastal migrations.... Telemetry data also indicates that shortnose sturgeon utilize smaller coastal river systems during these migrations. Fish moving between the Penobscot and Kennebec rivers have been documented utilizing a number of small coastal rivers in between these two larger systems (e.g., Damariscotta as well as the St. George, Medomak, and Passagasawakeag). As such, not only are inter-basin transfers between the Merrimack and GOM evident, but there also is the potential for shortnose sturgeon undertaking these migrations to utilize smaller riverine systems along the way. Therefore NMFS will consider that shortnose sturgeon could occur in any coastal river, below the first impassable barrier as well as in nearshore coastal waters throughout the state.[3]

(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 dissolved oxygen (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); and

- **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.

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[3] NMFS's Appendix I (NMFS-listed Species in New Hampshire) to a March 22, 2013 letter from NMFS to EPA regarding NH's Small MS4 NPDES Permit and Technical Comments on the Draft Permit

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). 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).

b. **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 Stages and Activities

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).

On June 3, 2016, NMFS issued two proposed rules to designate critical habitat for the five listed distinct population segments (DPSs) of Atlantic sturgeon found in U.S. waters (Gulf of Maine, New York Bight, and Chesapeake Bay DPSs: 81 FR 35701; Carolina and South Atlantic DPSs: 81 FR 36078).

(3) Population and Distribution

Summary of Distribution & Population 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 Albemarle Sound southward along the southern Virginia, North Carolina, and South Carolina coastal areas to Charleston Harbor	Roanoke, Tar-Pamlico, Cape 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 General Permit includes Massachusetts and New Hampshire 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**: 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**: 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).

- **Piscataqua River/Great Bay Estuary System** – According to the ASSRT, few Atlantic sturgeon have been captured in the Piscataqua River. In June of 1981, one subadult Atlantic sturgeon was captured by New Hampshire Fish and Game (NHFG) at the mouth of the Oyster River in Great Bay (NH Fish and Game, 1981). Since 1990, the NHFG has not observed or received reports of Atlantic sturgeon of any age-class being captured in the Great Bay Estuary and its tributaries (Grout, 2006). It is unknown if the Piscataqua River is still used by Atlantic sturgeon (Atlantic Sturgeon Status Review Team, 2007).

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).

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, Hattala, & McKown, 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.

<u>Gulf of Maine DPS</u>

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 CWA. 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).

<u>New York Bight DPS</u>

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 CWA 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 Atlantic 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 DO (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.)

c. 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 Stages and Activities

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) Population and Distribution

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).

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 PWTF GP 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. However, no potable water treatment facilities currently discharge in that area. 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).

<u>Population</u>

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).

<u>Ship Collisions</u>

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).

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, Josephson, Maze-Folew, & Rosel, 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, Josephson, Maze-Folew, & Rosel, 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).

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, Brown, Kraus, & Gaskin, 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.

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

(1) Life Stages and Activities

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) Population and Distribution

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, Quintal, & Swartz, 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).

Since this permit is only applicable to waters of Massachusetts and New Hampshire, only the Gulf of Maine (formerly the Western North Atlantic) stock of humpback whales would be located in that area. Therefore, that is the only stock relevant for this discussion.

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, Josephson, Maze-Folew, & Rosel, 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., Mortality and serious injury determinations for baleen whale stocks along the Gulf of Mexico, United States East Coast and Atlantic Canadian Provinces, 2006-2010, 2012). Additional threats to humpback whales include:

- **Whale 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).

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

(1) Life Stages and Activities

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, Webber, & Pitman, 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, Webber, & Pitman, 2008). It has been estimated that the average calving interval is about 2 years (Christensen, Haug, & Oien, 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) Population and Distribution

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 20-75°N and 20-75 °S (Perry, DeMaster, & Silber, 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, Silber, & Payne, 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, Josephson, Maze-Folew, & Rosel, 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, Jonsson, Mathisen, & Jonsgard, 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, Ratnaswamy, Kenney, & Winn, 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, Ratnaswamy, Kenney, & Winn, 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, Clapham, Mayo, & Hawvermale, 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, Josephson, Maze-Folew, & Rosel, 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, Knowlton, Mead, Collet, & Podesta, 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, Cole, Garron, & Hall, Mortality and Serious Injury Determinations for Baleen Whale Stocks along the Gulf of Mexico, United States and Canadian Eastern Seaboards, 2005-2009, 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.

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

(1) Life Stages and Activities

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 below:

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, Filonov, Tereshchenko, & Marquex, 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) Population and Distribution

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).

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

(1) Life Stages and Activities

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, Crowder, Crouse, Epperly, & Frazer, 2003). Therefore, the phases discussed in Section 3.6.1, including those that occur in the terrestrial, neritic, and oceanic zones, 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). The table 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).

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, Ecology of neonate loggerhead turtles inhabiting lines of downwelling near a Gulf Stream front, 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, Crowder, Crouse, Epperly, & Frazer, 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, Standora, & SJ, 1993). Matrix models estimate that this neritic juvenile stage can last from 14 to 24 years (Heppell, Crowder, Crouse, Epperly, & Frazer, 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) Population and Distribution

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 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, the table also provides the population status/trend for each recovery unit (NMFS & USFWS, 2008).

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 earlier in this document 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**

h. **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 and New Hampshire waters.

(1) Life Stages and Activities

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).

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, Wallace, Frazier, Eckert, & Pritchard, 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, Wallace, Frazier, Eckert, & Pritchard, 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, Wallace, Frazier, Eckert, & Pritchard, 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 S., 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, Wallace, Frazier, Eckert, & Pritchard, 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, Iverson, & Bowen, 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) Population and Distribution

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). The table below summarizes the results for only a select number of nesting assemblages, namely those nesting sites affiliated with the United States.

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, Diez, Barriento-

					Munoz, White, & Roman, 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, Dutton, Chaloupka, & Boulon, 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, Diez, Barriento-Munoz, White, & Roman, 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**
- **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).

i. **Green Turtle (*Chelonia mydas*) – Threatened or Endangered Threatened for Most Populations; Endangered for breeding populations in Florida & Pacific Coast of Mexico**

(1) Life Stages and Activities

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, Status of reproductive characteristics of green turtles (Chelonia mydas) nesting in Florida, 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 A. , 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) Population and Distribution

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).

Below, information will be presented 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, Schroeder, & Mosier, 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 earlier 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, Coles, & McKenzie, 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, Longstaff, & Mellors, 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).

4. Effects Determination

a. Environmental Baseline

(1) 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).

Table 1 below, summarizes the parameters for select MA SWQS. Massachusetts provides narrative water quality standards for solids (in accordance with 314 CMR 4.05(3)(a)5, 4.05(3)(b)5, 4.05(4)(a)5, 4.05(4)(b)5). The pH limits for the applicable surface water quality standards are in accordance with 314 CMR 4.05(3)(a)3, 4.05(3)(b)3, 4.05(4)(a)3, 4.05(4)(b)3. The Commonwealth of Massachusetts' surface water-quality standards require the use of federal water-quality criteria where a specific (toxic) pollutant could reasonably be expected to adversely affect existing or designated uses (314 CMR 4.05 (5)(e)). Parts 2.1.1 and 3.1.1 of the draft PWTF General Permit provides the actual discharge limits for the permit, which incorporates both water quality standards for both Massachusetts and New Hampshire, respectively.

Table 1: Summary of Massachusetts Surface Water Quality Standards: Class A, Class B, Class SA, and Class SB (MassDEP 2006)

	Class A	Class B	Class SA	Class SB
Solids	"These waters shall be free from floating, suspended and settleable solids in concentrations or combinations that would impair any use assigned to			

	this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom"			
pH	6.5 – 8.3 SU and Δ0.5 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	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"			
Metals (including Aluminum, Arsenic, etc.)	"all surface waters shall be free from pollutants in concentrations that are toxic to humans, aquatic life or wildlife. For pollutants not otherwise listed in 314 CMR 4.00, the *National Recommended Water Quality Criteria: 2002, EPA 822-R-02-047, November 2002* published by EPA...are the allowable receiving water concentrations for the affected waters, unless the Department either establishes a site specific criterion or determines that naturally occurring background concentrations are higher"			

MA SWQS also 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).

(2) New Hampshire Surface Water Quality Standards

The New Hampshire Surface Water Quality Regulations (Env-WQ 1700) define the goals for water quality in the state of New Hampshire. According to the New Hampshire Statute (Chapter 485-A.8) regarding the classification of waters, there are 2 classes or grades of surface waters for the state: Class A and Class B waters.

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. However, The State of New Hampshire does not allow discharges to Class A waters under the PWTF General Permit.

Class B waters shall be of the second highest quality and shall have no objectionable physical characteristic. These waters are considered acceptable for fishing, swimming, and other recreational purposes, and, after adequate treatment, for use as water supplies.

Table 2 below, summarizes the parameters for select NH WQS. New Hampshire provides narrative water quality standards for solids (covered under General Water Quality Criteria Env-Wq 1703.03). Env-Wq 1703.18 sets the applicable surface water quality standards in New Hampshire for pH while Env-Wq 1703.21 sets the water quality criteria for toxic substances (which includes chlorine and metals).

Table 2: Summary of NH Water Quality Standards: Class B only

	Class B
Solids	"All surface waters shall be free from substances in kind or quality which: settle to form harmful deposits; float as foam, debris, scum, or other visible substances; produce odor, color, taste, or turbidity which is not naturally occurring and would render it unsuitable for its designated uses; result in the dominance of nuisance species"
pH	6.5 – 8.0 except when due to natural causes
Toxic Substances (Including Total Residual Chlorine, Aluminum, Arsenic, etc.)	"Unless naturally occurring or allowed under part Env-Wq 1707, 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..."

b. **Potential Effects from Pollutants Found in Discharges from PWTFs**

As discussed in Section 3 (NMFS Listed Species and Critical Habitat in the Action Area) of this document, the Shortnose sturgeon, Atlantic sturgeon, North Atlantic right whale, humpback whale, fin whale, Kemp's ridley sea turtle, Northwest Atlantic Distinct Population Segment (DPS) of the loggerhead sea turtle, leatherback sea turtle, and green sea turtle are the ESA-listed species of concern for this assessment. Of these, only the shortnose sturgeon and Atlantic sturgeon are found in the riverine environment (including the Connecticut River downstream of Turner's Falls in MA, including the area near the Holyoke Dam); the Merrimack River below the Essex Dam (Merrimack River Dam) in Lawrence, MA, including the area near Haverhill; the Taunton River in Massachusetts; and the Piscatagua River in New Hampshire.

In this assessment, the emphasis will be placed on any potential impact of a potable water treatment facility's discharges on the shortnose and Atlantic sturgeon. Although the aforementioned four (4) ESA-listed sea turtles and three (3) ESA-listed whales can be found in coastal embayments and/or marine waters of both Massachusetts and New Hampshire, the species are either not in their earliest life stages or are a distance from the near-shore facilities covered under the PWTF General Permit. In addition, these sea turtles and whales which inhabit offshore waters are highly mobile species. Based on these factors, EPA believes that any impact from the relatively small (generally below 1 MGD), localized discharges covered under this permit will be insignificant and/or discountable and are not likely to adversely impact the North Atlantic right whale, humpback whale, fin whale, Kemp's ridley sea turtle, Northwest Atlantic Distinct Population Segment (DPS) of the loggerhead sea turtle, leatherback sea turtle, and green sea turtle.

In further examining the potential effects of the issuance of the PWTF GP on ESA listed species, (particularly the shortnose and Atlantic sturgeon) and critical habitat, EPA focused on the impacts from the following parameters: TSS, pH, total residual chlorine (TRC), and metals (such as aluminum and arsenic). The PWTF GP is intended for facilities with smaller wastewater discharges that are less likely to impact surface water quality, especially in consideration of the effluent limits set forth in the permit (as will be described below). Therefore, the design flow of the facility, which is reported by the facility on the Notice of Intent (NOI), will be the facility's daily maximum flow limit, up to a maximum of one million gallons per day (1 MGD). On a case-by-case basis, EPA will consider approval for a facility that discharges a volume greater than 1.0 million gallons per day (MGD), such as an infrequent (non-continuous) discharger. Nonetheless, EPA believes that PWTFs will rarely exceed this discharge flow. If there is a case where this maximum flow is significantly exceeded, such as a PWTF for a large metropolitan area, an individual permit will be required.

Also, the PWTF General Permit establishes "end of pipe" effluent limits that permittees are required to follow, as part of submitting their NOI (Notice of Intent) to request coverage under the general permit. The permit uses both technology-based effluent limits (i.e., flow, TSS), as well as water-quality based effluent limits (i.e., TRC). Although the water-quality based effluent limits do take dilution into account, the permit does *not* allow for defined mixing zones. Therefore, the water-quality based effluent limits are "end of pipe" effluent limits. EPA believes that this fact further protects the aforementioned ESA listed species.

(1) Total Suspended Solids (TSS)

TSS measures the total mass of suspended sediment particles in water. Solids are the most common pollutant in water treatment plant residuals and could include inorganic (e.g., silt, sand, clay, and insoluble hydrated metal oxides) and organic matter (e.g., flocculated colloids and compounds that contribute to color). Suspended solids also provide a medium for the transport of other sorbed pollutants, including nutrients, pathogens, and metals, which may accumulate in settled deposits that may have a long-term impact on the water column through cycles of re-suspension. Solids residuals primarily come from the raw source water, but the addition of treatment chemicals can add to the measured value (e.g., metals present in coagulants).

Solids that settle out as bottom deposits contribute to sedimentation and can alter and eventually destroy habitat for fish, including sturgeon, and bottom-dwelling organisms. Suspended solids also increase turbidity in receiving waters and reduce light penetration through the water column, thereby limiting the growth of rooted aquatic vegetation that serves as a critical habitat for fish and other aquatic organisms and can clog fish gills, resulting in an increase in susceptibility to infection or asphyxiation.

TSS can either affect aquatic life directly by killing them or reducing growth rate or resistance to disease, by preventing the successful development of fish eggs and larvae, by modifying natural movements and migration, and by reducing the abundance of available food (USEPA, 1976). For example, the Biological Assessment for the shortnose sturgeon stated that elevated turbidity, from events including dredging, construction, or erosion, can be lethal by clogging the gills of (juvenile) fish (Ross, 1996). It can also impair the ability of juvenile and adult sturgeon when foraging for prey (Peterson, et al., 2000). It should be noted that eggs and larvae are less tolerant of sediment levels than juveniles and adults because successful spawning for both shortnose and

Atlantic sturgeon is dependent upon the availability of relatively clean, hard substrate upon which the eggs can adhere (McCord, n.d.).

However, the Potable Water Treatment Facility General Permit establishes effluent limits for total suspended solids (TSS) that can be achieved by well-operated wastewater treatment facilities. As indicated in Part 2.1.1 and 3.1.1 of the draft PWTF GP, permittees under the PWTF GP are required to monitor for TSS on a weekly basis. The permit establishes an average monthly discharge limit for TSS of 30 mg/l while the maximum daily discharge limit is 50 mg/l. These are sufficiently stringent to achieve the water quality standards of Massachusetts and New Hampshire. They are also based on the Massachusetts narrative water quality standard for solids that waters shall be free from floating, suspended and settleable solids in concentrations that would impair any use assigned to the class or would impair the benthic biota and New Hampshire's narrative standard in Env-Wq 1703.03.

Studies of the effects of turbid water (high sediment concentrations) on fish suggest that concentrations of suspended sediments can reach the thousands of milligrams per liter before an acute toxic reaction is expected (Burton, 1993). The TSS maximum daily discharge limit of 50 mg/l for the PWTF GP is significantly below such a threshold. Based on all of these factors, EPA concludes that the impact of TSS from discharges under the PWTF GP on ESA listed species, including the Shortnose Sturgeon and the Atlantic Sturgeon, will be insignificant and/or discountable and not likely to adversely affect any of the ESA-listed species in the Connecticut River, Merrimack River, Taunton River, or Piscataqua River.

(2) pH

Effluent with pH values markedly different from the receiving water pH can have a detrimental effect on the environment. Sudden pH changes can kill aquatic life. As summarized in Table 1 of Section 4.A.1, the pH range designated by the Massachusetts Water Quality Standards for Class A and B Inland waters is from 6.5-8.3 while the pH range for Class SA and Class SB waters is 6.5-8.5. According to the Surface Water Quality Regulations for the State of New Hampshire, the pH range shall be 6.5 – 8.0, unless due to natural causes. As previously mentioned, New Hampshire does not allow discharge into Class A waters.

The effluent limits for pH in the Draft PWTF General Permit are established to be consistent with the aforementioned water quality standards in Massachusetts and New Hampshire. Based on these water-quality standards, the Draft Permit contains the following limits for the indicated waterbody classifications.

Massachusetts Class A and B: 6.5 – 8.3 standard units
Massachusetts Class SA and SB: 6.5 – 8.5 standard units
New Hampshire Class B: 6.5 – 8.0 standard units

Also, the permit indicates there shall be no change from natural conditions that would impair any uses assigned to the receiving water. EPA, with State approval, may expand the pH range to the federal standard of 6.0-9.0 standard units, where the more restrictive pH limits cannot be consistently achieved by the treatment facility, and where receiving water quality and dilution characteristics allow state water quality standards to be achieved. Refer to Part 2.1.1 of the General Permit for Massachusetts facilities and Part 3.1.1 of the General Permit for New Hampshire facilities.

According to a prior ESA concurrence letter from NMFS to EPA regarding a separate general permit (regarding the Lawrence Hydroelectric Project Under the NPDES HYDRO GP), a pH range of 6.0 – 9.0 is harmless to the ESA listed species of shortnose and Atlantic sturgeon (NMFS, Nov. 4, 2013). Since the pH effluent limit for the draft PWTF GP falls within this 6.0 – 9.0 range, EPA believes that the impact of pH from PWTF discharges will be insignificant and/or discountable. Therefore, it is not likely to adversely affect any of the aforementioned endangered species or their critical habitat in the Connecticut River, Merrimack River, Taunton River, or Piscataqua River.

(3) Total Residual Chlorine (TRC)

Chlorine and chlorine compounds can be toxic to aquatic life. Free chlorine is directly toxic to aquatic organisms and can react with naturally occurring organic compounds in receiving waters to form toxic compounds such as trihalomethane. Potable water sources are typically chlorinated to minimize or eliminate pathogens. 40 CFR §141.72(a)(3) stipulates that a public water system's residual disinfectant concentration in the water entering the distribution system cannot be less than 0.2 mg/L for more than four hours.

For those facilities whose discharges contain water which has been previously chlorinated or which contain residual chlorine, the PWTF GP sets effluent limits for total residual chlorine (TRC). 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 Commonwealth of Massachusetts' surface water-quality standards require the use of the 2002 EPA National Recommended Water Quality Criteria where a specific pollutant could reasonably be expected to adversely affect existing or designated uses (314 CMR 4.05 (5)(e)). The Massachusetts Water Quality Standards Implementation Policy for the Control of Toxic Pollutants in Surface Waters, dated February 23, 1990, states that waters shall be protected from unnecessary discharges of excess chlorine. The maximum effluent concentration of chlorine shall not exceed 1.0 mg/l TRC. The State of New Hampshire's water quality standards for chlorine, found at Chapter 1700, Surface Water Quality Regulations, Part Env-Wq 1703.21(b), are the same as the recommended federal water quality criteria.

Therefore the established effluent limits for TRC in the PWTF General Permit follow the recommended federal water-quality criteria and are summarized below:

- Freshwater acute = 19 ug/l (0.019 mg/l); use for daily maximum
- Freshwater chronic = 11 ug/l (0.011 mg/l); use for average monthly
- Marine acute = 13 ug/l (0.013 mg/l); use for daily maximum
- Marine chronic = 7.5 ug/l (0.0075 mg/l); use for average monthly

In the Draft Permit, the maximum daily and average monthly concentration allowed in the effluent are based on the appropriate water-quality criterion and the available dilution in the receiving water. (See Appendix VII of the draft PWTF GP for the equations.) For those facilities whose discharges contain water which has been previously chlorinated or which contain residual chlorine, the dilution factor and applicable chlorine limits will be approved by EPA and the appropriate state agency during review of the facilities' notice of intent (NOI). The permittee will be provided with these limits when notified of permit coverage. If EPA and the appropriate state agency determine that the receiving water affords no dilution, the limits for total residual chlorine will be the appropriate federal water-quality criterion listed above.

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.

Therefore, the limits in the PWTF GP are intended to satisfy EPA's ambient water quality criteria as well as Massachusetts Implementation Policy for Toxics, where appropriate. For this reason, discharges containing TRC under the PWTF GP are likely to have an insignificant and/or discountable effect on ESA species and are not likely to adversely affect the listed species or critical habitat in the Connecticut River, Merrimack River, Taunton River, or Piscataqua River.

(4) Chemicals/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. For example, contaminants including toxic metals, PAHs, pesticides, and polychlorinated biphenyls (PCBs) can cause lesions, retard the growth, or impair the reproductive capabilities of aquatic life (Cooper, 1989); (Sindermann, 1994). However, it should be noted that early life stages of fishes appear to be more susceptible to environmental and pollutant stress than older life stages (Shortnose Sturgeon Status Review Team, 2010). As stated in the recovery plan for the shortnose sturgeon and the status review for the Atlantic sturgeon, the life history of these species (which includes a long lifespan and benthic foraging habit) predispose the sturgeon to long-term and repeated exposure to environmental contamination (NMFS, 1998); (Atlantic Sturgeon Status Review Team, 2007). Although heavy metals are known to accumulate in the fat tissues of sturgeon, the long term effects are not yet fully known (Ruelle & Henry, 1992).

Treatment chemicals used at drinking water treatment facilities such as coagulants contain active ingredients (e.g., aluminum). Certain types of treatment (e.g., disinfection) can result in residual chemicals and/or the generation of chemical by-products (e.g., chlorides, ammonia). Pollutants that may be generated as a result of water treatment may include: chlorine (disinfection residual), ammonia (disinfection by-product), and aluminum (coagulation residual). Total Residual Chlorine (TRC) was already discussed in this assessment. This section will focus on the requirements in the PWTF GP designed to decrease any potential impacts, specifically from metals/chemicals, on aquatic organisms.

i. Aluminum

Aluminum-based coagulants, such as alum and poly-aluminum chloride, are commonly used in coagulation and clarification to remove solid particles from raw water sources at PWTFs. Due to filter backwashing following the coagulation/clarification processes, there is the potential for elevated levels of aluminum in the discharges. However as stated in EPA's document on *Ambient Water Quality Criteria for Aluminum,*[4] the chemistry of aluminum in surface water is complex. In addition, aluminum can be found in some source waters in New England, including many high quality waters, typically present because of the chemistry of local surficial or bedrock geology and weathering processes. Aluminum can be toxic in the aquatic environment. However, the direct effect of aluminum residuals on the aquatic environment is difficult to isolate from the effect of naturally-occurring aluminum. The aluminum species concentration causing toxicity depends on water chemistry, aquatic organism affected, and the effect being monitored. Studies on the toxic effects of aluminum in the aquatic environment has shown that inorganic aluminum can be toxic to several freshwater species of fish, invertebrates, bacteria, and algae, particularly at pH conditions less than 6.0 SU.[5] As previously mentioned, the pH limits under the PWTF GP range from 6.5 to 8.5, which exceeds this 6.0 s.u. threshold.

As summarized in Section 2, there are eight facilities that are: 1) covered under the expired PWTF GP; 2) use an aluminum-based coagulant, and 3) discharge into areas where shortnose sturgeon or Atlantic sturgeon may be present. There is also one (1) potable water treatment facility (covered under the expired permit) that is allowed to discharge into the Piscataqua River/Great Bay on an emergency basis. However according to its monthly discharge monitoring reports (DMR), the facility has not reported a discharge since January of 2009. EPA currently does not have data on both the ambient concentration of Total Recoverable Aluminum and the concentration of Total Recoverable Aluminum in each facility's effluent. In fact, the draft PWTF GP is now requiring that permittees (who use aluminum-based coagulants) monitor for aluminum in both the *ambient* water and the effluent on a monthly basis. This future data will help EPA make an informed decision as to whether or not an aluminum limit is appropriate for these facilities under the general permit. For those facilities in New Hampshire that use aluminum, their results will be reported as total recoverable, but with the conservative assumption that 100% of the aluminum is in the acid-soluble form. This is in accordance with EPA's discussion with NHDES regarding their water quality regulations.

According to EPA's *1998 Ambient Water Quality Criteria Document for Aluminum*, acid-soluble aluminum is considered a better measurement of the forms that are toxic to aquatic life or that

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[4] Ambient Water Quality Criteria for Aluminum – Freshwater. EPA 440/5-86-008, August 1988

[5] Summarized from U.S. Environmental Protection Agency, *Drinking Water Treatment Plant Residuals Management Technical Report*, EPA 820-R-11-003; U.S. Environmental Protection Agency, Entry: Causal Analysis/Diagnosis Decision Information System, Volume 2: Sources, Stressors & Responses, Metals and pH; and Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Aluminum*, September, 2008.

can be readily converted to toxic forms under natural conditions. MassDEP began the process of revising their aluminum criteria to be expressed as acid-soluble. It is currently expressed in terms of total recoverable aluminum, per the 2002 National Recommended Water Quality Criteria[6]. Therefore, facilities in Massachusetts are currently only required to monitor for total recoverable Al.

As previously mentioned, EPA anticipates that some facilities that use aluminum during their process and were *not* authorized under the last PWTF (because of their aluminum concentration levels at that time) will seek coverage under this issuance of the PWTF GP. EPA is requiring additional NOI aluminum information (i.e., water quality samples) to inform a reasonable potential analysis for such facilities. If it is determined that there *is* reasonable potential to cause or contribute to and exceedance of water quality standards, then a Water Quality Based Effluent Limit (WQBEL) would need to be set before the facility was authorized under this general permit.

In addition, the PWTF GP has established several requirements to minimize the aluminum concentration in the facilities' discharges and protect water quality and aquatic life. The general permit contains the requirement for permittees to develop, implement, and maintain a Best Management Practices (BMP) Plan for wastewater discharges from the PWTF. The purpose of the BMP Plan, which contains non-numeric technology-based effluent limitations, is to prevent or minimize the concentration of pollutants (biological, chemical and physical) in the wastewater discharged to surface waters. The new BMP Plan will ensure that not only is the drinking water produced by PWTFs safe for human consumption, but also that the wastewater produced by PWTFs is protective of the quality of the receiving water.

In addition, this BMP Plan includes *specific language* requiring the implementation of an *aluminum minimization program*, if a PWTF uses aluminum in part of its treatment process. Part 2.1.3 and Part 3.1.3 of the General Permit highlight these requirements. At a minimum, this program must include the procedures used for the removal of solids, including sludge, and the procedures used to minimize the discharge of aluminum to surface waters, while maintaining compliance with the Safe Drinking Water Act (SDWA) requirements, including 40 CFR 141.135, for removal of contaminants during treatment. Additional best management practices include an evaluation of using non-aluminum based coagulants, a description of alternate procedures or improvements to increase the efficiency of solids and/or aluminum removal, and a consideration of the design standards used for devices that treat residuals. The permittee is required to certify at least annually that the facility is in compliance with the requirements of the BMP plan and that training of employees has occurred on an annual basis.

Section 4.b.(4)iii, below, also highlights another new requirement of the draft PWTF GP, designed to ensure that the PWTFs are not having an adverse impact on living organisms, such as the shortnose or Atlantic sturgeon. All facilities that discharge wastewater on an intermittent or continuous basis will be required to conduct annual acute and chronic Whole Effluent Toxicity (WET) testing. Specifically, EPA is requiring the testing of one species, *Ceriodaphnia dubia* for the freshwater WET testing (both acute and chronic). The vast majority of PWTFs under this

[6] EPA, *National Recommended Water Quality Criteria*: 2002, EPA-822-R-02-047.

General Permit are freshwater and *C.dubia* is the most sensitive species. If a facility discharges into a coastal/marine area, one acute and one chronic saltwater WET Test must be conducted instead. Likewise, testing of only one species, Inland Silverside (*Menidia beryllina)* for saltwater WET testing (both acute and chronic) is required because of its sensitivity.

WET Testing is conducted to determine whether certain effluents, which may contain potentially toxic pollutants, are discharged in a combination which produces a toxic amount of pollutants in the receiving water. The principal advantages of biological techniques, like WET testing, are: (1) the effects of complex discharges of many known and unknown constituents can be measured only by biological analyses; (2) bioavailability of pollutants after discharge is best measured by toxicity testing including any synergistic effects of pollutants; and (3) pollutants for which there are inadequate chemical analytical methods or criteria can be addressed. For acute WET testing, the LC_{50} is the concentration of the effluent that causes mortality to 50% of the test organisms. For chronic WET testing, C-NOEC (chronic-no observed effect concentration) is defined as the highest concentration of toxicant or effluent to which organisms are exposed in a life cycle or partial life cycle test which causes no adverse effect on growth, survival, or reproduction, based on a statistically significant difference from dilution control, at a specific time of observation as determined from hypothesis testing.

In addition to the acute and chronic Whole Effluent Toxicity, the WET testing requires chemical analysis for the following parameters: hardness, total residual chlorine, alkalinity, pH, specific conductance, total solids, total dissolved solids, ammonia, total organic carbon, total recoverable cadmium, total recoverable lead, total recoverable copper, total recoverable zinc, total recoverable nickel, total recoverable magnesium, and total recoverable aluminum. As previously, these include several potential pollutants that may be present in PWTF effluent. Analysis of this new set of data, representing the effluents as a whole, will inform any future issuance of the PWTF General Permit to determine if routine monitoring or a limit for any of these chemicals is necessary in the future.

Based on these new requirements and the non-numeric technology-based effluent limitations in the PWTF GP, EPA has concluded that discharges from the facilities covered under the PWTF GP are likely to have an insignificant and/or discountable effect on ESA species and are not likely to adversely affect the listed species or critical habitat in the Connecticut River, Merrimack River, Taunton River, or Piscataqua River.

ii.) Arsenic

Arsenic, a toxicant, can be present at high levels in raw source water, including groundwater sources. Most systems in the Northeast have arsenic levels between 2 and 10 μg/L.[7] Although the SDWA establishes a maximum contamination level (MCL) of 0.010 mg/L (10 μg/L) for arsenic in drinking water, the *National Recommended Water Quality Criteria* for acute and chronic arsenic in freshwater are 340 μg/L and 150 μg/L, respectively. This suggests that systems with arsenic levels in the 2 – 10 μg/L range are far below the water quality criterion. This information, combined with the fact that no facilities under the expired PWTF GP reported the presence of arsenic in their raw source water, allows EPA to conclude that these PWTF

[7] Drinking Water Treatment Plant Residuals Management Technical Report. EPA 820-R-11-003, September 2011

discharges are likely to have an insignificant and/or discountable effect on ESA species and are not likely to adversely affect the listed species or critical habitat in the Connecticut River, Merrimack River, Taunton River, or Piscataqua River. In order to be protective, the draft PWTF GP still retains the monthly monitoring requirement for arsenic, in case any new facilities that apply for the PWTF GP report arsenic in their water source.

iii.) Ammonia

High levels of ammonia in the water column can be toxic to fish by making it more difficult for fish to excrete this chemical via passive diffusion from gill tissues. Ammonia can also lower dissolved oxygen levels by conversion to nitrate/nitrate, which consumes oxygen. This can lead to the development of eutrophic conditions in the receiving water. Generally, as values of pH and temperature increase, the concentration of NH_3 increases and the concentration of NH_4^+ decreases and the toxicity of total ammonia increases as pH increases.[8] Since the pH range for facilities is limited, this decreases the potential for toxicity.

Depending upon the type of disinfection process a PWTF employs, a plant *may* discharge residual disinfectants that contain chloramines, formed primarily by chlorine and ammonia. Then chemical treatment applied prior to the effluent being discharged can cause the chloramines to be re-suspended in solution as ammonia and chlorides. Existing data at EPA from *individual* PWTFs (not covered under the PWTF) suggests that some facilities have elevated concentrations of ammonia in their effluent. In order to determine the extent of this *potential* pollutant in PWTFs covered under this General Permit, as a whole, EPA is requiring facilities to annually conduct and submit the results of acute Whole Effluent Toxicity testing (which includes ammonia-nitrogen) and chronic Whole Effluent Toxicity testing. EPA will review the WET results to ensure that these PWTF facilities are not having an adverse impact on living organisms, such as shortnose or Atlantic sturgeon.

Collectively, the WET test data from all of the PWTFs will also inform EPA as to whether routine monitoring (or a limit) for any additional parameters is necessary. As previously mentioned, in addition to the acute and chronic freshwater Whole Effluent Toxicity, the WET testing requires chemical analysis for the following parameters: hardness, total residual chlorine, alkalinity, pH, specific conductance, total solids, total dissolved solids, ammonia, total organic carbon, total recoverable cadmium, total recoverable lead, total recoverable copper, total recoverable zinc, total recoverable nickel, and total recoverable aluminum.

Both Massachusetts and New Hampshire have narrative criteria in their water quality regulations (See Massachusetts 314 CMR 4.05(5)(e) and New Hampshire Part Env- Ws 1703.21) that prohibit toxic discharges in toxic amounts. Excepting chemicals used for pH neutralization and/or dechlorination, the PWTF GP prohibits the addition of toxic materials or chemicals to the discharges and prohibits the discharge of pollutants in amounts that would be toxic to aquatic life. Based upon this factor, as well as the BMP plan (discussed above), the NOI requirements, the newly established requirement for facilities to conduct WET testing, and establishment of a WQBEL for aluminum if reasonable potential is determined, EPA believes that discharges from potable water treatment facilities are likely to have an insignificant

[8] Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater. EPA 822-R-13-001, April 2013.

and/or discountable effect on ESA species and are not likely to adversely affect the listed species in the Connecticut River, Merrimack River, Taunton River, or Piscataqua River.

c. **Effects of the Action on Essential Elements of Proposed/Designated Critical Habitat**

Designated Critical Habitat for North Atlantic right whale:

As discussed in detail in Section 3.c.(3) of this document, designated critical habitat for the North Atlantic right whale (*Eubalaena glacialis*) does fall within a portion of the Action Area for this permit. The Cape Cod Bay/Massachusetts Bay Critical Habitat Area in Massachusetts, which is part of the broader Northeast Atlantic critical habitat, was designated in June of 1994 because of its importance as a feeding/forage ground for North Atlantic right whales (59 FR 28805, 1994).

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). Vessel activities within the CCB, including those from the Cape Cod Canal, Boston Harbor traffic lanes, commercial fishing and whale-watching activities, can change the behavior of whales, disrupt their feeding practices, disperse their food sources, and injure or kill whales. Entanglement, particularly from gill nets and associated ropes, can serious injure or kill whales. The final ruling also indicated that the discharge of pollutants including oil, drilling muds, and suspended solids from oil/gas exploration or discharges from municipal, industrial and non-point sources could degrade essential habitat in northern CCB.

One public comment submitted to NMFS in 59 FR 28805 did indicate concern about such discharges and suggested the need for a water quality monitoring program. NMFS responded that a Right Whale Recovery Plan Implementation Team had been assembled to investigate possible activities in Massachusetts Bay that could affect the CCB (59 FR 28805, Comment 20). NMFS' 2005 Recovery Plan for the North Atlantic Right Whale did discuss potential sources of habitat degradation, but focused more on oil spills, noise pollution from shipping or oil and gas development, and dredging. Although NMFS' 5 Year Review of the North Atlantic right whale mentioned that pollution from human activities did represent a *potential* risk to habitat degradation, it should be noted that the review also stated that this was *not* limiting the recovery of the species (NMFS, 2012).

As previously discussed, the draft Potable Water Treatment Plant General Permit does have established effluent limitations and/or monitoring requirements for TSS, pH, TRC (when applicable), total recoverable aluminum (when applicable), and arsenic (when applicable), which are sufficiently stringent to assure that state and federal water quality standards will be met. These limits have been designed to ensure the protection of aquatic life and maintenance of the receiving water(s) as an aquatic habitat. Also based on the distance between the localized, on-shore PWTF activities and the Cape Cod Bay Critical Habitat Area, EPA has determined that the activities authorized under the PWTF GP are not likely to adversely impact the critical habitat of the North Atlantic Right Whale.

Proposed Critical Habitat for Atlantic Sturgeon

Proposed Critical Habitat

On June 3, 2016, NMFS issued two proposed rules to designate critical habitat for the five listed distinct population segments (DPSs) of Atlantic sturgeon found in U.S. waters (Gulf of Maine, New York Bight, and Chesapeake Bay DPSs: 81 FR 35701; Carolina and South Atlantic DPSs: 81 FR 36078). Federal agencies are required to confer with NFMS on any action that is likely to jeopardize the continued existence of any species proposed for listing or result in destruction or adverse modification of proposed critical habitat (50 CFR §402.10). "Destruction or adverse modification" is defined as a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species (50 CFR § 402.02)

The proposed rules identified the following four essential physical and biological features (PBFs) necessary for the conservation of the species. The term "physical and biological features" is defined as the features that support the life-history needs of the species, including, but not limited to, water characteristics, soil type, geological features, sites, prey, vegetation, symbiotic species or other features. For example, physical features essential for Atlantic sturgeon reproduction and recruitment are:

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

NFMS has proposed to designate Atlantic sturgeon critical habitat for the Gulf of Maine DPS in the Piscataqua River from its confluence with the Salmon Falls and Cocheco rivers downstream to where the main stem river discharges at its mouth into the Atlantic Ocean, as well as the waters of the Cocheco

River from its confluence with the Piscataqua River and upstream to the Cocheco Falls Dam, and waters of the Salmon Falls River from its confluence with the Piscataqua River and upstream to the Route 4 dam. Although there is currently only one known facility under the expired PWTF GP that could potentially discharge into the Piscataqua River on an emergency basis (but hasn't since 2009), the proposed action could authorize discharges from potable water treatment facilities into areas in these rivers.

As discussed in Section 3.b.(3) of this document, proposed critical habitat for the Atlantic Sturgeon (*Acipenser oxyrinchus*) does fall within a portion of the Action Area for this permit. The proposed designation includes approximately 152 miles of aquatic habitat in rivers in Maine, **New Hampshire**, and **Massachusetts** for the Gulf of Maine DPS; approximately 340 miles of aquatic habitat in rivers in Connecticut, **Massachusetts**, New York, New Jersey, Pennsylvania, and Delaware for the New York Blight DPS; about 453 miles of aquatic habitat in rivers in Maryland, Virginia, and the District of Columbia for the Chesapeake Bay DPS;

EPA has determined that the discharges from potable water treatment facilities covered under this General Permit will have no effect on the four PBFs identified (in Section 3.b.(3)) as essential for the proposed critical habitat of Atlantic sturgeon. As described above, EPA believes that the PWTF GP's established effluent limitations and/or monitoring requirements, especially for parameters like TSS and pH, are sufficiently stringent to assure that state and federal water quality standards will be met. These limits have been designed to ensure the protection of aquatic life and maintenance of the receiving water(s) as an aquatic habitat. Therefore, there will be no destruction or adverse modification of proposed critical habitat, and no conference is necessary.

d. **Indirect Effects**

Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. The Potable Water Treatment Facility General Permit requires permittees to comply with discharge limits, by using appropriate BMPs (when necessary), and to meet federal and state water quality standards for all receiving waters. The BMPs requirements include a *written plan* designed to reduce or prevent the discharge of pollutants in the facility's wastewater as well as a special aluminum minimization *plan* for facilities that use aluminum in their water treatment process. These plans focus on operational and preventative maintenance activities, an examination of control measures to minimize aluminum, procedures and schedules for the removal of waste, etc. These BMPs do not require the installation of any structural BMPs on adjacent land or in/near the waterbodies within the defined Action Area. Therefore, indirect effects to the 2 ESA-listed species of sturgeon, 3 ESA- listed whales, or 4 ESA-listed sea turtles as a result of EPA's reissuance of the PWTF General Permit are not expected to occur.

e. **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 potable water treatment facility discharges within the states of Massachusetts and New Hampshire.

5. Conclusions

Based on the analysis that all effects of the proposed action will be insignificant and/or discountable, EPA has determined that the proposed reissuance of the PWTF GP is **not likely to adversely affect (NLAA)** the shortnose sturgeon, Atlantic sturgeon (or its proposed Critical Habitat), North Atlantic right whale (or its Designated Critical Habitat), humpback whale, fin whale, Kemp's Ridley sea turtle, Northwest Atlantic Distinct Population Segment (DPS) of the loggerhead sea turtle, leatherback sea turtle, and green turtle. We certify that we have used the best scientific and commercial data available to complete this analysis. EPA requests your concurrence with this determination.

Sincerely,

David M. Webster

David Webster, Chief
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