NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT
BIOLOGICAL OPINION

Agency: US Army Corps of Engineers, New England District

Activity Considered: Construction of a Combined Sewer Overflow Abatement Project around Bond Brook in Augusta, Maine by the Greater Augusta Utility District
F/NER/2010/06494

Conducted by: National Marine Fisheries Service
Northeast Region

Date Issued: FEB 22, 2011

Approved by: [signature]

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1. INTRODUCTION AND BACKGROUND

This constitutes the biological opinion (Opinion) of NOAA's National Marine Fisheries Service (NMFS) on the effects of the construction of a Combined Sewer Overflow[1] (CSO) abatement project around Bond Brook in Augusta, Maine as proposed by the Greater Augusta Utility District (GAUD) in accordance with Section 7 of the Endangered Species Act (ESA), as amended (16 U.S.C. 1531 et seq.). GAUD has applied for authorization from the U.S. Army Corps of Engineers (ACOE) to place fill below the high water line of Bond Brook and its tributaries in conjunction with the construction of a new sewer interceptor, installation of a storage conduit pipe, pump station replacement, and construction of a new sewer force main with the goal of eliminating CSO discharges to Bond Brook. The ACOE is proposing to issue a permit to GAUD under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. This Opinion is based on information provided in the ACOE's July 20, 2010 consultation initiation package and additional information provided on September 23, 2010, September 30, 2010, November 11, 2010, November 30, 2010, January 6, 2011, January 10, 2011 and January 26, 2011. A complete administrative record of this consultation will be kept at the NMFS Northeast Regional Office. Formal consultation was initiated on September 23, 2010.

1.1. Consultation History

February 4, 2010 Woodard and Curran requested preliminary comments on the GAUD's proposed Bond Brook CSO Abatement Project.

March 8, 2010 NMFS submitted preliminary comments on the Bond Brook Abatement Project including information on the presence of federally listed species in the project area.

July 13, 2010 Representatives from NMFS, ACOE, GAUD, Maine Department of Environmental Protection (MDEP), Maine Department of Marine Resources (MDMR), Central Maine Power (CMP), ARCADIS-US, CDM, and Woodard & Curran attended an on-site meeting to discuss the Bond Brook CSO Abatement project.

July 19, 2010 Woodard and Curran submitted a copy of the Natural Resources Protection Act permit application to NMFS for review.

July 20, 2010 ACOE requested initiation of formal Section 7 consultation for the GAUD CSO Abatement Project.

1 Combined sewer systems are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe. During periods of dry weather, combined sewer systems transport all of their wastewater to a sewage treatment plant, where it is treated and then discharged to a water body. During periods of heavy rainfall or snowmelt, the wastewater volume in a combined sewer system can exceed the capacity of the sewer system or treatment plant. For this reason, combined sewer systems are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies. CSO discharges occur during large wet weather events (i.e., storms) when the capacity of the combined sewer collection system is exceeded resulting in excess flow, which is comprised of a mixture of sewage and storm water runoff.

August 2, 2010	Woodard and Curran submitted additional information to NMFS.
August 16, 2010	Woodard and Curran submitted an aerial map of the project area to NMFS.
August 16, 2010	NMFS requested additional information from ACOE concerning construction related impacts of project.
September 9, 2010	NMFS requested additional information concerning permanent and temporary impacts related to fill for the project.
September 23, 2010	Woodard and Curran and ACOE submitted final study design to NMFS.
September 30, 2010	Woodard and Curran submitted additional information to NMFS as requested on September 29, 2010.
October 10, 2010	NMFS submitted a letter to ACOE indicating that all of the information required to initiate a formal consultation for the project had been received. In this letter NMFS noted that the date that the final study design was received (September 23, 2010) will serve as the commencement of the formal consultation process.
November 11, 2010	Woodard and Curran submits a description of changes to the proposed action indicating that a smaller diameter storage conduit will be used to reduce impacts to Bond Brook.
November 30, 2010	Woodard and Curran submitted additional information to NMFS concerning siltation and turbidity control and coffer dam details.
January 6, 2011	Woodard and Curran submitted additional information to NMFS concerning siltation and turbidity control at the crossings of the two tributaries.
January 10, 2011	Woodard and Curran submitted an action area map and an updated impact table to NMFS.
January 26, 2011	Woodard and Curran submitted additional information to NMFS concerning siltation and turbidity control and coffer dam details.
January 26, 2011	ACOE approves a request for a 30-day extension by NMFS to provide NMFS with additional time to review and process the draft Biological Opinion. As such, NMFS agrees to provide a final Biological Opinion to ACOE by March 7, 2011.

1.2. Relevant Documents

The analysis in this Opinion is based on a review of the best available scientific and commercial information. Specific sources are listed in Section 12 and are cited directly throughout the body of the document. Primary sources of information include: 1) information provided in the ACOE's July 27, 2010 initiation letter and BA in support of formal consultation under the ESA, and additional information provided by GAUD on September 23, 2010, September 30, 2010, November 11, 2010, November 30, 2010, January 6, 2011, January 10, 2011 and January 26, 2011; 2) the final rule designating Endangered Status for a Distinct Population Segment of Anadromous Atlantic Salmon (*Salmo salar*) in the Gulf of Maine (65 FR 69459; Nov. 17, 2000); 3) Status Review for Anadromous Atlantic Salmon (*Salmo salar*) in the United States (Fay et al. 2006); 4) Determination of Endangered Status for the Gulf of Maine Distinct Population Segment of Atlantic salmon; Final Rule (74 FR 29345; June 19, 2009); 5) Designation of Critical Habitat for Atlantic salmon Gulf of Maine Distinct Population Segment (74 FR 29300; June 19, 2009); 6) Final Recovery Plan for Shortnose Sturgeon (December, 1998).

1.3. Application of ESA Section 7(a)(2) Standards – Analytical Approach

This section reviews the approach used in this Opinion in order to apply the standards for determining jeopardy and destruction or adverse modification of critical habitat as set forth in Section 7(a)(2) of the ESA and as defined by 50 CFR §402.02 (the consultation regulations). Additional guidance for this analysis is provided by the Endangered Species Consultation Handbook, March 1998, issued jointly by NMFS and the USFWS. In conducting analyses of actions under Section 7 of the ESA, NMFS takes the following steps, as directed by the consultation regulations:

- Identifies the action area based on the action agency's description of the proposed action ;
- Evaluates the current status of the species with respect to biological requirements indicative of survival and recovery and the essential features of any designated critical habitat;
- Evaluates the relevance of the environmental baseline in the action area to biological requirements and the species' current status, as well as the status of any designated critical habitat;
- Determines whether the proposed action affects the abundance, reproduction, or distribution of the species, or alters any physical or biological features of designated critical habitat;
- Determines and evaluates any cumulative effects within the action area; and,
- Evaluates whether the effects of the proposed action, taken together with any cumulative effects and the environmental baseline, can be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the affected species, or is likely to destroy or adversely modify their designated critical habitat.

In completing the last step, NMFS determines whether the action under consultation is likely to jeopardize the ESA-listed species or result in the destruction or adverse modification of designated critical habitat. If so, NMFS must identify a reasonable and prudent alternative(s) (RPA) to the action as proposed that avoids jeopardy or adverse modification of critical habitat and meets the other regulatory requirements for an RPA (see 50 CFR §402.02). In making these determinations, NMFS must rely on the best available scientific and commercial data.

The critical habitat analysis determines whether the proposed action will destroy or adversely modify designated or proposed critical habitat for ESA-listed species by examining any change in the conservation value of the primary constituent elements of that critical habitat. This analysis focuses on statutory provisions of the ESA, including those in Section 3 that define "critical habitat" and "conservation", in Section 4 that describe the designation process, and in Section 7 that set forth the substantive protections and procedural aspects of consultation. Although some "properly functioning" habitat parameters are generally well known in the fisheries literature (e.g., thermal tolerances), for others, the effects of any adverse impacts are considered in more qualitative terms. The analysis presented in this Opinion does not rely on the regulatory definition of "adverse modification or destruction" of critical habitat issued in the 9th Circuit Court of Appeals (Gifford Pinchot Task Force et al. v. U.S. Fish and Wildlife Service, No. 03-35279, August 6, 2004).

2. PROJECT DESCRIPTION AND PROPOSED ACTION

2.1. Project Overview

The GAUD has been attempting to address CSO discharges in its collection system in Augusta, Maine for many years. The proposed project around Bond Brook is a major component of this effort. Bond Brook receives CSO discharges at four locations; three in the tidal portion of the Brook and one into freshwater. The Kennebec River currently receives discharge from a single location. The proposed project will eliminate all four of the CSO discharges into Bond Brook and will minimize discharge at the Kennebec River location by installing a storage conduit that will be able to contain overflow from a 1-year, 2-hour event. Excess flow during storms larger than a 1-year, 2-hour event will discharge into the tidally influenced waters of the Kennebec River.

The project is comprised of three components: the replacement of the Mt. Vernon Avenue interceptor, the construction of an in-line storage conduit, and the addition of a combined wet weather/dry weather pumping station with associated force main.

Interceptor Replacement

The existing interceptor system conveys flow from the Northwest part of Augusta via several gravity and pressure sewer lines. These lines run cross-country, roughly parallel to Bond Brook, for a distance of approximately 4,400-feet. The majority of the pipeline is located behind the residential, retail and commercial buildings of Mt. Vernon Avenue.

This system contains two pump stations that are more than 40 years old and are in need of rehabilitation or replacement. This project will replace the existing interceptor system with a new 24-inch or 36-inch gravity line and will include the removal of the existing pumping station.

The new interceptor pipe will cross two unnamed streams (Stream Crossing # 1 and #2); both are tributaries to Bond Brook. The first stream is mapped intermittent, whereas the other (#2) primarily conveys storm water runoff from Mount Vernon Avenue and adjacent parking lots. It is anticipated that there will be minimal flow in these tributaries at the time of construction. The interceptor pipe will also cross Bond Brook itself near the Mt. Vernon Avenue Bridge (Stream Crossing # 3). The Brook is 40-feet wide at this location and has steep vegetated banks on either side.

Storage Conduit

An in-line storage conduit will be constructed along Bond Brook from the Mt. Vernon Avenue bridge to the Kennebec River, a distance of approximately 1400-feet. The conduit will likely be a 10-foot x 10-foot precast concrete culvert, designed to store excess wet weather flow until it can be processed through the GAUD wastewater treatment facility. The conduit will be sized to store flow resulting from storms equivalent to a 1-year, 2-hour event[2]. A lean concrete foundation mat may be placed at the base of the trench, prior to setting the storage conduit.

The majority of the storage conduit, approximately 1,000-feet, will be installed within 75-feet of Bond Brook and the Kennebec River. The conduit will cross Bond Brook in two locations (Stream Crossings #4 and #5). Stream Crossing #4 will convey flows from the storage conduit on the eastern bank to the storage conduit/pumping station on the western bank. To minimize the effect of a deep excavation on the stream, the conduit will be reduced to a 36-inch pipe at Crossing #4. A 12-inch force main will also cross the Brook at this location. Stream Crossing #5 will occur 800-feet downstream of the Mt. Vernon Avenue Bridge. The crossing will be made by a 36-inch gravity line, or two smaller siphon pipes that will convey flows from two CSOs on the western bank of Bond Brook to the proposed storage conduit on the eastern bank. The 12-inch force main will also cross at this location.

Pumping Station and Force Main

A pumping station will be constructed near the Mt. Vernon Bridge. It will be designed to pump 2.5 million gallons per day of flow to the existing West Side Interceptor. The 12-inch force main will parallel the storage conduit and will cross Bond Brook in two locations (Stream Crossings #4 and #5).

2.2. Construction Activities

As described above, this project will involve three crossings of Bond Brook and two crossings of unnamed tributaries. In addition, portions of the storage conduit and 36-inch conveyance pipeline will be placed adjacent to Bond Brook, and will require excavation to several feet below streambed elevation. Given the depth of excavation and the steepness of the banks, a row of sheeting will be placed at the edge of the brook to safely install the pipelines.

GAUD's proposed project will entail placing 10,270 ft^2 of fill below the high water line of Bond Brook and its tributaries. There will be temporary impacts due to the placement of cofferdams and bypass structures necessary to ensure that the work areas are isolated from stream flow (Table 1). After construction these structures will be removed as soon as possible and normal flow conditions will resume. There will be permanent impacts associated with the application of

2 The most amount of rain anticipated for a single two-hour rainfall event during a calendar year at a specific location.

riprap below the ordinary high water mark in order to stabilize the stream banks post-construction. In addition to in-stream impacts, there will be shoreline impacts associated with the clearing (and corresponding restoration) of the stream bank in order to provide equipment access.

Table 1. Impacts to Bond Brook and its tributaries associated with the GAUD CSO abatement project.

	Disturbance area below High Water Line (ft^2)		Disturbance Area along shoreline
Stream Crossing	Temporary	Permanent	embankment (ft^2)
1	180	0	1620
2	160	0	1068
3	2184	1104	3278
4	2592	1158	1800
5	1657	1235	3314
Pipeline along lower Bond Brook			10581
Total	**6773**	**3497**	**21661**

Prior to earthmoving activities, erosion and sedimentation control devices and spill protection measures will be installed on site. These devices may include the use of stabilized construction entrances, hydraulic mulch, hay and straw mulch, erosion control blankets, turf reinforced matting, rip rap, and sediment traps. Erosion and sediment control measures shall be constructed and maintained in accordance with the Maine Erosion and Sediment Control BMPs Handbook, as published by the Maine Department of Environmental Protection (MDEP 2003).

In-stream Activities

All in-water work will occur between June 1st and October 1st using appropriate erosion and sedimentation controls. Bond Brook will be crossed in three locations in the lower tidal portion of the Brook; and, there will be an additional two crossings of freshwater tributaries by the interceptor line. It is anticipated that the crossings of Bond Brook will each take approximately 2 to 3 weeks to complete, and will most likely be constructed sequentially. The crossings of the smaller tributaries will take 1-2 days to complete, but the access roads over the streams will be left in place to provide access for construction equipment. Shoreline vegetation will be cleared and the embankment will be temporarily graded to allow for safe access of excavation equipment. The use of sheeting may be necessary to create work platforms along the stream banks for equipment access. This would be done by setting a row of sheetpiles at the edge of the Brook approximately at, or just below, the ordinary high water line. These sheetpiles will extend several feet above the existing top of the bank. Fill will then be deposited between the sheetpiles and the top of the stream bank to create a work platform. In-water work will then commence. The sheets will be cut off and left in place post-construction to help stabilize the steep banks. Restoration of the vegetated riparian habitat will occur after construction is complete.

Construction activities will be conducted in a manner that allows for the continuous conveyance of stream flow around the sewer excavation areas. Two alternatives have been proposed for the diversion of flow. Stream flow will either be diverted through temporary culverts or by phasing work activities so that only one half of the stream channel is blocked at a time. If sheetpiles are used for either alternative they will likely be driven with a vibratory hammer; however, depending on site characteristics the contractor may elect to use an impact hammer. Once installed, the cofferdams will be dewatered to ensure that work will occur in the dry. The water from the cofferdams will be discharged into a sediment removal basin or, if it is anticipated that there may be contaminants from the former Manufactured Gas Plant nearby, the water may be pumped into frac tanks and then removed to be processed offsite. If sediment basins are used, they will contain splash pads of riprap underlain with geotextile to prevent scouring. The basins will discharge via sheet flow to a well vegetated buffer whenever possible. The distance between the discharge area and nearby water resources will be maximized.

Alternative 1

The contractor may elect to construct a series of work platforms across the stream from which to operate heavy equipment for the excavation of a trench for the placement of the sewer line. The work platforms, which will be contained within a 20-foot wide dewatered cofferdam, will be composed of washed course aggregate stone. Diversion culverts will be placed within the cofferdam to convey stream flow through the work area. The culverts will be of sufficient size and quantity to convey stream flow without creating a significant difference between upstream and downstream water surface elevations. The invert of each culvert will be set at or below the elevation of the stream bed. The velocity of the stream flow shall be maintained so as to not create scour or erosion of the streambed. The trenching operation will occur through the work platform, and the new sewer will be set with minimum disturbance to the temporary culverts. After the sewer installation is complete, the trench will be backfilled, the brook bottom will be returned to its existing grade, and the temporary culverts and work platforms will be removed.

Alternative 2

The contractor may elect to install steel sheetpile, sand bag, or portable plastic dams across Bond Brook along the alignment of the new sewer line crossing. If this alternative is selected, these cofferdams will be installed across half the brook at a time, leaving the other half of the brook to carry flow. The cofferdams will be removed at the completion of construction, and the brook bottom will be restored to the existing grade.

Regardless of alternative, the excavated streambed materials, including any spawning materials, will be used as backfill above the structural backfill envelope of the sewer pipe. Large rocks encountered during excavation will be placed in Bond Brook.

Crossing of Tributaries

The interceptor line will cross two un-named tributaries to Bond Brook. Both streams are approximately 5-feet wide and are relatively shallow. Work within these streams will be coordinated so that the streams are dammed for the minimum duration necessary to complete the sewer installation. It is anticipated that placement of the sewer line under each of these tributaries will take 1 to 2 days. After the placement of the sewer line, temporary culverts will be placed and a temporary road will be constructed to allow equipment access to the project on both sides of the streams. The contractor will install an erosion and sedimentation control barrier (i.e. turbidity curtain, silt fencing or hay bale dyke) downstream of the crossings to minimize the amount of sediment moving into Bond Brook, which is less than 50 feet downstream. After construction, the dams and culverts will be removed and the stream beds will be returned to their existing grade, therefore no permanent impacts to these streams are anticipated.

Pipeline Installation adjacent to Bond Brook

Portions of the proposed in-line storage conduit and 36-inch conveyance pipeline will parallel Bond Brook and the Kennebec River. Excavation for the pipelines will extend to a depth several feet below the bottom of Bond Brook. Given the necessary depth of excavation, the steepness of the embankment, and the site's space limitations, two rows of sheeting will likely be necessary to safely install the pipelines along the east bank of Bond Brook. This work will not occur below ordinary high water.

The bank of Bond Brook will be cleared of vegetation in order to provide access for construction equipment. The clearing will be kept to the minimum amount necessary and will be restored post-construction (Table 1). The existing access path along the eastern bank of Bond Brook will be utilized by construction vehicles to install the first row of sheeting along the bottom of the eastern bank of Bond Brook, near the water line. This sheeting will extend several feet above the elevation of the existing top of the bank. Common fill will then be placed and compacted within the envelope between the sheeting and the existing bank up to the elevation of the top the existing access path to create a temporary working platform. A temporary access road consisting of 12-inches of crushed stone will then be installed over the existing access path and temporary backfill material. The crushed stone will serve as a solid base for the construction equipment and will also help mitigate sediment transport through the work area into Bond Brook. The working platform/access road will be used to install the second row of sheeting on the far side of the road in order to support the steep slope that runs up toward Northern Avenue in this area. Once the second row of sheeting is installed, excavation for the pipeline will proceed. After the pipeline is installed and the trench backfilled, both rows of sheeting will likely be abandoned in place. The temporary working platform material will then be removed and the area returned to existing grades. The row of sheeting furthest from Bond Brook will be cut off approximately one foot below final grade. The row of sheeting nearest the brook will be cut off approximately at existing grade and will serve to support the rip rap/stone armoring to be placed on the bank.

Site Restoration

Restoration of the vegetated riparian buffer will occur following the installation of the pipeline. Restoration of the steep bank will consist of the placement of a geotextile filter fabric over the existing grade, a 6-inch stone bedding layer, and a layer of D50-12-inch riprap approximately 18-inches thick. The geotextile fabric will provide separation between the existing material and the bedding layer to ensure the stability of the slope. The bedding layer will help provide drainage beneath the riprap to protect its integrity. The row of sheetpile driven along the bottom of the bank will help support the layer of riprap.

Joint planting within the riprap will be incorporated to encourage the naturalization of the bank. Dormant live willow stakes (*Salix exigua*) approximately 5 feet long and 3/8-inch to 1-inch diameter will be installed at five feet on center slightly above the mean high water line along the face of the embankment in three staggered rows. The stakes will be installed with a minimum of 50 percent of the length of the stake in natural soil and will be watered immediately after the installation.

Additional tree and shrub plantings will be installed along the top of the embankment. Temporary erosion and sedimentation control devices shall be maintained throughout construction. These devices shall be removed when the site is permanently stabilized and the specified vegetation is established. The contractor will monitor the plantings for one year post-construction to ensure success.

2.3. Action Area

The action area is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The proposed CSO abatement project reviewed in this Opinion involves 5 stream crossings (3 of them in Bond Brook) in the City of Augusta, in Kennebec County, Maine (Figure 1). Bond Brook is located within the Merrymeeting Bay Salmon Habitat Recovery Unit (SHRU) and the Kennebec River at Merrymeeting Bay watershed (HUC 10).

The action area includes some or all of the following:

- The area of stream that is temporarily isolated and dewatered within a cofferdam so that construction work can proceed in the dry;
- The area downstream of the cofferdam that would experience a temporary increase in sediment from construction activities, particularly during removal of the cofferdam;
- The area upstream and downstream of the cofferdam affected by the noise and vibration produced by the driving of sheetpile;
- The area of riparian land along the stream bank where vegetation is removed to facilitate construction, including access of equipment to the stream; and,
- The area upstream of the project temporarily inaccessible to migrating Atlantic salmon.

Thus, the action area for this consultation encompasses all of Bond Brook. The Kennebec River is not considered to be part of the action area as no construction-related effects will extend into the River. The project also will not result in any new CSO discharges into the Kennebec River. Therefore, no part of the Kennebec River will be affected directly or indirectly by the proposed action.

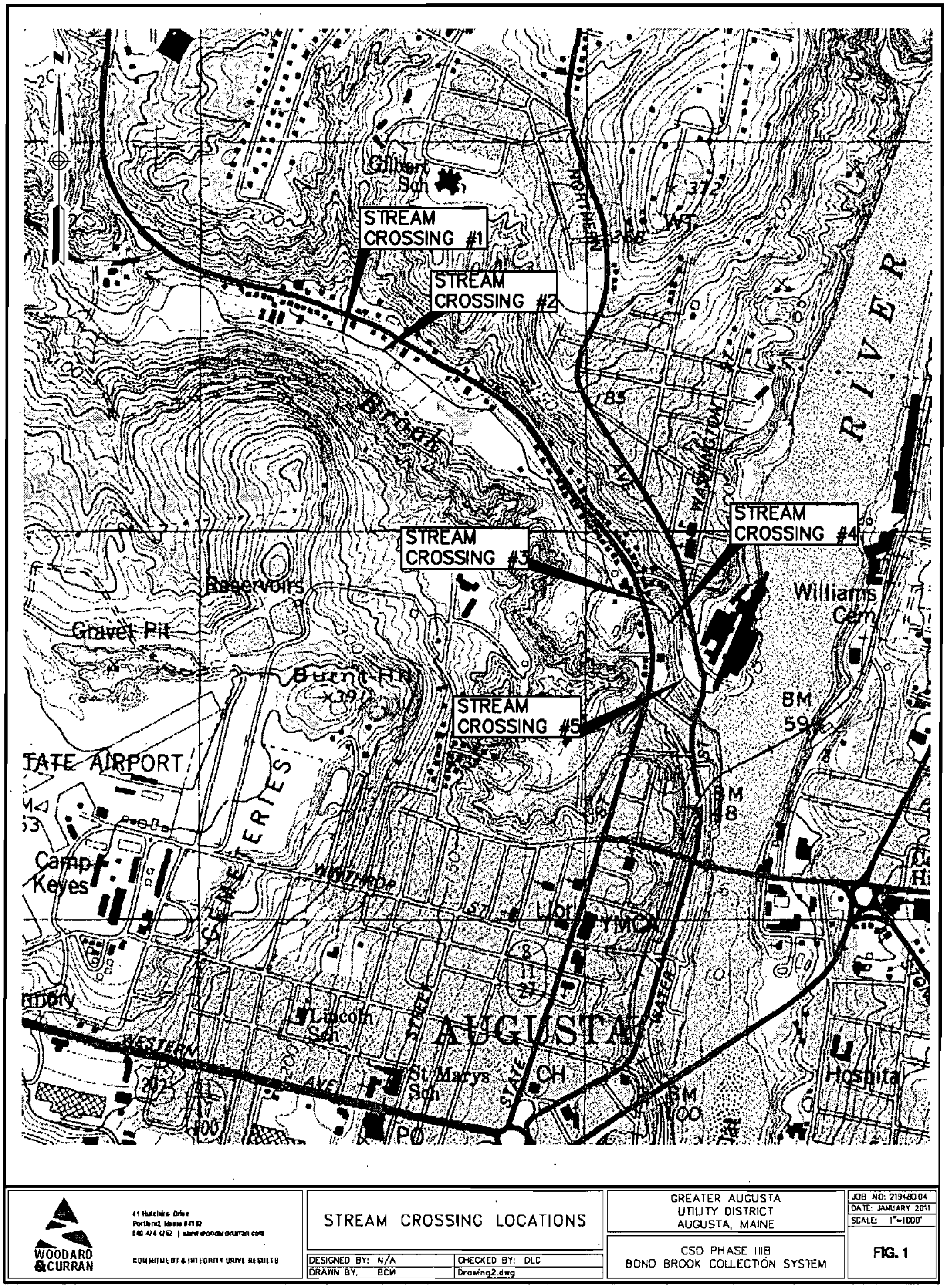

Figure 1. Location of the stream crossings associated with the CSO abatement project being proposed by the Greater Augusta Utility District.

3. LISTED SPECIES IN THE ACTION AREA

This section will focus on the status of listed species within the action area, summarizing information necessary to establish the environmental baseline and to assess the effects of the proposed action on listed species.

The Federally-listed Gulf of Maine Distinct Population Segment (DPS) of Atlantic salmon (*Salmo salar*) is known to occur in the action area. While listed shortnose sturgeon (*Acipenser brevirostrum*) are known to occur in the Kennebec River, they are not known to occur in Bond Brook and habitat in the action area is inconsistent with the type of habitat where shortnose sturgeon are known to occur. On October 6, 2010, NMFS published two rules proposing to list four distinct population segments (DPS) of Atlantic sturgeon *(Acipenser oxyrinchus oxyrinchus)* as endangered and one DPS as threatened (Gulf of Maine DPS) under the ESA (75 FR 1872). Like shortnose sturgeon, Atlantic sturgeon are known to occur in the Kennebec River, but are not known to occur within the action area. Therefore, neither species will be considered further in this Opinion.

3.1. Gulf of Maine DPS of Atlantic salmon

The Atlantic salmon is an anadromous fish species that spends most of its adult life in the ocean but returns to freshwater to reproduce. The Atlantic salmon is native to the basin of the North Atlantic Ocean, from the Arctic Circle to Portugal in the eastern Atlantic, from Iceland and southern Greenland, and from the Ungava region of northern Quebec south to the Connecticut River (Scott and Crossman 1973). In the United States, Atlantic salmon historically ranged from Maine south to Long Island Sound. However, the Central New England DPS and Long Island Sound DPS have both been extirpated (65 FR 69459; Nov. 17, 2000).

The Gulf of Maine (GOM) Distinct Population Segment (DPS) of anadromous Atlantic salmon was initially listed by the USFWS and NMFS (collectively, the Services) as an endangered species on November 17, 2000 (65 FR 69459). A subsequent listing as an endangered species by the Services (74 FR 29344; June 19, 2009) included an expanded range for the GOM DPS of Atlantic salmon. The decision to expand the geographic range of the GOM DPS was largely based on the results of a Status Review (Fay et al. 2006) completed by a Biological Review Team (BRT) consisting of federal and state agencies and Tribal interests. Fay et al. (2006) concluded that the DPS delineation in the 2000 listing designation was largely appropriate, except in the case of large rivers that were excluded in the 2000 listing determination. Fay et al. (2006) concluded that the salmon currently inhabiting Maine's larger rivers (Androscoggin, Kennebec, and Penobscot) are genetically similar to the rivers included in the GOM DPS as listed in 2000, have similar life history characteristics, and/or occur in the same zoogeographic region. Further, the salmon populations inhabiting the large and small rivers from the Androscoggin River northward to the Dennys River differ genetically and in important life history characteristics from Atlantic salmon in adjacent portions of Canada (Spidle et al. 2003; Fay et al. 2006). Thus, Fay et al. (2006) concluded that this group of populations (a "distinct population segment") met both the discreteness and significance criteria of the Services' DPS Policy (61 FR 4722; Feb. 7, 1996) and, therefore, recommended the geographic range included in the new expanded GOM DPS. The final rule expanding the GOM DPS agreed with the conclusions of BRT regarding the DPS delineation of Maine Atlantic salmon.

The newly listed GOM DPS includes all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, and wherever these fish occur in the estuarine and marine environment. The following impassable falls delimit the upstream extent of the freshwater range: Rumford Falls in the town of Rumford on the Androscoggin River; Snows Falls in the town of West Paris on the Little Androscoggin River; Grand Falls in Township 3 Range 4 BKP WKR on the Dead River in the Kennebec Basin; the un-named falls (impounded by Indian Pond Dam) immediately above the Kennebec River Gorge in the town of Indian Stream Township on the Kennebec River; Big Niagara Falls on Nesowadnehunk Stream in Township 3 Range 10 WELS in the Penobscot Basin; Grand Pitch on Webster Brook in Trout Brook Township in the Penobscot Basin; and Grand Falls on the Passadumkeag River in Grand Falls Township in the Penobscot Basin. The marine range of the GOM DPS extends from the Gulf of Maine, throughout the Northwest Atlantic Ocean, to the coast of Greenland.

Included in the GOM DPS are all associated conservation hatchery populations used to supplement these natural populations; currently, such conservation hatchery populations are maintained at Green Lake National Fish Hatchery (GLNFH) and Craig Brook National Fish Hatcheries (CBNFH), both operated by the USFWS. Excluded from the GOM DPS are landlocked Atlantic salmon and those salmon raised in commercial hatcheries for the aquaculture industry (74 FR 29344; June 19, 2009).

Species Description

Atlantic salmon have a complex life history that includes territorial rearing in rivers to extensive feeding migrations on the high seas. During their life cycle, Atlantic salmon go through several distinct phases that are identified by specific changes in behavior, physiology, morphology, and habitat requirements.

Adult Atlantic salmon return to rivers from the ocean and migrate to their natal stream to spawn. Adults ascend the rivers within the GOM DPS beginning in the spring. The ascent of adult salmon continues into the fall. Although spawning does not occur until late fall, the majority of Atlantic salmon in Maine enter freshwater between May and mid-July (Meister 1958; Baum 1997). Early migration is an adaptive trait that ensures adults have sufficient time to effectively reach spawning areas despite the occurrence of temporarily unfavorable conditions that naturally occur within rivers (Bjornn and Reiser 1991). Salmon that return in early spring spend nearly five months in the river before spawning, often seeking cool water refuge (e.g., deep pools, springs, and mouths of smaller tributaries) during the summer months.

In the fall, female Atlantic salmon select sites for spawning. Spawning sites are positioned within flowing water, particularly where upwelling of groundwater occurs, allowing for percolation of water through the gravel (Danie et al. 1984). These sites are most often positioned at the head of a riffle (Beland et al. 1982); the tail of a pool; or the upstream edge of a gravel bar where water depth is decreasing, water velocity is increasing (McLaughlin and Knight 1987; White 1942), and hydraulic head allows for permeation of water through the redd (a gravel depression where eggs are deposited). Female salmon use their caudal fin to scour or dig redds. The digging behavior also serves to clean the substrate of fine sediments that can embed the cobble/gravel substrate needed for spawning and consequently reduce egg survival (Gibson 1993). As the female deposits eggs in the redd, one or more males fertilize the eggs (Jordan and Beland 1981). The female then continues digging upstream of the last deposition site, burying the fertilized eggs with clean gravel.

A single female may create several redds before depositing all of her eggs. Female anadromous Atlantic salmon produce a total of 1,500 to 1,800 eggs per kilogram of body weight, yielding an average of 7,500 eggs per 2 sea-winter (SW) female (an adult female that has spent two winters at sea before returning to spawn) (Baum and Meister 1971). After spawning, Atlantic salmon may either return to sea immediately or remain in freshwater until the following spring before returning to the sea (Fay et al. 2006). From 1967 to 2003, approximately 3 percent of the wild and naturally reared adults that returned to rivers where adult returns are monitored--mainly the Penobscot River--were repeat spawners (USASAC 2004).

Embryos develop in the redd for a period of 175 to 195 days, hatching in late March or April (Danie et al. 1984). Newly hatched salmon referred to as larval fry, alevin, or sac fry, remain in the redd for approximately 6 weeks after hatching and are nourished by their yolk sac (Gustafson-Greenwood and Moring 1991). Survival from the egg to fry stage in Maine is estimated to range from 15 to 35 percent (Jordan and Beland 1981). Survival rates of eggs and larvae are a function of stream gradient, overwinter temperatures, interstitial flow, predation, disease, and competition (Bley and Moring 1988). Once larval fry emerge from the gravel and begin active feeding they are referred to as fry. The majority of fry (>95 percent) emerge from redds at night (Gustafson-Marjanen and Dowse 1983).

When fry reach approximately 4 cm in length, the young salmon are termed parr (Danie et al., 1984). Parr have eight to eleven pigmented vertical bands on their sides that are believed to serve as camouflage (Baum 1997). A territorial behavior, first apparent during the fry stage, grows more pronounced during the parr stage, as the parr actively defend territories (Allen 1940; Kalleberg 1958; Danie et al. 1984). Most parr remain in the river for 2 to 3 years before undergoing smoltification, the process in which parr go through physiological changes in order to transition from a freshwater environment to a saltwater marine environment. Some male parr may not go through smoltification and will become sexually mature and participate in spawning with sea-run adult females. These males are referred to as "precocious parr."

First year parr are often characterized as being small parr or 0+ parr (4 to 7 cm long), whereas second and third year parr are characterized as large parr (greater than 7 cm long) (Haines 1992). Parr growth is a function of water temperature (Elliott 1991); parr density (Randall 1982); photoperiod (Lundqvist 1980); interaction with other fish, birds, and mammals (Bjornn and Resier 1991); and food supply (Swansburg et al. 2002). Parr movement may be quite limited in the winter (Cunjak 1988; Heggenes 1990); however, movement in the winter does occur (Hiscock et al. 2002) and is often necessary, as ice formation reduces total habitat availability (Whalen et al.1999). Parr have been documented using riverine, lake, and estuarine habitats; incorporating opportunistic and active feeding strategies; defending territories from competitors including other parr; and working together in small schools to actively pursue prey (Gibson

1993; Marschall et al.1998; Pepper 1976; Pepper et al. 1984; Erkinaro et al. 1998; Halvorsen and Svenning 2000; Hutchings 1986; O'Connell and Ash 1993; Erkinaro et al. 1995; Dempson et al. 1996; Klemetsen et al. 2003).

In a parr's second or third spring (age 1 or age 2 respectively), when it has grown to 12.5 to 15 cm in length, a series of physiological, morphological, and behavioral changes occur (Schaffer and Elson 1975). This process, called "smoltification," prepares the parr for migration to the ocean and life in salt water. In Maine, the vast majority of naturally reared parr remain in freshwater for 2 years (90 percent or more) with the balance remaining for either 1 or 3 years (USASAC 2005). In order for parr to undergo smoltification, they must reach a critical size of 10 cm total length at the end of the previous growing season (Hoar 1988). During the smoltification process, parr markings fade and the body becomes streamlined and silvery with a pronounced fork in the tail. Naturally reared smolts in Maine range in size from 13 to 17 cm, and most smolts enter the sea during May to begin their first ocean migration (USASAC 2004). During this migration, smolts must contend with changes in salinity, water temperature, pH, dissolved oxygen, pollution levels, and predator assemblages. The physiological changes that occur during smoltification prepare the fish for the dramatic change in osmoregulatory needs that come with the transition from a fresh to a salt water habitat (Ruggles 1980; Bley 1987; McCormick and Saunders 1987; McCormick et al. 1998). The transition of smolts into seawater is usually gradual as they pass through a zone of fresh and saltwater mixing that typically occurs in a river's estuary. Given that smolts undergo smoltification while they are still in the river, they are pre-adapted to make a direct entry into seawater with minimal acclimation (McCormick et al. 1998). This pre-adaptation to seawater is necessary under some circumstances where there is very little transition zone between freshwater and the marine environment.

The spring migration of post-smolts out of the coastal environment is generally rapid, within several tidal cycles, and follows a direct route (Hyvarinen et al. 2006; Lacroix and McCurdy 1996; Lacroix et al. 2004, 2005). Kocik et al. (2009) documented smolt migrating with the tides primarily at night. Post-smolts generally travel out of coastal systems on the ebb tide and may be delayed by flood tides (Hyvarinen et al. 2006; Lacroix and McCurdy 1996; Lacroix et al. 2004, 2005). Lacroix and McCurdy (1996), however, found that post-smolts exhibit active, directed swimming in areas with strong tidal currents. Studies in the Bay of Fundy and Passamaquoddy Bay suggest that post-smolts aggregate together and move near the coast in "common corridors" and that post-smolt movement is closely related to surface currents in the Bay (Hyvarinen et al. 2006; Lacroix and McCurdy 1996; Lacroix et al. 2004). European post-smolts tend to use the open ocean for a nursery zone, while North American post-smolts appear to have a more near-shore distribution (Friedland et al. 2003). Post-smolt distribution may reflect water temperatures (Reddin and Shearer 1987) and/or the major surface-current vectors (Lacroix and Knox 2005). Post-smolts live mainly on the surface of the water column and form shoals, possibly of fish from the same river (Shelton et al. 1997).

During the late summer and autumn of the first year, North American post-smolts are concentrated in the Labrador Sea and off of the west coast of Greenland, with the highest concentrations between 56 °N. and 58°N. (Reddin 1985; Reddin and Short 1991; Reddin and Friedland 1993). The salmon located off Greenland are composed of both 1SW fish and fish that have spent multiple years at sea (multi-sea winter fish, or MSW) and includes immature salmon from both North American and European stocks (Reddin 1988; Reddin et al. 1988). The first winter at sea regulates annual recruitment, and the distribution of winter habitat in the Labrador Sea and Denmark Strait may be critical for North American populations (Friedland et al. 1993). In the spring, North American post-smolts are generally located in the Gulf of St. Lawrence, off the coast of Newfoundland, and on the east coast of the Grand Banks (Reddin 1985; Dutil and Coutu 1988; Ritter 1989; Reddin and Friedland 1993; and Friedland et al. 1999).

Some salmon may remain at sea for another year or more before maturing. After their second winter at sea, the salmon over-winter in the area of the Grand Banks before returning to their natal rivers to spawn (Reddin and Shearer 1987). Reddin and Friedland (1993) found non-maturing adults located along the coasts of Newfoundland, Labrador, and Greenland, and in the Labrador and Irminger Sea in the later summer and autumn.

Status and Trends of Atlantic Salmon Rangewide

The abundance of Atlantic salmon within the range of the GOM DPS has been generally declining since the 1800s (Fay et al. 2006). Data sets tracking adult abundance are not available throughout this entire time period; however, Fay et al. (2006) present a comprehensive time series of adult returns to the GOM DPS dating back to 1967. It is important to note that contemporary abundance levels of Atlantic salmon within the GOM DPS are several orders of magnitude lower than historical abundance estimates. For example, Foster and Atkins (1869) estimated that roughly 100,000 adult salmon returned to the Penobscot River alone before the river was dammed, whereas contemporary estimates of abundance for the entire GOM DPS have rarely exceeded 5,000 individuals in any given year since 1967 (Fay et al. 2006).

Contemporary abundance estimates are informative in considering the conservation status of the GOM DPS today. After a period of population growth in the 1970s, adult returns of salmon in the GOM DPS have been steadily declining since the early 1980s and appear to have stabilized at very low levels since 2001, which a slight increase in abundance during 2008 and 2009 (Figure 2). The population growth observed in the 1970s is likely attributable to favorable marine survival and increases in hatchery capacity, particularly from GLNFH that was constructed in 1974. Marine survival remained relatively high throughout the 1980s, and salmon populations in the GOM DPS remained relatively stable until the early 1990s. In the early 1990s marine survival rates decreased, leading to the declining trend in adult abundance observed throughout 1990s. Poor marine survival persists in the GOM DPS to date.

Adult returns to the GOM DPS have been very low for many years and remain extremely low in terms of adult abundance in the wild. Further, the majority of all adults in the GOM DPS return to a single river, the Penobscot, which accounted for 91 percent of all adult returns to the GOM DPS in 2007. Of the 1044 adult returns to the Penobscot in 2006, 996 of these were the result of smolt stocking and only the remaining 48 were naturally-reared. A total of 916 and 2,117 adult salmon returned to the Penobscot River in 2007 and 2008, respectively. Most of these returns were also of hatchery origin (USASAC 2008). The term naturally-reared includes fish originating from natural spawning and from hatchery fry (USASAC 2008). Hatchery fry are included as naturally-reared because hatchery fry are not marked; therefore, they cannot be distinguished from fish produced through natural spawning. Because of the extensive amount of fry stocking that takes place in an effort to recover the GOM DPS, it is possible that a substantial number of fish counted as naturally-reared were actually stocked as fry.

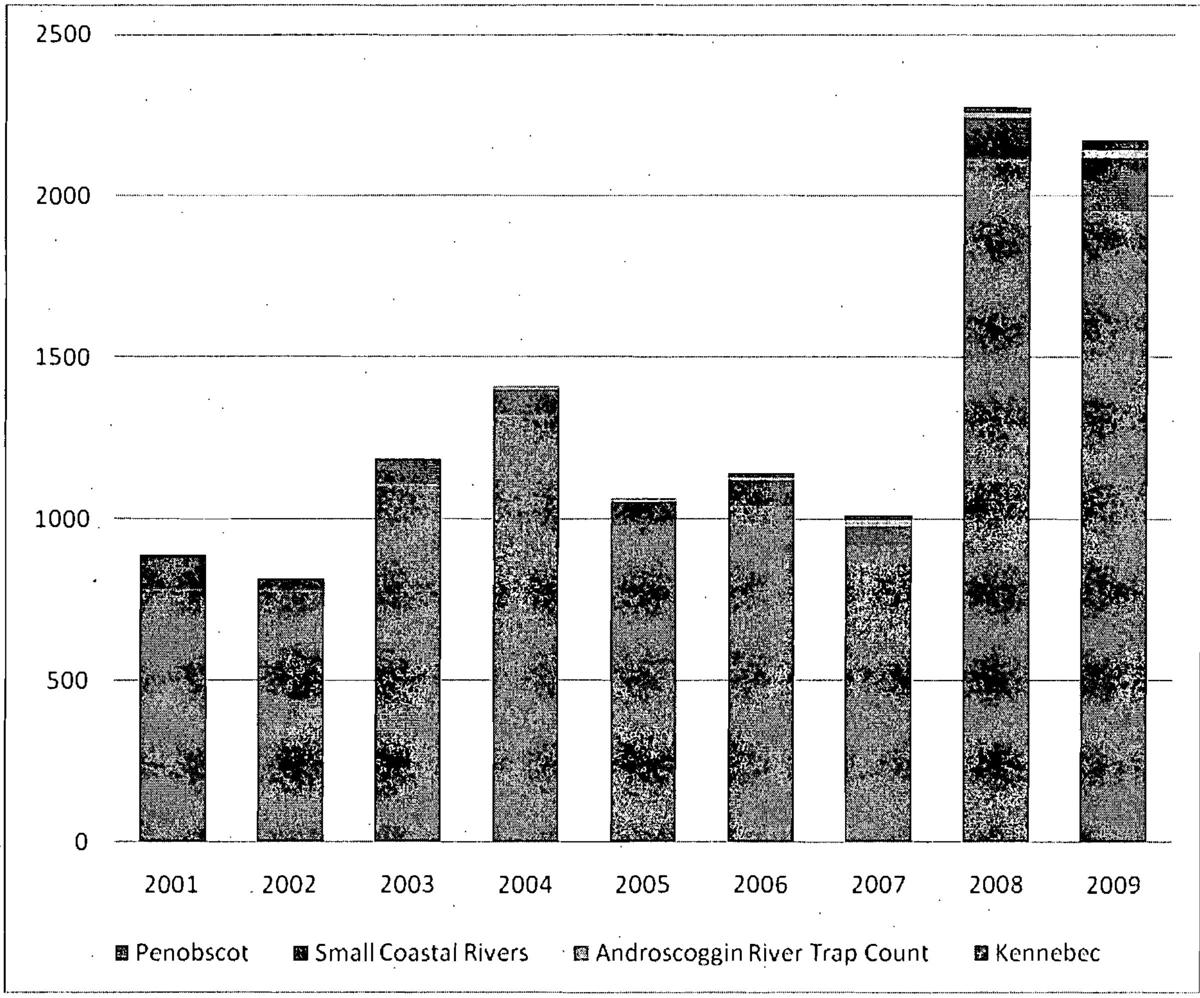

Figure 2. Adult returns to the GOM DPS 2001-2009.

Low abundances of both hatchery-origin and naturally-reared adult salmon returns to Maine demonstrate continued poor marine survival. Declines in hatchery-origin adult returns are less sharp because of the ongoing effects of hatcheries. In short, hatchery production over this time period has been relatively constant, generally fluctuating around 550,000 smolts per year (USASAC 2008). In contrast, the number of naturally reared smolts emigrating each year is likely to decline following poor returns of adults (three years prior). Thus, wild smolt production would suffer three years after a year with low adult returns, because the progeny of adult returns typically emigrate three years after their parents return. The relatively constant inputs from smolt stocking, coupled with the declining trend of naturally reared adults, result in the apparent stabilization of hatchery-origin salmon and the continuing decline of naturally reared components of the GOM DPS observed over the last two decades.

Adult returns for the GOM DPS remain well below conservation spawning escapement (CSE) goals that are widely used (ICES 2005) to describe the status of individual Atlantic salmon populations. When CSE goals are met, Atlantic salmon populations are generally self-sustaining. When CSE goals are not met (i.e., less than 100 percent), populations are not reaching full potential; and this can be indicative of a population decline. For all GOM DPS rivers in Maine, current Atlantic salmon populations (including hatchery contributions) are well below CSE levels required to sustain themselves (Fay et al. 2006), which is further indication of their poor population status.

In conclusion, the abundance of Atlantic salmon in the GOM DPS has been low and either stable or declining over the past several decades. The proportion of fish that are of natural origin is very small (approximately 10%) and is continuing to decline. The conservation hatchery program has assisted in slowing the decline and helping to stabilize populations at low levels, but has not contributed to an increase in the overall abundance of salmon and has not been able to halt the decline of the naturally reared component of the GOM DPS.

3.2. Critical Habitat

Coincident with the June 19, 2009 endangered listing, NMFS designated critical habitat for the GOM DPS of Atlantic salmon (74 FR 29300; June 19, 2009) (Figure 3). Designation of critical habitat is focused on the known primary constituent elements (PCEs) within the occupied areas of a listed species that are deemed essential to the conservation of the species. Within the GOM DPS, the PCEs for Atlantic salmon are 1) sites for spawning and rearing and 2) sites for migration (excluding marine migration[3]). NMFS chose not to separate spawning and rearing habitat into distinct PCEs, although each habitat does have distinct features, because of the GIS-based habitat prediction model approach that was used to designate critical habitat (74 FR 29300; June 19, 2009). This model cannot consistently distinguish between spawning and rearing habitat across the entire range of the GOM DPS.

The physical and biological features of the two PCEs for Atlantic salmon critical habitat are as follows:

Physical and Biological Features of the Spawning and Rearing PCE

A1. Deep, oxygenated pools and cover (e.g., boulders, woody debris, vegetation, etc.), near freshwater spawning sites, necessary to support adult migrants during the summer while they await spawning in the fall.

A2. Freshwater spawning sites that contain clean, permeable gravel and cobble substrate with oxygenated water and cool water temperatures to support spawning activity, egg incubation, and larval development.

A3. Freshwater spawning and rearing sites with clean, permeable gravel and cobble substrate with oxygenated water and cool water temperatures to support emergence, territorial development and feeding activities of Atlantic salmon fry.

A4. Freshwater rearing sites with space to accommodate growth and survival of Atlantic salmon parr.

A5. Freshwater rearing sites with a combination of river, stream, and lake habitats that

3 Although successful marine migration is essential to Atlantic salmon, NMFS was not able to identify the essential features of marine migration and feeding habitat or their specific locations at the time critical habitat was designated.

accommodate parr's ability to occupy many niches and maximize parr production.

A6. Freshwater rearing sites with cool, oxygenated water to support growth and survival of Atlantic salmon parr.

A7. Freshwater rearing sites with diverse food resources to support growth and survival of Atlantic salmon parr.

Physical and Biological Features of the Migration PCE

B1. Freshwater and estuary migratory sites free from physical and biological barriers that delay or prevent access of adult salmon seeking spawning grounds needed to support recovered populations.

B2. Freshwater and estuary migration sites with pool, lake, and instream habitat that provide cool, oxygenated water and cover items (e.g., boulders, woody debris, and vegetation) to serve as temporary holding and resting areas during upstream migration of adult salmon.

B3. Freshwater and estuary migration sites with abundant, diverse native fish communities to serve as a protective buffer against predation.

B4. Freshwater and estuary migration sites free from physical and biological barriers that delay or prevent emigration of smolts to the marine environment.

B5. Freshwater and estuary migration sites with sufficiently cool water temperatures and water flows that coincide with diurnal cues to stimulate smolt migration

B6. Freshwater migration sites with water chemistry needed to support sea water adaptation of smolts.

Habitat areas designated as critical habitat must contain one or more PCEs within the acceptable range of values required to support the biological processes for which the species uses that habitat. Critical habitat has only been designated in areas considered currently occupied by the species. Critical habitat includes the stream channels within the designated stream reach and includes a lateral extent as defined by the ordinary high-water line or the bankfull elevation in the absence of a defined high-water line. In estuaries, critical habitat is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of extreme high water, whichever is greater.

For an area containing PCEs to meet the definition of critical habitat, the ESA also requires that the physical and biological features essential to the conservation of Atlantic salmon in that area "may require special management considerations or protections." Activities within the GOM DPS that were identified as potentially affecting the physical and biological features and therefore requiring special management considerations or protections include agriculture, forestry, changing land-use and development, hatcheries and stocking, roads and road crossings, mining, dams, dredging, and aquaculture.

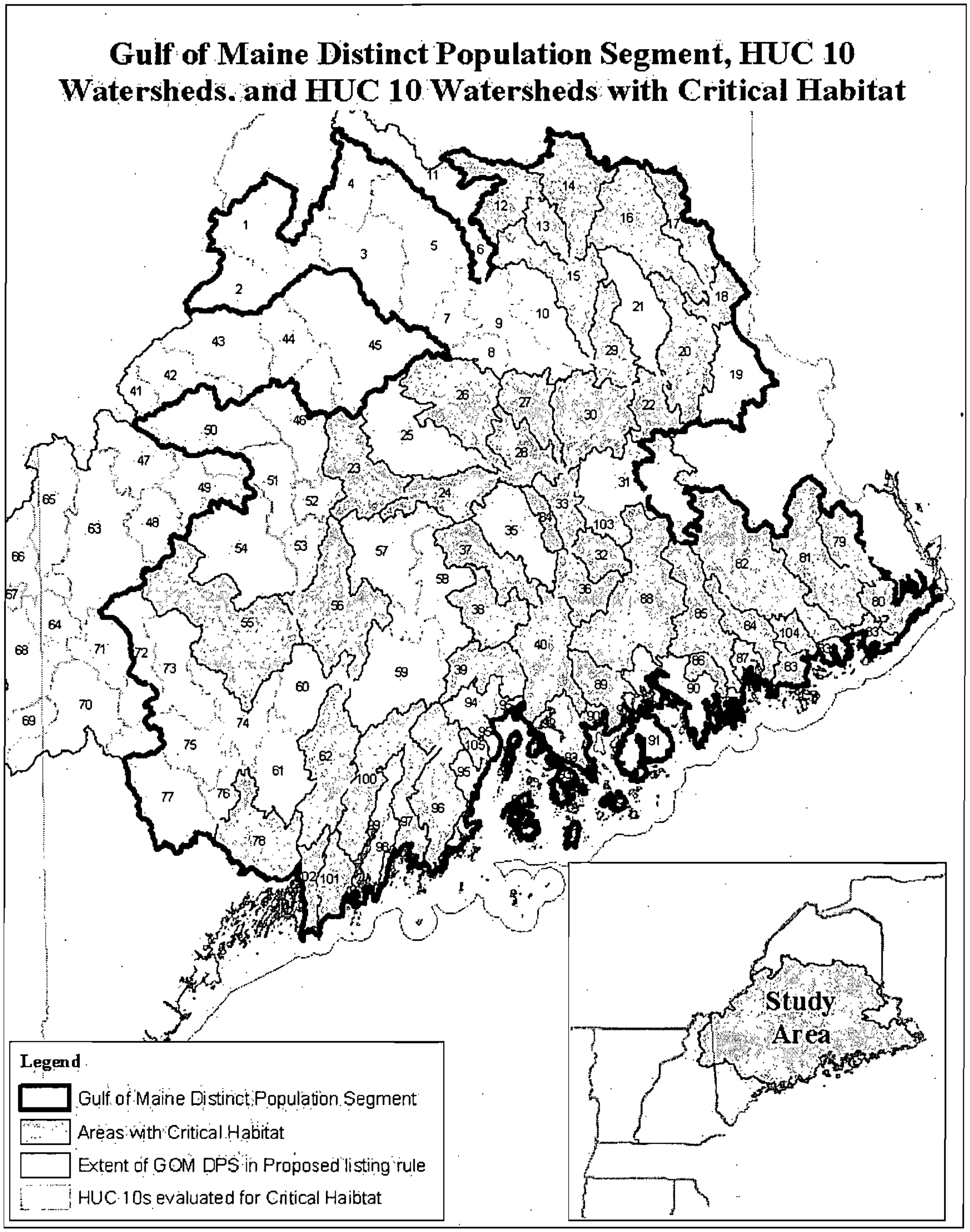

Figure 3. HUC 10 watersheds designated as Atlantic salmon critical habitat within the GOM DPS.

Salmon Habitat Recovery Units within Critical Habitat for the GOM DPS

In describing critical habitat for the Gulf of Maine DPS, NMFS divided the GOM DPS into three Salmon Habitat Recovery Units or SHRUs. The three SHRUs are the Downeast Coastal, Penobscot Bay, and Merrymeeting Bay. The SHRU delineations were designed by NMFS to ensure that a recovered Atlantic salmon population has widespread geographic distribution to help maintain genetic variability and, therefore, a greater probability of population sustainability in the future. Areas designated as critical habitat within each SHRU are described in terms of habitat units. One habitat unit represents 100 m^2 of suitable salmon habitat (which could be spawning and rearing habitat or migration habitat). Habitat units within the GOM DPS were estimated through the use of a GIS-based salmon habitat model (Wright et al. 2008). Additionally, NMFS discounted the functional capacity of modeled habitat units in areas where habitat degradation has affected the PCEs. For each SHRU, NMFS determined that 30,000 fully functional units of habitat are needed in order to achieve recovery objectives for Atlantic salmon. Brief historical descriptions for each SHRU, as well as contemporary critical habitat designations and special management considerations, are provided below.

Merrymeeting Bay SHRU

In the Merrymeeting Bay SHRU, there are approximately 372,600 units of historically accessible spawning and rearing habitat for Atlantic salmon located among approximately 5,950 km of historically accessible rivers, lakes and streams. Of the 372,600 units of spawning and rearing habitat, approximately 136,000 units of habitat are considered to be currently occupied. Of the 136,000 occupied units within the Merrymeeting Bay SHRU, NMFS calculated these units to be the equivalent of nearly 40,000 functional units or approximately 11 percent of the historical functional potential. This estimate is based on the configuration of dams within the Merrymeeting Bay SHRU that limit migration and other activities that cause degradation of physical and biological features from land use activities which reduce the productivity of habitat within each HUC 10. The combined quality and quantities of habitat available to Atlantic salmon within the currently occupied areas within the Merrymeeting Bay SHRU meet the objective of 30,000 fully functional units of habitat available to Atlantic salmon.

In conclusion, the June 19, 2009 final critical habitat designation for the GOM DPS includes 45 specific areas occupied by Atlantic salmon that comprise approximately 19,571 km of perennial river, stream, and estuary habitat and 799 square km of lake habitat within the range of the GOM DPS and on which are found those physical and biological features essential to the conservation of the species which may require special management consideration. Within the occupied range of the GOM DPS, approximately 1,256 km of river, stream, and estuary habitat and 100 square km of lake habitat have been excluded from critical habitat pursuant to section 4(b)(2) of the ESA.

3.3. Summary of Factors Affecting Recovery of Atlantic salmon

The recovery plan for the previously designated GOM DPS (NMFS and USFWS 2005) and the most recent status review (Fay et al. 2006) as well as the 2009 listing rule, provide a comprehensive assessment of the many factors, including both threats and conservation actions, currently impacting listed Atlantic salmon.

Efforts to Protect the GOM DPS and its Critical Habitat

Efforts aimed at protecting Atlantic salmon and their habitats in Maine have been underway for well over one hundred years. These efforts are supported by a number of federal, state, and local government agencies, as well as many private conservation organizations. The 2005 recovery plan for the originally-listed GOM DPS (NMFS and USFWS 2005) presented a strategy for recovering Atlantic salmon that focused on reducing the most severe threats to the species and immediately halting the decline of the species to prevent extinction. The 2005 recovery plan included the following elements:

1. Protect and restore freshwater and estuarine habitats;
2. Minimize potential for take in freshwater, estuarine, and marine fisheries;
3. Reduce predation and competition for all life-stages of Atlantic salmon;
4. Reduce risks from commercial aquaculture operations;
5. Supplement wild populations with hatchery-reared DPS salmon;
6. Conserve the genetic integrity of the DPS;
7. Assess stock status of key life stages;
8. Promote salmon recovery through increased public and government awareness; and
9. Assess effectiveness of recovery actions and revise as appropriate.

A wide variety of activities have focused on protecting Atlantic salmon and restoring the GOM DPS, including (but not limited to) hatchery supplementation; removing dams or providing fish passage; improving road crossings that block passage or degrade stream habitat; protecting riparian corridors along rivers; reducing the impact of irrigation water withdrawals; limiting effects of recreational and commercial fishing; reducing the effects of finfish aquaculture; outreach and education activities; and research focused on better understanding the threats to Atlantic salmon and developing effective restoration strategies. In light of the 2009 GOM DPS listing and designation of critical habitat, the Services will produce a new recovery plan for the GOM DPS of Atlantic salmon.

Threats to Atlantic Salmon Recovery

A threats assessment performed as part of the 2005 recovery plan resulted in the following list of high priority threats requiring action to reverse the decline of GOM DPS salmon populations:

- Acidified water and associated aluminum toxicity, which decrease juvenile survival
- Aquaculture practices, which pose ecological and genetic risks
- Avian predation
- Changing land use patterns (e.g., development, agriculture, forestry)
- Climate change
- Depleted diadromous fish communities
- Incidental capture of adults and parr by recreational anglers
- Introduced fish species that compete or prey on Atlantic salmon
- Low marine survival

- Poaching of adults in DPS rivers
- Recovery hatchery program (potential for artificial selection/domestication)
- Sedimentation of spawning and rearing habitat
- Water extraction

It is important to note that this analysis was conducted for the species as listed in 2000 and therefore did not include the Atlantic salmon population throughout the Androscoggin, Kennebec and Penobscot Rivers.

Fay et al. (2006) examined each of the five statutory ESA listing factors and determined that each of the five listing factors is at least partly responsible for the present low abundance of the GOM DPS. The information presented in Fay et al. (2006) is reflected in and supplemented by the final listing rule for the new GOM DPS (74 FR 29344; June 19, 2009). The following gives a brief overview of the five listing factors as related to the GOM DPS.

1. **Present or threatened destruction, modification, or curtailment of its habitat or range** – Historically and, to a lesser extent currently, dams have adversely impacted Atlantic salmon by obstructing fish passage and degrading riverine habitat. Dams are considered to be one of the primary causes of both historic declines and the contemporary low abundance of the GOM DPS. Land use practices, including forestry and agriculture, have reduced habitat complexity (e.g., removal of large woody debris from rivers) and habitat connectivity (e.g., poorly designed road crossings) for Atlantic salmon. Water withdrawals, elevated sediment levels, and acid rain also degrade Atlantic salmon habitat.

2. **Overutilization for commercial, recreational, scientific, or educational purposes** – While most directed commercial fisheries for Atlantic salmon have ceased, the impacts from past fisheries are still important in explaining the present low abundance of the GOM DPS. Both poaching and by-catch in recreational and commercial fisheries for other species remain of concern, given critically low numbers of salmon.

3. **Predation and disease** – Natural predator-prey relationships in aquatic ecosystems in the GOM DPS have been substantially altered by introduction of non-native fishes (e.g., chain pickerel, smallmouth bass, and northern pike), declines of other native diadromous fishes, and alteration of habitat by impounding free-flowing rivers and removing instream structure (such as removal of boulders and woody debris during the log-driving era). The threat of predation on the GOM DPS is noteworthy because of the imbalance between the very low numbers of returning adults and the recent increase in populations of some native predators (e.g., double-crested cormorant), as well as non-native predators. Atlantic salmon are susceptible to a number of diseases and parasites, but mortality is primarily documented at conservation hatcheries and aquaculture facilities.

4. **Inadequacy of existing regulatory mechanisms** – The ineffectiveness of current federal and state regulations at requiring fish passage and minimizing or mitigating the aquatic habitat impacts of dams is a significant threat to the GOM DPS today. Furthermore, most dams in the GOM DPS do not require state or federal permits. Although the State of Maine has made substantial progress in regulating water withdrawals for agricultural use,

threats still remain within the GOM DPS, including those from the effects of irrigation wells on salmon streams.

5. **Other natural or manmade factors** – Poor marine survival rates of Atlantic salmon are a significant threat, although the causes of these decreases are unknown. The role of ecosystem function among the freshwater, estuarine, and marine components of the Atlantic salmon's life history, including the relationship of other diadromous fish species in Maine (e.g., American shad, alewife, sea lamprey), is receiving increased scrutiny in its contribution to the current status of the GOM DPS and its role in recovery of the Atlantic salmon. While current state and federal regulations pertaining to finfish aquaculture have reduced the risks to the GOM DPS (including eliminating the use of non-North American Atlantic salmon and improving containment protocols), risks from the spread of diseases or parasites and from farmed salmon escapees interbreeding with wild salmon still exist.

Threats to Critical Habitat within the GOM DPS

The final rule designating critical habitat for the GOM DPS identifies a number of activities that have and will likely continue to impact the biological and physical features of spawning, rearing, and migration habitat for Atlantic salmon. These include agriculture, forestry, changing land-use and development, hatcheries and stocking, roads and road-crossings and other instream activities (such as alternative energy development), mining, dams, dredging, and aquaculture. Most of these activities have or still do occur, at least to some extent, in each of the three SHRUs.

The Penobscot SHRU once contained high quality Atlantic salmon habitat in quantities sufficient to support robust Atlantic salmon populations. The mainstem Penobscot has the highest biological value to the Penobscot SHRU because it provides a central migratory corridor crucial for the entire Penobscot SHRU. Dams, along with degraded substrate and cover, water quality, water temperature, and biological communities, have reduced the quality and quantity of habitat available to Atlantic salmon populations within the Penobscot SHRU. A combined total of twenty FERC-licensed hydropower dams in the Penobscot SHRU significantly impede the migration of Atlantic salmon and other diadromous fish to nearly 300,000 units of historically accessible spawning and rearing habitat. Agriculture and urban development largely affect the lower third of the Penobscot SHRU below the Piscataquis River sub-basin by reducing substrate and cover, reducing water quality, and elevating water temperatures. Introductions of smallmouth bass and other non-indigenous species significantly degrade habitat quality throughout the mainstem Penobscot and portions of the Mattawamkeag, Piscataquis, and lower Penobscot sub-basins by altering predator/prey relationships. Similar to smallmouth bass, recent Northern pike introductions threaten habitat in the lower Penobscot River below the Great Works Dam.

Today, dams are the greatest impediment, outside of marine survival, to the recovery of salmon in the Penobscot, Kennebec and Androscoggin river basins (Fay et al. 2006). Hydropower dams in the Merrymeeting Bay SHRU significantly impede the migration of Atlantic salmon and other diadromous fish and either reduce or eliminate access to roughly 352,000 units of historically accessible spawning and rearing habitat. In addition to hydropower dams, agriculture and urban development largely affect the lower third of the Merrymeeting Bay SHRU by reducing substrate and cover, reducing water quality, and elevating water temperatures. Additionally, smallmouth bass and brown trout introductions, along with other non-indigenous species, significantly degrade habitat quality throughout the Merrymeeting Bay SHRU by altering natural predator/prey relationships.

Impacts to substrate and cover, water quality, water temperature, biological communities, and migratory corridors, among a host of other factors, have impacted the quality and quantity of habitat available to Atlantic salmon populations within the Downeast Coastal SHRU. Two hydropower dams on the Union river, and to a lesser extent the small ice dam on the lower Narraguagus River, limit access to roughly 18,500 units of spawning and rearing habitat within these two watersheds. In the Union River, which contains over 12,000 units of spawning and rearing habitat, physical and biological features have been most notably limited by high water temperatures and abundant smallmouth bass populations associated with impoundments. In the Pleasant River and Tunk Stream, which collectively contain over 4,300 units of spawning and rearing habitat, pH has been identified as possibly being the predominate limiting factor. The Machias, Narraguagus, and East Machias rivers contain the highest quality habitat relative to other HUC 10's in the Downeast Coastal SHRU and collectively account for approximately 40 percent of the spawning and rearing habitat in the Downeast Coastal SHRU.

4. ENVIRONMENTAL BASELINE

The Environmental Baseline provides a snapshot of a species health or status at a given time within the action area and is used as the biological basis upon which to analyze the effects of the proposed action. Assessment of the environmental baseline includes an analysis of the past and present impacts of all state, federal, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02). The environmental baseline for this biological opinion includes the effects of several activities that may affect the survival and recovery of the endangered species in the action area. The activities that shape the environmental baseline in the action area of this consultation generally include: water quality impacts, scientific research, recreational fisheries, and recovery activities associated with reducing those impacts.

4.1. Status of the Gulf of Maine DPS and Critical Habitat in the Action Area

A summary of the status of the species rangewide and designated critical habitat in its entirety was provided above. This section will focus on the status of Atlantic salmon and designated critical habitat in the action area. Due to the fact that the project is located in the tidal portion of Bond Brook, it is reasonable to assume that only migratory life stages (e.g. smolt and adults) of Atlantic salmon would be present in the vicinity of this project.

Status and Trends of Atlantic salmon in the Action Area

At the time the GOM DPS was listed, the Services determined that the Kennebec River supported a population of naturally reproducing Atlantic salmon. Bond Brook flows into the Kennebec River just downstream of the former Edwards dam site. There is mapped spawning and rearing habitat approximately 2,000-feet upstream of the proposed crossings of Bond Brook. The lower tidal portion of the stream, however, is primarily suitable as migratory habitat.

The Edwards Dam was constructed in Augusta in the 1830s a quarter mile upriver from the confluence of the Kennebec River with Bond Brook. In 1999, the dam was removed opening up approximately 20 miles of habitat to Atlantic salmon. During the approximately 170 years when passage was blocked in the mainstem, adult salmon used the lower tributaries of the Kennebec (Bond Brook and Togus Stream) for spawning, rearing and, in the case of Bond Brook, thermal refuge in the warm summer months. Prior to 1999, as many as 100 adult Atlantic salmon could be observed resting in the deep pool adjacent to the Water Street Bridge when the water temperatures in the river were high. Since the dam's removal, however, no fish have been observed using this pool as thermal refuge; presumably because they have located other refugia upstream of the former dam site. Similarly, the removal of the dam marked a turning point in salmon usage of Bond Brook and Togus Stream. The surveys conducted since the dam removal in 1999 by the MDMR indicate that spawning has all but ceased in Bond Brook (only 1 redd found over 10 years of observation).

MDMR has conducted annual baseline monitoring of Atlantic salmon populations in Bond Brook for the last 10 years. The surveys focus on spawning and rearing habitat in the upper portion of the Brook. Between 2000 and 2009 only one redd was found, and that was discovered in 2000. Parr surveys have been conducted annually over the same time period and no salmon have been identified. However, in spring 2010, due to an increase in spawning in the Sheepscot River, the MDMR stocked Bond Brook with 30,000 Atlantic salmon fry (Paul Christman, MDMR, pers. comm.). In the fall of 2010, 0+ parr were found throughout the system. In 2011, when construction is anticipated to occur, these parr would be age 1. Parr are quite mobile and given the number of fry stocked, it is possible they could occur in lower Bond Brook at certain times of year. Parr are known to take up residency in tidal areas in the winter prior to their movement out of a river system as smolts the following spring. Any parr in the tidal portion of Bond Brook in the summer would likely be transient and would not take up full-time summer residency (Norm Dube, MDMR, pers. comm.). The June 1-October 1 work window is protective of smolts, as well as any pre-smolt parr residing in the tidal portion of the stream in the winter in preparation for outmigration as these life stages are unlikely to be present in the action area during the work window. Therefore, the only salmon that are anticipated to be affected by this project are adults.

In addition to the work in the lower tidal portion of Bond Brook, this project will entail the crossing (Crossings #1 and #2) of two small tributaries in the non-tidal portion of the stream; both located approximately 4,000 feet upstream of the Mount Vernon Avenue Bridge. It is likely that some of the juvenile salmon that were stocked in 2010 are in Bond Brook in the vicinity of these tributaries. However, the tributaries themselves are small, intermittent, and are unlikely to provide suitable habitat to juvenile salmon at low flows (Norm Dube and Paul Christman, MDMR, pers. comm.); therefore, juvenile salmon are unlikely to occur in the tributaries. At the flows anticipated during construction it is not expected that any sedimentation or noise effects in these tributaries will extend downstream to Bond Brook where juvenile salmon may be present.

Status and Trends of Critical Habitat in the Action Area

The environmental baseline of this Opinion describes the status of salmonid habitat, which is important for two reasons: a) because it affects the viability of the listed species within the action area at the time of the consultation; and b) because those habitat areas designated "critical" provide primary constituent elements (PCEs) essential for the conservation (i.e., recovery) of the species. The environmental baseline also describes the status of critical habitat over the duration of the proposed action because it includes the persistent effects of past actions and the future effects of Federal actions that have not taken place but have already undergone Section 7 consultation.

The complex life cycles exhibited by Atlantic salmon give rise to complex habitat needs, particularly during the freshwater phase (Fay et al. 2006). Spawning gravels must be a certain size and free of sediment to allow successful incubation of the eggs. Eggs also require cool, clean, and well-oxygenated waters for proper development. Juveniles need abundant food sources, including insects, crustaceans, and other small fish. They need places to hide from predators (mostly birds and bigger fish), such as under logs, root wads, and boulders in the stream, as well as beneath overhanging vegetation. They also need places to seek refuge from periodic high flows (side channels and off-channel areas) and from warm summer water temperatures (coldwater springs and deep pools). Returning adults generally do not feed in fresh water but instead rely on limited energy stores to migrate, mature, and spawn. Like juveniles, they also require cool water and places to rest and hide from predators. During all life stages, Atlantic salmon require cool water that is free of contaminants. They also need migratory corridors with adequate passage conditions (timing, water quality, and water quantity) to allow access to the various habitats required to complete their life cycle.

As discussed in Section 3.2, critical habitat for Atlantic salmon has been designated in Bond Brook. Both PCEs for Atlantic salmon (sites for spawning and rearing and sites for migration) are present in the action area of this consultation. PCEs consist of the physical and biological elements identified as essential to the conservation of the species in the documents designating critical habitat. These PCEs include sites essential to support one or more life stages of Atlantic salmon (sites for spawning, rearing, and migration) and contain physical or biological features essential to the conservation of the species, for example, spawning gravels, water quality and quantity, unobstructed passage, and forage.

The spawning and rearing PCE occurs upstream of the project area and is therefore not expected to be directly affected by this project. The project will cause a temporary delay in migration for Atlantic salmon moving upstream to spawning habitat during the summer months. This temporary reduction in the habitat suitability is not anticipated to extend beyond the conclusion of construction.

Factors Affecting Atlantic salmon in the Action Area

Non-Federally Regulated Fishery Operations

Unauthorized take of Atlantic salmon is prohibited by the ESA. However, if present, Atlantic salmon juveniles may be taken incidentally in brook trout fisheries by recreational anglers. Bond Brook falls under general regulations for Maine Department of Inland Fish and Wildlife fishing regulations. Due to a lack of reporting, no information on the number of Atlantic salmon caught and released or killed in recreational fisheries in Bond Brook is available.

Contaminants and Water Quality

Point source and non-point source discharges (i.e., wastewater, agricultural or erosion) could potentially contribute to diminished water quality and sedimentation that impacts Atlantic salmon habitat in Bond Brook. Loss of riparian habitat in the stream from private and commercial development is also likely degrading water quality and habitat in Bond Brook through sedimentation and thermal warming.

Habitat Fragmentation

Improperly designed or maintained road crossings fragment habitat used by Atlantic salmon. Habitat fragmentation prevents Atlantic salmon from accessing necessary habitat for various life stages of the species. While the extent of habitat fragmentation by road crossings in Bond Brook is presently unknown, road crossing surveys conducted in a similar watershed (Kenduskeag Stream) indicate the problem may be significant (Fay et al. 2006).

Scientific Studies

MDMR has conducted periodic monitoring of Atlantic salmon populations in Bond Brook since the 1990's (MDMR unpublished data). MDMR was authorized in 2001 to sample listed Atlantic salmon in the GOM DPS under the USFWS' endangered species blanket permit (No. 697823) issued pursuant to Section 10(a)(1)(A) of the ESA. Under USFWS permit No. 697823, MDMR is authorized to take (typically meaning capture) up to 2% of any given lifestage of Atlantic salmon during scientific research and recovery efforts (except for adults of which less than 1% can be taken). Lethal take of salmon in Bond Brook during MDMR sampling is expected to be less than 2% consistent with take estimates for other Maine streams where such records are maintained by MDMR.

Climate Change

There is a large and growing body of literature on past, present, and future impacts of global climate change induced by human activities - frequently referred to in layman's terms as "global warming." Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. The EPA's climate change webpage provides basic background information on these and other measured or anticipated effects (see www. epa.gov/climatechange/index.html). Activities in the action area that may have contributed to global warming include the combustion of fossil fuels by vessels.

The impact of climate change on Atlantic salmon is likely to be related to ocean acidification, changes in water temperatures, potential changes to salinity in rivers, and the potential decline of forage. These changes may effect the distribution of species and the fitness of individuals and populations due to the potential loss of foraging opportunities, displacement from ideal habitats and potential increase in susceptibility to disease (Elliot and Simmonds 2007). A decline in reproductive fitness as a result of global climate change could have profound effects on the abundance and distribution of Atlantic salmon in the action area, and throughout their range.

As described above, global climate change is likely to negatively affect Atlantic salmon by affecting the distribution of prey, water temperature and water quality. Any activities occurring within and outside the action area that contribute to global climate change are also expected to negatively affect Atlantic salmon in the action area. However, given the timeframe of the proposed action, which is expected to be complete by October 2011, it is unlikely that any new effects of climate change will be experienced by Atlantic salmon in the action area during this time period.

Conservation and Recovery Actions

In November 2005, NMFS and the USFWS issued the Final Recovery Plan for the Gulf of Maine Distinct Population Segment of Atlantic salmon (NMFS and USFWS 2005). The major areas of action in the recovery plan are designed to stop and reverse the downward population trends of Atlantic salmon populations and minimize the potential for human activities to result in the degradation or destruction of Atlantic salmon habitat essential to survival and recovery. The new recovery plan for the GOM DPS is expected to be issued in 2011.

4.2. Summary and Synthesis of the Status of the GOM DPS

The Status of the Species, Environmental Baseline, and Cumulative Effects Sections, taken together, establish a "baseline" against which the effects of the proposed action are analyzed to determine whether the action is likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of designated critical habitat. To the extent available information allows, this "baseline" (which does not include the future effects of the proposed action) would be compared to the backdrop plus the effects of the proposed action. The difference in the two trajectories would be reviewed to determine whether the proposed action is likely to jeopardize the continued existence of the species. This section synthesizes the Status of the Species, the Environmental Baseline, and Cumulative Effects sections.

Adult returns for the GOM DPS remain well below conservation spawning escapement (CSE). For all GOM DPS rivers in Maine, current Atlantic salmon populations (including hatchery contributions) are well below CSE levels required to sustain themselves (Fay et al. 2006), which is further indication of their poor population status. The abundance of Atlantic salmon in the GOM DPS has been low and either stable or declining over the past several decades. The proportion of fish that are of natural origin is very small (approximately 10%) and is continuing to decline. The conservation hatchery program has assisted in slowing the decline and helping to stabilize populations at low levels, but has not contributed to an increase in the overall abundance of salmon and has not been able to halt the decline of the naturally reared component of the GOM DPS.

A number of activities within the GOM DPS including Bond Brook will likely continue to impact the biological and physical features of spawning, rearing, and migration habitat for Atlantic salmon. These include agriculture, forestry, changing land-use and development, hatcheries and stocking, roads and road-crossings and other instream activities (such as alternative energy development), mining, dams, dredging, and aquaculture. Dams, along with degraded substrate and cover, water quality, water temperature, and biological communities, have reduced the quality and quantity of habitat available to Atlantic salmon populations within the GOM DPS.

Impacts from actions occurring in the Environmental Baseline have the potential to impact Atlantic salmon. Despite improvements in water quality and the elimination of directed fishing for these species, Atlantic salmon still face threats in Bond Brook. The number of listed GOM DPS Atlantic salmon in Bond Brook is very small. Data collected by the MDMR indicates that few if any listed adult Atlantic salmon are returning to Bond Brook. In addition, very few juvenile Atlantic salmon or spawning redds have been documented in the stream since 2000.

5. EFFECTS OF THE ACTION

This section of a biological opinion assesses the direct and indirect effects of the proposed action on threatened or endangered species or critical habitat, together with the effects of other activities that are interrelated or interdependent (50 CFR 402.02). Indirect effects are those that are caused later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. This biological opinion examines the likely effects (direct and indirect) of the proposed action on the GOM DPS of Atlantic salmon and its designated critical habitat within the context of the species' current status and the environmental baseline.

5.1. Effects to GOM DPS of Atlantic salmon

During construction the proposed action may affect Atlantic salmon by exposing individuals to increases in sediment, construction noise, riparian vegetation removal, temporary alterations in fish passage conditions, and by disturbing fish during the construction and removal of cofferdams and bypass structures. These temporary project related effects could potentially lead to avoidance behavior, which could in turn cause a delay in migration to upstream spawning habitat. As described in Section 3.1, adult salmon begin ascending the rivers within the GOM DPS beginning in the spring; although spawning does not occur until fall. Early migration is an adaptive trait that ensures adults have sufficient time to effectively reach spawning areas despite the occurrence of temporarily unfavorable conditions that naturally occur within rivers (Bjornn and Reiser 1991). Consequently, a delay in migration could potentially prevent adult Atlantic salmon from reaching suitable spawning habitat in time to spawn.

Cofferdam Construction Effects

Atlantic salmon may be killed or more likely temporarily disturbed, displaced, or injured by instream work activities. Isolation of a stream work area within a cofferdam is a conservation measure intended to minimize the overall adverse effects of construction activities on Atlantic salmon and their habitat. Isolating the work area within a cofferdam, however, could lead to negative impacts on fish if any individuals are trapped within the isolated work area. To minimize the probability of entrapping an adult Atlantic salmon within the work area, a daily visual survey will be conducted by qualified personnel to verify that there are no Atlantic salmon within the project area prior to and during the installation and removal of any in-water bypass structure, including cofferdams.

Salmon present during the installation of the cofferdam or turbidity curtain may either be temporarily disturbed or displaced so that they move away from the instream work area while a cofferdam or bypass structure is being installed. As discussed above, this could cause a delay in migration to spawning habitat upstream of the project area. Given the recent adult returns to GOM DPS rivers, the likelihood of an adult being present at any given project site is very small. Given the level of instream activity associated with setting up the cofferdams and other construction-related activities along the stream banks, any adult salmon present in the project area would very likely be disturbed and move away from the work zone. Based on the low number of adult Atlantic salmon likely to occur in the action area and the likelihood that any adult salmon present are likely to avoid the immediate project area, it is unlikely that any adult Atlantic salmon would become entrapped in a cofferdam or turbidity curtain. However, in the unlikely event that any Atlantic salmon are observed within an enclosed cofferdam, all in-water work will cease and the NMFS Maine Field Office will be contacted to remove the fish.

The stream bypass structures proposed by GAUD will allow continual flow of water through the project site for the duration of the project. This will minimize the probability that any part of the downstream channel will "dry" out, which could potentially strand adult salmon in downstream pools. In the eventuality that pumps will be required to pump water around the cofferdam, or to dewater an enclosed cofferdam, the intake hose has the potential to affect fish by causing impingement and entrainment. Approach velocities across the screen that are faster than a fish's swimming capability can draw and hold fish against the screen surface (*i.e.*, impingement), resulting in suffocation or physical damage to the fish (NMFS 2008). Impingement and entrainment can be avoided by putting a properly designed fish screen on the end of the intake hose. According to the best available information, the installation of a ¼-inch mesh screen on the end of an intake hose will protect fish (2.36-inches and longer) from entrainment and impingement. With the implementation of this protective measure, no Atlantic salmon are likely to become impinged or entrained in the diversion pumps. Diversion pumps should also have minimal, if any, effects on the diverse fish community in Bond Brook.

Sedimentation Effects

Construction activities that involve work in a stream or near the banks of the stream are likely to result in some level of sediment being discharged into the stream as a result of disturbance to either land-based soils or stream substrates. The amount of sediment entering streams in association with this project, however, is expected to be relatively minor given the measures proposed to minimize erosion and sedimentation. All instream work will be limited to the period from June 1 to October 1 when stream flows are relatively low, consequently limiting the potential for stream flows to generate erosion and carry sediment downstream. Furthermore, precipitation is usually fairly low during the summer in Maine, limiting the potential for rain and subsequent construction-site runoff to cause erosion and carry sediment into a stream. The project will be constructed using erosion and sedimentation controls. The erosion and sedimentation control plan will be approved and fully enforced by GAUD.

Salmon eggs and newly emerged fry, which are generally considered the most sensitive life stages to the effects of increased suspended sediments, will not be present in the action area during the summer instream work window (Robertson et al. 2007) and therefore will not be exposed to any increases in suspended sediment associated with the proposed action.

Limiting most instream work to a dewatered section of stream within a cofferdam will minimize the amount of sediment mobilized and distributed downstream. Turbid water from within a cofferdam will be pumped into the "dirty water" treatment system to minimize sedimentation impacts to the stream when the diverted water is returned downstream.

The installation and removal of the bypass (either a cofferdam or pipe diversion) can result in some amount of sediment being dispersed in the stream. Because most of the sediment in the project area is composed of sand and gravel, there is an opportunity for sediment to be mobilized and carried downstream by construction activities. Construction-related disturbances in riparian areas near the stream also have the potential to result in erosion and sediment entering the stream, particularly if there are rainstorms during periods when there are disturbed soils on the construction site. Strict adherence to the erosion and sedimentation control plan and vigilant monitoring by GAUD staff should minimize this source of erosion and subsequent sediment reaching the stream, as well.

Atlantic salmon are adapted to natural fluctuations in water turbidity, such as during high water events from spring runoff; a variety of anthropogenic activities, however, can result in short-term increases in suspended sediments and unnatural increases in stream turbidity (Robertson et al. 2007). Potential adverse effects of these increases in stream turbidity on Atlantic salmon could include the following (Robertson et al. 2006; Newcombe 1994): 1) reduction in feeding rates; 2) increased mortality; 3) physiological stress, including changes in cardiac output, ventilation rate, and blood sugar level; 4) behavioral avoidance of the work area; 5) physical injury (e.g., gill abrasion); 6) reduction in macroinvertebrates as a prey source, and 7) a reduction in territorial behavior. An increase in stream turbidity may provide temporary enhancement of cover conditions, which could result in less susceptibility to predation (Danie et al. 1984).

In a review of the effects of sediment loads and turbidity on fish, Newcombe and Jensen (1996) concluded that more than 6 days exposure to total suspended solids (TSS) greater than 10 mg/l is a moderate stress for juvenile and adult salmonids. A single day exposure to TSS in excess of 50 mg/l is also a moderate stress to salmonids. Robertson et al. (2007) found adverse effects to juvenile Atlantic salmon from short-term increases in suspended sediment at sediment levels as low as 15 nephelometric turbidity units (NTU) in a laboratory setting. Effects on fish from short-term turbidity increases (hours or days) are generally temporary and are reversed when turbidity levels return to background levels (Robertson et al. 2006).

In a study conducted by Foltz et al. (2008) on eleven culvert removals (2 to 5 foot diameter) on logging roads in Idaho and Washington; it was observed that turbidity measurements exceeded Idaho water quality standards (50 NTU above background) 300 feet downstream of the project location. However, when a sedimentation barrier was placed downstream of the project the sediment yield was reduced by 98%. Since the crossings proposed by GAUD will occur within dewatered cofferdams using appropriate erosion and sedimentation control BMPs, it is unlikely that the sedimentation effects will approach the levels detected by Foltz et al.

Based on the best available information outlined above, TSS levels that could be stressful to Atlantic salmon (i.e., 6 day exposure of 10mg/l or greater or single day exposure of 50mg/l or greater (Newcombe and Jensen 1996)), are unlikely to occur in association with the proposed action. The sediment and erosion control measures that will be employed for this project should keep sediment effects on Atlantic salmon to a minimal level on a temporary basis. Although the turbidity-related effects described above are expected to be minor and short-term and not result in any physiological stress or injury, it is possible that TSS levels will be high enough to cause avoidance behavior in adult Atlantic salmon that could contribute to a delay in migration to spawning habitat upstream of the project (see below).

Construction-Related Noise Effects

Hydroacoustic effects from construction activities can kill, injure, or affect the behavior of fish, including Atlantic salmon which could be present during the driving of sheetpiles when constructing the cofferdams. Extreme changes in pressure can be especially damaging to species that have swim bladders, such as salmonids, and can cause severe injury or mortality, either instantaneously or over the course of a few days, in individuals exposed for any length of time (NMFS 2003).

An interagency work group (including USFWS and NMFS), has reviewed the best available scientific information and developed criteria for assessing the potential of pile driving activities to cause direct physical injury to fish (*i.e.*, injury or "harm" in terms of the ESA) (Fisheries Hydroacoustic Working Group 2008). When evaluating potential injury impacts to fish, peak sound pressure (dB_{peak}) is often used (WSDOT 2010). The workgroup established dual sound criteria for injury, measured 10 meters away from the pile, of 206 dB_{Peak} and 187 dB_{SEL} (the second criteria applies only to fish weighing 2 grams or more).

The driving of sheet piles is a potential activity associated with this project, but was not specifically addressed by the hydroacoustic working group. While information on the expected sound levels expected in Bond Brook from the driving of sheet piles for cofferdam construction has not been developed by the ACOE or the applicant, data exist from monitoring of other sheet pile installation projects that allow for the comparison between the noise produced by driving sheet piles and the dual threshold criteria.

At this time it is unknown whether the sheet piles necessary for cofferdam construction will be installed with a vibratory or impact hammer. Overall, data collected on in-water noise produced by vibratory versus impact hammers demonstrate that vibratory hammers produce lower sound levels. Vibratory hammers produce sounds of lower intensity, with a rapid repetition rate. Based on monitoring of sheet pile installation projects, the California Department of Transportation (CADOT) determined that the noise produced by driving a sheet pile with an impact hammer was more intense (average of 5 piles: 204 dB_{Peak}, 188 dB_{RMS}, and 176 dB_{SEL}) than a sheet driven with a vibratory hammer (average of 10 piles: 172 dB_{Peak}, 159 dB_{RMS}, and 159 dB_{SEL}) at a distance of 10 meters from the piles (CADOT 2009). As the noise associated with driving sheetpiles in Bond Brook is likely to be similar to the monitoring results compiled by CADOT, it is reasonable to conclude that the noise produced from driving sheetpiles by either vibratory or impact hammer (204 dB_{Peak}, 176 dB_{SEL} and 1725 dB_{Peak}, 159 dB_{SEL} respectively) is unlikely to exceed the thresholds described by the hydroacoustic working group in 2008 (206 dB_{Peak} and 187 dB_{SEL}) and is therefore not likely to cause physical injury or mortality to any salmon locatioed at least 10 meters from the pile being driven.

If an impact hammer is used, however, it is possible that any salmon located within 10 meters of the sheetpile could be exposed to noise levels that could cause injury (i.e., greater than 206 dB_{Peak} or 187 dB_{SEL}). If GAUD, or their contractor, decides to use an impact hammer, they will be required to utilize appropriate noise attenuation techniques in order to meet the 2008 interim noise criteria and, therefore, avoid physical injury. Noise attenuation techniques include (but are not limited to) 1) confined and unconfined air bubble curtains; 2) work inside a dewatered cofferdam; and 3) work inside a larger casing that isolates the pile. A properly installed bubble curtain is a commonly used method for noise attenuation and can achieve noise reductions ranging from 5 dB to 30 dB peak SPLs (WSDOT 2008). As an effective attenuation technique will be utilized if an impact hammer is used, underwater noise levels even within 10 meters of the pile being driven will not be loud enough to cause physical injury or mortality to salmon in the action area.

Noise in the water column may, however, still affect the behavior of salmon in the action area. Sound pressure levels in excess of 150 dB_{RMS} are expected to cause temporary behavioral changes, such as elicitation of a startle response, disruption of feeding, or avoidance of an area (WSDOT 2010). If used, sheetpiles would be installed and removed at intervals over an approximately 9 week period (3 crossings constructed sequentially, 2-3 weeks per crossing). As explained above, noise levels associated with pile installation are expected to range from 188 dB_{RMS} - 159 dB_{RMS} at a distance of 10 m from the pile being installed. The practical spreading loss equation has been recommended by NMFS for estimating the distance at which pile driving sound attenuates to threshold levels. Using this equation and the average sound levels cited by CADOT for the driving of steel sheetpiles, it is estimated that noise will attenuate below the 150 dB_{RMS} threshold for behavioral effects 130-feet from the pile when using a vibratory hammer. If the contractor opts to use an impact hammer, an attenuation technique, as described above, will be utilized to ensure that sound levels within Bond Brook are minimized. An effective noise attenuation technique will ensure that the zone of impact for behavioral effects due to the use of an impact hammer will approximate that produced by the use of a vibratory hammer. Therefore, based on the best available information detailed above, only Atlantic salmon located within 130 feet of the pile being driven would be affected in a way that would cause temporary behavioral changes. Affected salmon could demonstrate avoidance behavior which could in turn contribute to a delay in migration to upstream spawning habitat.

Effects of delay in migration to upstream spawning habitat

As explained above, adult Atlantic salmon in the action area during the time when cofferdams are installed may be exposed to increases in suspended sediment/turbidity and/or underwater noise that cause avoidance behaviors and result in a delay in migration to upstream spanwning habitat. Atlantic salmon data collected in the stream since 2000 can be used to estimate the number of fish likely to be affected by the proposed action. However, it is extremely difficult to predict the number of GOM DPS Atlantic salmon that are likely to occur inside the work area, or to be forced to delay migration due to noise, vibration, sedimentation, or barrier effects.

Based on certain assumptions outlined below, it is possible to develop an estimate of the number of GOM DPS Atlantic salmon reasonably likely to be affected through entrapment in the work area and delay of migration. As all instream work will occur during the summer (June 1 to October 1), only Atlantic salmon adults are reasonably likely to be vulnerable to entrapment within the project area, or a delay in migration resulting from exposure to underwater noise and increases in suspended sediment.

Since 2000, between 0 and 1 Atlantic salmon redds have been documented in the stream annually. The single redd was found upstream of the project area. As there is not anticipated to be an increase in available habitat or in the abundance of adults returning to the Kennebec River system, it is reasonable to assume that this range of spawning effort will continue in the stream in 2011. It is possible that adult salmon might use Bond Brook as thermal refuge in the summer months; however, such refugia have historically been available downstream of the GAUD crossings and the project will not affect the suitability of that habitat. Therefore, the only adult Atlantic salmon likely to be present in the area where the stream crossings are being constructed and that could therefore be potentially entrapped in a cofferdam or affected by an increase in suspended sediment or underwater noise are adult salmon attempting to migrate upstream to spawn. As such, NMFS does not expect any more than one pair of adult Atlantic salmon to be present in Bond Brook in the summer of 2011. As noted above, NMFS recognizes that this estimate is based on several assumptions; however, NMFS believes it is a reasonable estimate of the number of Atlantic salmon that could become entrapped in the work area or delayed in migration due to the construction of stream crossings associated with this CSO abatement project.

Effects on the Riparian Zone

At each crossing location some vegetation, including trees, shrubs, or the herbaceous layer, will be removed from the stream banks to allow for construction access. Vegetation removal will be kept to the minimum necessary to accomplish the project, and should not result in any input of sediment into the streams, as long as appropriate erosion control BMPs, such as silt fence, are employed. It is not anticipated that the removal of a small amount of the canopy cover along Bond Brook will significantly alter the temperature in Bond Brook and; therefore, Atlantic salmon will not be affected by this activity.

Effects from Hazardous Materials Associated with Construction

As a component of the erosion and sedimentation control plan for this project, GAUD or their contractor will develop and implement a Spill Prevention Control and Countermeasure Plan (SPCCP) designed to avoid any impacts to rivers and streams from hazardous chemicals associated with construction, such as diesel fuel, oil, lubricants, and other hazardous materials. All refueling or other construction equipment maintenance will be done at a location consistent with the SPCCP and in a manner which avoids chemicals or other hazardous materials getting into the stream. Petroleum-based materials, such as diesel fuel and oil, contain polycyclic aromatic hydrocarbons (PAHs). PAHs can be acutely toxic to salmonids and other aquatic organisms at high exposure levels or can cause sublethal effects at lower exposures (Albers 2003).

This portion of Bond Brook has been identified as having areas of coal tar contamination as a result of the operations of the former Augusta Gas Works. In some areas of the stream, although not in the proposed crossing locations, PAH's have been discovered in the sediments of Bond Brook 4-inches below the streambed. Although coal tar deposits are not anticipated to exist at the crossing locations, the water removed from the cofferdams may be stored in frac tanks and removed from the site for processing if it is determined during construction that there is a chance of contamination. Careful adherence to an approved SPCCP, avoidance of contaminated deposits during excavation, and the removal and treatment of any contaminated water, make it highly unlikely that Atlantic salmon would be exposed to harmful chemicals during this construction project. As such, no Atlantic salmon are expected to be exposed to any harmful chemicals during the proposed action.

CSO Discharge Effects

CSO discharges can include raw sewage, which often contains a combination of untreated human waste and pollutants discharged by commercial and industrial point sources. CSOs also have a significant storm water component that may include pollutants from urban and rural runoff. Therefore, pathogens, solids, and toxic pollutants may be discharged directly to the receiving waters. According to the US Environmental Protection Agency (EPA), CSOs have been shown to be a major contributor to use impairment and aesthetic degradation of many receiving waters and have contributed to shellfish harvesting restrictions, beach closures, and even occasional fish kills. Considering the known adverse affects of CSOs on aquatic life, NMFS has concerns that listed Atlantic salmon may be adversely affected by CSO discharges.

Bond Brook receives CSO discharges at four locations; and the Kennebec River receives discharge at one. The proposed project will eliminate all four of the CSO discharges into Bond Brook and will reduce discharge at the Kennebec River location by installing a storage conduit that will be able to contain overflow from a 1-year, 2-hour event. Excess flow during storms larger than a 1-year, 2-hour event will discharge into the tidally influenced waters of the Kennebec River. The elimination of CSO discharges into Bond Brook, and the reduction of the discharge into the Kennebec River, will improve water quality and will minimize effects to Atlantic salmon using the system.

5.2. Effects to Atlantic salmon Critical Habitat

The proposed action was evaluated to determine which of the critical habitat PCEs (and their associated physical and biological features) are present within the action area. The action area, defined as the entirety of Bond Brook, contains both the spawning and rearing and migration PCEs. However, the spawning and rearing PCE will not be directly affected as it is upstream of the project area. The habitat in the vicinity of the project contains habitat suitable for smolt and adult migration.

The discussion that follows lists each PCE and then discusses how the proposed CSO abatement project may affect it.

5.2.1 Effects to the Spawning and Rearing Primary Constituent Element and its Seven Physical and Biological Features

The spawning and rearing PCE exists upstream of the project in Bond Brook. It is not anticipated that any of the physical and biological features will be affected directly by this project. The only effect to the upstream environment will be a temporary disruption of access to adult salmon migrating to spawning habitat.

5.2.2 Effects to the Migration Primary Constituent Element and its Six Physical and Biological Features

The CSO abatement project would result in a blockage of both upstream and downstream fish movements for approximately nine weeks (2-3 weeks per crossing, constructed sequentially). The proposed project will be constructed between June 1 and October 1 during the early portion of the upstream migration period for adult Atlantic salmon in the Kennebec River. Since the work window occurs after the downstream migration of Atlantic salmon smolts; these stream blockages will not affect smolt migration. Most adult Atlantic salmon ascend the Kennebec River beginning in the spring, with numbers peaking in June; hold in the vicinity of their natal streams until the fall, and spawn from late October to November. The total number of adult salmon counted at the Lockwood Dam, the first dam on the mainstem approximately 20 miles upstream of Bond Brook, from 2007 to 2010 was 15, 22, 24 and 4 fish, respectively. No spawning has been documented in Bond Brook itself, despite its available habitat, since 2000.

Given the recent adult returns to the Kennebec River, in general, and Bond Brook specifically, the likelihood of an adult being present in the action area is very small. However, the habitat upstream of the project in Bond Brook is suitable for spawning and rearing and has been used as such in the past. Therefore, it is possible that a small number of adult salmon could be in the action area at the time of construction.

Adult salmon may be affected by the project by impacting the migratory corridor in such a manner as to delay or prevent their movement upstream. This effect could occur from an incidence of high turbidity that may cause the fish to hold or seek refuge; creation of a temporary impediment to passage through a stream bypass structure; or delay or injury from loud noise. The GAUD is addressing these effects by avoidance or minimization measures:

1. The effect of turbidity will be minimized by using cofferdams to isolate the excavation areas from Bond Brook;
2. Qualified GAUD personnel, or a qualified consultant, will conduct daily visual surveys during installation and removal of in-water cofferdams and bypass structures to ensure that adult Atlantic salmon are not within the project area. This will minimize the probability that there will be any physical harm caused to an adult;
3. GAUD will be in the water for as short duration as possible to minimize the extent of the effect.

NMFS has analyzed the potential impacts of this permitting action on designated critical habitat in the action area and has determined that given the above avoidance and minimization efforts the potential adverse effects to critical habitat will be insignificant because:

1) the project will not result in a significant or permanent migration barrier;

2) the project will not increase the risk of predation;

3) the project is not expected to significantly affect water quality at the time of any salmon migrations in the action area;

4) the project will not significantly affect the forage of juvenile or adult Atlantic salmon because of the timing and location; and,

5) any effects to the natural structure of the nearshore habitat are not expected to appreciably diminish the capacity of substrate, food resources, and natural cover to meet the conservation needs of listed Atlantic salmon.

6. CUMULATIVE EFFECTS

Cumulative effects are defined in 50 CFR §402.02 as those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation. Future federal actions that are unrelated to the proposed action are not considered in this section, because they require separate consultation pursuant to Section 7 of the ESA. During construction of the CSO abatement project, Central Maine Power (CMP) will be conducting remediation activities at the former Augusta Gas Works site, which is within the project limits of the GAUD's project. CMP and GAUD propose to use a single contractor for both projects and to conduct the projects within the same time frame in order to reduce adverse impacts to Bond Brook and its environs. Impacts to ESA listed species and critical habitat from the CMP project will be addressed in a separate Opinion.

Future state and private activities in the action area that are reasonably certain to occur during project operations are recreational fisheries, pollutants, and development and/or construction activities resulting in excessive water turbidity and habitat degradation. Atlantic salmon are also vulnerable to direct and indirect effects from these types of activities.

Impacts to Atlantic salmon from non-federal activities are largely unknown in Bond Brook. In December 1999, the State of Maine adopted regulations prohibiting all angling for sea-run salmon statewide. Although there have been no documented takes in the action area in recent years, it is possible that occasional recreational fishing for other fish species may result in incidental takes when fisheries operate in the presence of Atlantic salmon.

Despite strict state and federal regulations, both juvenile and adult Atlantic salmon remain vulnerable to injury and mortality due to incidental capture by recreational anglers and as bycatch in commercial fisheries. The best available information indicates that Atlantic salmon are still incidentally caught by recreational anglers. Evidence suggests that Atlantic salmon are also targeted by poachers (NMFS 2005). No estimate of the numbers of Atlantic salmon caught incidentally in recreational or commercial fisheries exists.

Atlantic salmon are also vulnerable to impacts from pollution and are also likely to continue to be impacted by water quality impairments.

7. INTEGRATION AND SYNTHESIS OF EFFECTS

7.1. GOM DPS

Atlantic salmon in the GOM DPS currently exhibit critically low spawner abundance, poor marine survival, and are still confronted with a variety of threats. Numbers of endangered adult Atlantic salmon returning to the GOM DPS are extremely low. Based upon the best available scientific information, NMFS has determined that the proposed study will result in disturbance and potential delay in migration of up to 2 adult Atlantic salmon. Based upon assumptions outlined in this Opinion, no incidental mortality of Atlantic salmon is likely to occur during the project.

NMFS believes that the proposed action would not reduce the numbers or distribution of Atlantic salmon in Bond Brook. The action will not directly affect suitable spawning or rearing habitat. However, this action could potentially reduce reproduction by temporarily obstructing the migratory pathway to spawning habitat, which could prevent adult Atlantic salmon from accessing suitable habitat in time to spawn. It is not likely to reduce distribution because the action will only temporarily impede Atlantic salmon from accessing any foraging, overwintering or spawning habitat upstream of the project area. Nor is it expected that the action would reduce the distribution of Atlantic salmon throughout the GOM DPS.

For these reasons, NMFS believes that there is not likely to be any reduction in the numbers or distribution of Atlantic salmon in the action area. Any effects to reproduction are expected to be temporary and, based on the small number of adults returning to Bond Brook, minor. As such, there is not likely to be an appreciable reduction in the likelihood of survival and recovery of the GOM DPS of Atlantic salmon in the wild of lower Kennebec River populations or the species as a whole.

7.2. Critical Habitat

The complex life cycles exhibited by Atlantic salmon give rise to complex habitat needs, particularly during the freshwater phase (Fay et al. 2006). For example, in order for Atlantic salmon to persist in the freshwater environment, spawning gravels must be a certain size and free of sediment to allow successful incubation of the eggs and juveniles need diverse habitats that provide abundant food sources, including insects, crustaceans, and other small fish, places to hide from predators, and areas that act as refuge from changing environment conditions. Returning adults generally do not feed in fresh water but instead rely on limited energy stores to migrate, mature, and spawn. Like juveniles, they also require cool water and places to rest and hide from predators. During all life stages, Atlantic salmon require cool water that is free of contaminants. They also need migratory corridors with adequate passage conditions (timing, water quality, and water quantity) to allow access to the various habitats required to complete their life cycle.

As discussed in Section 3.2, critical habitat for Atlantic salmon has been designated for the GOM DPS and includes Bond Brook. The physical and biological elements of the spawning and rearing PCE as identified as essential to the conservation of the species are present in the action area of this consultation. However, the habitat is present upstream of the project and will not be directly affected by the proposed CSO abatement project. The only effect to the upstream habitat will be a temporary disruption of adult salmon migrating to spawning habitat.

The physical and biological elements of the migration PCE as identified as essential to the conservation of the species are present in the action area of this consultation. Migration through the stream will be obstructed for approximately nine weeks, due to the installation of cofferdams at the three crossings proposed in Bond Brook. Once the cofferdams and bypass structures are removed, the migration habitat will be restored to its original condition and there will be minimal permanent effect to the habitat. There will be permanent stream impact associated with the riprap placed below the high water line to stabilize the stream banks (Table 1). This effect is not anticipated to affect the migratory function of the habitat.

The spawning and rearing PCE, as well as the migratory PCE, are present in the mainstem Kennebec River 300 to 400 feet downstream of the lower most crossing of Bond Brook. It is possible that a small amount of sediment will be transported to the river but it is expected to be diluted quickly, and will not affect the functioning of the habitat. No part of this project will affect the suitability of the habitat at the outlet of Bond Brook that has been historically used as thermal refuge for adult salmon when the temperatures in the mainstem increase during the summer months.

CSO discharges degrade Atlantic salmon critical habitat by putting pathogens, solids, and toxic pollutants directly to the receiving waters. Bond Brook currently receives CSO discharges at four locations. The proposed project will eliminate all four of these by sending excess flow during storms larger than a 1-year, 2-hour event to a single location, which will discharge into the tidally influenced waters of the Kennebec River. The elimination of CSO discharges into Bond Brook will improve water quality and, thus, benefit the critical habitat within Bond Brook.

NMFS has analyzed the potential impacts of this permitting action on designated critical habitat in the action area and has determined that the potential adverse effects to critical habitat will be insignificant.

8. CONCLUSION

After reviewing the best available information on the status of endangered and threatened species under NMFS jurisdiction, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is NMFS' biological opinion that the proposed action may adversely affect but is not likely to jeopardize the continued existence of the GOM DPS of Atlantic salmon. Critical habitat has been designated for the GOM DPS however, NMFS has determined that the potential adverse effects to critical habitat will be insignificant; therefore, it is NMFS' biological opinion that the proposed action is not likely to result in the destruction or adverse modification of critical habitat designated for the GOM DPS of Atlantic salmon.

9. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species. The statutory definition of "take" includes "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (ESA § 3(18)). Harass in the definition of take in the ESA means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 C.F.R. § 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Amount or Extent of Incidental Take

The proposed construction of a CSO Abatement Project around Bond Brook in Augusta, Maine has the potential to directly affect Atlantic salmon by delaying adult migration to spawning grounds upstream of the project area. NMFS considers such a delay in migration harassment since it could potentially lead to a significant disruption of normal spawning behavior. The early migration to spawning habitat by adult Atlantic salmon ensures that they have sufficient time to effectively reach spawning habitat. A potential nine week delay due to the proposed crossings of Bond Brook could significantly disrupt this migration. Based upon Atlantic salmon abundance data collected by the MDMR in Bond Brook since 2000, the known quantities of salmon stocked by MDMR, and the assumptions outlined in the Effects of the Action (Section 5), NMFS anticipates that no juvenile Atlantic salmon and no more than 2 adult Atlantic salmon are likely to be affected during construction of this project. No lethal take of adult Atlantic salmon is authorized for this project.

Qualified GAUD personnel, or a qualified consultant, will conduct daily visual surveys within the work area during the installation and removal of cofferdams and bypass structures. Additional surveys will be conducted on a weekly basis while the in-water structures are in place to document whether Atlantic salmon are being delayed (i.e. harassed) by the blockage of the stream channel. These monitoring surveys will provide a mechanism for documenting incidental take associated with the proposed project.

NMFS believes that this level of incidental take is reasonable given the seasonal distribution and abundance of Atlantic salmon in the action area. In the accompanying biological opinion, NMFS determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measure (RPM) is necessary and appropriate to monitor and minimize the impacts of incidental take of Atlantic salmon:

- Minimize the adverse effects to Atlantic salmon in Bond Brook by employing construction techniques that avoid or minimize adverse effects to water quality, aquatic or riparian habitats, and aquatic organisms.

To implement this reasonable and prudent measure, Terms and Conditions outlining monitoring and reporting requirements are given below. The RPM, with its implementing terms and conditions, is designed to minimize and monitor incidental take resulting from the CSO abatement project. NMFS believes that adherence to these conditions will reduce the potential for interactions with Atlantic salmon.

Terms and Conditions

In order to be exempt from prohibitions of section 9 of the ESA, ACOE must comply with the following terms and conditions, which implement the reasonable and prudent measure described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The ACOE must ensure that GAUD hold a pre-construction meeting with the contractor(s) to review all procedures and requirements for avoiding and minimizing impacts to Atlantic salmon and to emphasize the importance of these measures for protecting salmon.

2. The ACOE shall notify NMFS 48 hours prior to commencement of in-water construction. NMFS Point of Contact is Dan Tierney at 207-866-3755 or by email at Dan.Tierney@noaa.gov.

3. The ACOE must ensure that the contractor minimize the potential for impacts to Atlantic salmon and their habitat by conducting all construction activities for this project in accordance with an erosion and sedimentation control plan approved by GAUD and ACOE.

4. The ACOE must ensure that the contractor develops a spill prevention and control plan for review and approval by ACOE and GAUD before any construction begins. The plan must require all refueling or adding of other fluids to be done in an appropriate location at least 100 feet away from Bond Brook.

5. The ACOE must require that, to minimize the effects of entrainment and impingement from diversion pumps, GAUD and their contractors use a screen on all intake hoses with a maximum mesh size of 0.25 inches. Furthermore, GAUD shall insure that the approach velocity to the intake hose does not exceed 0.4 ft/sec.

6. To minimize adverse effects to Atlantic salmon, particularly physical injury or mortality, the ACOE will ensure that any sheetpiles driven using an impact hammer will use one or more noise attenuation techniques. Such techniques can include (but are not limited to) an air bubble curtain and isolation of the piles within a cofferdam.

7. To minimize the probability of entraining an adult Atlantic salmon within the work area, a fish evacuation protocol must be approved by NMFS prior to the commencement of in-water work. The ACOE must submit this plan to NMFS at least two weeks prior to the commencement of construction. Daily visual surveys will be conducted by qualified personnel to verify that there are no Atlantic salmon within the project area during the installation and removal of any in-water cofferdam or bypass structure. Additional surveys will be conducted on a weekly basis while the in-water structures are in place to document whether Atlantic salmon are being delayed (i.e. harassed) by the blockage of the stream channel. If cofferdams overtop due a high flow event, the cofferdam will be resurveyed for adult Atlantic salmon prior to dewatering. If any Atlantic salmon are observed within the enclosed cofferdam, all in-water work will cease and the NMFS Maine Field Office will be contacted to remove the fish.

8. The ACOE must require that GAUD carefully monitor the actions described in this opinion and document the level of incidental take. Within 30 days of the project's completion ACOE will submit a final report to the NMFS that details how each of the Terms and Conditions were met, and how much take of Atlantic salmon occurred. Any interactions with Atlantic salmon must be reported to NMFS' Maine Field Office within 24 hours.

The reasonable and prudent measure, with its implementing terms and conditions, is designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, reinitiation of consultation and review of the reasonable and prudent measures are required. ACOE must immediately provide an explanation of the causes of the taking and review with NMFS the need for possible modification of the reasonable and prudent measures.

The RPM and Terms and Conditions will keep NMFS informed of when and where construction activities are taking place and will require the GAUD to report any take in a reasonable amount of time. This RPM and Terms and Conditions also require the GAUD to conduct fish surveys/evacuations and to conduct preconstruction meetings. The ACOE, as well as the applicants, have reviewed the RPM and Terms and Conditions outlined above and all parties have agreed to implement all of these measures as described herein. The discussion below explains why this RPM and each of the Terms and Conditions are necessary and appropriate to minimize or monitor the level of incidental take associated with the proposed action and how they represent only a minor change to the action as proposed by the GAUD and ACOE.

The RPM, as well as Terms and Conditions #1-6, are necessary and appropriate as they will require that the GAUD and their contractors use best management practices and best available technology for the stream crossings. This will ensure that take of listed Atlantic salmon is minimized to the extent practical. These procedures represent only a minor change to the proposed action as following these procedures should not increase the cost of the project or result in any delays or reduction of efficiency of the project.

The RPM, as well as Terms and Conditions #6-7, are necessary and appropriate to ensure the proper documentation of any interactions with listed species as well as requiring that these interactions are reported to NMFS in a timely manner with all the necessary information. This is essential for monitoring the level of incidental take associated with the proposed action. This RPM and the Terms and Conditions represent only a minor change as compliance will not result in a significant increase in cost, delay of the project or decrease in the efficiency of the project.

10. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. NMFS has determined that the construction to be permitted by ACOE for the CSO Abatement Project around Bond Brook in Augusta, Maine is not likely to jeopardize the GOM DPS of Atlantic Salmon or adversely modify or destroy critical habitat for listed Atlantic salmon. NMFS recommends that the following conservation recommendation be implemented:

- If any lethal take occurs, contaminant analysis of the specimen should be conducted. If this recommendation is to be implemented, the fish should be immediately frozen and NMFS should be contacted within 24 hours to provide instructions on shipping and preparation.

11. REINITIATION NOTICE

This concludes formal consultation on construction to be permitted by ACOE for the CSO Abatement Project around Bond Brook in Augusta, Maine. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the action that may not have been previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species; or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, Section 7 consultation must be reinitiated immediately.

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