NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT
BIOLOGICAL OPINION

Agency:	Federal Highway Administration (FHWA)
Activity Considered:	Brewer Dam Removal Project F/NER/2008/01466
Conducted by:	National Marine Fisheries Service Northeast Region
Date Issued:	7/14/08
Approved by:	Patricia Kurkul for Patricia Kurkul

INTRODUCTION

This constitutes the biological opinion (Opinion) of NOAA's National Marine Fisheries Service (NMFS) on the effects of the Brewer Dam Removal Project as proposed by the Federal Highway Administration (FHWA) in Sedgeunkedunk Stream, Maine on threatened and endangered species in accordance with Section 7 of the Endangered Species Act (ESA), as amended (16 U.S.C. 1531 et seq.). Sedgeunkedunk Stream, which is a tributary of the lower Penobscot River in Maine, is located within the geographic range of the Gulf of Maine (GOM) Distinct Population Segment (DPS) of Atlantic salmon (*Salmo salar*). This Opinion is based on information provided in the FHWA's March 11, 2008 consultation initiation package. A complete administrative record of this consultation will be kept at the NMFS Northeast Regional Office. Formal consultation was initiated on March 11, 2008.

CONSULTATION HISTORY

March 11, 2008 - NMFS received a letter from FWHA requesting initiation of formal Section 7 consultation for the proposed Brewer Dam Removal Project on Sedgeunkedunk Stream in Brewer, Maine. The March 11, 2008 letter contained a Biological Assessment prepared by FWHA concerning the effects of the project on listed Atlantic salmon. As the submission from FWHA contained all of the information necessary to conduct Section 7 consultation, the date that the letter was received (March 11, 2008) serves as the date of initiation of consultation.

March 27, 2008 – NMFS files a letter with FWHA acknowledging that all information required to initiate form Section 7 consultation has been received and formal consultation will be concluded by July 24, 2008.

DESCRIPTION OF THE PROPOSED ACTION

Sedgeunkedunk Stream is a tributary to the lower Penobscot River. Like most tributaries to the lower Penobscot River, Sedgeunkedunk Stream likely historically supported runs of anadromous fish species including Atlantic salmon and alewives. The construction of three dams on the stream (Brewer Dam, Meadow Dam, and Brewer Lake Dam) have prevented access for diadromous fish to the watershed for decades.

The FHWA, City of Brewer, and Maine Department of Transportation (Maine DOT) have proposed to remove the lowermost dam on Sedgeunkedunk Stream (Brewer Dam) to provide unobstructed upstream and downstream passage for anadromous and catadromous fish to an additional 2.5 miles of the Sedgeunkedunk Stream. The Brewer Dam will be removed as part of the wetland mitigation plan for a slope stabilizing project performed by the City of Brewer along the Penobscot River. This mitigation is required for a permit issued by the Corps of Engineers. FHWA and Maine DOT provided funding to the City of Brewer for the slope stabilizing project. Brewer Dam is located approximately 0.5 miles from the confluence of Sedgeunkedunk Stream with the Penobscot River in Brewer, Maine (Figure 1). The dam was originally built in the 1930's to supply process and fire protection water to the former Eastern Fine Paper Mill located along the banks of the Penobscot River. It does not appear that fish passage facilities were ever installed at the Brewer Dam. Fish species that will likely benefit from the dam removal project include Atlantic salmon, alewife, lamprey, and American eel. Additional benefits of the proposed project include improving water quality, aquatic habitat, channel morphology, and natural communities in areas upstream and downstream of the dam. Section 7 consultation on the effects of the bank stabilization project was completed between NMFS and FHWA. In a letter dated June 27, 2003, NMFS concurred with the determination made by FHWA that the proposed project was not likely to adversely affect any species listed by NMFS.

The Brewer Dam is comprised of a 41-foot westerly wing wall, a 40-foot spillway, a 5 foot-wide dam gate, a screen house, and an approximately 100-foot easterly wing wall (Figure 2). Wing walls and the spillway are comprised of concrete. Remnants of an older concrete dam are present about 15 feet upstream from existing Brewer Dam (Figure 2).

Figure 1. Location of the Brewer Dam.

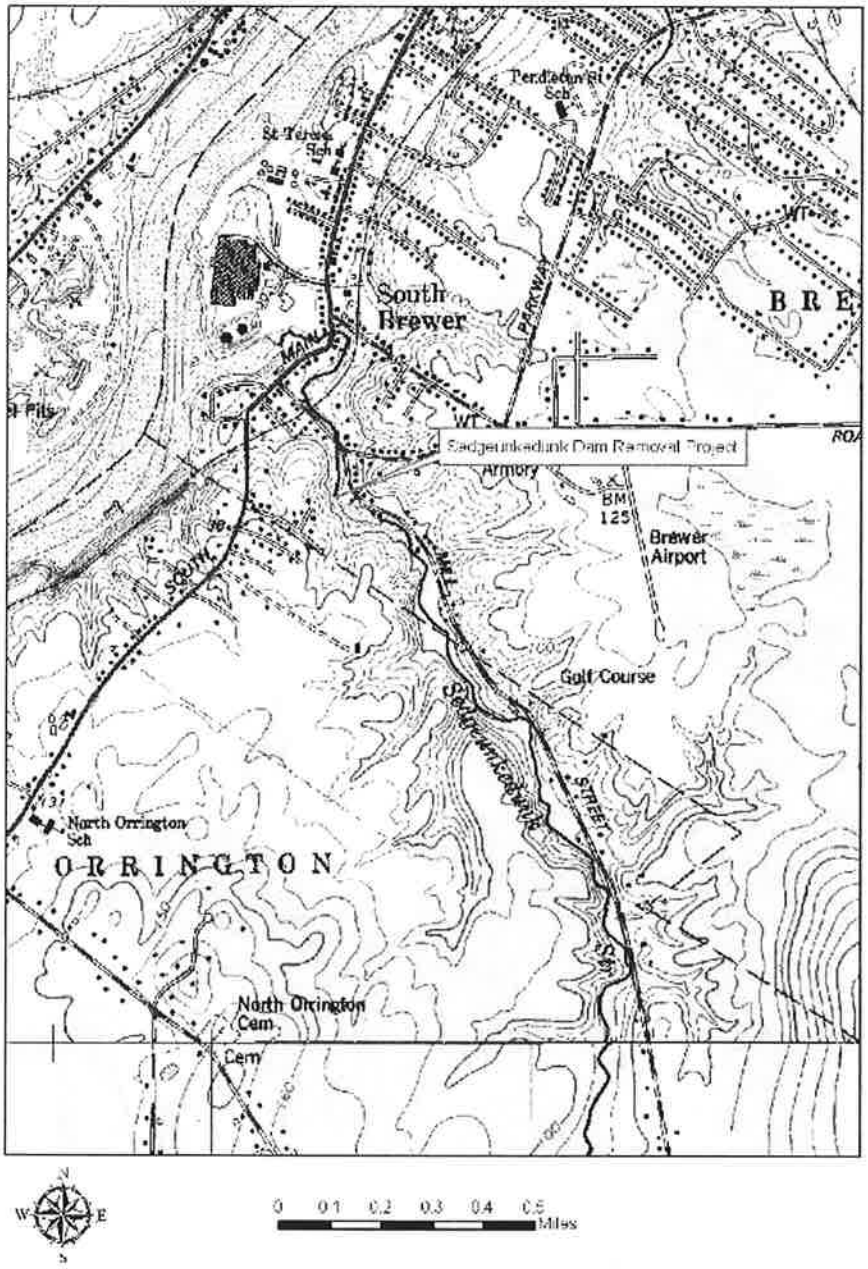
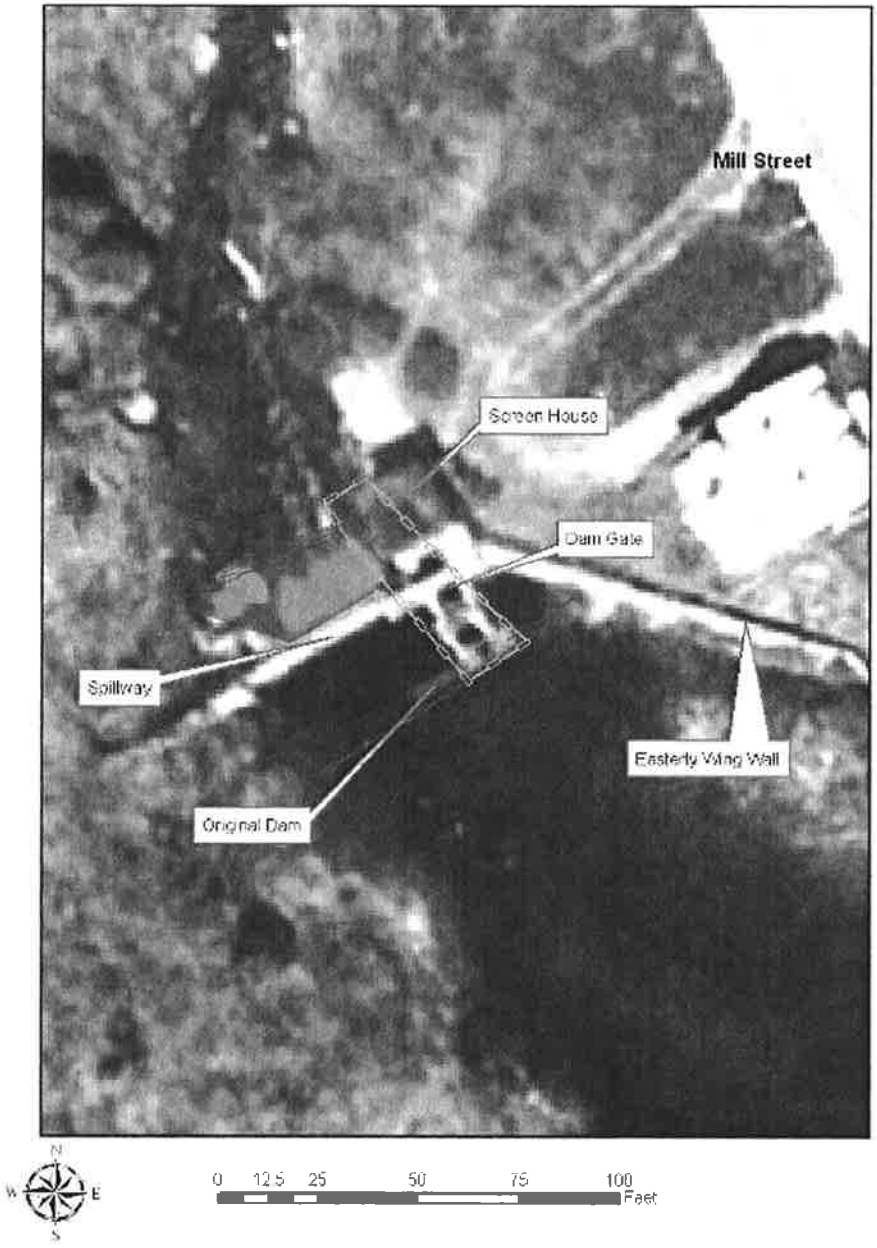


Figure 2. Aerial photograph of the Brewer Dam.



Instream Work Activities

FWHA proposes to remove the Brewer Dam during low flow periods in the summer of 2008 (July 15 – September 30). Dam removal activities are expected to take approximately 1 month to complete. In the summer of 2007, the impoundment upstream of the Brewer Dam was gradually drained over several days. The gradual drawdown facilitated consolidation of sediment that had accumulated behind the dam and allowed for natural re-vegetation of exposed soils to stabilize the sediments prior to removing the dam. Eastern Fine Paper removed some accumulated sediment from the area above the dam approximately 15 years ago. At that time, testing revealed that sediments did not contain any contaminants of concern. The remaining sediments are also expected to be free of contaminants.

Immediately prior to any demolition activities at the site, erosion and sedimentation control measures will be installed. Sandbag cofferdams will be set both upstream and downstream of the work area to allow work to occur in the dry. Its is anticipated that less than 200 ft of stream will be cofferdammed to allow removal of the Brewer Dam in the dry. Stream water will be carried through the work area via a temporary pipe that will be placed within the old dam gate. Dirty water that collects within the work area will be pumped out and treated prior to returning it to the stream downstream of the work site. The concrete dam portions will be broken and removed by an excavator working in the dry. Rebar, rails, pipes, and other metal appurtenances to the dam will be removed and stored separately for disposal as soon as they are encountered. The contractor will start demolition activities on the Mill Street (easterly) side of the dam and will use an excavator to construct a temporary crossing, using the concrete rubble from removal of the dam, to access the entire stream width. Once the furthest extent of the westerly end of the dam is removed, the excavator will work back across the stream, removing the temporary crossing. The easterly wing wall will remain and the screen house will be cut at a slope from the top of wing wall to the elevation of the new stream bed.

Once the Brewer Dam and old dam remnants are removed, the contractor will restore the stream channel. A stream channel approximately 20 feet-wide will be constructed with additional depth of at least 2 feet provided for a thalweg (deepest portion of riverbed). Stream substrates will be placed over the restored channel using substrates similar to that which exists downstream of the dam. Rubble fill will be placed against the upstream side of the easterly wing wall to raise the adjacent grade to within 6 feet of the top of the wing wall. The area downstream of the screen house will be graded to form a gradual (less than 3:1) slope from the new stream channel to a point of intersection with the existing grade.

Pipes that exit the screen house, originally installed to carry water to the mill, will be removed to a point at least 20 feet downstream of the dam. The remaining pipe will remain below surface but will be sealed with flowable fill. There is also a broken pipe approximately 20 feet downstream from the dam. It will be removed to at least the width of the stream so it does not form an impediment to migrating fish. All demolition debris including metal, wood, and concrete rubble will be separated and removed from the site as the work progresses.

After the temporary crossing and the dam debris have been removed from the stream channel, a second sandbag cofferdam will be set up within the dry area around the old dam gate and the

temporary pipe. The original upstream and downstream cofferdams will then be removed, allowing the stream to flow freely around the dammed areas surrounding the gate and pipe. Flow through the pipe will then be blocked by sandbags. The pipe will be removed along with any concrete left within the work area. The final set of sandbags will then be pulled and stream flow will be restored.

To minimize the impacts of instream work and placement of cofferdams in Sedgeunkedunk Stream, FHWA and Maine DOT proposes to evacuate any Atlantic salmon trapped within the cofferdam. During dewatering of the cofferdam area, Maine DOT biologists will continually monitor for any salmon trapped in the work area. Any salmon observed in the work area will be netted and transported to a downstream area. See Attachment 1 for Maine DOT's fish evacuation plan.

An erosion and sedimentation control plan will be prepared by the contractor, and submitted to FHWA, Maine DOT and the City for approval, prior to commencing work to remove the dam. The contractor will be required to follow Maine DOT's best management practices (BMP). The contractor will be required to immediately apply mulch to disturbed area of the riparian banks of the stream that have a potential to erode, and devise a plan to minimize the area of disturbance exposed to precipitation at all times. Available information about the site indicates that the soils are sand and gravel and, therefore, will not be highly erodable. All erosion and sedimentation control measures will be removed when the dam removal project is complete.

Post Dam Removal Monitoring

Following dam removal, Maine DOT will monitor the site in the fall of 2008 and spring of 2009 to ensure that exposed areas have re-vegetated and suitable passage for fish exists. In the event that natural re-vegetation has not occurred and erodable soils are exposed, the City of Brewer will ensure that a New England Erosion Control Mix is used to seed the site to prevent further erosion. In the event that an impediment to fish passage exists, further excavation of the channel shall be conducted to remove the exposed impediment and to prevent a future impediment from forming. As this Opinion does not assess the effects of future channel modifications, any additional instream work would require reinitiation of consultation.

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 Action Area for this consultation encompasses not only the area where dam removal activities will take place (i.e., the area within the cofferdam) but those areas of the stream where indirect effects of dam removal will be experienced. Therefore, the action area will encompass the entire length of Sedgeunkedunk Stream, from its confluence with the Penobscot River to its head waters. This represents approximately 12 river kilometers.

STATUS OF AFFECTED SPECIES

The Status of the Species section presents biological information relevant to formulating this opinion and documents the effects of all past human and natural activities that have led to the current status of the species throughout its range.

Federally-listed species known to occur in Sedgeunkedunk Stream include the GOM DPS of Atlantic salmon. While listed shortnose sturgeon (*Acipenser brevirostrum*) are known to occur in the Penobscot River, due to the lack of suitable habitat in Sedgeunkedunk Stream they are not expected to occur in the action area. Therefore, shortnose sturgeon will not be considered further in this consultation.

Gulf of Maine DPS of Atlantic salmon

The GOM DPS of anadromous Atlantic salmon was listed by the USFWS and NMFS (collectively, the Services) as an endangered species on November 17, 2000 (65 FR 69459). The GOM DPS encompasses all naturally reproducing remnant populations of Atlantic salmon downstream of the former Edwards Dam site on the Kennebec River northward to the mouth of the St. Croix River. To date, the Services have determined that these populations are found in the Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot Rivers, Kenduskeag Stream, Sedgeunkedunk Stream, and Cove Brook. The GOM DPS includes naturally reproducing Atlantic salmon in the Penobscot River downstream of the former Bangor Dam. The USFWS' GOM DPS river-specific hatchery-reared fish are also included as part of the listed entity. Critical habitat has not been designated for this species.

In the final rule listing the GOM DPS of Atlantic salmon, the Services deferred a determination of inclusion of fish that inhabit the main stem and tributaries of the Penobscot River above the site of the former Bangor Dam (65 FR 69464). The deferred decision reflected a need for further analysis of scientific information, including a detailed genetic characterization of the Penobscot population. In June 2006, a new status review of additional Atlantic salmon populations, including the upper Penobscot River population, was completed by a Biological Review Team led by NMFS (Fay et al. 2006). Although the 2000 listing of Atlantic salmon did not include populations in the Penobscot River above the former site of the Bangor Dam, the recently completed status review of additional Atlantic salmon populations indicates that the mainstem Penobscot River population of Atlantic salmon is closely related to the GOM DPS (Fay et al. 2006). The BRT also concluded that Atlantic salmon populations in the Kennebec River upstream of the former Edwards Dam and Androscoggin River are also closely related to the GOM DPS. NMFS is currently considering the information presented in the new Status Review to determine if a listing action under the ESA is warranted at this time. Currently, Atlantic salmon originating from above the former Bangor Dam are considered by NMFS to be a candidate species for listing under the ESA.

Atlantic Salmon Life History

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 and Long Island Sound DPSs have been extirpated (65 FR 69459, Nov. 17, 2000).

Adult Atlantic salmon ascend the rivers of New England beginning in the spring and continuing into the fall, with the peak occurring in June. Once an adult salmon enters a river, rising river temperatures and water flows stimulate upstream migration. When a salmon returns to its home river after two years at sea (referred to as 2-sea-winter or 2SW fish), it is approximately 75 cm long and weighs approximately 4.5 kg. A minority (10-20%) of Maine salmon return as smaller fish, or grilse, after only one winter at sea (1SW) and still fewer return as larger 3-sea-winter (3SW) fish. A spawning run of salmon with representation of several age groups ensures some level of genetic exchange among generations. Once in freshwater, adult salmon cease to feed during their up-river migration. Spawning occurs in late October through November.

Approximately 20% of Maine Atlantic salmon return to the sea immediately after spawning, but the majority overwinter in the river until the following spring before leaving (Baum 1997). Upon returning to salt water, the spawned salmon, or kelt, resumes feeding. If the salmon survives another one or two years at sea, it will return to its home river as a repeat spawner.

The salmon's preferred spawning habitat is coarse gravel or rubble substrate (up to 8.5 cm in diameter) with adequate water circulation to keep the buried eggs well oxygenated (Peterson 1978). Water depth at spawning sites is typically between 30 and 61 cm, and water velocity averages 60 cm per second (Beland 1984). Spawning sites are often located at the downstream end of riffles where water percolates through the gravel or where upwellings of groundwater occur (Danie et al. 1984). Redds, the depressions where eggs are deposited, average 2.4 m long and 1.4 m wide (Baum 1997). An average of 240 eggs is deposited per 100 m^2, or one unit of habitat (Baum 1997). Beland (1984) reported that the total original Atlantic salmon spawning and nursery habitat in Maine rivers was 398,466 units.

In late March or April, the eggs hatch into larval alevins or sac fry. Alevins remain in the redd for about six weeks and are nourished by their yolk sac. Alevins emerge from the gravel about mid-May, generally at night, and begin actively feeding. The survival rate of these fry is affected by stream gradient, overwintering temperatures and water flows, and the level of predation and competition (Bley and Moring 1988).

Within days, the free-swimming fry enter the parr stage. Parr prefer areas with adequate cover (rocks, aquatic vegetation, overhanging streambanks, and woody debris), water depths ranging from approximately 10 to 60 cm, velocities between 30 and 92 cm per second, and temperature near 16°C (Beland 1984). Parr actively defend territories (Allen 1940; Danie et al. 1984; Kalleberg 1958; Mills 1964). Some male parr become sexually mature and can successfully spawn with sea-run adult females. Water temperature (Elliot 1991), parr density (Randall 1982), photoperiod (Lundqvist 1980), the level of competition and predation (Fausch 1988; Hearn 1987), and the food supply, all influence the growth rate of parr. Maine Atlantic salmon produce from five to ten parr per unit of habitat (Baum 1997). Parr feed on larvae of mayflies and

stoneflies, chironomids, caddisflies and blackflies, aquatic annelids and mollusks, as well as numerous terrestrial invertebrates that fall into the river (Scott and Crossman 1973).

In a parr's second or third spring, when it has grown to 12.5-15 cm in length, 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 majority of parr (80%) remain in fresh water for two years, while the balance remains for three years (Baum 1997). The biochemical and physiological modifications that occur during smoltification prepare the fish for the dramatic change in osmoregulatory needs that comes with the transition from a freshwater to a saltwater habitat (Bley 1987; Farmer et al. 1977; Hoar 1976; Ruggles 1980; USFWS 1989). As smolts migrate from the rivers between April and June, they tend to travel near the water surface, where they must contend with changes in water temperature, pH, dissolved oxygen, pollution levels, and predation. Most smolts in New England rivers enter the sea during May and June to begin their ocean migration. It is estimated that Maine salmon rivers produce 19 fry per unit of habitat, resulting in five to ten parr per unit and ultimately three smolts per unit (Baum 1997).

Atlantic salmon of U.S. origin are highly migratory, undertaking long marine migrations from the mouths of U.S. rivers into the northwest Atlantic Ocean, where they are distributed seasonally over much of the region (Reddin 1985). The marine phase starts with smoltification and subsequent migration through the estuary of the natal river. Upon completion of the physiological transition to salt water, the post-smolt grows rapidly and has been documented to move in small schools loosely aggregated close to the surface (Dutil and Coutu 1988). After entering the nearshore waters of Canada, the U.S. post-smolts become part of a mixture of stocks of Atlantic salmon from various North American streams. Upon entry into the marine environment, post-smolts appear to feed opportunistically, primarily in the neuston (near the surface). Their diet includes invertebrates, amphipods, euphausiids, and fish (Fraser 1987; Hislop and Shelton 1993; Hislop and Youngson 1984; Jutila and Toivonen 1985).

Most of the GOM DPS-origin salmon spend two winters in the ocean before returning to Maine streams for spawning. Aggregations of Atlantic salmon may still occur after the first winter at sea, but most evidence indicates that they travel individually (Reddin 1985). At this stage, Atlantic salmon primarily eat fish, feeding upon capelin, herring, and sand lance (Hansen and Pethon 1985; Reddin 1985; Hislop and Shelton 1993).

Status and Trends of Atlantic Salmon Rangewide

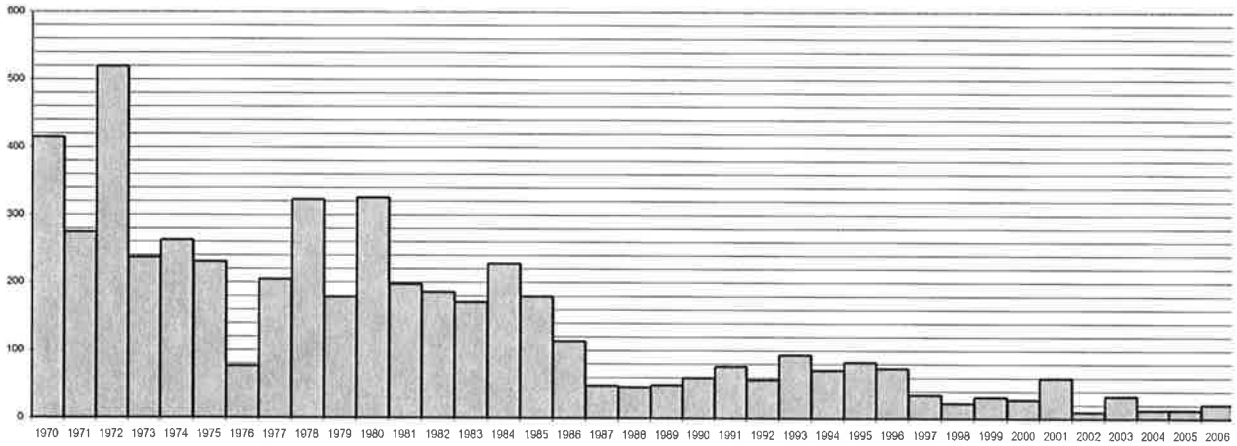
Anadromous Atlantic salmon were native to nearly every major coastal river north of the Hudson River in New York (Atkins 1874; Kendall 1935). The annual historic Atlantic salmon adult population returning to U.S. rivers has been estimated to be between 300,000 (Stolte 1981) and 500,000 (Beland 1984). The largest historical salmon runs in New England were likely in the Connecticut, Merrimack, Androscoggin, Kennebec, and Penobscot Rivers.

By the early 1800s, Atlantic salmon runs in New England had been severely depleted due to the construction of dams, over fishing, and water pollution, all of which greatly reduced the species' distribution in the southern half of its range. Restoration efforts were initiated in the mid-1800s,

but there was little success due to the presence of dams and the inefficiency of early fishways (Stolte 1981). There was a brief period in the late nineteenth century when limited runs were reestablished in the Merrimack and Connecticut Rivers by artificial propagation, but these runs were extirpated by the end of the century (USFWS 1989). By the end of the nineteenth century, three of the five largest salmon populations in New England (in the Connecticut, Merrimack, and Androscoggin Rivers) had been eliminated. As with most anadromous species, Atlantic salmon can exhibit temporal changes in abundance. Angler catch and trapping data from 1970 to 1998 provide the best available composite index of recent adult Atlantic salmon population trends within the GOM DPS rivers. These indices indicate that there was a dramatic decline in the mid-1980s, and that populations have remained at low levels ever since. Figure 4 below demonstrates this trend.

Total documented natural (wild and conservation hatchery) GOM DPS spawner returns for 1995 through 2007 are as follows: 1995 (85); 1996 (82); 1997 (38); 1998 (23); 1999 (32); 2000 (28); 2001 (60); 2002 (16); 2003 (33); 2004 (13); 2005 (13); 2006 (21); and 2007 (14) (USASAC 2008). These counts (as well as the counts shown in Figure 3) represent minimal estimates of the wild adult returns, because not all GOM DPS rivers have trapping facilities (e.g., weirs) to document spawner returns in all years. The counts of redds conducted annually by the Maine Department of Marine Resources Bureau of Sea Run Fisheries and Habitat (MDMR) demonstrate that salmon do return to those rivers for which no adult counts are possible. Since 2001, scientists have estimated the total number of salmon returning to the GOM DPS with a linear regression model. This estimate is calculated using capture data on GOM DPS rivers with trapping facilities (Dennys, Pleasant, and Narraguagus Rivers), combined with redd count data from the other five GOM DPS rivers. Total return estimates based on these redd counts and trap data are 99 adults in 2001, 33 adults in 2002, 72 adults in 2003, and 82 adults in 2004, 71 adults in 2005, 79 adults in 2006, and 53 adults in 2007 (at 90% probability).

Figure 3. Total documented natural (wild and conservation hatchery) spawner returns from USASAC (2007) data (minimal estimates) for the GOM DPS 1970-2006.



Densities of young-of-the-year salmon (0+) and parr (1+ and 2+) generally remain low relative to potential carrying capacity. This depressed juvenile abundance is a direct result of low adult returns in recent years. Survival from the parr to the smolt stage has previously been estimated to range from 35-55% (Baum 1997). Research in the Narraguagus River, however, demonstrated at the 99% probability level that survival was less than 30% (Kocik et al. 1999). Survival from fry to smolt, based on results from hatchery fry stocking, is reported by Bley and Moring (1988) to range from about 1-12%; and survival from egg to smolt stage is reported by Baum (1997) to be approximately 1.25%.

In summary, naturally-producing Atlantic salmon populations in the GOM DPS are at extremely low levels of abundance. This conclusion is based principally on the fact that: 1) spawner abundance is below 10% of the number required to maximize juvenile production; 2) juvenile abundance indices are lower than historical counts; and 3) smolt production is less than one-third of what would be expected based on the amount of habitat available. Counts of adults and redds in all rivers continue to show a downward trend from these already low abundance levels. Based upon Population Viability Analysis (PVA) modeling, the likelihood of extinction for the GOM DPS ranges from 19% to 75% within the next 100 years, even with the continuation of current levels of hatchery reproduction (Fay et al. 2006).

Threats to Atlantic Salmon Recovery

The Services listed the GOM DPS as endangered because of the danger of extinction created by inadequate regulation of agricultural water withdrawals, disease, aquaculture, and low marine survival (65 FR 69476, Nov. 17, 2000). At this time, the Services consider the Atlantic salmon an endangered species that is faced with a variety of threats including acidified water and associated aluminum toxicity, Atlantic salmon aquaculture off the coast of Maine, poaching of adults in DPS rivers, incidental capture of adults and parr by recreational fishermen, predation, sedimentation of habitat, depletion of diadromous fish communities, and water withdrawals. The 2006 status review of Atlantic salmon populations in Maine identified obstructed fish passage and degraded habitats caused by dams as one of the greatest impediments to self-sustaining Atlantic salmon populations in Maine (Fay et al. 2006). No single factor can be pinpointed as the cause of the continuing decline of the DPS. Rather, all threats that were key factors in the listing determination, in combination with other recently identified threats, have the potential to adversely affect Atlantic salmon and their habitat. Continued research and assessment is needed to understand the impacts of and interactions among all the threats faced by the DPS. Not all threats are pervasive throughout the DPS rivers, and not all threats would be expected to adversely affect the DPS if populations were stable (e.g., predation and competition). Despite a wide variety of conservation activities already completed or currently in progress, the GOM DPS has not shown any recent signs of population recovery.

GOM DPS of Atlantic salmon in the Action Area

Unpublished data collected by the MDMR and NMFS suggests that Atlantic salmon are naturally reproducing in Sedgeunkedunk Stream. The MDMR has conducted periodic electrofishing surveys in Sedgeunkedunk Stream since 1970. Most electrofishing sampling in Sedgeunkedunk Stream by MDMR has occurred below the Brewer Dam. Samples were not collected annually during this period nor were population estimates or densities generated from

these data. Electrofishing sampling, however, indicates that juvenile Atlantic salmon routinely occur in Sedgeunkedunk Stream (Table 1). From 1970 to 2007, the number of young-of-year salmon captured ranged from 0 (multiple years) to 138 (1980). Parr collected during sampling ranged from 0 (2006) to 132 (1979). One parr was collected upstream of the Brewer Dam in 2007 by NMFS. It is likely that the parr was able to move upstream of the dam through the dam gate which was left open to lower the impoundment. Several adult salmon have also been observed by MDMR and others in the stream during this period. Based upon stocking records maintained by the USFWS' Craig Brook National Fish Hatchery, it does not appear any Atlantic salmon have been stocked in Sedgeunkedunk Stream for the period of record. It is possible that some of the parr found in Sedgeunkedunk Stream originated from upstream stocking in the Penobscot River; however, no genetic information have been collected from parr collected in Sedgeunkedunk Stream so NMFS must assume that these fish were naturally reproduced. Overall, the population of Atlantic salmon in Sedgeunkedunk Stream appears very small and natural reproduction may not be occurring annually. Low numbers of Atlantic salmon in the stream is likely attributed to the lack of upstream fish passage facilities at dams in the watershed.

Atlantic salmon habitat was mapped in the vicinity of the Brewer Dam in 2006 (Aquatic Science Associates 2007). Generally, riffle habitats are typically the most productive areas for juvenile salmon production. Run habitats are also considered suitable for juvenile Atlantic salmon but at lower densities than riffles. Since lowering the impoundment in 2007, habitat upstream of the Brewer Dam has been converted from impounded habitat to run habitat. Potential juvenile salmon production in the former impoundment remains low and little or no spawning habitat is available. Downstream of the Brewer Dam, habitat consists of alternating riffle, run, and pool sequences with good instream and overhead cover. Potential salmon production appears good downstream of the Brewer Dam.

Table 1. Electrofishing results from Sedgeunkedunk Stream during 1970-2007 (MDMR and NMFS unpublished data).

	Number of Atlantic Salmon Captured	
Year	Young-of-Year	Parr
1970	0	7
1971	0	3
1975	3	9
1976	0	10
1977	6	8
1978	69	10
1979	0	132
1980	138	2
1981	73	91
1983	3	8
2000	2	10
2001	0	19
2002	0	2
2003	0	1
2005	0	4
2006	0	0
2007	0	2

ENVIRONMENTAL BASELINE

Environmental baselines for biological opinions include 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, scientific research, and fisheries, and recovery activities associated with reducing those impacts.

Effects of Federal Actions that have Undergone Formal or Early Section 7 Consultation

No formal or early consultations have been completed on actions occurring in the action area for this consultation.

Other Potential Sources of Impacts 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. Sedgeunkedunk Stream 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 Sedgeunkedunk Stream 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 Sedgeunkedunk Stream. Loss of riparian habitat in the stream from private and commercial development is also likely degrading water quality and habitat in Sedgeunkedunk Stream 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 Sedgeunkedunk Stream is presently unknown, road crossing surveys conducted in a nearby 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 Sedgeunkedunk Stream since 1996 (MDMR unpublished data). MDRM 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 Sedgeunkedunk Stream during MDRM sampling is expected to be less than 2% consistent with take estimates for other Maine streams where such records are maintained by MDMR.

Summary and Synthesis of the Status of the Species and Environmental Baseline
Impacts from actions occurring in the Environmental Baseline have the potential to impact Atlantic salmon. Atlantic salmon face multiple threats in Sedgeunkedunk Stream and the GOM DPS including water quality issues, incidental capture by recreational anglers, and habitat fragmentation due to improperly designed or maintained road crossings. The number of listed GOM DPS Atlantic salmon in Sedgeunkedunk Stream is very small. Data collected by the MDMR indicates that few if any listed adult Atlantic salmon are returning to Sedgeunkedunk Stream. In addition, very few juvenile Atlantic salmon or spawning redds have been documented in the stream since 2000.

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 habitat within the context of the species' current status and the environmental baseline.

A. Instream Work

Atlantic salmon may be killed or more likely temporarily disturbed, displaced, or injured by instream work activities associated with removal of the Brewer Dam. FHWA and Maine DOT propose to perform all instream work in the dry within sand bag cofferdams. These cofferdams will be constructed according to Maine DOT's most recent manual of BMPs for sediment and erosion control (Maine DOT 2002). Although isolation of stream work areas by a cofferdam is a conservation measure intended to minimize the adverse effects of construction activities on Atlantic salmon and their habitat, any fish present in the proposed cofferdam area will impacted. These salmon will either be temporarily disturbed or displaced so that they move away from the work area, or they will be captured inside the cofferdam and then handled and released downstream outside of the action area according to a fish evacuation plan.

Capturing and handling salmon causes physiological stress and can cause physical injury, although these effects can be kept to a minimum through proper handling procedures. The Maine DOT fish evacuation plan focuses on minimizing such stresses by requiring minimal handling time; minimal time that fish are held out of the water; and using transfer containers with

aerated stream water of ambient temperature. Impacts to Atlantic salmon will be further minimized by requiring that only qualified biologists (either from Maine DOT or fishery agencies) handle the fish. The contractor and its employees may not handle any Atlantic salmon.

Because the instream work areas will be isolated by cofferdams, the impacts of noise and vibration from construction equipment are expected to be very minimal, if any. The FHWA reports that noise from construction equipment does not carry from the air into the water column. Vibration through stream substrates into the stream outside of the cofferdam during removal activities may result in some avoidance of the work area by juvenile salmon. Dewatering of the cofferdams will result in the loss of aquatic invertebrates within the isolated stream channel areas, however, the impacts are expected to be relatively minor.

Atlantic salmon data collected in the stream since 2000 can be used to estimate the number of fish likely to be captured inside the cofferdam at the Brewer Dam project; however, due to the difficulty in predicting the number of salmon that will be present within Sedgeunkedunk Stream when the cofferdam is constructed and the percentage of those salmon that will not be able to escape from enclosure in the cofferdam, it is extremely difficult to predict the number of GOM DPS Atlantic salmon likely to be captured inside the cofferdam.

However, 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 subject to entrapment and subsequent capture and handling. As all instream work will occur during the summer (July 15 to September 30), only Atlantic salmon parr or adults could be present in Sedgeunkedunk Stream. Therefore, parr and adults are the only lifestages reasonably likely to be vulnerable to entrapment within the cofferdam area.

Since 2000, between 0 and 19 Atlantic salmon parr have been documented in the stream annually. Most of these fish were collected in the 0.5 miles of stream downstream of the Brewer Dam. As there is nothing to suggest that more parr are likely to be present in the stream in 2008, NMFS assumes that this range is a reasonable estimate of the number of parr likely to be present in the stream in 2008. As such, NMFS does not expect any more than 19 Atlantic salmon parr to be present in Sedgeunkedunk Stream downstream of the Brewer Dam in the summer of 2008 (0.7 parr/100 feet of stream). Only a fraction of these fish, if any at all, are likely to become entrapped within the cofferdam area. The sandbags for construction of the cofferdam will encompass approximately 200 feet of the streambed. Assuming that salmon are equally distributed throughout the 0.5 mile stretch of the stream, it is reasonably likely that no more than 2 Atlantic salmon parr are likely to become trapped within the cofferdam area. 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 likely to become entrapped in the cofferdam. Once trapped within the cofferdam, these fish will be removed and placed in the area downstream of the cofferdam. The use of the evacuation procedures and qualified staff is likely to minimize the potential for injury or mortality to trapped fish. Therefore, no Atlantic salmon parr are expected to die as a result of being evacuated from the cofferdam area.

No adult Atlantic salmon are likely to become entrapped in the cofferdam as adults are expected

to be exceedingly rare in the stream and even if adults were present they are expected to be able to leave the area prior to completion of the placement of sandbags.

B. Water Quality Effects

Instream construction activities can result in temporary increases of suspended solids within the stream. Use of sandbag cofferdams to allow most of the construction work to be done in the dry and doing all instream work during the prescribed summer low-flow work window (July 15 to September 30) will minimize the amount of suspended solids entering Sedgeunkedunk Stream. Turbid water from within the cofferdams will be pumped into an appropriate area (such as a sedimentation basin or a tank truck) to avoid sedimentation impacts to Sedgeunkedunk Stream. Installation, maintenance, and removal of the cofferdams will be done in accordance with the Maine DOT BMP manual; following these procedures will minimize the amount of construction-related sediment in the stream. Accumulated sediments in the impoundment could also be released downstream following dam removal causing temporary turbidity, however, natural revegetation of the stream banks should minimize these effects. Likewise, a minor amount of sediment could be released downstream when the sandbag cofferdams are removed. These potential sedimentation events are expected to be very short in duration and involve very small amounts of sediment. Therefore, impacts on Atlantic salmon would be negligible.

Potential adverse effects of increases in stream turbidity on Atlantic salmon could include the following: 1) reduction in feeding rates; 2) increased mortality; 3) physiological stress; 4) behavioral avoidance of the work area; 5) physical injury (e.g., gill abrasion); and 6) reduction in macroinvertebrates. 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 most years, flows in Sedgeunkedunk Stream are very low during summer months. The low water level will allow for essentially complete containment of the work area within the cofferdam. This will lead to only a negligible amount of sediment released when the cofferdams are removed at the end of the in-stream work. Because of the minor amount of construction-related sediment expected to be released into the stream and because of the small number of juvenile salmon expected to be in the action area, turbidity-related effects are expected to be minor and very short-term.

The contractor will use a Maine DOT-approved spill prevention and control plan designed to avoid any impacts to Sedgeunkedunk 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 spill plan and at least 100 feet from the shoreline of Sedgeunkedunk 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).

Natural streambed substrates will be placed in the newly formed channel and rubble will be placed along areas of the streambank. Adding rubble can cause an increase in stream water

temperature due to an increase in solar radiation. This minor amount of rubble, however, is not expected to have any effect on the water temperature of Sedgeunkedunk Stream. Rather, the additional of natural substrates in expected to improve overall aquatic habitat conditions for salmon in the project area.

Some minor vegetation removal is likely to be needed to allow for construction equipment access to the dam. All disturbed areas will be mulched and stabilized following construction. This minor vegetation removal will not result in any increase in stream water temperature. Furthermore, this minor vegetation removal should not result in any input of sediment into Sedgeunkedunk Stream, as long as appropriate erosion control BMPs are used.

C. Improvements to Fish Passage

Removal of the Brewer Dam will improve upstream and downstream passage for Atlantic salmon in Sedgeunkedunk Stream. Historically, no upstream passage was available for any migratory fish species at the dam. Removal of the dam is also expected to improve water quality conditions in the stream through increased aeration and reductions in thermal warming. Thus, the removal of Brewer Dam should have long-term direct and indirect beneficial effects to listed Atlantic salmon in the GOM DPS.

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.

Impacts to Atlantic salmon from non-federal activities are largely unknown in this river. It is possible that occasional recreational fishing for other fish species may result in incidental takes. There have been no documented takes in the action area, however, there is always the potential for this to occur when fisheries are known to operate in the presence of Atlantic salmon.

In December 1999, the State of Maine adopted regulations prohibiting all angling for sea-run salmon statewide. A limited catch-and-release fall fishery (September 15 to October 15) for Atlantic salmon in the Penobscot River was recently authorized by the MDMR for 2006. Angling is limited to 150 feet downstream of the Veazie Dam to the Bangor Dam. In 2008, a limited catch-and-release spring fishery was authorized by the MDMR. Considering the low numbers of GOM DPS origin Atlantic salmon in this area of the Penobscot, this fishery is not expected to significantly affect listed Atlantic salmon. Despite strict state and federal regulations, both juvenile and 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). Commercial fisheries for elvers (juvenile eels) and alewives may also capture Atlantic salmon as bycatch. 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.

INTEGRATION AND SYNTHESIS OF EFFECTS

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, with only 53 adults in 2007. Based upon the best available scientific information, NMFS has determined that the proposed study will result in the entrapment and subsequent capture and release of up to 2 juvenile Atlantic salmon. Based upon assumptions outlined in this Opinion, no incidental mortality of Atlantic salmon is likely to occur during the project. No adult Atlantic salmon are expected to be injured or killed as a result of the proposed Brewer Dam removal project.

NMFS believes that the proposed action would not reduce the reproduction or distribution of Atlantic salmon in Sedgeunkedunk Stream. This action is not likely to reduce reproduction because it is not likely to affect spawning activity and the action will not affect suitable spawning habitat or prevent Atlantic salmon from attempting or completing spawning. 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 Brewer Dam. Nor is it expected that the action would reduce the distribution of Atlantic salmon throughout the GOM DPS. Rather, removal of the Brewer Dam will restore access to historic habitat within the Atlantic salmon's range in the GOM DPS.

For these reasons, NMFS believes that there is not likely to be any reduction in reproduction and distribution and only a small and undetectable impact to listed Atlantic salmon in the lower Penobscot River tributaries. As such, there is not likely to be an appreciable reduction in the likelihood of survival and recovery in the wild of lower Penobscot River populations or the species as a whole.

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. No critical habitat has been designated for this species; therefore, none will be affected. As explained above, no effects to listed shortnose sturgeon are likely to result from the proposed action.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any

such conduct. NMFS interprets the term "harm" as an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering (50 CFR §222.102). 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 Brewer Dam removal project has the potential to directly affect Atlantic salmon by causing individuals to be entrapped in the cofferdam and then subsequently be handled and placed downstream. Based upon Atlantic salmon abundance data collected by the MDMR in Sedgeunkedunk Stream since 1970 and the assumptions outlined in the Effects of the Action section above (see p. 15), NMFS anticipates that no more than 2 Atlantic salmon are likely to be taken during this project. No lethal take of Atlantic salmon is expected during the project.

NMFS believes 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.

Reasonable and Prudent Measures
NMFS believes the following reasonable and prudent measure is necessary and appropriate to monitor and minimize the impacts of incidental take of Atlantic salmon:

1. Minimize the adverse effects to Atlantic salmon in Sedgeunkedunk Stream 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 dam removal project. NMFS believed that adherence to these conditions would reduce the potential for interactions with Atlantic salmon.

Terms and Conditions
In order to be exempt from prohibitions of section 9 of the ESA, FHWA 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. 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. Minimize the potential for impacts to Atlantic salmon and their habitat by conducting all instream work from July 15 to September 30 (of any given year) during periods of low stream flow. Notify NMFS when construction activities are expected to commence.

3. While carrying out the fish evacuation plan during construction and dewatering of all cofferdams, the equipment disinfection procedures of the MDMR must be followed for all gear including waders, nets, and buckets (Attachment 2). Furthermore, only qualified Maine DOT biologists (or qualified staff from state and federal fishery agencies) shall handle Atlantic salmon according to the evacuation plan. The names of currently approved biologists are included in Attachment 1.

4. The contractor must develop a spill prevention and control plan for review and approval by FHWA and Maine DOT 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 Sedgeunkedunk Stream.

5. FHWA and Maine DOT staff must carefully monitor the actions described in this opinion and document the level of incidental take, with a report provided to the NMFS, to ensure that the project is minimizing the take of Atlantic salmon. Any interactions with Atlantic salmon must be reported to NMFS' Maine Field Office within 24 hours. A final report must be submitted within 30 days of project completion.

The reasonable and prudent measures, with their implementing terms and conditions, are 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. FHWA 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.

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 dam removal project to be funded and carried out by FWHA in Sedgeunkedunk Stream is not likely to jeopardize the continued existence of the GOM DPS of Atlantic Salmon. NMFS recommends that the following conservation recommendations be implemented:

1. The FHWA and Maine DOT should collaborate with the MDMR and other fisheries agencies to monitor the effectiveness of upstream fish passage in Sedgeunkedunk Stream after removal of

Brewer Dam and associated stream channel enhancements.

REINITIATION OF CONSULTATION

This concludes formal consultation on the Brewer Dam Removal Project to be funded and carried out by FWHA in Sedgeunkedunk Stream. 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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{Macdonald, 1984 #1496}

ATTACHMENT A
FWHA ATLANTIC SALMON EVACUALTION PLAN

Attachment 1

Atlantic Salmon Evacuation Plan

Capturing and handling salmon causes physiological stress and can cause physical injury; to minimize these effects, the following procedures will be followed by Maine DOT during activities associated with the removal of a dam on Sedgeunkedunk Stream in Brewer, Maine.

1. Maine DOT Environmental Office staff will be onsite during construction and dewatering of all cofferdams
2. Maine DOT Environmental Office staff will follow the Maine Atlantic Salmon Commission Disinfection Procedures (attached)
3. Atlantic salmon will be handled only by qualified Maine DOT Environmental staff or biologists from the fishery agencies
4. Atlantic salmon will be netted (1/4" knotless nylon) and immediately placed in a disinfected 5-gallon bucket. The bucket will be filled with aerated stream water of ambient temperature. Handling time will be minimized. Salmon will be transferred downstream of the action area. All other fish species will be placed in a separate disinfected 5-gallon bucket with aerated stream water of ambient temperature and released downstream
5. A report of all transferred salmon will be submitted to NMFS and MDMR.

Due to variability in construction timing, potential scheduling conflicts, and other potential unforeseen issues, to insure coverage and eliminate Project delays several Maine DOT employees will be available during construction and dewatering of cofferdams. The list of qualified Maine DOT Environmental staff includes:

1. John Perry
2. Ryan Annis
3. Dan Tierney
4. Jared Stanley
5. Richard Bostwick
6. Peter Newkirk

Others may be added to the list pending NMFS approval.

Attachment 2

MAINE ATLANTIC SALMON COMMISSION
DISINFECTION PROCEDURES

A disinfecting area should be established at each office. The disinfecting area needs to have an outside water faucet and an adequate length of garden hose with sprayer. Ideally, the area should have excellent drainage or percolation.

Vehicles and equipment should be kept clean and free of dirt and mud, which can harbor pathogens and prevent effective disinfection. Normal soap and water goes a long way in accomplishing this.

Equipment needed:

1 large (40+ gal.) trash can
Large stiff bristle brush
Spray bottle
Nolvasan disinfectant
Rubbing alcohol

Crew vehicles:

Wash periodically during the field season.

Transport trucks and tanks:

All transport trucks and transport tanks are to be disinfected before they are used to haul fish from different river systems. Care must be taken to run all recirculation pumps and aerators during disinfection and rinsing. Disinfection is accomplished with a 2oz. Nolvasan/gallon water solution.

Field equipment:

All field equipment must be disinfected before use between river systems. Disinfection for most equipment is accomplished with a 2oz. Nolvasan/gallon water solution in the large trash can. Equipment that comes in constant contact with stream water, such as waders, dip nets, seines, gloves, live cars, shocker wand and tail, fish boards, etc., should be allowed to set in solution for 10 minutes then rinsed thoroughly. Delicate equipment, such as electronic scales, conductivity meters, thermometers, etc., should be sprayed with alcohol and allowed to air dry.