This Biological Opinion is no longer active.
Please visit

http://www.nero.noaa.gov/Protected/section7/bo/actbo.html

to find active Biological Opinions.

INACTIVE

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

SEP 21 2009

Stephen J. Silva, Chief
Water Quality Branch
United States Environmental Protection Agency, Region 1
1 Congress Street, Suite 1100
Boston, Massachusetts 02114-2023

RE: Kennebec River Fish Assemblage Assessments

Dear Mr. Silva:

Enclosed is the biological opinion (Opinion), issued under Section 7(a)(2) of the Endangered Species Act (ESA), for the US Environmental Protection Agency's (EPA) proposed support of bioassessment studies in the Kennebec River, pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended. This Opinion is based on NOAA's National Marine Fisheries Service's (NMFS) independent evaluation of the following: EPA's Biological Assessment dated March 2009, correspondence with EPA staff and contractors, scientific papers and other sources of information. The Opinion concludes that the proposed action is likely to adversely affect but is not likely to jeopardize the continued existence of the Gulf of Maine Distinct Population Segment (DPS) of Atlantic salmon. Additionally, the consultation concludes that the proposed action is not likely to adversely affect critical habitat designated for Atlantic salmon.

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) of the ESA, 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. The Incidental Take Statement (ITS) accompanying the Opinion, pursuant to Section 7 (b)(4) of the ESA, exempts the incidental taking of a certain number of Atlantic salmon from exposure to the electric current associated with the electrofishing boat. Based on the estimates of take calculated in the Opinion, a total of no more than 2 Atlantic salmon are likely to be exposed to electric current, with no mortalities expected.

The ITS specifies four reasonable and prudent measures (RPMs) and eight Terms and Conditions necessary to minimize and monitor take of listed species. The RPMs and Terms and Conditions outlined in the ITS are non-discretionary, and must be undertaken so that they become binding

INACTIVE

conditions for the exemption in section 7(o)(2) to apply. Failure to implement the terms and conditions through enforceable measures may result in a lapse of the protective coverage of section 7(o)(2). Monitoring that is required by the ITS will continue to supply information on the level of take resulting from the proposed action.

This Opinion concludes consultation for the EPA's proposed support of the bioassessment studies in the Kennebec River. Reinitiation of consultation is required and shall be requested by EPA or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (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.

We look forward to continuing to work cooperatively with your office to further the conservation of listed species. For further information regarding any consultation requirements, please contact Julie Crocker of my staff at (978)282-8480 or by e-mail (Julie.Crocker@noaa.gov). Thank you for working cooperatively with my staff throughout this consultation process.

Sincerely,

Patricia A. Kurkul
Regional Administrator

EC: Crocker, F/NER3
Abele, EPA

File Code: EPA R1 – Kennebec Fish Assemblage Assessments 09-10
PCTS: F/NER/2009/04801

INACTIVE

NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT
BIOLOGICAL OPINION

Agency: **Environmental Protection Agency (EPA), Region I**

Activity Considered: **Kennebec River Bioassessment Studies**
F/NER/2009/04801

Conducted by: National Marine Fisheries Service
Northeast Region

Date Issued: SEPT 21, 2009

Approved by:

This constitutes the biological opinion (Opinion) of NOAA's National Marine Fisheries Service (NMFS) issued pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended, on the effects of the US Environmental Protection Agency's (EPA) funding and carrying out of a proposed bioassessment study on the Kennebec River, Maine. This Opinion is based on information provided in the Biological Assessment (BA) dated March 2009, correspondence with EPA staff and contractors, scientific papers and other sources of information. A complete administrative record of this consultation will be kept at the NMFS Northeast Regional Office. Formal consultation was initiated on June 22, 2009.

INACTIVE

Consultation History
In 2008, EPA provided information to NMFS on proposed electrofishing surveys to be conducted throughout New England in 2009. Over the course of several conference calls, EPA and NMFS were able to identify rivers where NMFS listed species are known to be present. On April 1, 2009, EPA requested formal consultation with NMFS on the effects of their proposed bioassessment project on the Kennebec River, Maine. Throughout the consultation period, EPA and NMFS have held several conference calls to clarify the proposed action. Additional information on the proposed action was received through June 22, 2009 and this date serves as the date that consultation was initiated.

DESCRIPTION OF THE PROPOSED ACTION

Proposed Action
U.S. EPA, Region I is conducting a bioassessment project in the Kennebec River, Maine that will take place in September 2009; the project includes a fish assemblage assessment based on a single gear electrofishing methodology. The project has been designed to document changes in fish assemblages following the removal of the Edwards Dam in 1999 and has been ongoing since 2002. The study, as it has in the past, will follow the Index of Biotic Integrity (IBI) study design (see below) which involves conducting electrofishing surveys in randomly selected 1-km reaches of the river, adjacent to the shoreline; one of the seven sites will occur at the confluence of the Sebasticook River with the Kennebec River. Additionally, one site will be sampled in South

Gardiner, Maine, also along the Kennebec River. This site will serve as a reference site for an ongoing National Rivers and Streams Assessment and will also be sampled following the IBI methodology. EPA is currently proposing to provide funding to the Midwest Biodiversity Institute (MBI) to complete a contract to carry out this work.

In keeping with the methodology established by Yoder et al. (2006a; i.e., the IBI approach), boat electrofishing will be conducted once at each electrofishing site during a summer-fall (July 1 – September 30) index period. The work is currently proposed to take place in late September 2009.

Field Sampling Methods

Methods for the collection of fish in the survey are based on those developed and used in Maine during 2002-7 (Yoder et al. 2006 a,b) and referred to as the IBI Methodology. IBI type sampling occurs over a 1-km long transect with the sampling equipment described below. A total of 7 sampling events will occur between Waterville and Augusta, Maine, with an additional site in South Gardiner. Sampling is expected to occur in late September. Each site will be sampled once over an approximately 3 day period.

Electrofishing Methodology

Individual electrofishing sites are located along the shoreline with the most diverse habitat features in accordance with established methods (Yoder et al. 2006 a,b). This is generally along the gradual outside bends of larger rivers, but it is not invariable. Sampling distance is determined with a GPS unit and/or laser range finder.

Electrofishing entails passing an electric current in the water to capture or control fish. The electric current causes fish within the effective area of the electric field to become temporarily stunned or immobilized (referred to as electrotaxis) to facilitate capture by nets.

An electrofishing boat will make a single pass along each transect, traveling approximately 1 km along the shoreline. Electric currents will be applied to maintain power densities sufficient to generate electrotaxis in targeted fish (i.e., shad, salmon, and eels). Minimum settings will be estimated by measuring water conductivity and evaluating behavioral responses of fish prior to changing settings. Efforts to adjust settings will favor low frequency and pulse width to minimize any injuries to fish. Target electrical currents are 2 to 4 amps, 400 volts, and 60 pulses per second. Based upon these setting, the expected range of electrotaxis for fish in the electric field will be approximately 4.5 meters in diameter down to a depth of approximately 2.5 meters. During sampling the anode and cathode will be held as far apart as practical to generate a more diffuse field in order to minimize the risk of injury to fish. Stunned fish will be captured using hand held nets and removed from the water as rapidly as possible.

Captured fish will be immediately placed in aerated live wells containing ambient river water. Each transects typically takes 45 minutes to complete with an additional 45 minutes to process all of the fish captured. The total time held for each fish will vary; however, as fish are processed after each transect the maximum holding time for any one fish will be 90 minutes. Captured fish will be identified to species, measured, enumerated and released alive.

INACTIVE

Sampling Procedure
A boat-rigged, pulsed D.C. electrofishing apparatus is the single gear employed in the largest mainstem rivers where navigation with a john boat is feasible. This consists of a 16' john boat specifically constructed and modified for electrofishing. Electric current is converted, controlled, and regulated by Smith-Root 5.0 GPP alternator-pulsator that produces up to 1000 volts DC at 2-20 amperes depending on the relative conductivity. The pulse configuration consists of a fast rise, slow decay wave that can be adjusted to 30, 60, or 120 Hz (pulses per second). Generally, electrofishing is conducted at 60 or 120 Hz, depending on which selection is producing the optimum combination of voltage and amperage output and most effectively and safely stunning fish.

The voltage range is selected based on what percentage of the power range produces the highest amperage readings. Generally, the high range is used at conductivity readings less than 50-100 µS/cm2 and the low range is used at higher conductivities up to 1200 µS/cm2. Lower conductivities usually produce lower amperage readings. In 2005 a 14' raft mounted gear was tested and used to sample intermediate sized rivers where use of the 16' boat was not practical primarily due to navigational issues such as depth and fast flows. This method employs the same basic design as the 16' boat, but uses a Smith-Root 2.5 GPP unit. Electric current is converted, controlled, and regulated by Smith-Root 2.5 GPP alternator-pulsator that produces up to 1000 volts DC at 2-8 amperes depending on the relative conductivity. The principles of operation are the same as with the 5.0 unit.

The electrode array on the 16' boat consists of four 8' long cathodes (negative polarity; 1" diameter flexible steel conduit) which are suspended from the bow and 2-3 gangs of anodes (positive polarity) suspended from a retractable aluminum boom, the number used being dependent on the conductivity of the water. The raft configuration is similar except there are 6 cathodes in two gangs of 3 suspended from the sides of the raft. In both platforms the gangs of anodes consist of four 3/8" woven steel cable strands (each 4' in length) formed into a "gang" by binding them together near the attachment point on the boom. These gangs are added or detached as conditions change; anodes are increased at low conductivity (3 gangs) and reduced (2 gangs and/or fewer wires) at high conductivity. The anodes are suspended from a retractable aluminum boom that extends 2.75 meters in front of the bow on the 16' boat and 2.5 m on the 14' raft. The width of both arrays is 0.9 meters. Anodes and cathodes are replaced when they are lost, damaged, or become worn. For night sampling, 100-Watt floodlights are fixed on the guardrail and side rails on the netting platform located on the bow of the 16' boat; the 14' raft is not used at night. These are powered by the 12-volt DC output of the 5.0 GPP generator. Auxiliary lighting includes headlamps worn by the sampling crew and hand held lamps of 500,000 to 1,000,000 candle power. A 16' boat electrofishing crew consists of a boat driver and two netters; the 14' raft crew consists of a raft driver and one netter. Limited access to free-flowing segments may necessitate launching at an upstream location and recovering at a downstream location. Put-in and take-out sampling is conducted where navigational barriers preclude contiguous navigation.

For boat and raft electrofishing at individual sampling locations, the accepted procedure is to slowly and methodically maneuver the electrofishing boat in a down current direction along the shoreline maneuvering in and around submerged cover to advantageously position the netters to

INACTIVE

pick up stunned and immobilized fish. This may require frequent turning, backing, shifting between forward and reverse, changing speed, etc. depending on current velocity and cover density and variability. Although sampling effort is measured by distance, the time fished is an important indicator of adequate effort. Time fished can legitimately vary over the same distance as dictated by cover and current conditions and the number of fish encountered. In all cases, there is a minimum time that should be spent sampling each zone regardless of the catch. In practice this is generally in the range of 2000-2500 seconds for 0.5 km, but could range upwards to 3500-4000 seconds where there is extensive instream cover and slack flows. For the 1.0 km standard distance, this was determined to be from 3000-4000 seconds for impounded and tidal sites and 3500-4500 seconds or more at riverine sites in 2002 and 2003.

Netters are required to wear polarized sunglasses to facilitate seeing stunned fish in the water during each daytime boat electrofishing run. A boat net with a 2.5m long handle and 7.62mm Atlas mesh knotless netting is used to capture stunned fish as they are attracted to the anode array and/or stunned. A concerted effort is made to capture every fish sighted by both the netters and driver. Since the ability of the netters to see stunned and immobilized fish is partly dependent on water clarity, sampling is conducted only during periods of "normal" water clarity and flows. Periods of high turbidity and high flows are avoided due to their negative influence on sampling efficiency. If high flow conditions prevail, sampling will be delayed until flows and water clarity return to seasonal, low flow norms.

Field Sample Processing Procedures

Captured fish are immediately placed in an on-board live well for processing. Water is replaced regularly in warm weather to maintain adequate dissolved oxygen levels in the water and to minimize mortality. Aeration will be provided to further minimize stress and mortality. Special handling procedures are employed for certain species. Adult Atlantic salmon and sturgeon, for example, would not be netted when sighted and the electric current would be turned off upon observation of these species. Any size estimates would be made visually. Fish that are not retained for voucher or other purposes are released back into the water after they are identified to species, examined for external anomalies, weighed and, if necessary, measured for total length. Every effort is made to minimize holding and handling times. Non-indigenous species may be kept and appropriately disposed of out of the water per the request of the state management agencies. The majority of captured fish are identified to species in the field; however, any uncertainty about the field identification of individual fish requires their preservation for later laboratory identification. Fish are preserved for future identification in borax buffered 10% formalin and labeled by date, river or stream, and geographic identifier (e.g., river mile). Fish weighing less than 1000 grams are weighed to the nearest gram on a spring dial scale (1000 g x 2g) or a 1000 g hand held spring scale. Fish weighing more than 1000 grams weighed to the nearest 25 grams on a 12 kg spring dial scale (12 kg x 50 g) or a 50 kg hand held spring scale. Samples that are comprised of two or more distinct size classes of fish (e.g., y-o-y, juveniles, and adults) are processed separately.

Electrofishing Effective Range

The electrofishing method as described generally produces an electric field of approximately 4.5-5.5 meters in diameter and depths of up to 2.5-3.5 meters. It is most effective along the shoreline and adjacent to hard structures such as bedrock ledges, woody debris, and hard substrates. The

INACTIVE

effective extent of the electric field is species dependent and based on the susceptibility of each to the electric field. The size of individual fish also affects their susceptibility to being influenced by the electric field. Generally larger fish are the most susceptible as the voltage gradient increases with length, but the method is generally effective for all sizes of fish >25 cm.

Sampling Site Configuration

The sampling sites are generally located immediately adjacent to the shoreline or submerged features such as bedrock ledges and gravel shoals. Generally, the "deepest side" of the river with the "best combination and heterogeneity of habitat, flow, and structural cover" is thoroughly sampled. A 1.0 km site typically requires between 3600 and 5400 seconds of "current time", i.e., the cumulative time that the electric field is activated within a site (the netters operate a foot pedal switch, current is applied intermittently). The variance in time fished is affected by site navigability, current velocity, current types, boat maneuverability, and the number of fish collected.

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." For purposes of this Section 7 consultation, the action area is defined as all areas where electrofishing sampling has the potential to affect listed species under the jurisdiction of NMFS. As discussed below, listed shortnose sturgeon and listed Atlantic salmon are known to occur in the Kennebec River. As explained above, the action will involve running multiple transects along the shoreline in the Kennebec River. Each transect will result in an electric field 4.5-5.5 meters wide, 2.5-3.5 meters deep and 1 km long. Thus, the action area is defined as the stretches of the Kennebec River being sampled by the proposed study. The proposed action is not expected to have any direct or indirect effects to listed species outside of the eight areas where electric current will be experienced.

INACTIVE

STATUS OF AFFECTED SPECIES

This section will focus on the status of the various species within the action area, summarizing information necessary to establish the environmental baseline and to assess the effects of the proposed action. NMFS has determined that the following endangered species occur in the Kennebec River:

Fish

Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Gulf of Maine Distinct Population Segment of Atlantic salmon	Endangered

Additionally, the action area has been designated as critical habitat for the GOM DPS of Atlantic salmon.

A population of endangered shortnose sturgeon occurs in the Kennebec River. A Schnabel estimate using tagging and recapture data from 1998, 1999 and 2000 indicates a population estimate of 9488 for the estuarine complex. This is the most recent population estimate for the Kennebec River shortnose sturgeon population; however, this estimate includes fish from the

Androscoggin and Sheepscot rivers as well and does not include an estimate of the size of the juvenile population.

In the Kennebec River, movement to the spawning grounds occurs in early spring (April - May). Movement to the spawning areas is triggered in part by water temperature and fish typically arrive at the spawning locations when water temperatures are between 8-9°C. Shortnose sturgeon typically spawn at the most upstream accessible site with suitable conditions. The Lockwood Dam at Waterville is the upstream limit of shortnose sturgeon in the Kennebec River. Spawning sites have been identified near Gardiner in the Kennebec River, at the base of the Brunswick Dam in the Androscoggin River, and may also occur in the Cathance River. Since the removal of the Edwards Dam in 1999, shortnose sturgeon have been able to travel as far upstream as the Lockwood Dam. Therefore, an additional spawning site may be present between Augusta and Waterville. Shortnose sturgeon quickly leave the spawning grounds for summer foraging areas when temperatures exceed 15°C (Squiers et al. 1982).

Summer foraging areas have been identified in the Sasanoa River entrance and in the mainstem of the Kennebec River below Bath. Between June and September, shortnose sturgeon forage in shallow waters on mud flats that are covered with rooted aquatic plants. In the summer months, concentrations of shortnose sturgeon have also been known to move up into the freshwater reaches of the Kennebec River and foraging shortnose sturgeon have also been seen in Montsweag and Hockomock Bays in the Sheepscot River, which is located near the eastern end of the Sasanoa River (NMFS 1996).

Until a study aimed at specifically determining overwintering locations was conducted by the Maine Department of Marine Resources (DMR) in 1996 for the Maine Department of Transportation (DOT), the sites thought to be the most likely overwintering sites were deep pools below Bluff Head, and possibly in adjacent estuaries such as the Sheepscot (Squiers and Robillard 1997). The 1996 study of overwintering activity suggests that at least one overwintering site is located above Bath in Merrymeeting Bay.

Based on the best available information on the seasonal distribution of shortnose sturgeon in the Kennebec River, adult shortnose sturgeon are only likely to be present in the Augusta to Waterville section of the river in the spring while migrating to and from any spawning sites that may exist in this river reach. If spawning occurs in this reach, early life stages could also be present in the spring, with larvae drifting further down into the river in the early summer. As noted above, each of the 8 sites selected for electrofishing will be sampled in September 2009. No shortnose sturgeon of any life stage are likely to be present in the action area at this time. Therefore, no shortnose sturgeon will be exposed to any effects of the proposed action. This conclusion is supported by the lack of interactions with or observations of any shortnose sturgeon during the past 7 years of electrofishing sampling within this reach of the river. As such, shortnose sturgeon will not be considered further in this Opinion.

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

INACTIVE

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 GOM 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 re-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 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 the 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 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; Snow 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).

INACTIVE

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 sea 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 5 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

INACTIVE

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; Hutchings 1986; Erkinaro et al. 1998; Halvorsen and Svenning 2000; Hutchings 1986; O'Connell and Ash 1993; Erkinaro et al. 1995; Dempson et al. 1996; Halvorsen and Svenning 2000; 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.

INACTIVE

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). 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

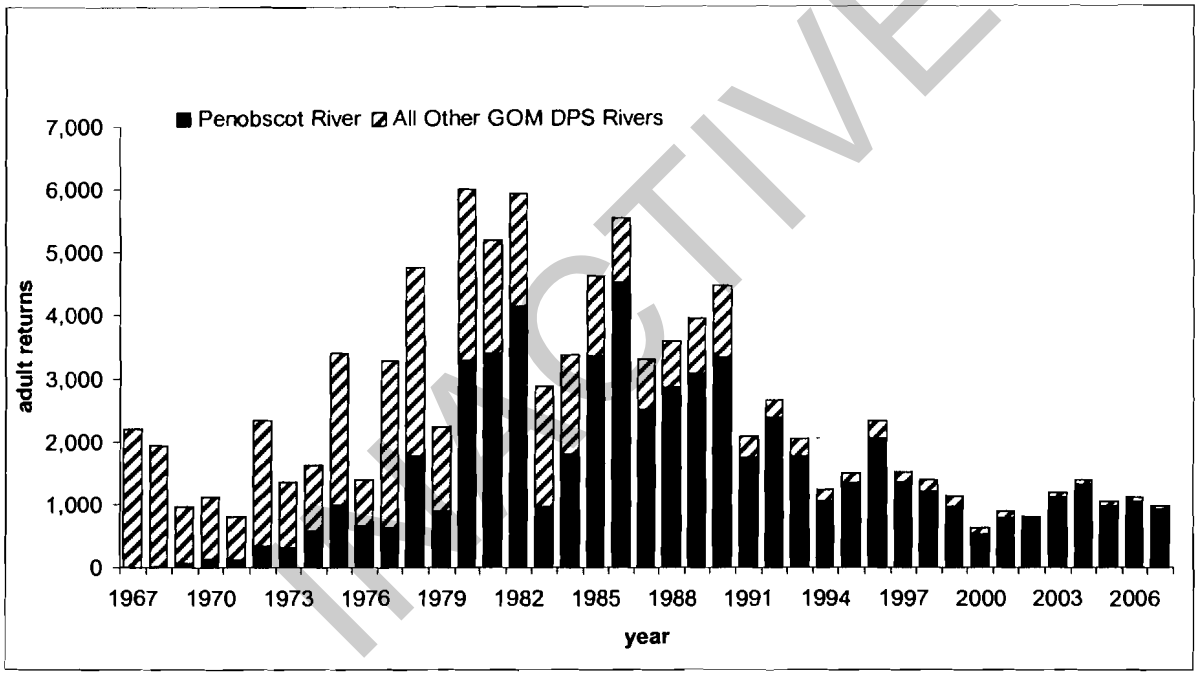
The abundance of Atlantic salmon within the range of the GOM DPS has been generally declining since the 1800s (Fay *et al.* 2006). Data sets tracking adult abundance are not available throughout this entire time period; however, Fay *et al.* (2006) present a comprehensive time series of adult returns 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).

INACTIVE

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 2000 (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

Figure 1. Adult returns to the GOM DPS 1967-2007.



INACTIVE

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. 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 hatchery fry.

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). Although it is impossible to distinguish truly wild salmon from those stocked as fry, it is likely that some portion of naturally reared adults are in fact wild. 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.

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[1]). 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:

1 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.

INACTIVE

Physical and Biological Features of the Spawning and Rearing PCE[2]

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 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.

INACTIVE

2 Appendix A designates the seven physical and biological features of the spawning and rearing PCE as A1 – A7. That convention will be used throughout this opinion.

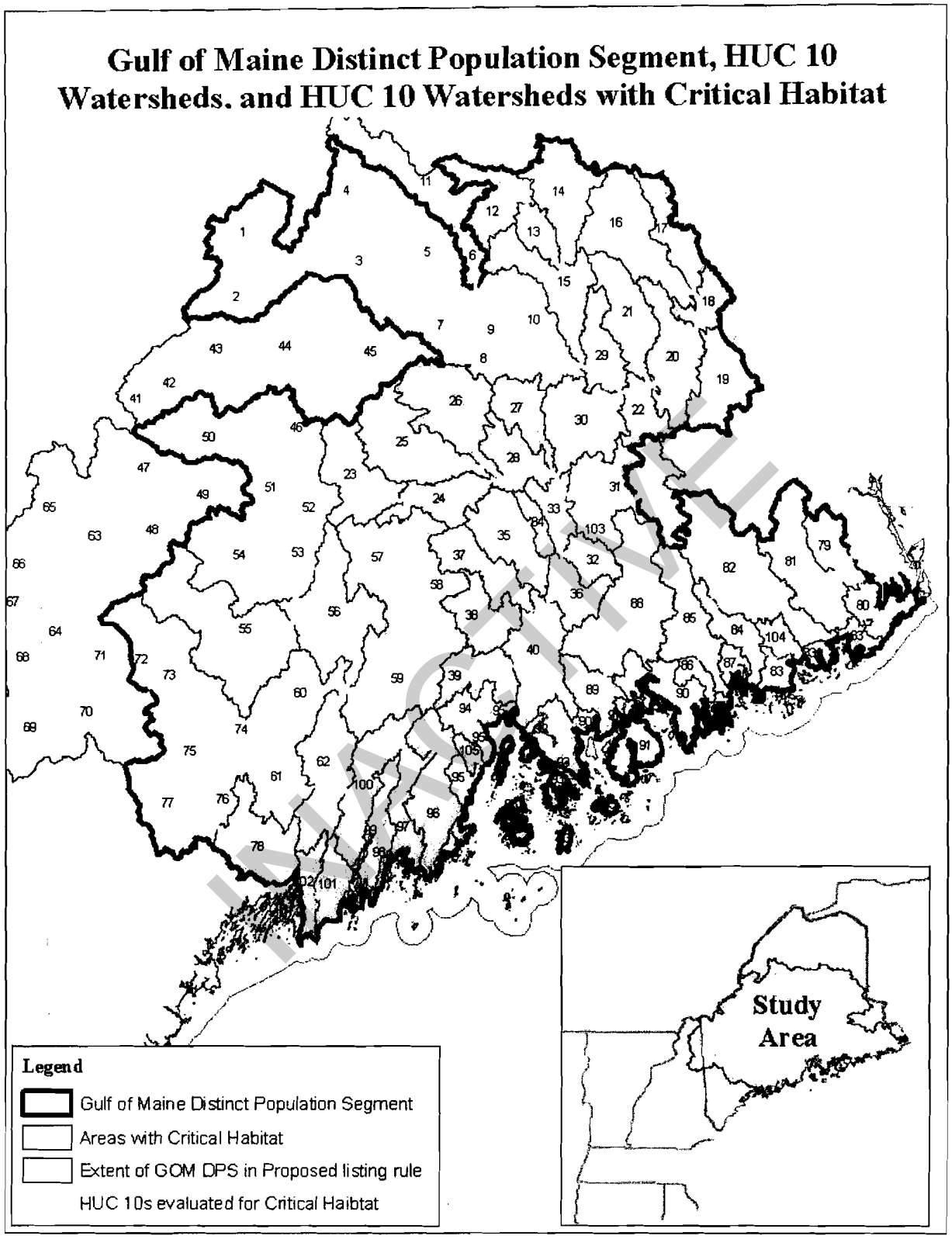


Figure 2. HUC 10 watersheds designated as Atlantic salmon critical habitat within the GOM DPS.

Physical and Biological Features of the Migration PCE[3]

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 includes all perennial rivers, streams, and estuaries and lakes connected to the marine environment within the range of the GOM DPS, except for those areas that have been specifically excluded as critical 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.

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 include 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

3 Appendix A designates the six physical and biological features of the migration PCE as B1-B6. That convention will be used throughout this opinion.

INACTIVE

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

The Merrymeeting Bay SHRU drains approximately 2,691,814 hectares of land (6,651,620 acres) and contains 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. There are forty-five HUC 10 watersheds in this SHRU, but only nine are considered 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 land use activities that cause degradation of physical and biological features and which reduce the productivity of habitat within each HUC 10. The combined qualities 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. Lands controlled by the Department of Defense within the Little Androscoggin HUC 10 and the Sandy River HUC 10 are excluded as critical habitat.

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. 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.

Summary of Factors Affecting Recovery of Atlantic Salmon

The recovery plan for the GOM DPS (NMFS and USFWS 2005) and the most recent status review (Fay *et al.* 2006) 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 severest threats to the species and

INACTIVE

immediately halting the decline of the species to prevent extinction. The 2005 recovery program 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 expect to produce a new recovery plan for Atlantic salmon.

INACTIVE

Threats to Atlantic Salmon Recovery

A threats assessment done as part of the 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

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 one of the significant threats 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 form the spread of diseases or parasites and from farmed salmon escapees interbreeding with wild salmon still exist.

INACTIVE

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 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.

Status of Atlantic Salmon in the Action Area
Adult Atlantic salmon ascend the rivers of New England beginning in the spring and continuing into the fall, with the peak occurring in June. Spawning occurs in late October through November. 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. 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

INACTIVE

smoltification, prepares the parr for migration to the ocean and life in salt water. 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. Due to the time of year of the proposed action (i.e., September 2009), the only life stage of Atlantic salmon that would be present in the action area are adults that may be migrating upriver.

Counts for Atlantic salmon in the Kennebec River are available since 2006 (NMFS and USFWS 2009). In 2006, the Kennebec River trap count was 15 returning adult salmon; in 2007, the number was 16. In 2008, the number of Atlantic salmon observed at the Lockwood fish lift, which is located at the first dam on the river, was 22 fish with the majority (15) observed in July and the remainder in June (5), September (1) and October (1). To date, 20 adult Atlantic salmon have been documented at the Lockwood fish lift in 2009, with 14 in July and the remainder in May (1), June (4), and August (1).

Based on the best available information, there are likely to be a small number of adult Atlantic salmon in the action area at the time when the proposed electrofishing occurs. No other life stage is likely to be present.

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 Opinion includes the effects of several activities that may affect the survival and recovery of the listed species in the action area. The activities that shape the environmental baseline in the action area of this consultation generally include: dredging operations, water quality, scientific research, fisheries, and recovery activities associated with reducing those impacts. The section below will discuss several threats that are global in nature and thus, impact Atlantic salmon throughout their range (i.e., climate change) as well as the impacts of localized actions that only affect Atlantic salmon in the action area.

INACTIVE

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

No formal or early consultations on the effects to Atlantic salmon of actions authorized, funded or carried out by Federal agencies 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 fisheries by recreational anglers. Due to a lack of reporting, no information on the number of Atlantic salmon caught and released or killed in recreational fisheries in the Kennebec River 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 the Kennebec River. Point source discharges (i.e., municipal wastewater, paper mill effluent, industrial or power plant cooling water or waste water) and compounds associated with discharges (i.e., metals, dioxins, dissolved solids, phenols, and hydrocarbons) contribute to poor water quality and may also impact the health of sturgeon populations. The compounds associated with discharges can alter the pH or receiving waters, which may lead to mortality, changes in fish behavior, deformations, and reduced egg production and survival.

Hydroelectric facilities
The Kennebec River Basin has been extensively developed for hydroelectric power production. The Federal Energy Regulatory Commission (FERC) issued a new license for the continued operation of the Lockwood Hydroelectric Project located in Waterville, Maine on March 4, 2005. The Lockwood Dam represents the upstream limit of the action area. As such, the operation of this facility affects water quality and flow within the action area. The Lockwood Dam is the first impediment to upstream migration on the Kennebec River mainstem. The Lockwood Project includes a fish lift which adult Atlantic salmon have been documented to use, with 15-22 adults documented annually between 2006 and 2008.

There are 9 facilities upstream of the Lockwood Project on the mainstem Kennebec River and an additional 4 on upstream tributaries. There are also 7 facilities located on downstream tributaries. While the effects of these other facilities are largely unknown, they all have the potential to affect flow and water quality in the River and may affect Atlantic salmon in the action area and may impede salmon movements within this river system.

Scientific Studies
MDMR has conducted periodic monitoring of Atlantic salmon populations in the Kennebec River. MDMR was authorized in 2009 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 the Kennebec River 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.

Global 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.

INACTIVE

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.

Summary and synthesis of the Status of Species, Environmental Baseline, and Cumulative Effects sections

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—the proposed electrofishing survey - is likely to jeopardize the continued existence of the species. 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 as best as possible given that some information on shortnose sturgeon is quantified, yet much remains qualitative or unknown.

Cumulative impacts from federal and private actions occurring in the Kennebec River have the potential to impact Atlantic salmon and critical habitat designated for this species. These include direct and indirect modification of habitat due to hydroelectric facilities and the introduction of pollutants from paper mills, sewers, and other industrial sources. Hydroelectric facilities can alter the river's natural flow pattern and temperatures and release of silt and other fine river sediments during dam maintenance can be deposited in sensitive spawning habitat nearby. These facilities also often represent barriers to normal upstream and downstream movements. Pollution has been a major problem for this river system, which continues to receive discharges from sewer treatment facilities and paper production facilities (metals, dioxin, dissolved solids, phenols, and hydrocarbons). The number of listed GOM DPS Atlantic salmon in the Kennebec River is very small, with adult returns from 2006-2008 ranging between 15 and 22; for 2009, 20 returns were documented through the end of August 2009.

EFFECTS OF THE ACTION

This section of an Opinion assesses the direct and indirect effects of the proposed action on threatened and 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 (50 CFR 402.02). This Opinion examines the likely effects (direct and indirect) of the proposed action on shortnose sturgeon in the action area and their habitat within the context of the species' current status, the environmental baseline and cumulative effects.

INACTIVE

As explained in the "Description of the Action" section above, the proposed action will involve electrofishing at 8 sites in the Kennebec River. All sampling will take place in September 2009. This section of the Opinion analyzes the effects of the proposed sampling events on Atlantic salmon present within the action area of this consultation.

Atlantic salmon

Based upon the best available data for the Kennebec River, Atlantic salmon could be present in any of the 8 river reaches identified for sampling. Due to the time of year when sampling will occur and the types of habitats that will be sampled, no spawning or overwintering fish will be affected; similarly no Atlantic salmon eggs or other early life stages would be present in the action area during this time of year. Additionally, as all sampling will take place in deeper, non-wadeable habitats, no parr would occur in the areas to be sampled. Also, no smolts are likely to be present in the action area during the month of September. Therefore, the only life stage likely to be exposed to effects of the action are adults.

Electrofishing can cause mortality or injury to fish. Fish encountering the electric current typically undertake an involuntary movement toward the positive electrode. Harmful effects to fish during electrofishing can include spinal injuries, bleeding at gills or vent, hemorrhaging, and excessive physiological stress (Snyder 2004). Snyder (2004), however, states that injuries heal and seldom result in delayed mortality if electrofishing is conducted carefully. Handling and anesthesia associated with electrofishing surveys can also cause harm to fish. Snyder (2004), in a review of the effects of electrofishing on fish, notes that electrofishing mortalities related to asphyxiation are often the result of poor handling.

As evidenced by the counts of Atlantic salmon at the Lockwood fish lift (see Table 1, below), the majority of adult Atlantic salmon entered the Lockwood lift in July, with only 1 Atlantic salmon at the lift in September. Based on the best available information, few Atlantic salmon are likely to be present in the action area during September. However, as Atlantic salmon adults have been documented at the fish lift in September and October, it is reasonable to expect that some number of Atlantic salmon may be present in the action area, which is located downstream of the Lockwood fish lift, during the three day period in September 2009 when electrofishing will occur.

INACTIVE

Table 1.

Number of Atlantic salmon captured at the Lockwood Project fish trap in 2007 and 2008

	May	June	July	August	September	October
2008	0	5	15	0	1	1
2009	1	4	14	1	0	-

As a small number of Atlantic salmon are likely to be present in the action area over the three day period in September when electrofishing will occur, these fish could be exposed to the electric current associated with the sampling. Electrofishing can cause mortality or injury to fish. Handling and anesthesia associated with electrofishing surveys can also cause harm to fish. Snyder (2004), in a review of the effects of electrofishing on fish, notes that electrofishing mortalities related to asphyxiation are often the result of poor handling. Snyder (2004) also states that injuries heal and seldom result in delayed mortality if electrofishing is conducted

carefully.

Based upon the best available information, few Atlantic salmon are expected to be present in the action area when the sampling takes place. For example, in 2008 only 1 Atlantic salmon was observed at the Lockwood fish lift in September. MBI has reported that over the last seven years of sampling within the Waterville – Augusta reach of the Kennebec River, in only one year were adult Atlantic salmon documented. On August 12, 2002, two adult Atlantic salmon were encountered during electrofishing in Waterville. Both fish swam away unharmed. Also, in July 2003, one young of the year Atlantic salmon was captured during electrofishing near the confluence of the Sebasticook River with the Kennebec River. However, as noted above, no young of the year are likely to occur in the action area during September. Based on the available information, including the seasonal distribution of Atlantic salmon in the Kennebec River, the number of adult Atlantic salmon returning to the Kennebec River from 2006-2009, the number of Atlantic salmon captured at the Lockwood fish lift in September 2008, the number of Atlantic salmon observed during the past seven years of the Waterville-Augusta electrofishing survey, the short duration of the study (3 days), the small number of transects being sampled (8 total), and the relatively small effective range of the electrofishing boat, NMFS expects that no more than 2 adult Atlantic salmon will encounter the electric current associated with the electrofishing gear.

The electrofishing survey to be undertaken in the Kennebec River will be performed pursuant to protocols developed specifically by the MASC to minimize the potential for injury or mortality to Atlantic salmon. Mortality rates during electrofishing surveys carried out by MDMR in the GOM DPS of Atlantic salmon have annually remained below 1% (MDMR unpublished data). Documented mortality of large parr during MASC electrofishing surveys in the Narraguagus has been less than 0.1%. No injury or mortality of adult Atlantic salmon is expected as the guidelines designed specifically to minimize the potential for injury or mortality will be followed.

Based upon this information, of the two adult Atlantic salmon that are likely to be present within the effective zone for the electrofishing boat, none are expected to experience mortality. Exposed salmon may be temporarily stunned and may roll or twitch. The available information indicates that these fish will recover immediately, likely within 5 minutes. It is likely that most adult Atlantic salmon will recover and swim away before they are netted. However, as adult Atlantic salmon may be vulnerable to injury during capture in hand nets, no adult salmon will be netted or handled during the study.

In summary, based on the limited size of the effective area of the electrofishing boat and the likely distribution of shortnose sturgeon within the action area, no more than 2 Atlantic salmon are expected to be affected by the September sampling event. Exposed salmon may be temporarily stunned and exhibit rolling or twitching behavior, but no injuries or mortalities are expected and any effects will be temporary. As no sampling will occur during salmon spawning activities and any adults encountered during sampling will have time to recover prior to any subsequent spawning activities, no significant effects to spawning salmon are expected. It is important to note that the low number of expected encounters is supported by the available information for other electrofishing surveys in the Kennebec River. As explained above, this survey has taken place for the last 7 years and only 2 adult Atlantic salmon and one young of the

INACTIVE

year have been observed.

Critical Habitat
The action area is a known migratory corridor for both juvenile and adult Atlantic salmon. A migratory corridor free from physical and biological barriers that delay or prevent access of adult salmon seeking spawning grounds or prevent emigration of smolts to the marine environment is identified in the critical habitat designation as essential for the conservation of Atlantic salmon. The Primary Constituent Elements (PCE) for designated critical habitat of listed Atlantic salmon in the action area are:

1) 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;
2) Freshwater and estuary migration sites with abundant, diverse native fish communities to serve as a protective buffer against predation; and,
3) Freshwater and estuary migration sites free from physical and biological barriers that delay or prevent emigration of smolts to the marine environment.

NMFS has analyzed the potential impacts of the project on designated critical and PCEs in the action area. NMFS has determined that the effects to these PCEs will be insignificant for the reasons outlined below.

The project will not result in a migration barrier as the electrofishing operation will only affect a small portion of the river at any given time, and because the electrofishing boat has a small effective range, electric current, which could deter fish from passing through the affected area, will be experienced in an extremely small area of the river at any given time. This will ensure that there is always a sufficient zone of passage past the electrofishing operation for any adult Atlantic salmon moving upstream past the area being sampled. The project will not alter the habitat in any way that would increase the risk of predation. Any effects to the water column will be limited to temporary electrification; there will be no other water quality impacts of the proposed action and therefore the project is not expected to affect water quality at the time of any salmon migrations in the action area. The types of species that will be stunned by the electrofishing gear and be subject to capture by the researchers are not likely to be the same species that juvenile or adult Atlantic salmon forage on; therefore, the project will not significantly affect the forage of juvenile or adult Atlantic salmon. Finally, as the action will not affect the natural structure of the nearshore habitat, there will be no reduction in the capacity of substrate, food resources, and natural cover to meet the conservation needs of listed Atlantic salmon. Based upon this reasoning, NMFS has determined that any effects to designated critical habitat in the action area will be insignificant.

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

INACTIVE

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. The effects of future state and private activities in the action area that are reasonably certain to occur during the proposed action are recreational and commercial fisheries, discharge of pollutants, and development and/or construction activities resulting in excessive water turbidity and habitat degradation.

As noted above, impacts to listed species from all of these activities are largely unknown. However, NMFS has no information to suggest that the effects of future activities in the action area will be any different from effects of activities that have occurred in the past.

□SEQ CHAPTER \h \r 1□**INTEGRATION AND SYNTHESIS OF EFFECTS**

GOM DPS of Atlantic salmon

The GOM DPS of Atlantic salmon is listed as endangered throughout its range. 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 1014 adults in 2007, and only 16 of these returning to the Kennebec (NMFS and USFWS 2009). Based upon the best available scientific information, NMFS has determined that the proposed study will result in the exposure of 2 adult Atlantic salmon to the electric current associated with the electrofishing equipment. 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 action.

This action will not reduce reproduction of Atlantic salmon in the Kennebec River because it will (1) not result in the mortality of any Atlantic salmon and therefore will not effect any potential reproduction of that individual; (2) not affect any spawning adults; (3) not affect spawning habitat; and (4) as recovery from exposure is expected to be rapid and complete, will not affect the reproductive fitness of any individual by reducing fecundity or increasing the interval between spawning.

This action will not reduce the numbers of Atlantic salmon in the Kennebec River because it will not result in the mortality of any Atlantic salmon. The proposed action will not reduce distribution because the action will not impede Atlantic salmon from accessing any habitat, including spawning, foraging or overwintering grounds in the Kennebec River. Further, the action is not expected to reduce the river by river distribution of Atlantic salmon.

For these reasons, NMFS believes that there is not likely to be any reduction in reproduction, numbers or distribution of GOM DPS Atlantic salmon in the Kennebec River or the species as a whole. As there will not be a reduction in reproduction or numbers of Atlantic salmon in the Kennebec River and no reduction in the rangewide distribution of this species, this action is not likely to impede the ability of the species to recover. As such, there is not likely to be an appreciable reduction in the likelihood of survival and recovery in the wild of the Kennebec River population of Atlantic salmon or the species as a whole.

INACTIVE

Critical Habitat designated for Atlantic salmon
As explained above, the proposed action will have only an insignificant effect on critical habitat designed for the GOM DPS of Atlantic salmon. This conclusion is based on the determination that there will be no permanent impacts to the habitat and because: (1) the project will not result in a migration barrier to or through any estuarine habitat; (2) the project will not increase the risk of predation; (3) the project is not expected to 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) there will be no effects to the natural structure of the nearshore habitat and therefore there will be no reduction in the capacity of substrate, food resources, and natural cover to meet the conservation needs of listed Atlantic salmon.

□SEQ CHAPTER \h \r 1□**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. Additionally, as any effects to designated critical habitat will be insignificant, NMFS has concluded that the action is not likely to adversely affect critical habitat designated for the GOM DPS of Atlantic salmon.

INCIDENTAL TAKE STATEMENT
Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species respectively, without special exemption. 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 action has the potential to directly affect Atlantic salmon by causing them to be stunned by the electric current and then be captured and handled. As explained in the "Effects of the Action" section of this consultation, no mortalities are likely and all Atlantic salmon exposed to the current are expected to recover quickly. While Atlantic salmon may exhibit behaviors such as rolling or twitching, no injuries are likely to be sustained. Based on available population estimates, the known distribution of the species within the action area, the location of the sampling sites, and the effective range of the electrofishing boat, NMFS has determined that no more than 2 adult Atlantic salmon are likely to be effected by the electrofishing survey. While no injuries or mortalities to any Atlantic salmon are expected, the anticipated interaction of 2 Atlantic salmon with sampling gear would be considered harassment under Section 9 of the

INACTIVE

ESA. 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
Reasonable and prudent measures are those measures necessary and appropriate to minimize incidental take of a listed species. NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize and monitor impacts of incidental take of shortnose sturgeon:

1. EPA must ensure that the contractor contact the NMFS NERO Protected Resources Division before sampling commences and again upon completion of the sampling activity.
2. EPA must ensure that personnel electrofishing have appropriate training in electrofishing and be trained in the handling and identification of Atlantic salmon.
3. EPA must ensure that all electrofishing procedures are designed to minimize the potential for injury or mortality of Atlantic salmon.
4. EPA must ensure that the contractor promptly report all interactions with Atlantic salmon to NMFS Protected Resources Division

Terms and conditions
In order to be exempt from prohibitions of section 9 of the ESA, EPA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and which outline required reporting/monitoring requirements. These terms and conditions are non-discretionary. These terms and conditions must be included as part of the contractual and assistance agreements between EPA and MBI and their subcontractors.

1. To implement RPM #1, EPA must contact NMFS within 48 hours of beginning and ending sampling (Jeff Murphy: by email (Jeff.Murphy@noaa.gov) or phone (207-866-7379) or the Section 7 Coordinator by phone (978-281-9328) or fax (978-281-9394)).
2. To implement RPM #2, EPA must contact NMFS within 24 hours of any interactions with Atlantic salmon, including non-lethal and lethal takes (Jeff Murphy: by email (Jeff.Murphy@noaa.gov) or phone (207-866-7379) or the Section 7 Coordinator by phone (978-281-9328) or fax (978-281-9394)).
3. To implement RPM #2, personnel shall be trained in Atlantic salmon biology and MDMR electrofishing and handling protocols (Attachment A).
4. To implement RPM #3, EPA must instruct the contractor that in the event adult salmon come in contact with sampling gear, all electrofishing must cease for 5 minutes or until the fish is observed to recover and leave the sampling area
5. To implement RPM #3, EPA must instruct the contractor to not net any adult Atlantic salmon
6. To implement RPM #4, in the event of any lethal take of Atlantic salmon, any dead specimens or body parts must be photographed, and immediately preserved (refrigerate or

INACTIVE

freeze) until disposal procedures are discussed with NMFS.

7. To implement RPM#4, in the event of any observation or interaction with a listed species, an incident report form (Appendix B) must be completed and submitted to NMFS **within 24 hours** by fax (978-281-9394 or e-mail (Jeff.Murphy@Noaa.gov)) of any interaction with a listed species.

8. To implement RPM #4, the EPA must submit a final report at the end of each calendar year summarizing the results of sampling activities and any takes of listed species to NMFS by mail (to the attention of the Section 7 Coordinator, NMFS Protected Resources Division, 55 Great Republic Drive, Gloucester, MA 01930).

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize and monitor the impact of incidental take that might otherwise result from the proposed action. Specifically, these RPMs and Terms and Conditions will keep NMFS informed of when sampling activities are taking place and will require EPA to report any take in a reasonable amount of time, as well as avoid additional sources of injury and mortality to adult fish that may result from handling associated with netting. Term and Condition #1, #2, #6, and #7 are specifically designed to monitor take. Term and Condition #3 will insure that any Atlantic salmon are appropriately identified which is necessary and appropriate to monitor take. As Atlantic salmon adults may be vulnerable to additional injury and/or mortality if captured in a hand held net, Term and Condition #5 is necessary and appropriate to prevent the occurrence of this additional source of injury and mortality. Term and Condition #4 will further reduce any impacts to the species by allowing any adult Atlantic salmon interacting with sampling gear to recover and move outside of the sampling area. As NMFS does not anticipate any lethal take, the implementation of Term and Condition #6 is necessary and appropriate to preserve any dead Atlantic salmon so that they may be salvaged and examined to determine the cause of death. Genetic information is also important to document, if possible, whether the fish was naturally reared or hatchery origin.

INACTIVE

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 proposed action is not likely to jeopardize the continued existence of endangered shortnose sturgeon. To further reduce the adverse effects of fisheries sampling on listed species, NMFS recommends that NEFSC implement the following conservation recommendations.

(1) If any lethal take occurs, the EPA should arrange for contaminant analysis of the specimen. If this recommendation is to be implemented, the fish should be immediately frozen and NMFS's NER should be contacted within 24 hours to provide instructions on shipping and preparation

REINITIATION OF CONSULTATION

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.

INACTIVE