ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

PROGRAMMATIC BIOLOGICAL OPINION

Lead Action Agency:	U. S. Department of Agriculture, Natural Resources Conservation Service
Activity:	Proposed funding of eight specific conservation activities throughout the State of Maine
Consultation Conducted By:	U.S. Fish and Wildlife Service, Maine Field Office [53411-2010-F-0198]
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INTRODUCTION

This constitutes the programmatic biological opinion (Opinion) of the U.S. Fish and Wildlife Service (USFWS) for eight specific activities that could be funded by the Natural Resources Conservation Service (NRCS) in Maine within the geographic range of the Gulf of Maine (GOM) Distinct Population Segment (DPS) for Atlantic salmon (*Salmo salar*) and within areas designated as critical habitat for salmon. These eight specific activities include the following: 1) stream crossing replacements, 2) stream crossing removals, 3) stream bank and shoreline stabilization using soil bioengineering techniques, 4) low-water stream crossings, 5) additions of boulders and large woody debris to streams, 6) removal of artificial obstructions from stream side channels, 7) remnant dam removals, and 8) installation of new and repair of existing fish passage structures.

The NRCS will consider funding and providing technical assistance for various projects covered by this programmatic consultation under programs in the 2008 Farm Bill, including the Environmental Quality Incentives Program and the Wildlife Habitats Incentives Program. The proposed action will include NRCS activities over a five-year period from the date of this Opinion. This programmatic Opinion complements an informal programmatic section 7 consultation with NRCS covering Atlantic salmon and shortnose sturgeon that was completed by the USFWS and the National Marine Fisheries Service (NMFS) in 2010.

This Opinion and incidental take statement were prepared by the USFWS in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, *et seq.*), and implementing regulations at 50 CFR 402. With respect to designated critical habitat, the following analysis relied only on the statutory provisions of the ESA, and not on the regulatory definition of "destruction or adverse modification" at 50 CFR 402.02. The NMFS, which shares joint jurisdiction for GOM DPS Atlantic salmon with USFWS, has participated in this consultation and contributed to the development of this Opinion. The USFWS, however, is the lead agency for this consultation.

Consultation History

November 3, 2008 – NRCS, USFWS and NMFS personnel conducted a site visit to Knox County to discuss variable width setback distances NRCS is exploring for use with ESA consultations. NRCS discussed the desirability of a programmatic formal consultation for actions beneficial for aquatic resources.

March 11, 2009 – NRCS, USFWS and NMFS personnel met to discuss the initiation of an informal programmatic consultation covering certain NRCS conservation practices. NRCS also discussed the need to conduct a programmatic formal consultation, especially if the expanded salmon GOM DPS listing is finalized.

June 8, 2009 – NRCS sent an email request to the USFWS and NMFS (collectively, the Services) asking if an attached outline for a Biological Assessment for a formal programmatic consultation was acceptable.

June 9, 2009 – NMFS replied to NRCS with a copy to USFWS that the Biological Assessment outline looked fine.

September 21, 2009 – NRCS met with the USFWS, in part to discuss both the informal and formal programmatic section 7 ESA consultation processes currently underway.

October 21, 2009 – NRCS met with the USFWS and the NMFS to continue the informal programmatic section 7 ESA consultation and to update the Services on NRCS' progress in the development of its Biological Assessment (BA) for formal programmatic consultation. NRCS provided the Services a copy of the draft programmatic BA, and discussed the approach taken and its content. NRCS and the Services agreed that a 5-year programmatic formal interagency agreement was desirable for all parties.

November 2009 to March 2010 – NRCS met with the USFWS and the NMFS six times and communicated via electronic mail and telephone numerous times to continue the informal programmatic section 7 consultation and to update the Services on NRCS' progress in the development of its Biological Assessment (BA) for formal programmatic consultation. The Services were informed that by the end of March, NRCS would be 1) submitting a letter requesting concurrence on the practice effects matrix NRCS developed with the Services using the informal ESA consultation process and 2) would also be submitting a letter and BA requesting initiation of a formal programmatic ESA consultation. During this time period, USFWS was focusing on the informal programmatic consultation and was not able to review and provide comments to NRCS on their draft BA.

March 11, 2010 – NRCS submits a letter to both the USFWS and the NMFS requesting concurrence on the Practice Effects Matrix for those practices that are not likely to adversely affect Atlantic salmon and shortnose sturgeon. This letter also identified 47 additional conservation practices that would have no effect on salmon or sturgeon.

March 29, 2010 – NRCS submits a request to the Services for a programmatic formal section 7 consultation on a broad range of conservation practices that may adversely affect Atlantic salmon and shortnose sturgeon. The NRCS request was accompanied by a BA.

May 20, 2010 – The Services sent a letter to NRCS in response to their request for formal consultation. This letter indicated that until the informal programmatic consultation was completed, the Services were unable to determine if sufficient information had been submitted to initiate a formal programmatic consultation.

November 17, 2010 – The Services sent a joint concurrence letter to NRCS concluding informal programmatic section 7 consultation for 47 conservation practices and acknowledging a no effect determination for 47 additional conservation practices.

March 15, 2011 – The Services and NRCS met to discuss the formal programmatic consultation. A primary topic of discussion was the appropriate scope of activities that could be reasonably covered in a programmatic consultation.

March 24, 2011 – The Services and NRCS met to continue review of the activities included in the NRCS BA and to work on identifying a reduced list of activities appropriate to include in the programmatic formal consultation.

April 5, 2011 – USFWS received an April 4, 2011 letter from NRCS providing a reduced list of activities to include in the programmatic consultation.

April 15, 2011 – USFWS sent a letter to NRCS in response to their April 5 letter providing our perspective on an appropriate scope for the programmatic consultation, including outstanding information needs for some of the activities.

April 28, 2011 and May 3, 2011 – NRCS sent letters to USFWS and NMFS, respectively, agreeing to a final list of eight activities to be included in the formal programmatic consultation and expressing interest in adding the use of " select flow redirection and soft-bioengineered techniques" to the programmatic consultation in the future.

May 10, 2011 – USFWS and NRCS met to confirm the scope of the programmatic section 7 consultation and discuss a proposed workshop in mid-June to discuss flow redirection techniques and other activities aimed at stream restoration.

June 2, 2011 – NRCS, USFWS, and NMFS met to discuss progress on the consultation. Most of the discussion focused on efforts to refine the detailed project descriptions for the eight specific activities.

June 8, 2011 –NRCS and USFWS met to work on the project description for streambank and shoreline stabilization and low-water crossings. Also discussed planning for the proposed mid-June stream restoration workshop.

June 15-16, 2011 – Stream restoration workshop with staff from NRCS, USFWS, NMFS and other partners involved with stream restoration projects.

July 7, 2011 – NRCS, USFWS, and NMFS met to discuss project descriptions for remnant log drive dam removals and repair of existing fishways.

July 12, 2011 – NRCS and USFWS meet to discuss details of streambank and shoreline stabilization projects (primarily construction details) and low water crossings.

July 14, 2011 – NRCS, USFWS, and NMFS met to discuss progress on the programmatic consultation. A draft Opinion will be delivered to NRCS by August 1, 2011.

August 1, 2011 – A draft Opinion was delivered to NRCS for review and comment, with a copy to NMFS.

August 8 and 11, 2011 – Comments were received back from NRCS on the draft Opinion.

The consultation history for this action also includes numerous other telephone conversations and electronic mail exchanges between staffs of the USFWS, NMFS, and NRCS to share additional information or make relatively minor changes to various aspects of the eight activities or other components of the programmatic consultation.

This Opinion presents USFWS's review of the status of Atlantic salmon, the condition of designated critical habitat, the environmental baseline for the action area, all the effects of the action as proposed, and cumulative effects (50 CFR 402.14(g)). For the jeopardy analysis, USFWS analyzes those combined factors to conclude whether the proposed action is likely to appreciably reduce the likelihood of both the survival and recovery of the affected listed species.

This Opinion is based on the following resources: 1) information provided in the NRCS March 29, 2010 initiation letter requesting formal consultation and accompanying Biological Assessment; 2) information provided by NRCS on March 11, 2010 in their request for informal programmatic consultation; 3) Final Endangered Status for a Distinct Population Segment of Anadromous Atlantic Salmon (*Salmo salar*) in the Gulf of Maine (65 FR 69459; November 17, 2000); 4) Status Review for Anadromous Atlantic Salmon (*Salmo salar*) in the United States (Fay *et al.* 2006); 5) Determination of Endangered Status for the Gulf of Maine Distinct

Population Segment of Atlantic salmon; Final Rule (74 FR 29345; June 19, 2009); 6) Designation of Critical Habitat for Atlantic Salmon Gulf of Maine Distinct Population Segment (74 FR 29300; June 19, 2009 and 74 FR 39903; August 10, 2009); 7) various field investigations; 8) numerous meetings; and 9) other sources of information. A complete administrative record of this consultation will be maintained by the USFWS Maine Field Office in Orono, Maine. The USFWS log number is 53411-2010-F-0198.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

The following description of the proposed action is modified from NRCS's March 2010 BA. Discussions between the NRCS, USFWS, and NMFS resulted in narrowing the scope of activities covered by this programmatic consultation to eight distinct activities. NRCS had originally proposed a very broad consultation that would cover essentially all activities that they might fund that would have adverse effects on Atlantic salmon or its critical habitat or both. In addition, NRCS's 2010 BA also included the federally endangered shortnose sturgeon, which is under the sole jurisdiction of the NMFS. On August 12, 2011 NMFS provided a concurrence letter to NRCS explaining that the activities covered by this Opinion would be not likely to adversely affect shortnose sturgeon and thus would not require formal section 7 consultation. This Opinion does not further address effects to shortnose sturgeon from the proposed NRCS action.

The agencies then worked together to modify the project description (as necessary) for each of the eight activities that are included in this programmatic consultation. Over the course of the five-year term of this programmatic consultation, NRCS may fund, as well as provide technical assistance in planning and designing, multiple projects that fit within the descriptions of the eight proposed activities. Actual construction work will be done by the landowners or hired contractors, but NRCS staff would likely be on-site at some point during construction to provide oversight and guidance to keep projects in compliance with the requirements of the programmatic consultation. Under various programs in the 2008 Farm Bill, NRCS may fund projects on private lands to help resolve identified natural resource problems and to conserve soil, water, air, plant and animal resources.

In addition, this programmatic consultation will also require a "second tier" or project-specific review for each applicable project that NRCS plans to fund. NRCS will submit their ME-ECS-1 form and other project information to USFWS or NMFS for each future project, as appropriate based on the type of activity. In turn, USFWS or NMFS will submit a written confirmation to NRCS stating that the project complies with the requirements of the programmatic Opinion and providing authorization of incidental take that is appropriate given the specific details of each project.

Over the five-year period of this programmatic consultation (2011-2016), NRCS has estimated the number of projects that might be implemented for each activity. Because NRCS conservation programs are customer-based, however, the frequency of projects can be quite variable from year-to-year and within any specific timeframe. For purposes of this consultation, NRCS estimates the following number of projects could be implemented within each activity category:

- Stream crossing replacements and stream crossing culvert removals - 50
- Streambank and shoreline stabilization – 5
- Low-water crossings – 50
- Large woody debris and boulder supplementation – 10

- Side channel or off-channel reconnection – 5
- Remnant log drive dam removals – 15
- Installation/Repair/Replacement of Denil and Alaska Steeppass Fishways - 5

NRCS, USFWS, and NMFS will re-evaluate this programmatic consultation at the end of five years, with the intention of renewing the agreement as it currently exists or with modification(s) to address any issues that may arise over the course of implementation. The agencies will also consider if there are other categories of projects that are appropriate to add to the existing list of eight activities covered by this programmatic consultation.

NRCS may consider funding other types of projects which could adversely affect Atlantic salmon and critical habitat and that either 1) do not fit within the eight activities described here or 2) while fitting in one of the basic activity categories (e.g., steam bank stabilization), do not fit all of the requirements necessary to be considered under this programmatic consultation. These projects may still be funded by NRCS but would need to go through a project-specific section 7 consultation with USFWS or NMFS. For example, a stream bank stabilization project that proposes using both rock to stabilize the toe of the bank and a brush revetment to stabilize the stream bank would not fit under this programmatic consultation but could proceed with an individual section 7 consultation.

1.1 Descriptions of the Eight Activities

The following descriptions are modified from the NRCS March 2010 BA and represent a subset of activities for which a programmatic approach to section 7 was originally requested. Furthermore, most of the activities included below have been modified in terms of design requirements and other details as compared to the descriptions in the BA. In all cases, the activity descriptions given below should be used in lieu of those found in the NRCS BA.

1.1.1 Stream Crossing Replacements

Replacement stream crossings will be designed with the goal of creating, within the structure, a channel as similar as possible to the natural channel in both structure and function. The crossing structures will strive to 1) maintain ecological processes; 2) sustain aquatic communities by passing sediment, debris, and all aquatic species; and 3) providing some floodplain connectivity. New stream crossings (i.e., where a crossing did not previously exist) are not included in this activity, nor covered by this Opinion.

Structure Types – Structure types will include open-bottomed arch culverts, timber or metal\timber bridges, and open-bottom box or embedded closed-bottom box culverts. Standard engineering drawings are provided for each of these structures in Appendix A of the NRCS BA.

Structure Width – All structures will be sized to accommodate a 25-year flood event; however, many structures will pass a larger flood event. Sediment and bedform will be continuous through the structure and of similar particle size distribution and morphology as exhibited in upstream and downstream reference reaches, as appropriate.

- Open Arch Culverts – Stream Simulation (USDA-FS 2008) or a No-slope design (Bates et al. 2003) will be used for open arch culverts.

i. Open arch culvert designs will be according to criteria provided by the USDA-FS (2008) or Bates et al. (2003). All culverts will be 1.2 X bankfull width or wider.

ii. The minimum width of an open-bottomed arch or box culvert will be 6 feet to allow manual placement of rock materials inside the culvert to protect the footings from erosion.

- Box culverts (3- or 4-sided) will be designed using stream simulation techniques to promote streambed dynamics and aquatic organism passage and will have a width 1.2 X bankfull or wider.
- Bridges – Bridge abutments will be placed outside the channel and stream bank with enough room to place straw bales to ensure sediments do not enter the stream when concrete block abutments are installed.
- Stream Alignment – Where possible, NRCS will install culverts aligned with the natural stream channel. In some cases this will necessitate completely moving culverts from one location to another to restore flows to the historic channel location.

Floodplain Continuity – Flood relief culverts or road-dips may be designed and installed to restore and maintain access to off-channel rearing and high flow areas for juvenile and adult fish, and to protect roads and crossings during catastrophic flood events. Existing floodplain channels will be the first priority for location of flood relief culverts, which will be installed in a manner that matches floodplain gradient and reduces scour at the outlet.

Channel Slope – The slope of culverts shall approximate the average channel gradient of the natural stream up- and downstream of the structure. A no-slope design may be used for moderate to low gradients streams (<3%) if the structure is large enough to be countersunk to protect footings and sediment continuity within the structure will eventually emulate natural up- and downstream channel condition. The maximum slope for close-bottomed box culverts shall not exceed 6%, due to difficulties in retaining substrate in the culvert at higher gradients (USDA-FS 2008). Open-bottomed arches can be placed in channel gradients exceeding 6%; however, pre-project surveys must be very thorough and follow the principles and procedures described in the Stream Simulation Handbook (USDA-FS 2008).

Woody Debris Management – When woody debris is removed from the inlet to a road-stream crossing, the woody debris will be placed downstream of the road crossing, unless it is a threat to another nearby road-stream crossing. If a threat is identified, woody debris will be stockpiled for later use in other activities or discarded to the maximum extent practicable.

Grade Control Structures – Culvert replacement projects that require a grade stabilization structure (e.g., to address head-cutting of the stream channel) will require an individual section 7 consultation.

Access Road or Forest Trail Renovation – When installing larger culverts to facilitate aquatic organism passage, it may be necessary to raise the roadbed or to increase road fill above the structure to handle expected maximum vehicular loads. Where road erosion or road approaches are identified as a significant contributor of sediment to a stream, it may be necessary to re-grade, add gravel, underlay erosion control fabric, line road ditches with stone (Lined Waterway,

code 468), or divert water runoff from roads and ditches into adjacent forest using turnouts, cross drainage pipes and\or waterbars, or route water to a sediment basin.

Bank Stabilization – The use of riprap may be needed above bankfull height to protect the inlet and outlet of culverts. Where riprap is required to stabilize and protect culvert footings, the culvert will be sized to ensure that bankfull flows are not constricted by riprap. Areas not covered by rip rap will be stabilized temporarily with annual grains, mulch, or permanently with conservation mix, erosion control fabric, and native shrub\tree plantings suited to the site and surroundings.

Riparian Buffer Plantings – Disturbed channel banks and riparian zones will be restored to pre-project dimensions and planted to native shrub and tree species representative of a stream's riparian vegetation.

Work Progression – When there is a series of barriers to be removed from one stream system with known listed fish during a construction season (i.e., July 15 to Sept 30 within a calendar year), work will start at the most upstream barrier to minimize impacts to listed fish.

Additional Conservation Measures – See below Section **1.2 - General Prescriptions**.

NRCS Conservation Practices that could be used to accomplish the activity discussed above include, but may not be limited to:

Fish Passage, Code 396	Access Road, code 560
Stream Habitat Improvement and Management, code 395	Streambank and Shoreline Protection, code 580
Stream Crossing, code 578	Forest Trails and Landings, code 655
Grade Stabilization Structure, code 410	Mulching, code 484
Critical Area Planting, code 342	Tree and Shrub Establishment, code 612
Clearing and Snagging, code 326	Lined Waterway, code 468
Sediment Basin, code 350	

All Conservation Practices used to accomplish *Stream Crossing Replacements* must adhere to the activity description found above on pages 6-8 of this Opinion, regardless of the activities that might otherwise be allowed under a given Conservation Practice.

1.1.2 Stream Crossing Culvert Removals with Optional Abutments for Temporary Bridge

Stream crossings on access roads or forest trails will be decommissioned by removing existing stream crossings. Where circumstances permit, culvert removal is the preferred alternative. In some cases concrete block abutments will be placed on banks upslope of the channel bank to serve as a base for placement of temporary, removable bridges in the future as needed by the landowner. A description of proposed actions associated with this type of project is provided below:

Channel Morphology – After stream crossings are removed, channel banks and channel condition (slope, width, sediment and bedform) will be restored to natural conditions indicated

by up- and down-stream morphology in undisturbed reaches following stream simulation principles (USDA-FS 2008).

Abutments for Temporary Bridges – Bridge abutments will be placed outside the channel and stream bank with enough room to place straw bales to ensure sediments do not enter the stream when concrete block abutments are installed. The surface height of abutments will be designed to pass a 25-year flow event, at a minimum, if a temporary bridge were in place.

Grade Control Structures – Culvert removal projects that require a grade control structure (e.g., to address head-cutting of the stream channel) will require an individual section 7 consultation.

Access Road or Forest Trail Renovation – Where road erosion or road approaches are identified as a significant contributor of sediment to a stream, it may be necessary to re-grade, add gravel, underlay erosion control fabric, line road ditches with stone (Lined Waterway, code 468), or divert water runoff from roads and ditches into adjacent forest or sediment basins using turnouts, cross drainage pipes and\or waterbars.

Bank Stabilization – Banks will be stabilized, as needed, using only non-rock armoring techniques. See Section *1.1.3 Streambank and Shoreline Stabilization* below for a detailed discussion of techniques covered by this consultation.

Riparian Forest Buffer Plantings – If roads or trails are to be decommissioned as well, the channel bank and adjacent riparian zone will be restored to pre-project dimensions and planted to native shrub and tree species representative of a stream's riparian vegetation.

Work Progression – When there is a series of barriers to be removed from one stream system with known listed fish during a construction season (i.e., July 15 to Sept 30 within a calendar year), work will start at the most upstream barrier to minimize impacts to listed fish.

Access Control – Where previous crossings are located proximal to high value habitat and when the landowner desires to control access, NRCS may place gates, fences, or stone, wood or other barriers to restrict or permanently exclude access to the previous crossing site.

Additional Conservation Measures – See below Section **1.2 - General Prescriptions.**

NRCS Conservation Practices that could be used to accomplish the activities discussed above include, but may not be limited to:

Fish Passage, Code 396	Access Road, code 560
Stream Habitat Improvement and Management, code 395	Streambank and Shoreline Protection, code 580
Grade Stabilization Structure, code 410	Forest Trails and Landings, code 655
Critical Area Planting, code 342	Mulching, code 484
Lined Waterway, code 468	Tree and Shrub Establishment, code 612
Channel Stabilization, code 584	Riparian Forest Buffer, code 391
Access Control, code 472	Clearing and Snagging, code 326
Fencing, code 382	

All Conservation Practices used to accomplish *Stream Crossing Culvert Removals with Optional Abutments for Temporary Bridge* must adhere to the activity description found above on pages 8-9 of this Opinion, regardless of the activities that might otherwise be allowed under a given Conservation Practice.

1.1.3 Streambank and Shoreline Stabilization

The proposed activities under this section are those described as "streambank soil bioengineering" stabilization methods but do not include any hard-armored bank stabilization methods like rock stabilization of the toe or rip-rap of the entire bank. Rip-rap stabilization projects or other techniques not listed below can still be pursued but would require a project-specific section 7 consultation. Streambank soil bioengineering is the use of living and nonliving plant materials in combination with natural and synthetic support materials for slope stabilization, erosion reduction, and vegetative establishment.

Where site conditions allow, the use of bioengineered solutions can result in significant environmental and aesthetic benefits. Plant roots help hold and stabilize soil particles, increase water infiltration, capture nutrients, remove nitrogen and phosphorous from the soil, and trap and retain pollutants. Vegetation can dampen waves and dissipate wave energy. Stalks, stems, branches and foliage can slow flow velocities, help induce coarse sediment settling, and can shield banks from abrasive effects of debris and sediment. Additionally, the use of live and dead plant material can enhance aesthetics and provide shade and habitat during higher flows.

Stabilization treatments may occur at three different zones as described below:

1) Toe Zone – The zone located below the average water elevation or baseflow. This zone seldom supports vegetation and typically must endure the highest stresses. It is essential for this zone to be stable to ensure the success of any streambank or shoreline stabilization. Rock is frequently used to stabilize this zone, when there is little tolerance for channel migration. However, the use of rock to armor the toe is *not being* proposed for this programmatic consultation. Where there is more tolerance for movement, softer bioengineered stabilization techniques, such as those listed below, are proposed.

2) Bank Zone – The area between the average water elevation and the bankfull discharge elevation. Although this zone is exposed to less erosive forces than the toe zone, exposure to wet and dry cycles, ice scour, debris deposition, and freeze-thaw cycles can be destabilizing and cause bank erosion and failure. The bank zone is generally vegetated with herbaceous species and flexible woody shrubs or small trees such as willow, dogwood, and elderberry. Therefore, this is the zone where live vegetative treatments predominate (e.g., brush matrices, layering, packing, wattles, contour fascine bundles, vegetated reinforced soils slope, and live or dormant stake\pole plantings). Additionally, rock is not being proposed for surface stabilization of the bank zone for this programmatic consultation.

3) Top of Bank/Floodplain – The zone from the bankfull discharge elevation to the edge of the active floodplain; also called the overbank zone. A bioengineering technique called brush trenching is sometimes used at the top of the bank; otherwise, planting in this zone will typically involve traditional planting methods for restoring riparian buffers.

The bioengineering methods listed below may be used to stabilize eroding banks under this programmatic consultation. A more detailed discussion of these techniques can be found in TS**14I** to the NEH/Part 654 (USDA-NRCS 2007):

Toe Treatments: Typically, techniques to stabilize eroding toe-of-slope areas may involve the use of rocks, cables, and/or stakes to anchor structures into the stream bank. However, the use of rock to armor the toe is not proposed for this programmatic consultation.

1) Coir fascines
2) Brush and tree revetments
3) Rootwad revetments
4) Live siltation
5) Fascines

Bank Treatments: Typically, techniques to stabilize eroding banks may involve the use of rocks, cables, and/or stakes to anchor structures into the stream bank and the use of erosion control fabrics to stabilize soil while vegetation establishes. However, the use of rock to armor the bank is not proposed for this programmatic consultation.

1) Live pole cuttings
2) Dormant post planting
3) Contour fascines
4) Brush layering
5) Brush mattress
6) Branch packing
7) Vegetated reinforced soil slope
8) Brush wattle fence

Top of Bank/Floodplain Treatments:

1) Brush trench
2) Tree and shrub plantings

NOTE: Other bank stabilization techniques that are consistent with the principles of "streambank soil bioengineering" and that conform to all other requirements of this activity as proposed may be suitable for review under the programmatic biological opinion. However, such projects should be reviewed early in their planning process with both NRCS and USFWS to determine their eligibility by be covered by this Opinion, based on site-specific conditions and project plans.

The following apply to all bank stabilization projects described above:

Design Criteria – Designs will follow criteria and specifications of NRCS' practices Streambank and Shoreline Stabilization, code 580 and Stream Habitat Improvement and Management, code 395; and planning guidance provided by Part **654** of the NEH/654 (**2007**) and associated TS **14I**.

Site Access – It may be necessary to create access to the project site by building a temporary access road or trail. If the area is treed, the route chosen will result in the minimum amount of woody vegetation removed. Upon completion of the project, the road\trail will be removed and the area restored by replanting.

Stream Bank Plantings – Eroding stream banks subject to stabilization efforts will be restored to dimensions that ensure stability and facilitate establishment of herbaceous and woody vegetation.

The following techniques may be used to establish native woody vegetation to stabilize the stream bank, to provide shade, habitat complexity and food:

1) Live or Dormant Stake or Brush Plantings – The following equipment may be used for planting of live stakes or dormant poles:
   - Dead blow hammer or rubber mallet – A dead blow hammer is a hammer filled with sand to evenly dissipate energy during a hammer strike to avoid splitting stakes.
   - Stingers – a metal pole attachment to a backhoe (see pg 66 of TS**14I** may be used to interplant stakes or poles in joints between riprap.
   - Waterjet hydrodrill – equipment that produces a concentrated jet of water (see pg 67 of TS TS**14I**) used to drill a hole through soil into which a stake is inserted. After planting, a slurry of water and soil is poured around stakes to get good seed-to-soil contact, or soil is tamped and compacted for the same purpose.
2) Brush plantings involving live cuttings – Bundles or mats of live cuttings are placed in trenches, anchored with stakes, and are covered with soil. The orientation of the cuttings and trenches will depend upon the method used, purpose and site-specific conditions.

Riparian Zone Plantings – Plantings from the top of bank through the floodplain and into uplands will be discussed under the Riparian Forest Buffers Establishment and Management section below.

Additional Conservation Measures – See below Section **1.2 - General Prescriptions.**

NRCS Conservation Practices that could be used to accomplish the activities discussed above include, but may not be limited to:

Streambank and Shoreline Protection, code 580	Stream Habitat Improvement and Management, code 395
Clearing and Snagging, code 326	Mulching, code 484
Critical Area Planting, code 342	Riparian Forest Buffer, code 391
Tree and Shrub Establishment, code 612	

All Conservation Practices used to accomplish *Streambank and Shoreline Stabilization* projects must adhere to the activity description found above on pages 10-12 of this Opinion, regardless of the activities that might otherwise be allowed under a given Conservation Practice.

1.1.4 Low-water Crossings

Low-water crossings are road-stream crossing structures designed to be overtopped by flows and can be effective at passing debris- or ice-laden flows. They may be desirable alternatives to culverts on low traffic roads or trails where flows are highly variable or flashy, followed by long periods of no or low flows. Low-water crossings may be a viable alternative for streams which transport large amounts of woody debris or sediment and where beavers cause frequent road-

stream crossing failure. Low-water crossings may cause fewer deleterious impacts to streams than do culverts, which can cause upstream aggradation, downstream degradation, and stream bank erosion and can result in crossing failure when flows exceed design capacities.

Low-water crossings can be used to provide livestock or equipment access to other portions of a property. Livestock-caused soil compaction in riparian zones and streambank erosion from trampling can increase sedimentation of streams, and introduction of nutrients or associated pathogens are more likely to occur where there is unlimited, broad access to a stream. Likewise, vehicular traffic can also degrade streams by increasing sedimentation, disturbing the streambed, and by introducing petroleum-based chemicals. Limiting, directing and controlling vehicle, equipment, and livestock access to a hardened low-water crossing or ford can reduce the scope, intensity and duration of deleterious effects caused by streams crossings during farm or forest operations.

NRCS proposes to construct low water crossings only where some type of problematic stream crossing currently exists (with or without a "structure"). New stream crossings (i.e., a new access point not previously used by the landowner) are not covered under this programmatic consultation.

NRCS proposes to construct low-water crossings according to the following general guidelines:

Structure Types – Proposed hardened low-water crossings are simple improved, unvented fords. These structures may be comprised of gravel, rock, concrete slab, or aggregate placed in geowebs or geocells. Use of poured concrete in streams is not covered under this consultation.

Design Criteria – Design criteria will be according to design and specifications of NRCS's stream crossing practice standard, code 578 and the USDA- Forest Service's *Low Water Crossings: Geomorphic, Biological and Engineering Design Considerations* (USDA-FS **2006**), as long as the following additional design criteria are met.

Hardened low-water crossings (i.e., improved and unvented fords):

- will be located where stream banks are naturally low (i.e., broad, shallow, non- or slightly entrenched streams);
- will not be constructed within known or suspected spawning habitat and will avoid, as much as possible, riffle habitats associated with coarse gravel substrate that provide juvenile rearing habitat;
- will have the driving surface as close as possible to the natural stream channel bottom and will conform to the shape and capacity of the natural channel;
- will be arranged perpendicular to the channel;
- will be constructed during times of no or low flow;
- will be designed to protect or provide a stable wetted perimeter at least up to a 25 year storm event;
- will be designed to not impede fish passage during any time when fish movement is possible in the adjacent channel;
- will, where possible, maintain natural streambed substrate material, roughness, slope, and form through the structure; and
- will avoid accelerating flow velocities through the structure.

Approaches to livestock fords will require establishment of fencing through riparian areas. Fencing will be placed in a manner that will minimize impacts to aquatic resources.

- Ground disturbance will be minimized during installation of fence posts. Where site conditions make it feasible to install posts by methods other than digging, fence posts will be pushed or pounded into the ground.
- If the area is treed, the route chosen will result in the minimum amount of woody vegetation removed.

Turnouts, dips and other measures will be used to divert road surface water prior to it reaching the crossing.

Approaches will have road or trail surfaces stabilized.

Bank Stabilization – Banks will be stabilized, as needed. See Section *1.1.3 Streambank and Shoreline Stabilization* above for a detailed discussion of techniques covered by this programmatic consultation.

Riparian Buffer Plantings – Disturbed channel banks and riparian zones will be restored to pre-project dimensions and planted to native shrub and tree species representative of a stream's natural riparian vegetation.

Additional Conservation Measures – See below Section **1.2 - General Prescriptions**.

NRCS Conservation Practices that could be used to accomplish the activity discussed above include, but may not be limited to:

Stream Crossing, code 578	Streambank and Shoreline Protection, code 580
Access Road, code 560	Forest Trails and Landings, code 655
Fencing, code	Fish Passage, Code 396
Lined Waterway, code 468	Channel Stabilization, code 584
Clearing and Snagging, code 326	Mulching, code 484
Critical Area Planting, code 342	Riparian Forest Buffer, code 391
Tree and Shrub Establishment, code 612	

All Conservation Practices used to accomplish *Low-water Crossings* must adhere to the activity description found above on pages 12-14 of this Opinion, regardless of the activities that might otherwise be allowed under a given Conservation Practice.

1.1.5 Large Woody Debris and Boulder Supplementation

NRCS proposes to increase stream habitat complexity by the addition of large woody debris (LWD) and boulders. Structural and hydraulic diversity is important and provides holding and rearing habitat for salmon; the addition of boulders has been shown to increase the carrying capacity of salmon within a given stream reach (Venter et al. 2008). LWD will be placed in stream channels, streambanks, or over channels as individual trees. LWD will often consist of an entire tree with its associated root wad.

Boulder additions will include individual large boulders or boulder clusters. The addition of boulders will only be used in streams identified as lacking structural diversity and that naturally and historically had boulders. Anchoring will **not** be used to secure either LWD or boulders to the stream bank or stream bed, nor will any stream bank or stream bed excavation occur during placement of the LWD or boulders.

Large trees may be dislodged or felled for constructing instream habitat in areas where the following criteria are met: (1) lack of instream LWD has been identified as a limiting factor by a biologist, ecologist, or fluvial geomorphologist; (2) presence of an adequately stocked and healthy, mature forest; (3) stream shading will not be significantly impacted by the removal of trees; (4) the threat of invasive plant species occupying the vacated space is low; and (5) limited site access makes the import of LWD impracticable.

Site Access – It may be necessary to create access to the site by building a temporary access road. If the area is treed, the route chosen will result in the minimum amount of woody vegetation removed. Upon completion of the project, the road will be removed and the area replanted to native species representative of a stream's riparian vegetation.

Design Criteria – Detailed descriptions of LWD techniques are found in Saldi-Caromile et al. (**2004**) and in Naumann (2011).

Specifications for boulder placement described by Saldi-Caromile et al. (**2004**) will be used. Boulders will be sized and located to avoid the need for anchoring. Boulder sizing and placement will be designed to avoid deleterious effects to existing spawning and high value rearing habitat. All rock used will be native to the watershed and not be trucked in from outside sources with different geologic conditions. Placement will occur during low flow periods (July 15 to September 30) to minimize temporary disturbance of stream habitat.

Bank Stabilization – Banks will be stabilized, as needed. See Section *1.1.3 Streambank and Shoreline Stabilization* above for a detailed discussion of techniques covered by this programmatic consultation.

Riparian Buffer Plantings – Disturbed channel banks and riparian zones will be restored to pre-project dimensions and planted to native shrub and tree species representative of a stream's riparian vegetation.

Additional Conservation Measures – See below Section **1.2 - General Prescriptions**.

NRCS Conservation Practices that could be used to accomplish the activities discussed above include, but may not be limited to:

Stream Habitat Improvement and Management, code 395	Streambank and Shoreline Protection, code 580
Critical Area Planting, code 342	Riparian Forest Buffer, code 391
Mulching, code 484	Tree and Shrub Establishment, code 612
Channel Stabilization, code 584	

All Conservation Practices used to accomplish *Large Woody Debris and Boulder Supplementation* projects must adhere to the activity description found above on pages 14-15 of this Opinion, regardless of the activities that might otherwise be allowed under a given Conservation Practice.

1.1.6 Side Channel or Off-channel Reconnection

Side channel habitats are generally small watered remnants of river meanders or distributary features activated at or above bankfull flow. They provide important spawning habitat and rearing habitat for juveniles, refuge during high flows and cool water refugia proximal to warmer mainstem streams during low summer flows. Off-channel habitat includes abandoned river channels, spring-flow channels, oxbows and flood swales. Off-channel habitat has often been disconnected from mainstem streams by diking or blocking with boulders, removal of LWD, channel straightening and bank armoring. This is especially true of rivers where log drives occurred.

The goal of channel reconnection is to create self-sustaining side channel or off-channel habitat. This is not a static condition, but means instead that the reconnected habitat will likely not need major or periodic maintenance and will function naturally within the processes of the floodplain. However, the reconnected side channel may or may not persist over time as the river adjusts in its floodplain.

The purpose of the proposed action is to accomplish reconnection of existing side channels with a focus on restoring fish access and habitat forming and maintaining flows. NRCS proposes to construct these features according to the following general guidelines:

Site Access – It may be necessary to create access to the project site by building a temporary access road. If the area is treed, the route chosen will result in the minimum amount of woody vegetation removed. Upon completion of the project, the road will be removed and the area replanted to native species representative of a stream's riparian vegetation.

Clearing and Snagging – Blockages (e.g., boulders, wood, gravel, soil) will be physically removed to reconnect the channel to the main stream channel. Removed material that belongs in the stream (i.e., LWD, stream boulders, cobble and gravel) will be returned to the stream but will not be placed in existing spawning habitat. Other materials will be removed off site and disposed of outside of the active floodplain.

Bank Stabilization – Banks will be stabilized, as needed. See Section *1.1.3 Streambank and Shoreline Stabilization* above for a detailed discussion of techniques covered by this consultation.

Riparian Buffer Plantings – Disturbed channel banks and riparian zones will be restored to pre-project dimensions and planted to native shrub and tree species representative of a stream's riparian vegetation.

Additional Conservation Measures – See below Section **1.2 - General Prescriptions**.

NRCS Conservation Practices that could be used to accomplish the activity discussed above include, but may not be limited to:

Stream Habitat Improvement and Management, code 395	Streambank and Shoreline Protection, code 580
Clearing and Snagging, code 326	Channel Stabilization, code 584
Riparian Forest Buffer, code 391	Tree and Shrub Establishment, code 612

All Conservation Practices used to accomplish *Side Channel or Off-channel Reconnection* projects must adhere to the activity description found on page 16 of this Opinion, regardless of the activities that might otherwise be allowed under a given Conservation Practice.

1.1.7 Remnant Dam Removals

A remnant log drive dam is defined as a man-made barrier constructed of timber or stone or both which is built across smaller streams (often 2nd or 3rd order streams) for the purpose of impounding or diverting water for use in floating logs downstream. Log drive dams normally consist of four common structural components - an earthen berm, log crib work, rocks, and toe pilings. The log crib work is generally configured in a rectangle design located beneath placed rocks and sediments within the stream channel and under the berm. Made of local gravel material, the berm is usually located outside the bankfull width of the stream and is not commonly removed. If removal of the berm or parts of the berm is necessary, the material will be removed using shovels and placed outside of the floodplain. Larger, hardened structures and dams on larger rivers are not considered in this Opinion and will be reviewed under individual section 7 consultations.

The dam owner will need to work with NRCS to develop a written dam removal plan which must be reviewed and approved by NMFS. The dam removal plan will require that removal be conducted in accordance with specific criteria listed below, as well as the General Prescriptions in this Opinion (*Section 1.2*, page 20). Provided the measures below are used during the removal of the dam, NMFS believes the activities are likely to promote the conservation of the GOM DPS and recovery of Atlantic salmon, with relatively small risk of negative effects. A dam removal plan must be developed and submitted to NMFS at least 45 days prior to the proposed removal.

If the requirements described in this Opinion are met and the dam removal plan is approved, then NMFS will authorize incidental take to implement the dam removal plan. Incidental take authorization may be revoked at the discretion of the NMFS if any terms and conditions are not satisfied or authorized take of Atlantic salmon has been exceeded.

NRCS proposes that the dam removal plan include the required information and adhere to the following criteria and general guidance listed below:

1. Work Window - Work must be restricted to low flows from July 15 to September 30. Work shall not be conducted during a significant rain event or when one is anticipated. Work outside the recommended work window may be allowed under certain circumstances but must be approved by NMFS with at least 7 days notification prior to the start of proposed construction.

2. Sediment Investigations – NRCS will quantify the amount of sediment accumulated behind dam structures. The potential of sedimentary contaminant redistribution post-dam removal will be evaluated based on past land uses at, proximal, and upstream of dam sites. As necessary, sediment core samples will be collected and tests for toxic chemicals and heavy metals will be conducted.

3. Impoundment Dewatering & Fish Salvage – In instances where the dam is still functioning and impounding water, it may be necessary to dewater the impoundment prior to the actual demolition of the dam. When required, the water levels within the impoundment will be gradually lowered (< 0.25 ft/hour) prior to breach so as to minimize sediment transport, streambed scour, bank erosion, and to allow aquatic organisms to acclimate to changing conditions and to migrate to deeper water. During drawdown, any stranded mussels or fish will be moved to permanent water. If dam removal is conducted outside of preferred work window or temporary coffer dams are required to dewater areas, salvage shall be conducted to move juvenile salmon downstream before dewatering. Electrofishing, seining, or other methods of fish removal shall be in accordance with the details in *Section 1.2.5* below. Salvage will be performed by NRCS staff or contracted biologists qualified for handling Atlantic salmon as outlined in *Section 1.2.5* below.

4. Structure Demolition – Removal will proceed in a systematic manner, beginning from the top of the structure. The demolition of the dam should be conducted using hand tools and manual labor. Stones and timbers should be removed in small, manageable sections and disposed of outside of the floodplain. Rocks that have been placed in the stream channel and on top of the crib logs are removed by hand. Once the crib logs are exposed, the logs are removed or cut to the bankfull width. The crib logs are removed using a Griphoist® or similar device. The Griphoist® is a portable manual hoist with a traversing wire rope. Logs are moved to the riparian zone to collect fine sediments for re-establishing the bankfull width upstream of the removed structure. The toe pilings located within the bankfull width at the front of the dam are also removed using the Griphoist®. When possible, fine sediments located within the bankfull channel are removed and placed outside of the floodplain.

5. Post-construction Inspection – NRCS will visually inspect the project site twice each year for two years after construction. Photos will be taken to document the restoration site, both upstream and downstream of the dam location. Results of these inspections will be provided to NMFS annually.

6. Bank Stabilization – Banks will be stabilized, as needed. See Section *1.1.3 Streambank and Shoreline Stabilization* above for detailed discussion of techniques covered by this consultation.

7. Riparian Buffer Plantings – As required, disturbed channel banks and riparian zones will be restored to pre-project dimensions and planted with native shrub and tree species representative of a stream's riparian vegetation

8. Work Progression – When there is a series of barriers to be removed from one stream system with known listed fish during a construction season (i.e., July 15 to Sept 30 within a calendar year), work will start at the most upstream barrier to minimize impacts to listed fish.

Additional Conservation Measures – See below Section **1.2 - General Prescriptions**.

NRCS Conservation Practices that could be used to accomplish the actions discussed above may include, but are not limited to:

Fish Passage, Code 396	Streambank and Shoreline Protection, code 580
Stream Habitat Improvement and Management, code 395	Channel Stabilization, code 584
Clearing and Snagging, code 326	Mulching, code 484
Critical Area Planting, code 342	Riparian Forest Buffer, code 391
Tree and Shrub Establishment, code 612	Access Control, code 472
Fencing, code 382	Clearing and Snagging, code 326

All Conservation Practices used to accomplish Remnant Dam Removals must adhere to the activity description found above on pages 17-19 of this Opinion, regardless of the activities that might otherwise be allowed under a given Conservation Practice.

1.1.8 Installation/Repair/Replacement of Denil and Alaska Steeppass Fishways

Denil fishways are similar to fish ladders in their application along a passage obstruction and can be composed of wood, steel, or concrete. Short Denils usually have no resting pools, but longer structures with greater lift usually require resting pools where the fishway changes direction. Alaska Steeppass fishways, a variation of the Denil ladder, are prefabricated, modular, and usually constructed of a lightweight material like aluminum. These are often called roughened-channel fishways due to placement of internal baffles in rectangular flumes designed to reduce mean water velocities by creating secondary helical currents to dissipate energy and increase passage efficiency.

NRCS expects that the installation of new fishways or the replacement or repair of existing fishways will have minimal adverse effects to fish or fish habitat, because the activities will typically be located adjacent to and not in stream channels. Denil fishways may require instream construction to position the fishway entrance in the stream channel. Worksite isolation and fish removal may be needed to facilitate this activity. Alaska Steeppass fishways are commonly assembled onsite and may require minimal instream disturbance to install. Generally, a boom truck or crane will be used to lower the fishway into place where it will be attached to the passage barrier. In some cases, Alaska Steeppasses will be installed only using hand labor. In-channel work will be mostly limited to fishway entrances, therefore instream work footprints from repair are expected to be small. If fishway installation or repair requires temporary coffer dams to dewater areas for construction, fish salvage shall be conducted in association with the cofferdam to capture and move juvenile salmon either upstream or downstream before dewatering (with a preference for upstream location so that relocated fish can avoid construction-related sedimentation downstream of the worksite). Electrofishing, seining, or other methods of fish removal shall be in accordance with the details in *Section 1.2.5* below. Salvage shall be performed by qualified NRCS staff or contracted biologists certified for handling Atlantic salmon. When there is a series of barriers to be removed from one stream system during a construction

season (i.e., July 15 to Sept 30 within a calendar year), work will start at the most upstream barrier to minimize impacts to listed fish.

NRCS proposes to install/repair/replace Denil and Alaska Steeppass Fishways by adhering to the following criteria and general guidance:

1. Impoundment Dewatering & Fish Salvage – When temporary coffer dams are required to dewater areas, fish salvage shall be conducted to move juvenile salmon either upstream or downstream before dewatering. Water levels within the coffer dams will be gradually lowered (< 0.25 ft/hour) prior to construction so as to allow biologists to identify and salvage stranded aquatic organisms. During drawdown, all salvaged aquatic organisms will be moved to permanent water. Salvage shall be performed by NRCS staff or contracted biologists qualified for handling Atlantic salmon. Electrofishing, seining, or other methods employed for fish relocation shall follow details in *Section 1.2.5* below.

2. Work Window - Work must be restricted to low flows low flows during the summer/fall (July-15- September 30). Work shall not be conducted during a significant rain event or when one is anticipated. Work outside the recommended work window may be allowed under certain circumstances but must be approved by NMFS with at least 7 days notification prior to the start of proposed construction. Fishway entrances must be screened for a minimum of 48 hours prior to repair or replacement so as to allow migrating fish to exit the structure.

3. Site Access – It may be necessary to create access to the site by building a temporary access road. If the area is treed, the route chosen will take the most direct course practicable and result in the minimum amount of woody vegetation being removed. Upon completion of the project, the road will be removed and the area replanted with native species representative of a stream's riparian vegetation.

4. Design Criteria – Prior to the installation of a new fishway, the preliminary structural design must be reviewed; appropriate surveys must be conducted, such as stream cross-sections and longitudinal profiles; and stream hydrology and streambed morphology must be assessed. Designs will follow procedures described in the NRCS TS 14N to the NEH/654 (Fish Passage Screening and Design), the Washington Department of Fish and Wildlife's Fishway Guidelines (draft) (WDFW 2000), and NMFS Northwest Region's Anadromous Salmonid Passage Facility Design Guidance (NMFS 2008a). Once the detailed design process commences, NMFS must have the opportunity to review the plans and provide comments at the 50% and 90% completion stages. NMFS comments usually entail refinements in the detailed design that will lead to better operations, enhanced maintenance, and fish safety benefits.

5. Bank Stabilization – Banks will be stabilized, as needed. See Section *1.1.3 Streambank and Shoreline Stabilization* above for detailed discussion of techniques covered by this consultation.

6. Riparian Buffer Plantings – Disturbed channel banks and riparian zones will be restored to pre-project dimensions and replanted with native shrub and tree species representative of a stream's riparian vegetation.

7. Additional Conservation Measures – See *Section 1.2* - General Prescriptions.

NRCS Conservation Practices that could be used to accomplish the actions discussed above may include, but are not limited to: Fish Passage, Code 396	Access Road, code 560
Stream Habitat Improvement and Management, code 395	Streambank and Shoreline Protection, code 580
Mulching, code 484	Riparian Forest Buffer, code 391
Clearing and Snagging, code 326	Critical Area Planting, code 342
Tree and Shrub Establishment, code 612	

All Conservation Practices used to accomplish Installation/Repair/Replacement of Denil and Alaska Steeppass Fishways must adhere to the activity description found above on pages 19-21 of this Opinion, regardless of the activities that might otherwise be allowed under a given Conservation Practice.

1.2 General Prescriptions

NRCS has identified a number of general prescriptions that would apply during the project planning, construction, and site reclamation phases of projects fitting within the eight activities described above. Individual projects may include minor variations to these prescriptions, but only where they are 1) still consistent with the activity description and 2) do not introduce new effects that are not analyzed in this Opinion.

1.2.1 Pre-construction Prescriptions Applying to All Actions

- A pre-construction meeting between the NRCS, the program cooperator and the contractor is required at least one week prior to the commencement of construction.
- The cooperator is responsible for obtaining and complying with all non-ESA regulatory permits (e.g., permits from the U.S. Army Corps of Engineers) or official project authorizations prior to project implementation.
- DIG-SAFE (1-888-344-7233) must be contacted prior to construction. The NRCS makes no representation as to the presence or absence of underground hazards. The contractor is responsible for contacting the number above.
- Proposed sediment and erosion control techniques to be used during construction shall be reviewed and approved by the NRCS in the form of a written plan or as staked in the field.

1.2.2 Construction Logistics, Methods and Sequencing

Applying to All Actions

- All practices shall be in accordance with the NRCS Conservation Practice Standards, and shall be operated and maintained for the lifespan of the practice as established in Maine.
- All Occupational Safety and Health Administration and other applicable safety requirements shall be met during construction.
- Existing roadways or travel paths will be used for access whenever possible.
- The removal of riparian vegetation for access will be minimized, and clearing limits associated with site access will be clearly marked.
- The number of temporary access-ways will be minimized and will be designed using the Maine Department of Transportation's Best Management Practices (BMPs) (MEDOT 2008) to avoid transporting sediments to surface waters. See the Erosion Control Section below.
- NRCS will require by contract that installers or other entities responsible for implementing conservation practices will use all measures necessary to protect aquatic organisms and their habitats during construction. This includes all work necessary to control erosion and sediment pollution, chemical pollution, water pollution and air pollution.
- Work on sloped ground proximal to streams shall not occur during a significant rain event or when one is anticipated.
- All construction sites will be stabilized during any significant break in work and within three days of the end of construction.
- Upon completion of a project, the cooperator shall ask for a final inspection from the NRCS. At this time, the NRCS and the cooperator shall review the required Operation and Maintenance Plan.
- Any design modifications shall be clearly indicated on the drawings and approved by the NRCS and must still be within the scope of this programmatic consultation.

Applying to Work Adjacent to or below a Stream's Ordinary High Water Mark (OHWM)

- Foot traffic across the streams, if necessary, shall be minimized to the greatest extent possible to minimize material transport.
- Spawning areas shall not be disturbed during the egg incubation period. Crossing of juvenile rearing habitat will be made at right angles to the channel whenever possible to minimize instream disturbances.
- All work conducted below the OHWM of a stream shall be conducted from July 15 to September 30. Work outside of this work window will require prior approval by either USFWS or NMFS, as appropriate, and might require re-initiation of section 7 consultation in some situations.

- In most circumstances, instream projects must be conducted in the dry and effects to Atlantic salmon and other fish will be avoided and minimized. Exceptions to instream work in the dry must follow all other requirements of this Opinion in Sections 1.1 and 1.2. See the Worksite Isolation and Fish Removal section below for additional guidance.
- All projects will maintain downstream flows with negligible changes in water quality.
- All construction sites that require de-watering will also control groundwater entry to the worksite to facilitate proper installation of structures, like culverts.
- Any water intakes used, including pumps used for dewatering, will have an approved fish screen installed. See the Water Management and Water Quality section below.
- All in- or near-stream operations will cease under high flow conditions that may inundate the project area, except as necessary to avoid or minimize resource damage.

1.2.3 Equipment Prescriptions

Applying to All Actions

- Mobilize contractor's equipment as found in the NRCS Construction Specification 408 - Mobilization and Demobilization.
- Areas proximal to streams, riparian zones and wetlands must not be used as equipment staging or refueling areas. Equipment must be stored, serviced and fueled in a contained area that is at least 150 feet away from listed fish habitat and other connected surface waters.
- Avoid use of heavy equipment and techniques that will result in excessive soil disturbances or compaction of soils and impacts to riparian vegetation, especially on steep or unstable slopes.

Applying to Work Adjacent to or Below a Stream's OHWM

- Equipment shall not work in a stream or below a stream's OHWM unless no other practicable alternative is available (e.g., equipment must cross the stream to access the opposite stream bank, because no other access is available).
- Before any equipment enters a stream, field crews should wade through the stream reach with 2-3 passes (including 50 feet upstream and downstream of the project endpoints) to temporarily displace any juvenile salmon from the work area.
- Heavy equipment used below a stream's OHWM will be cleaned (e.g., power washed, steamed) prior to use. Machinery will be inspected for fluid and fuel leaks after cleaning and prior to entering sensitive areas.
- Equipment operators will have a hazardous material spill kit at the project site at all times.

1.2.4 Erosion Control Prescriptions

Applying to all Actions

- Erosion control measures BMPs will be in place.
  - Guidance provided in the MDEP's *Maine Erosion and Sediment Control BMPs* (2003) will be followed.
  - For forestry operations in forest, riparian or shoreline areas, the Maine Department of Conservation's *Best Management Practices for Forestry* (Moesswilde 2004) will also be in effect. **However, BMPs for stream crossings and fish passage associated with stream crossings are superseded by the requirements of this programmatic consultation.**
  - All Maine NRCS conservation practice standards in Section IV of the electronic *Field Office Technical Guide* require use of site specific BMPs to minimize and control soil erosion.
- Erosion controls shall be installed before any soil moving activities are started and shall be inspected regularly for effectiveness during the course of construction.
- Erosion control measures will be maintained until the site is sufficiently stabilized following construction.
- The excavation and movement of soil materials shall be scheduled to minimize the areas disturbed and unprotected from erosion for the shortest reasonable time.
- Strip and stockpile topsoil from all areas to be graded.
  - Salvaged topsoil shall be stockpiled in upland areas at least above a stream's OHWM in a location which will prevent erosion and siltation of the stream.
  - Suspend topsoil handling during wet conditions.
  - Replace stored topsoil after grading is completed.
- Ensure graded and excavated subsoil are stored separately from topsoil.
- Minimize grading on steep slopes.
- Where excess excavation material is generated, the material must be salvaged and stored or disposed of properly to protect the stream or other aquatic habitats, like wetlands, from erosion and sedimentation (see NRCS Construction Specification 421 - Excavation for more details).
- All disturbed soils will be stabilized with appropriate materials, including planting of an annual cover crop, conservation mix, or native vegetation indigenous to the site, during any significant break in work or within three days of the end of construction.
- All exposed surfaces shall be permanently stabilized by seed and loam, erosion control fabric, mulch, or other approved methods. Any seeding shall be in accordance with NRCS Construction Specification 406 - Seeding and Mulching.

Applying to Stream Bank Stabilization

- Stream bank soil removed during grading will be stored above a stream's OHWM in a location which will prevent erosion and siltation of the stream.
- Original bank contours will be re-created to the fullest extent practicable.

1.2.5 Additional Prescriptions that Apply to Instream or Near-stream Projects

Worksite Isolation and Fish Exclusion and Removal

To reduce impacts to listed fish and all aquatic organisms, as well as their habitats, instream or near-stream work shall be performed in isolation from flowing waters. For projects where work will occur adjacent to the stream channel (e.g., placement of bridge footers, vegetative plantings, small areas where vegetation may need removal to access the work area), work will be done as far from the stream channel as feasible to minimize disturbance to the stream. Work conducted below the OHWM, but on the streambank (e.g., streambank shaping and grading, stabilization of culverts with rock and vegetative plantings, shaping needed to install low water crossings), will ensure that all equipment is clean and free of fluid leaks and that erosion control BMPs are installed to minimize the chance that sediment and contaminants will enter streams.

Most projects requiring instream work (installation of culvert footings, placement of rock to stabilize the toe of culvert footings, installation of culverts and low water crossings) will require de-watering of the instream work area. Activities not requiring instream work site isolation include those involving instream placements of wood, boulder or rock not requiring excavation or anchoring and those associated with streambank and shoreline stabilization.

Fish will be excluded and removed from the worksite before any instream work is started (with the exception of cofferdam installation and dewatering) using the protocols described below.

- Implementation of the work area isolation and fish capture and removal protocols shall be planned and directed by a qualified NRCS fishery biologist, partner biologist, or biologist under contract to NRCS, possessing all necessary knowledge, training, and experience (see below). An adequate number of personnel will be onsite during all worksite isolation and fish removal activities.
- Prior to worksite isolation and dewatering, the reach of stream affected by project activities will be worked with beach seines in an effort to "herd" fish out of the area. After the first sweep, the reach will be bracketed with block nets that are properly secured to the stream channel, bed, and banks. Another pass will be made in the downstream direction where fish will be passed through the block. Additional passes will be made as necessary until no more fish are seen at the downstream net. The block nets should be monitored once a day to ensure that they are properly functioning and free of organic accumulates.
- Instream worksites will be isolated using cofferdams (impermeable concrete blocks, metal plates, sandbags, etc.)

- All fish and mussels encountered in the work area shall be relocated from the work site to a suitable upstream or downstream location no more than 24 hours before the start of any instream work. Preference should be given to relocating fish and other organisms to an upstream location so that construction-related sediment that moves downstream can be avoided.
- During dewatering, the work area will be monitored for the presence of fish and mussels; and if any are encountered, they will be captured and moved to above or below the worksite.
- Up- and down-stream flows will be maintained.
- All work will be done during periods of low annual summer stream flow during the pre-approved work window of July 15 to September 30.
- Use one or a combination of the following methods to most effectively capture ESA-listed fish and minimize harm. Fish salvage efforts shall proceed from the least invasive site-appropriate method to the most invasive.

1. Hand Netting. If observed, collect fish by hand or dip-nets.
2. Seining. Seine using a net with mesh of such a size as to ensure entrapment of the residing ESA-listed fish. The bottom or lead line has lead weights strung or crimped onto it to weight the net. The top or float line includes cork, polystyrene foam, or plastic floats to keep the top of the seine near the water surface. The net is attached to wood or metal poles to handle the seine. Two persons hold the seine in a vertical position above the water and perpendicular to the flow at the downstream edge of a riffle. They then thrust the poles and lead line of the seine to the stream bottom. The poles are allowed to slant downstream so that the flow forms a slight pocket in the seine. This procedure is continued from one shoreline across the width of the channel to the other shoreline so that the entire riffle is sampled. The seine is then lifted out of the water and the fish removed (Bramblett and Fausch 1991).
3. Trapping. Minnow traps (or gee-minnow traps) are net or wire enclosures that trap live fish. Fish swim through the funnel shaped openings and are guided to a narrow opening at the center of the trap. These traps are best suited for collecting juvenile fish or small adult fish in pool habitat. Traps should be baited and fished overnight. In areas of moderate to high fish densities, maximum catches in minnow traps are approached within one to two hours, with catches dropping sharply when traps are fished longer than 24 hours between checks. Hamburger, canned cat food, canned corn, shrimp, sardines, and other baits have been used successfully (Magnus et al. 2006).
4. Electrofishing. Before dewatering, electrofishing will be used as the last step to remove Atlantic salmon and other fish after all other feasible measures discussed above have been employed to remove aquatic organisms.
    a. When electrofishing is used as a means of fish capture, the directing fishery biologist shall have a minimum of 100 hours electrofishing experience in the field using similar equipment. Any individuals operating electrofishing

equipment shall have a minimum of 40 hours electrofishing experience under direct supervision.

i. Additional NRCS personnel may be used under the supervision of the directing fishery biologist to help with installing fish block nets, herding of fish, and netting of fish.

ii. In addition to NRCS staff, other qualified fisheries consultants may be used pending USFWS approval. Anyone operating an electrofisher will be required to have experience electrofishing salmonids in Maine.

b. All individuals participating in fish capture and removal operations shall have the training, knowledge, skills, and ability to ensure safe handling of fish and to ensure the safety of staff conducting the operations.

c. Prior to the start of sampling at a new location, water temperature and conductivity measurements must be taken to evaluate electroshocker settings and adjustments to minimize the potential to harm fish.

d. Each electrofishing session must start with all settings (voltage, pulse width, and pulse rate) set to the **minimums** needed to capture fish. These settings should be gradually increased only to the point where fish are immobilized and captured, and generally not allowed to exceed conductivity-based maxima indicated in the NMFS (2000) guidelines for electrofishing listed salmonids (http://www.nwr.noaa.gov/ESA-Salmon-Regulations-Permits/4d-Rules/upload/electro2000.pdf). Only direct current (DC) or pulsed direct current (PDC) should be used.

e. Water temperature and conductivity are measured at all sites. If the temperature exceeds 23 degrees Celsius, electrofishing will **not** occur as prescribed by the Maine Atlantic Salmon Commission's (2005) guidelines for Atlantic salmon. Construction timing may need to be adjusted to accommodate this temperature restriction when stream temperatures are warm. In some situations, stream temperatures may be cool enough early in the morning to allow electrofishing.

5. Handling of fish:

a. Atlantic salmon will be netted (1/4" knotless nylon) and immediately placed in a disinfected 5-gallon bucket filled with aerated stream water of ambient temperature.

b. All other fish species will be placed in a separate disinfected 5-gallon bucket with aerated stream water of ambient temperature and released either upstream or downstream as appropriate.

c. Minimize the number of fish stored in each 5-gallon bucket to prevent overcrowding and stress.

d. Handling time will be minimized. Monitor water temperature in buckets and the well-being of captured fish.

e. Release captured fish into a pool or area that provides cover and flow refuge after fish have recovered from stress of capture. Fish release upstream of the project site is preferred as sediment impacts would not likely affect individuals upstream of the worksite.

Biosecurity and Disinfection Guidelines for Field Work

Biosecurity guidelines are practical steps that can be taken to minimize the spread of unwanted organisms. The guidelines below are designed to provide direction to NRCS working in Maine's lakes, rivers, and streams in order to minimize the potential for spread of aquatic species, particularly invasive species. These guidelines, which were adapted from the Maine Department of Inland Fisheries and Wildlife guidelines, have been written to separate aquatic plants, aquatic animals, and aquatic pathogens. Questions regarding proper cleaning and/or disinfection of field equipment should be addressed with the equipment's manufacturer.

- *Equipment:*
  - 1 large (40+ gallon) trashcan
  - Portable hand-pump sprayer for field disinfection
  - Large stiff bristle brush
  - Spray bottle
  - Rubbing alcohol
  - Nolvasan disinfectant

- *Procedures to minimize the spread of aquatic plants*
  - Personnel - visual inspection of personal equipment (i.e. boots/waders/gloves) with hand removal of plants before leaving area.
  - Other Equipment- *same as above*
  - Dip nets, trapnets and leads - aquatic plants must be removed from nets before they are moved between waters. Nets should be visually inspected on land with hand removal of plants before leaving the sampling area. After seasonal use, nets will be cleaned, thoroughly dried in direct sun or indoor storage area, and re-inspected to remove any remaining plant material. Ensure all net sections and components are thoroughly dried for a minimum of 3 days. When possible, clean and dry nets and leads should be used between waters.
  - Waters with Documented Infestations – Biological staff should be extra diligent when working on waters with known infestations to prevent the further spread of invasives. When possible, staff should minimize contact and disturbance of aquatic invasive plant beds to reduce the risks of spreading the plant within the water being sampled and elsewhere. A current list of known plant infestations is available at MDEP's website (www.maine.gov/dep/blwq/topic/invasives/doc.htm).

- *Procedures to minimize the spread of aquatic animals*
  - Personnel- personal equipment (i.e. boots/waders/gloves) should be rinsed clean of all visible mud and aquatic debris.
  - Other Equipment - rinsed clean of mud and aquatic debris.
  - Dip nets, trapnets and leads - Remove as much mud and aquatic debris as possible on site. After seasonal use, trapnets should be transported to a suitable location and cleaned, thoroughly dried in direct sun or indoor storage area, and re-inspected to remove any remaining material. Ensure all net sections and components are thoroughly dried for a minimum of 3 days. When possible, clean and dry nets and leads should be used between waters.

- Waters with Documented Infestations – Biological staff should be extra diligent when working on waters with known infestations to prevent the further spread of invasives. In this case, nets should be cleaned, soaked in salt brine (3%) overnight to destroy freshwater aquatic organisms, rinsed, and dried in sunlight between uses.

- *Procedures to minimize the spread of aquatic pathogens*
  - Equipment - Field equipment that comes in constant contact with stream or lake water (i.e. waders, nets, seines, gloves, shocker wand and tail, buckets, measuring boards, etc.) should be cleaned & disinfected before use between waters. Disinfection for most equipment is accomplished with a 2oz. Nolvasan/gallon water solution in a large trashcan. Equipment should be allowed to set in solution for 10 minutes and then rinsed thoroughly.
  - Equipment should be sprayed with a hand-pump style sprayer and allowed to set during transit to the new water.
  - Delicate equipment such as electronic scales, conductivity meters, thermometers, etc., should be sprayed with alcohol and allowed to air dry.
  - Dip nets, trapnets and leads – are too large to be soaked and unlikely to get reasonable disinfection with a spray system. After seasonal use, trapnets should be transported to a suitable location, cleaned, thoroughly dried in direct sun or indoor area, and re-inspected to remove any remaining material. Ensure all net sections and components are thoroughly dried for a minimum of 3 days. When possible, clean and dry nets and leads should be used between waters.
  - Waters with Documented Pathogens – Biological staff should be extra diligent with disinfection procedures when working on waters with known pathogen issues to prevent the further spread of the organisms.

In- or Near-stream Work Window

- All work conducted below the OHWM of a stream will be conducted from July 15 to September 30 of any given year during low stream flows.
- Work outside of this work window will require prior approval by either USFWS or NMFS, as appropriate, and might require re-initiation of section 7 consultation in some situations.

Water Management and Water Quality

- The contractor shall furnish the NRCS with a written proposal for diverting surface water before commencement of construction.
- The contractor shall install, maintain and operate all cofferdams, channels, sumps and all other temporary diversion and protective works needed to divert stream flows and other surface water through or around the site. Redundancy will be required if pumps supply flow to downstream habitat.

- If a site is to be dewatered, pump intakes will have a fish screen installed, operated and maintained according to criteria specified by NMFS in *Anadromous Salmonid Passage Facility Design* (NMFS 2008a). Pump intakes and return hoses must not disturb the streambed.
- Downstream flows will be maintained at all times.
- Methods used to maintain downstream flows (e.g., pumping, diversions) shall not cause erosion or introduce sediment into the channel.
- Removal of water from the construction site shall be accomplished in a manner that minimizes erosion and sediment transport.
- Dewatering activities shall be accomplished in a manner that maintains shallow groundwater quality.

Site Reclamation and Re-vegetation

- All temporary access ways to streams will be removed and restored to native herbaceous and\or native woody species representative of the site.
- All graded stream banks will be stabilized with woody shrub or tree species representative of the site.
- In areas where there is little to no slope and erosion and exploitation by invasive species are unlikely, natural regeneration may be used to re-vegetate and restore native vegetation to areas disturbed from construction activities.

1.3 Project Tracking and Correspondence Protocols

1.3.1 Project-specific Information for Proposed Actions

NRCS will use its ME-ECS-1 form (Appendix A) in the pre-project tracking process. The form will be used to provide site-specific project and practice information to the Services for each project proposed under this programmatic consultation. Before forwarding a ME-ECS-1 form to either USFWS or NMFS, NRCS will first determine if the project warrants formal consultation (i.e., will have adverse effects to either the species or critical habitat) and second whether the project meets the criteria of this programmatic consultation. The following support documentation will be provided along with the ME-ECS-1:

- A Location Map - maps will be at a scale where a project can easily be located on the landscape by ensuring nearby towns or other defining landscape features are visible.
- A Resource Inventory Map – A map depicting the likely presence of ESA-listed species and designated critical habitat that are within ¼ mile of the proposed NRCS action(s).
- A Conservation Map – this map will detail landowner boundaries and will identify the location and extent of planned NRCS practices.

- Site-specific Prescriptions – All required conservation measures applicable to the proposed action and any other conservation measures mutually agreed to by NRCS and the Services will be documented.
- Sufficient project-specific information will be provided so that USFWS or NMFS can determine if the project meets the requirements of this programmatic consultation and develop a project-specific incidental take statement (ITS) if appropriate. This information can include a narrative, photographs, site sketches, preliminary project plans, and pertinent site data (e.g., bankfull width, channel slope, channel cross sections, channel longitudinal profiles, pebble counts, etc.).

Depending on site-specific conditions and the proposed NRCS practices, additional information may include, but is not limited to:

- Soils Maps
- Topographic Contour Maps
- Habitat Evaluations
- Conceptual Engineering Specifications and Drawings – ***Final construction drawings will be provided to the Services at least 30 days prior to project implementation.***
- Practice Scope of Work Plans
- Practice Operation and Maintenance Plans
- Practice Job Sheets
- Project Site Pictures

Pre-project tracking paperwork will be used to refine specific construction methods, sequencing, and techniques that will avoid or minimize adverse effects to Atlantic salmon and their critical habitat (i.e., further define project-specific conservation measures). ***NRCS will submit as much site-specific information as possible, rather than relying on general or conceptual scopes of work or plans, to facilitate development of conservation measures that avoid and minimize effects to salmon and their habitat.***

1.3.2 Modification of Approved Project Work Plans

If changes to approved project designs are being considered, either before or during project construction, NRCS will ensure that these changes are still consistent with the requirements of the programmatic formal consultation, including the conservation measures and the ITS. Furthermore, all changes will be consistent with any additional requirements and refinements of the ITS that result from the project-specific review between NRCS and USFWS or NMFS. ***Project changes that would 1) result in new effects not considered in the programmatic consultation or 2) result in the authorized incidental take being exceeded would require re-initiation of section 7 consultation.*** NRCS will coordinate with USFWS or NMFS staff as necessary to discuss proposed changes.

1.3.3 Project Tracking and Monitoring

NRCS staff will carefully monitor all actions carried out under this programmatic Opinion to ensure that they are consistent with all requirements of the proposed action and the ITS. Specific monitoring and reporting requirements are found below in ITS, specifically Section C. Terms and Conditions (pages 82-83). As further specified in the ITS, NRCS will submit an annual report to the Services that summarizes all activities carried out under this programmatic consultation.

1.4 Action Area

'Action area' means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For purposes of this consultation, the overall action area consists of the combined action areas for each project authorized under this Opinion. The eight categories of activities included in this consultation could result in multiple projects being constructed over the five year period of implementation. NRCS provides technical and financial assistance to private agricultural and forest landowners throughout the State of Maine. Therefore, the overall action area for this Opinion includes the entire 45,980 km^2 of the geographic range of the Atlantic salmon GOM DPS in Maine. That said, the additive action areas for the individual projects authorized under this Opinion (estimated by NRCS to include 140 individual projects during the first 5 years of implementation) would only include a fraction of the entire GOM DPS range.

Within the range of the GOM DPS, projects could also occur in any of 45 specific areas (HUC[1]-10 watersheds) that are designated as critical habitat for Atlantic salmon. These projects could occur in any of the three Salmon Habitat Recovery Units (SHRU) within the GOM DPS. The three SHRUs represent the geographic framework within which critical habitat was designated. Projects authorized under this opinion are anticipated to only occur within the freshwater portion of the GOM DPS range. Figure 1 shows the following: 1) the geographic boundary of the GOM DPS in Maine, 2) the HUC-10 watersheds that are designated as critical habitat, and 3) the HUC-10 watersheds that were specifically excluded from designation as critical habitat for economic reasons under section 4(b)(2) of the ESA.

Within the GOM DPS, the eight activities discussed in this Opinion will only result in adverse effects that warrant formal consultation where Atlantic salmon are likely to be present such that fish could be adversely affected during construction activities. Currently, Atlantic salmon may occur within the following areas: 1) HUC-10 watersheds designated as critical habitat, 2) HUC-10 watersheds excluded from inclusion as critical habitat for economic, tribal, or military reasons, and 3) the three lower HUC-10 watersheds of the Sebasticook River. As recovery efforts proceed in the future and Atlantic salmon numbers increase, salmon may re-occupy other watersheds within the GOM DPS. Consequently, the geographic area within the GOM DPS where this Opinion would be applicable due to the presence of Atlantic salmon and associated adverse effects to fish may change over time.

[1] HUC = hydrologic unit code as defined by the U.S. Geological Survey.

Individual actions areas for each project could include upland areas, riparian areas, banks and shorelines, stream and river channels, ponds, and lakes. Action areas may extend both downstream of the actual construction footprint (e.g., sediment moving with stream flows) and upstream (e.g., restoring fish passage by removing a plugged culvert and re-establishing a natural stream channel through a former road crossing).

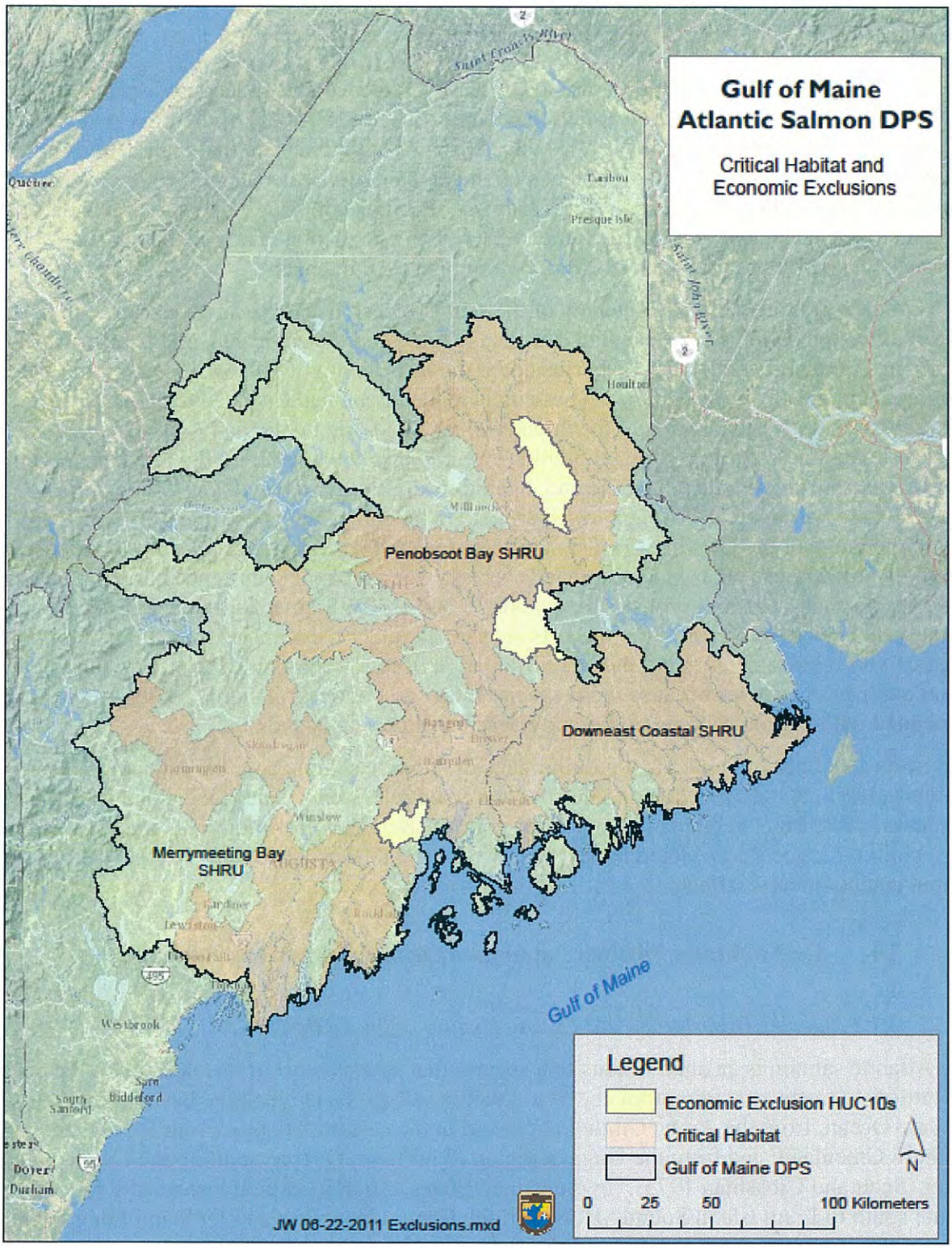

Figure 1. Gulf of Maine Distinct Population Segment and designated critical habitat. Note: This figure does ***not*** show either tribal or military exclusions from critical habitat.

II. STATUS OF THE SPECIES AND CRITICAL HABITAT

The ESA establishes a national program to conserve threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the USFWS, NMFS, or both to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitats. Section 7(b)(4) requires the provision of an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) to minimize such impacts.

This Opinion presents USFWS's review of the status of each listed species considered in this consultation, the condition of designated critical habitat, and the environmental baseline for the action area. Other federally-listed species under the jurisdiction of USFWS occur within the geographic range of the GOM DPS. These include the threatened Canada lynx (*Lynx canadensis)* and its critical habitat, the threatened small whorled pogonia (*Isotrea medeoloides*), the threatened Eastern prairie fringed orchid (*Plantanthera leucopehaea*), the threatened piping plover (*Charadrius melodus*), and the endangered roseate tern (*Sterna dougallii dougallii*). The New England cottontail (*Sylvilagus transitionalis*), a federal candidate species, also occurs within the range of the GOM DPS. This Opinion does not consider effects from the proposed action on any of these other federally listed species. The potential occurrence of and effects to these species will need to be considered by NRCS and USFWS on an individual project basis. It is likely, however, that most of the projects carried out under the authorization of this Opinion (e.g., culvert replacements and removals, installation of low-water crossings, etc.) would not affect other listed species because these species either do not occur in aquatic habitats or occur associated with marine habitats (e.g., sandy beaches or coastal islands).

This section defines the biological requirements of Atlantic salmon and the status of its designated critical habitat relative to those requirements. Listed species facing a high risk of extinction and critical habitats with degraded conservation value are more vulnerable to the aggregation of effects considered under the environmental baseline, the effects of the proposed action, and cumulative effects.

2.1 Gulf of Maine Distinct Population Segment of Atlantic Salmon

2.1.1. Species Description and Listing History of the GOM DPS

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

The GOM DPS of anadromous Atlantic salmon was initially listed jointly by the USFWS and NMFS 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; February 7, 1996) and, therefore, recommended the geographic range included in the new expanded GOM DPS.

The current 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 and Craig Brook National Fish Hatchery, 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).

2.1.2. Life History of Atlantic Salmon in the GOM DPS

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; a small percentage (1-2%) of returning adults in Maine will stray to a new river. 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 in rivers. 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). One or more males fertilize the eggs that the female deposits in the redd (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 fresh water until the following spring before returning to the sea (Fay *et al.* 2006). From 1968 to 2009, approximately 2.1 percent of the "naturally-reared" adults (fish originating from natural spawning or hatchery fry) in the Penobscot River were repeat spawners (USASAC 2010).

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

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

First year parr are often characterized as being small parr or 0+ parr (4 to 7 cm long), whereas second and third year parr are characterized as large parr (greater than 7 cm long) (Haines 1992). Parr growth is a function of water temperature (Elliott 1991); parr density (Randall 1982); photoperiod (Lundqvist 1980); interaction with other fish, birds, and mammals (Bjornn and Reiser 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.* 1998a; Halvorsen and Svenning 2000; 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 fresh water 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 various predator assemblages. The physiological changes that occur during smoltification prepare the fish for the dramatic change in osmoregulatory needs that come with the transition from a fresh to a salt water habitat (Ruggles 1980; Bley 1987; McCormick and Saunders 1987; McCormick *et al.* 1998). The transition of smolts into seawater is usually gradual as they pass through a zone of fresh and saltwater mixing that typically occurs in a river's estuary. Given that smolts undergo smoltification while they are still in the river, they are pre-adapted to make a direct entry into seawater with minimal acclimation (McCormick *et al.* 1998). This pre-adaptation to seawater is necessary under some circumstances where there is very little transition zone between freshwater and the marine environment.

The spring migration of post-smolts out of the coastal environment is generally rapid, within several tidal cycles, and follows a direct route (Hyvarinen *et al.* 2006; Lacroix and McCurdy 1996; Lacroix *et al.* 2004). 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, Lacroix and Knox 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 also 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 immature adults located along the coasts of Newfoundland, Labrador, and Greenland, and in the Labrador and Irminger Sea in the later summer and autumn.

2.1.3. Status and Trends of Atlantic Salmon in the GOM DPS

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; USASAC 2010; MASC 2011).

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. Total adult returns to the GOM DPS improved somewhat in 2008 and 2009 and returned to mid-decade levels in 2010 (Figure 2). The population growth observed in the 1970s is likely attributable to favorable marine survival and increases in hatchery capacity, particularly from Green Lake National Fish Hatchery 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 93 percent of all adult returns to the GOM

DPS in 2010. Of the 1,316 adult returns to the Penobscot, the vast majority are the result of smolt stocking and only a small portion were naturally-reared. The term naturally-reared includes fish originating from both natural spawning and from stocked hatchery fry (USASAC

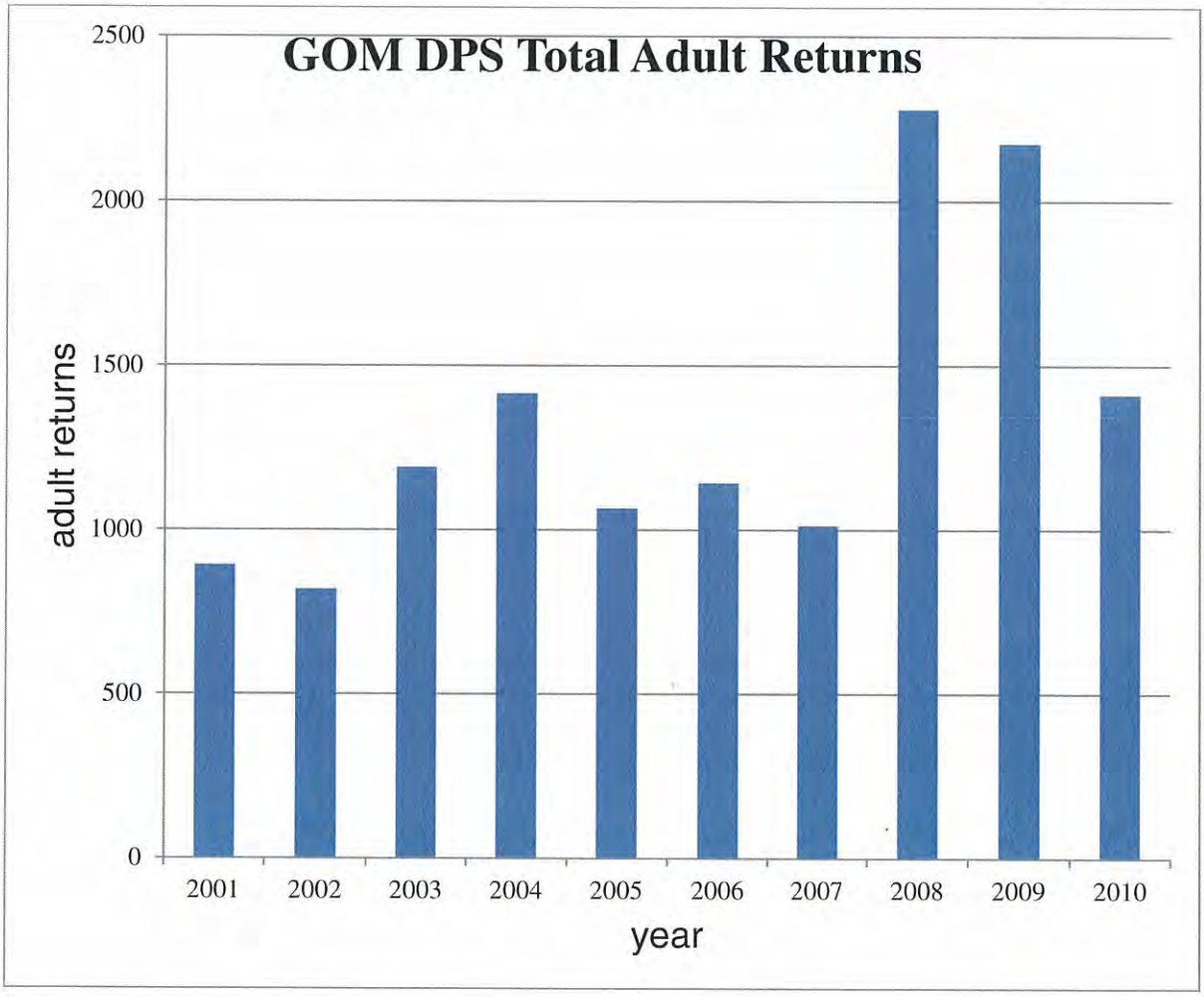

Figure 2. Total adult returns for the GOM DPS. Figure reproduced using data from US Atlantic Salmon Assessment Committee reports (USASC 2010) and Maine Atlantic Salmon Commission (2011) trap count statistics for 2010.

2010). Hatchery fry are included as naturally-reared because hatchery fry are not marked and, therefore, 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 consistent hatchery supplementation. In the GOM DPS, nearly all of the hatchery-reared smolts are released into the Penobscot River -- 560,000 smolts in 2009 (USASAC 2010). 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 as 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). Naturally-reared smolts have a better marine survival rate than do hatchery fish, but the capacity of rivers to produce adequate numbers of smolts is generally well below replacement rates under current marine survival rates (USASAC 2010).

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. Continued reliance on the conservation hatchery program will not allow recovery of the GOM DPS, which must be accomplished through increases in naturally reared salmon.

2.2. Critical Habitat for Atlantic Salmon in the GOM DPS

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). The final rule was revised on August 10, 2010; designated critical habitat for the expanded GOM DPS of Atlantic salmon was reduced to exclude trust and fee holdings of the Penobscot Indian Nation and a table was corrected (74 FR 39003; August 10, 2009).

2.2.1. Primary Constituent Elements of Atlantic Salmon Critical Habitat

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[2]). 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.

[2] 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.

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

Physical and Biological Features of the Spawning and Rearing PCE

1. 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.
2. 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.
3. 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.
4. Freshwater rearing sites with space to accommodate growth and survival of Atlantic salmon parr.
5. 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.
6. Freshwater rearing sites with cool, oxygenated water to support growth and survival of Atlantic salmon parr.
7. Freshwater rearing sites with diverse food resources to support growth and survival of Atlantic salmon parr.

Physical and Biological Features of the Migration PCE

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 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.
3. Freshwater and estuary migration sites with abundant, diverse native fish communities to serve as a protective buffer against predation.
4. Freshwater and estuary migration sites free from physical and biological barriers that delay or prevent emigration of smolts to the marine environment.
5. Freshwater and estuary migration sites with sufficiently cool water temperatures and water flows that coincide with diurnal cues to stimulate smolt migration.
6. 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 (HUC-10 watersheds) 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 OHWM 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 of salmon habitat 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.

2.2.2. 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 to provide protection from demographic and environmental variation. Such a widespread distribution would, therefore, provide a greater probability of population sustainability in the future, as will be needed to achieve recovery of the GOM DPS.

Areas designated as critical habitat within each SHRU are described in terms of habitat units. One habitat unit represents 100 m^2 of suitable salmon habitat (which could be spawning and rearing habitat or migration habitat). The quantity of habitat units within the GOM DPS was 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 (e.g., the presence of a dam) has affected the PCEs. For each SHRU, NMFS determined that there were sufficient habitat units available within the currently occupied habitat to achieve recovery objectives in the future; therefore, no unoccupied habitat (at the HUC-10 watershed scale) needed to be designated as critical habitat. A brief historical description for each SHRU, as well as contemporary critical habitat designations and special management considerations, are provided below.

Downeast Coastal SHRU

The Downeast Coastal SHRU encompasses fourteen HUC-10 watersheds covering approximately 747,737 hectares (1,847,698 acres) within Washington and Hancock counties. In this SHRU there are approximately 61,400 units of historical spawning and rearing habitat for Atlantic salmon among approximately 6,039 km of rivers, lakes and streams. Of the 61,400 units of historical spawning and rearing habitat, approximately 53,400 units of habitat in eleven HUC-10 watersheds are considered to be currently occupied. Of the 53,400 occupied units within the Downeast Coastal SHRU, NMFS calculated these units to be the equivalent of roughly 29,111 functional units of habitat or approximately 47 percent of the estimated historical functional potential. This estimate is based on the configuration of dams within the SHRU that limit migration and the degradation of physical and biological features from various land use activities, which reduce the productivity of habitat within each HUC-10. The Downeast SHRU has enough habitat units available within the occupied range that, in a restored state (*e.g.*

improved fish passage or improved habitat quality), the Downeast SHRU could satisfy recovery objectives as described in the final rule for critical habitat (74 FR 29300; June 19, 2009). Certain tribal and military lands within the Downeast Coastal SHRU are excluded from critical habitat designation.

Penobscot Bay SHRU

The Penobscot Bay SHRU, which drains approximately 22,234,522 hectares (54,942,705 acres), contains approximately 323,700 units of historically accessible spawning and rearing habitat for Atlantic salmon among approximately 17,440 km of rivers, lakes and streams. Of the 323,700 units of spawning and rearing habitat (within 46 HUC-10 watersheds), approximately 211,000 units of habitat are considered to be currently occupied (within 28 HUC-10 watersheds). Of the 211,000 occupied units within the Penobscot SHRU, NMFS calculated these units to be the equivalent of nearly 66,300 functional units or approximately 20 percent of the historical functional potential. This estimate is based on the configuration of dams within the SHRU that limit migration and the degradation of physical and biological features from land use activities which reduce the productivity of habitat within each HUC-10. Three HUC-10 watersheds - Molunkus Stream, Passadumkeag River, and Belfast Bay - are excluded from critical habitat designation due to economic impact. Certain tribal lands within the Penobscot Bay SHRU are also excluded from critical habitat designation.

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. 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 (as revised on August 10, 2009) includes 45 specific areas occupied by Atlantic salmon that comprise approximately 19,571 km of perennial river, stream, and estuary habitat and 799 km^2 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 $km^2$of lake habitat have been excluded from critical habitat pursuant to section 4(b)(2) of the ESA.

2.3 Summary of Factors Affecting Recovery within the GOM DPS

There are a wide variety of factors that have and continue to affect the current status of the GOM DPS and its critical habitat. The potential interactions among these factors are not well

understood, nor are the reasons for the seemingly poor response of salmon populations to the many ongoing conservation efforts for this species.

2.3.1. Threats to the Species

The recovery plan for the previously designated GOM DPS (NMFS and USFWS 2005), the latest status review (Fay *et al.* 2006), and the 2009 listing rule all provide a comprehensive assessment of the many factors, including both threats and conservation actions, that are currently affecting the status and recovery of listed Atlantic salmon. USFWS is writing a new recovery plan that will include the current, expanded GOM DPS and its designated critical habitat. The new recovery plan will likely include the following list of threats that may require action to reverse the decline of GOM DPS salmon populations.

- Degraded water quality
- Aquaculture practices, which pose ecological and genetic risks
- Climate change
- Depleted diadromous fish communities
- Dams, including inadequate regulatory mechanisms
- Reduced habitat connectivity, particularly from road-stream crossings
- 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-stream 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 existing dams in the GOM DPS did 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.

2.3.2. Threats to Critical Habitat

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 and rearing habitat 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.

Downeast Coastal SHRU

The Downeast Coastal SHRU once contained high quality Atlantic salmon habitat in quantities sufficient to support robust Atlantic salmon populations. Impacts to substrate and cover, water quality, water temperature, biological communities, and migratory corridors, among a host of other factors, have impacted the quality and quantity of habitat available to Atlantic salmon populations within the Downeast Coastal SHRU. Two hydropower dams on the Union river, and to a lesser extent the small ice dam on the lower Narraguagus River, limit access to roughly

18,500 units of spawning and rearing habitat within these two watersheds. In the Union River, which contains over 12,000 units of spawning and rearing habitat, physical and biological features have been most notably limited by high water temperatures and abundant smallmouth bass populations associated with impoundments.

In the Pleasant River and Tunk Stream, which collectively contain over 4,300 units of spawning and rearing habitat, pH has been identified as possibly being the predominate limiting factor. The Machias, Narraguagus, and East Machias rivers contain the highest quality habitat relative to other HUC-10's in the Downeast Coastal SHRU and collectively account for approximately 40 percent of the spawning and rearing habitat in the Downeast Coastal SHRU. Throughout the Downeast SHRU, many poorly designed road crossings provide complete or partial barriers to salmon movements and also degrade the quality of spawning and rearing habitat both upstream and downstream of the crossing.

Penobscot Bay SHRU

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 Federal Energy Regulatory Commission-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. Throughout the Penobscot SHRU, many poorly designed road crossings provide complete or partial barriers to salmon movements and also degrade the quality of spawning and rearing habitat both upstream and downstream of the crossing.

Merrymeeting Bay SHRU

Habitat throughout the Merrymeeting Bay SHRU was once of high enough quality to support a robust Atlantic salmon population. The mainstem Kennebec River has the highest biological value to the Merrymeeting Bay SHRU because it provides the central migration conduit crucial for much of the currently occupied habitat found in the Sandy River basin. The Sandy River has the greatest biological value for spawning and rearing habitat within the occupied range of the Merrymeeting Bay SHRU but is currently only accessible to adult salmon through a trap and truck program around the four lowermost dams. The construction of dams, and to a lesser extent pollution, has degraded habitat quality and accessibility and is likely responsible for the decline of Atlantic salmon populations within the Merrymeeting Bay SHRU. 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. Throughout the Merrymeeting Bay SHRU, many poorly designed road crossings provide complete or partial barriers to salmon movements and also degrade the quality of spawning and rearing habitat both upstream and downstream of the crossing.

2.3.3. 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 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 expanded listing and designation of critical habitat, the Services will produce a new recovery plan for Atlantic salmon. The new plan, which will cover the Kennebec, Androscoggin and Upper Penobscot watersheds, will address effects that result from the hydropower systems on these large rivers.

III. ENVIRONMENTAL BASELINE

The Environmental Baseline provides a snapshot of a species health or status at a given time within the action area and is used as a biological basis upon which to analyze the effects of the proposed action. Assessment of the environmental baseline includes an analysis of the past and present impacts of all state, federal, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02). An environmental baseline that does not meet the biological requirements of a listed species may increase the likelihood that adverse effects of the proposed action will result in jeopardy to a listed species or in destruction or adverse modification of designated critical habitat.

The action area for this programmatic consultation includes the combined action areas for multiple projects for which an exact location within the geographic range of the GOM DPS is not yet known. Consequently, it is not possible to precisely define 1) the current condition of Atlantic salmon and its critical habitat in the individual action areas, 2) the factors responsible for those conditions, or 3) the conservation role of those specific areas.

Therefore, in order to complete the jeopardy and destruction or adverse modification of critical habitat analyses in this Opinion, USFWS made several assumptions regarding the environmental baseline in each action area that will eventually be chosen to support an NRCS project. These assumptions include the following: 1) overall abundance of Atlantic salmon is very low and is orders of magnitude lower than historic abundance levels; 2) the percentage of naturally reared fish versus those from hatchery supplementation efforts is low throughout the GOM DPS; 3) low marine survival is negatively affecting the entire GOM DPS and contributing to low numbers of adult returns to all rivers; 4) Atlantic salmon abundance in each project's action area will vary depending on the location relative to ongoing conservation hatchery stocking locations and known spawning activity; 5) throughout the GOM DPS access to and quality of salmon habitat is often affected by dams and poorly designed road-stream crossings, limiting the current function of migration, spawning and rearing habitats; and 6) each project's action area is likely experiencing some degradation of aquatic habitat function as a result of the conservation problem being addressed by NRCS.

As described above in the Status of the Species and Critical Habitat section, the many factors that are influencing the current population of the GOM DPS and the condition of critical habitat are largely ubiquitous throughout the range of Atlantic salmon. Therefore, USFWS believes that our analyses and conclusions in this Opinion are broadly applicable to the numerous project-specific action areas that will chosen by NRCS in the future. Finally, a more precise delineation of the action area for each "covered" project will be provided to us as part of the second tier project review (as described above in Section 1.3); our second tier analysis will confirm that the assumptions made in the programmatic level environmental baseline are applicable to each project.

IV. EFFECTS OF THE ACTION

This section of the Opinion analyzes the direct and indirect effects of the proposed action on the GOM DPS of Atlantic salmon and its critical habitat, together with the effects of other activities that are interrelated or interdependent (50 CFR 402.02; June 30, 1986). Effects of the action that reduce the ability of a listed species to meet its biological requirements may increase the likelihood that the proposed action will result in jeopardy to that listed species or in destruction or adverse modification of a designated critical habitat. Indirect effects are those that are caused by the proposed action, are later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

This programmatic effects analysis is organized into a separate discussion for each of the eight proposed activities. Because these activities will have at least some effects that are similar (e.g., the effects on Atlantic salmon from worksite isolation), the Opinion will reference earlier discussions where the effects analysis is applicable to more than one activity.

4.1 Stream Crossing Replacements

Given the various requirements of stream crossing replacement projects under this programmatic Opinion (e.g., design using stream simulation techniques), these projects should generally result in long-term benefits for Atlantic salmon and critical habitat compared to the existing baseline condition. NRCS typically replaces stream crossings that are undersized or otherwise poorly designed. Such poorly designed structures generally impair upstream fish passage, contribute to elevated sediment levels, and result in poorly functioning watershed processes (e.g., sediment transport and bed load movement) both upstream and downstream of the site. Replacement culverts will result in better fish passage, decreased sediment inputs, improved hydrologic processes, and a reduced potential for future stream crossing failure. During construction, however, stream crossing replacements are likely to have short-term adverse effects to Atlantic salmon or critical habitat due to sedimentation, riparian vegetation removal, stream de-watering, and disturbing or handling fish during instream work activities. NRCS will use various conservation measures to minimize these construction-related adverse effects.

4.1.1. Effects to Atlantic Salmon

Worksite Isolation - Cofferdams, Dewatering, and Fish Relocation

Replacement of stream crossings will require instream work that is done in isolation from stream flows, typically through the installation of cofferdams and the use of pumps to divert stream flows around the work site. During this activity, individual Atlantic salmon may be killed or more likely temporarily disturbed, displaced, or injured by instream work activities. Isolation of a stream work area with a cofferdam is a conservation measure intended to minimize the overall adverse effects of construction activities on Atlantic salmon and their habitat from sedimentation and equipment working in the channel. Dewatering of a stream inside a cofferdam would have a

lethal effect on any fish left inside the cofferdam, but most fish in the work area would be successfully transported to a safe location before dewatering begins. Fish relocation is a conservation measure that uses a sequence of actions to exclude fish from the work area. Nevertheless, adverse effects could result from the capture, handling, and relocation of fish from the work area, as well as stranding of some fish inside the cofferdam. The discussion that follows below will generally apply to both stream crossing replacement and stream crossing removal projects. Both activities will require similar instream work activities, including worksite isolation and dewatering. NRCS informed USFWS that they anticipate performing 50 total stream crossing replacement and removal projects over the five year period of this Opinion, so the discussion below related to fish relocation activities and other effects to salmon from worksite isolation will refer to both activities collectively.

Prior to worksite isolation and dewatering, specific protocols will be followed as described in Section *1.2.5* (pages 25-28) to remove as many fish as possible from the area, including Atlantic salmon. Block nets will be installed both above and below the work area and properly secured to the stream channel, bed, and banks and then maintained throughout the project. These nets will minimize the opportunity for fish to enter the work site. Once procedures have been implemented to remove as many fish as possible from the general work area, cofferdams will be installed to isolate the culvert work site from flowing water.

Before or while the cofferdam is being dewatered, Atlantic salmon that don't move away and are subsequently captured inside the cofferdam will be relocated outside of the action area to suitable habitat according to the fish evacuation plan in Section *1.2.5*. Fish release upstream of the project site is preferred, as subsequent sedimentation events would not likely affect individuals upstream of the stream crossing (e.g., sediment released during removal of the cofferdam).

Gear such as dip nets, minnow traps and seines should be used first, as practicable, to remove fish; electrofishing gear should be used last in an attempt to clear the work area. To minimize temperature-related handling stress to Atlantic salmon, electrofishing will not be conducted in water temperatures above 23°C (MASC 2005). Construction scheduling will need to account for possible water temperature issues, given the July 15 to September 30 work window. Planning for fish evacuation first thing in the morning, when water temperatures are often cooler, can be effective during warm weather. In some situations, however, construction may need to be delayed to avoid a period of high air temperatures that is raising stream temperature above 23°C.

To minimize the stranding of fish caught inside a cofferdam as a result of dewatering, NRCS (or approved consultants) will capture and remove Atlantic salmon and other fish species. Capturing and handling salmon causes some physiological stress and can cause physical injury or death, including cardiac or respiratory failure from electrofishing (Snyder 2003). Studies have shown that all aspects of fish handling, such as dipnetting, time out of water, and data collection (e.g., measuring the length), are stressful and can lead to immediate or delayed mortality (Murphy and Willis 1996). Clément and Cunjak (2010) found a low incidence and severity of injuries to juvenile Atlantic salmon from electrofishing in New Brunswick, with injuries becoming more prevalent in larger parr. However, they recommend caution when electrofishing because sublethal effects other than physical injury remain largely unknown.

Direct mortality may occur when fish are handled roughly or kept out of the water for extended periods. Delayed fish mortality is often associated with a disease epizootic, which generally occurs from 24 hours to 14 days after handling. If a fish is injured during handling, disease may

develop within a few hours or days. Examples of injuries which can lead to disease problems are loss of mucus, loss of scales, damage to the integument, and internal damage. Internal injuries occur when fish are not properly restrained or not sedated during handling. It is common for fish to jump out of a worker's hand and fall onto a hard surface, resulting in internal injuries and mortality.

To minimize any injury, stress, or mortality of Atlantic salmon captured during fish relocation activities, only qualified NRCS staff or consultants will be allowed to handle fish; and all personnel involved with electrofishing will have appropriate experience with salmonids in Maine. Handling stress and risk of injury for salmon will be minimized by 1) ensuring minimal handling time (no data will be collected from individual Atlantic salmon other than to record the number of salmon captured); 2) ensuring minimal time that fish are held out of water and the stream; and 3) using transfer containers with aerated stream water of ambient temperature. To minimize adverse effects to Atlantic salmon, other NRCS staff (those not under the direction of the NRCS fisheries biologist), contractors, and landowners may not attempt to capture or handle any Atlantic salmon during the course of these construction projects.

All stream crossing replacement projects that will use cofferdams to isolate instream work areas have the potential to capture some juvenile Atlantic salmon within the cofferdam areas. Because of the programmatic nature of this consultation, project details are unknown regarding 1) the specific locations of culvert replacement projects, 2) the size of the streams, 3) the size of dewatered areas inside cofferdams, and 4) the type of salmon habitat present in the action area (spawning and rearing habitat or migration habitat). Typically, the size of the dewatered stream area is calculated based on the proposed cofferdam locations and the bankfull width of the stream.

NRCS expects that cofferdams, on average, will be placed in the stream about 7.6 m (25 ft) both downstream and upstream of the existing culvert ends. Based on past work with culvert replacement projects, NRCS expects that the average project will have a bankfull stream width of about 3.05 m (10 ft) and an average culvert length of about 15.2 m (50 ft). These figures are largely based on NRCS's prior work with Project SHARE[3] replacing culverts on industrial forest land within the Downeast SHRU. NRCS expects their future culvert replacement projects covered by this Opinion to be generally similar, although some projects will likely be smaller and some larger in terms of culvert and stream size.

Accordingly then, for purposes of this programmatic effects analysis associated with stream dewatering and fish removal activities, an average culvert length of 15.2 m (50 ft) and an average bankfull stream width of 3.05 m (10 ft) is used. During the future review of each specific culvert replacement project, the Service will refine the project-specific area of stream that will be de-watered based on actual stream and culvert dimensions at the project location.

Baum (1997) reported that Maine Atlantic salmon rivers support on average between five and ten parr per 100 m^2 of habitat (or one salmon habitat unit), based on data collected by the MEDMR. While electrofishing for juvenile Atlantic salmon population estimates and collection of parr for use as broodstock at the USFWS's Craig Brook National Fish Hatchery, the MEDMR collected a GOM DPS average of 4.92 salmon/100 m^2 in 2006; 10.65 salmon/100 m^2 in 2007; 8.03/100 m^2 in 2008, 10.31/100 m^2 in 2009, and 20.47/100 m^2 in 2010. The five-year GOM DPS average for

[3] Project SHARE is a non-profit conservation organization in Maine focusing on restoration of fish passage and natural stream functions to benefit Atlantic salmon and other native fishes.

juvenile Atlantic salmon density is then 10.88 salmon/100 m^2. These data are from electrofishing efforts in many streams located in watersheds throughout the GOM DPS (as defined in June 2009) and represent the best available scientific information to assist in determining the number of juvenile Atlantic salmon that are likely to be displaced or collected and relocated when a portion of a stream is dewatered within a cofferdam.

Given NRCS's estimate of 50 stream crossing replacement and removal projects over the 5-year term of this programmatic consultation, the total dewatered stream area during construction is expected to be approximately 4645.2 m^2 (50,000 ft^2) or 46.5 units of salmon habitat. Juvenile rearing habitat for Atlantic salmon is assumed to be present at or relatively close to all culvert replacement or removal projects. During the site-specific project review, information on stream habitat will be used to determine whether or not juvenile rearing habitat is present in the project vicinity. Additionally, more site-specific information on juvenile salmon densities will be used if available.

If juvenile Atlantic salmon were present at all culvert replacement and removal locations in densities similar to the average parr densities found by MEDMR in recent years, then it would be reasonable to expect that as many as 506 juvenile Atlantic salmon (10.88 parr/100 m^2 x 46.5 habitat units = 505.92 salmon parr) could be displaced from or captured inside cofferdams. However, 10.88 parr/100 m^2 is likely high for at least some of the project areas covered by this Opinion. MEDMR's data is mainly based on sites where the juvenile salmon densities are influenced by conservation hatchery stocking practices or the known occurrence of wild salmon spawning. At least some of NRCS's projects are likely to be in locations where there is no stocking or no wild spawning, so juvenile salmon densities would be expected to be considerably lower and in some cases absent altogether. Additionally, some of the habitat within the cofferdams would be inside of an existing culvert and may not be as suitable as habitat outside of the structure for Atlantic salmon. This is particularly true for under-sized culverts where increased water velocities tend to keep culvert bottoms clear of any stream substrate materials.

Therefore, we are reducing the number of salmon expected to be caught or displaced from the work areas by 50%. As a result, it is reasonable that as many as 253 (505.92 x 0.50 =252.96) juvenile Atlantic salmon could be displaced or captured inside cofferdams and subsequently relocated upstream or downstream of the isolated work areas during construction of up to 50 culvert replacements or removals over a 5-year timeframe. This number of fish is considered to account for any juvenile salmon which might be removed from the work area by other methods used prior to electrofishing, including "herding", dip-netting, seining, and trapping.

Despite precautions, some mortality is inevitable while electrofishing. The MEDMR annually reports to the USFWS juvenile salmon mortality associated with electrofishing activities in GOM DPS waters.[4] While the MEDMR usually handles a few thousand juvenile salmon each year during electrofishing, known mortalities are generally less than two percent of total fish captured. The vast majority of the mortality is to young-of-the-year salmon (YOY; i.e., parr during their first year after hatching). MEDMR staff instituted changes in operating protocols that reduced electrofishing mortality of YOY salmon from 2.72% in 2001 to 1.71 % in 2010.

[4] The MEDMR is authorized by the USFWS under section 10(a)(1)(A) of the ESA (Blanket Permit #697823) to conduct various research and recovery activities for GOM DPS Atlantic salmon, some of which may cause take of Atlantic salmon.

From 2006-2010, MEDMR reported a mean mortality of 1.45% for both YOY and 1+[5] or older parr (Trial 2011)[6].

Given that NRCS staff biologists and consultants who will be electrofishing are experienced with handling salmonids in Maine and will follow protocols similar to those used by MEDMR, over the long-term we expect a similar level of mortality during electrofishing efforts as that experienced by MEDMR. Consequently, USFWS expects that no more than four (4) juvenile Atlantic salmon will be killed as a result of electrofishing and handling to relocate fish outside of the cofferdam work areas (252.96 salmon captured x 1.45% mortality rate = 3.67 salmon mortalities; rounded up to four salmon mortalities).

Entrainment of fish in block nets could be an additional source of mortality associated with worksite isolation procedures. Experience with the use of block nets set around work areas at culvert replacement projects in Maine has not shown that fish from outside the work area become trapped in these nets (John Perry, MEDOT and Steve Koenig, Project SHARE; pers. comm.). In an Opinion for culvert replacement and removal projects in Idaho, NMFS (2006) concluded that the risk of fish mortality from entrainment on block nets was discountable. Therefore, we do not anticipate any additional capture and mortality of Atlantic salmon associated with entrainment on block nets.

Additionally, some mortality may occur if juvenile fish are missed or stranded in substrate interstices during salvage operations and subsequently left inside a dewatered cofferdam. Highly territorial salmonids, such as Atlantic salmon, that hold station and establish territories to maximize profitability under one flow condition may be more vulnerable to stranding effects owing to their reluctance to abandon territories (Armstrong *et al.* 1998). For ESA-listed Pacific salmon and steelhead, NMFS calculates an expected stranding rate of 8% (of the total exposed population) for both electrofished and non-electrofished sites (NMFS 2006). Furthermore, the relatively low voltages typically used in Maine when electrofishing in the GOM DPS to minimize injury or death of salmon makes it possible that some juvenile salmon (especially YOY) could be left in the stream substrate when dewatering begins (N. Dube, MEDMR and Scott Craig, USFWS; pers. comm.).

During dewatering, stranding does not always lead to mortality, as fish can survive for several hours in the substrate after dewatering. However, stranding over a longer period (which would be typical for culvert replacement projects) or removal of stream substrate for project construction would result in mortality. In a field experiment conducted in cold water (<4.5°C), Saltveit *et al.* (2001) found that 60% of Atlantic salmon YOY became stranded during dewatering over a period of 42 minutes. After searching the substrate, about 39% of the stranded fish could not be found. YOY Atlantic salmon were affected more severely than older juveniles. Only about 10% of 1+ Atlantic salmon parr were stranded during daylight in water greater than 9°C. In general, the incidence of Atlantic salmon stranding is much lower during summer, when water temperature is relatively high compared to winter conditions. This is likely attributable to lower fish activity and a substrate-seeking behavior during the cold season. Stranding is also

[5] 1+ parr refers to juvenile salmon during the period from July 1 to December 31 one year after hatching.

[6] This mortality figure does not include "catch per unit effort" sampling or random "poke" sampling because the size of the stream area sampled is not know in these instances. The data above, however, captures the majority of MEDMR's electrofishing effort for Atlantic salmon and is thought to be representative of overall mortality rates.

higher during the day, probably because salmon are predominantly active at night and more likely to move out of substrates.

We are not aware of data or literature that quantifies stranding of juvenile Atlantic salmon in stream substrates after fish removal efforts, including electrofishing. Given the best available scientific information, however, it is assumed that some juvenile salmon will be left stranded inside a cofferdam, particularly in streams with coarse gravel and cobble substrate where small fish can be very difficult to detect and remove. When cofferdams are de-watered and construction activities begin to replace or remove the existing stream crossing (e.g., excavation of the substrate), any fish left stranded in the substrate will be killed. Therefore, the Service anticipates the death of all juvenile Atlantic salmon left stranded within the stream substrate within the footprint of a de-watered cofferdam after all fish removal efforts have been completed. For the estimated 50 stream crossing replacement and removal projects, this stranding-related mortality would occur within approximately 46.5 units (4645.2 m^2) of Atlantic salmon habitat.

Even though very few Atlantic salmon are expected to be injured or killed by capture and relocation activities, relocated fish will be temporarily displaced and disrupted from their normal behaviors. Atlantic salmon parr are highly territorial and actively defend their feeding territory to maximize their opportunity to capture prey items, such as aquatic invertebrates. Territory size increases with fish age and size. Atlantic salmon parr temporarily displaced from their territory by construction activities, particularly the de-watering of a section of stream, may be more vulnerable to predators, may be less able to capture prey, and may experience stress while looking for another suitable, unoccupied area of stream in which to establish a new territory. Once construction activities are finished and stream flows are returned, parr will be able to re-occupy habitat that is largely unchanged or may, in fact, be improved compared to the former road-stream crossing situation.

In order to keep the stream flows diverted around the cofferdams for the duration of instream work, a pump will be used just upstream of the upper cofferdam. The intake hose has the potential to adversely affect fish, including juvenile Atlantic salmon, through impingement and entrainment. Approach velocities across the screen that are faster than a fish's swimming capability can draw and hold fish against the screen surface (*i.e.*, impingement), resulting in suffocation or physical damage to the fish (NMFS 2008a). Pump intake hoses without screens or with improper screens can result in fish being drawn into the pump (entrainment) and killed. Impingement and entrainment can be avoided by putting a properly designed fish screen on the end of the intake hose.

To prevent impingement and entrainment of Atlantic salmon juveniles, NRCS will use pump intake screens that are designed and sized to meet NMFS (2008a) criteria. With the implementation of this protective measure, diversion pumps should have minimal, if any, effects on Atlantic salmon from impingement and entrainment. In order for this protective measure to be effective, however, pump details must be carefully planned to suit the project site conditions and then monitored throughout the period of pumping.

Adult Atlantic salmon could occur in the vicinity of culvert replacement projects during the summer work window. During this time of year when river temperatures tend to be relatively warm, adult salmon typically hold in deep, oxygenated, well-shaded pools or near springs with cooler water temperatures while they wait for spawning in the fall. Unless this type of habitat is

present at or near a project site, adults are unlikely to be in the area. The currently low population of adults spawners in the GOM DPS also makes it unlikely that one or more adults will be present near any given project site (e.g., 1,494 adults were documented to return to the GOM DPS in 2010 but several hundred of these fish were removed from the Penobscot River and taken to USFWS hatcheries. Although final numbers are not yet available, adult returns for 2011 will be considerably higher). Given the level of instream activity associated with setting up the cofferdams and other construction-related activities along the stream banks, any adult salmon present in the project areas would likely be disturbed and temporarily move away from the work zone. Therefore, USFWS does not anticipate any injury or death of adult salmon will occur as the result of stream crossing replacement or removal projects.

Sedimentation Effects

Construction activities that involve work in a stream or near the banks of the stream are likely to result in some level of sediment being discharged into the stream as a result of disturbance to either land-based soils or stream substrates. Juvenile salmon could be present near each of the stream crossing replacement projects, but as many fish as possible will relocated away from the work areas, as discussed above. Fish removal and subsequent release upstream of the project site is preferred, as sediment impacts would not likely affect individuals upstream of the crossing.

The amount of sediment entering streams in association with these projects is expected to be relatively minor given the numerous conservation measures proposed by NRCS to minimize erosion and sedimentation and the limited duration of instream work (1-2 days) for most projects. All stream crossing replacement projects covered by this Opinion will have all instream work limited to the period July 15 to September 30. Stream flows are usually lowest during the summer in Maine, consequently reducing the potential for rain and subsequent construction-site runoff to cause erosion and carry sediment into a stream. Generally, the longer the construction period, the greater the need for various erosion control measures to protect a stream from sediment inputs.

Limiting instream construction work to the summer low flow period will avoid all effects from sediment exposure to salmon redds during the period from egg-laying in the fall through post-hatching in the spring when alevins are still within the stream substrate. Salmon adults may be near construction sites during the summer; however, the Service expects that adults would leave any areas of short-term, elevated instream turbidity and therefore avoid any significant impairment in behaviors, such as feeding or respiration.

All projects require pre-construction review and approval of sediment and erosion control techniques by NRCS, either in the form of a written plan or as staked in the field. NRCS requires that all projects follow the erosion and sediment control BMPs developed by the Maine Department of Environmental Protection (MEDEP 2003), as well as guidance found in NRCS's on-line *Field Office Technical Guide*, Section IV (http://www.nrcs.usda.gov/technical/efotg/).

Limiting instream work to a dewatered section of stream within a cofferdam will minimize the amount of sediment mobilized and distributed downstream of the work site. Turbid water from within a cofferdam will be pumped into a "dirty water" treatment system to minimize sedimentation impacts to the stream when the diverted water is returned downstream after treatment to remove sediments. However, the installation and removal of these cofferdams and

the diversion of stream flow around the construction site can result in some amount of sediment being dispersed into the stream. Construction-related disturbances in riparian areas near the stream also have the potential to result in erosion and sediment entering streams, particularly if there are rainstorms during periods when there are disturbed soils on construction sites. NRCS requires minimizing removal of riparian vegetation for construction access purposes, with clearing limits being plainly marked on the ground. Strict adherence to sediment and erosion control plans and vigilant monitoring by NRCS staff should minimize these sources of erosion and subsequent sediment reaching streams.

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

In a review of the effects of sediment loads and turbidity on fish, Newcombe and Jensen (1996) concluded that more than 6 days exposure to total suspended solids (TSS) greater than 10 mg/l is a moderate stress for juvenile and adult salmonids. A single day exposure to TSS in excess of 50 mg/l is also a moderate stress to salmonids. Robertson *et al.* (2007) found adverse effects to juvenile Atlantic salmon from short-term increases in suspended sediment at sediment levels as low as 15 nephelometric turbidity units (NTU) in a laboratory setting. These effects, however, were observed during the fall and winter seasons, a time period when NRCS projects will not be engaged in work activities that could release suspended sediment. Effects on fish from short-term turbidity increases (hours or days) are generally temporary and are reversed when turbidity levels return to background levels (Robertson *et al.* 2006).

The USFWS does not have sufficient information to compare the conclusions of Newcombe and Jensen (1996) with TSS levels that might be expected from the stream crossing replacement projects covered by this Opinion. However, based on our knowledge of instream construction activities in Maine of a similar nature to the projects discussed here, we would not expect construction-related TSS levels to reach those described by Newcombe and Jensen (1996). Most of these projects are located in sections of streams with coarser substrates (boulder, cobble, gravel, sand) where the opportunity for sediment to be mobilized and carried downstream by construction activities will be minimal. The sediment and erosion control measures that will be employed for each project, including construction in the dry, should keep sediment effects on Atlantic salmon to a minimal level on a temporary basis. Based on observations by Maine Department of Transportation (MEDOT) staff at similar culvert replacement projects throughout the GOM DPS, suspended sediment plumes do not extend more than 30.48 m (100 feet) downstream of the work site. Considering the expected small volume of suspended sediment likely to be introduced into the affected streams, any discharge is likely to dissipate quickly and return to background levels.

The effects of sediment on Atlantic salmon and their habitat will be most pronounced during cofferdam installation and removal, backfilling of road surfaces, and particularly when the diverted stream flow is returned through the dewatered work site. Suspended sediment pulses

are likely to last from a few minutes to several hours. Because of the minor amount of construction-related sediment expected to reach these streams and because of the relatively small number of salmon expected to be in the action areas, turbidity-related effects are expected to be minor and short-term. USFWS expects any exposed fish to volitionally seek adjacent, less turbid habitats, thus avoiding direct sediment exposure. Once suspended sediment levels return to background levels, Atlantic salmon displaced from the action area would be expected to return and normal behaviors would resume (*e.g.*, foraging, defending territory). Such effects would not be expected to injure or kill salmon. These conclusions, however, are contingent on careful implementation of all conservation measures by NRCS, including that almost all instream work is conducted in isolation from stream flows.

Effects from Hazardous Materials Associated with Construction

The NRCS requires a number of conservation measures related to hazardous materials that will minimize the potential for effects to Atlantic salmon from construction activities in or near streams, as outlined above in Section **1.2 General Prescriptions**. Use of vehicles and other construction equipment could result in spills of hazardous materials, such as diesel fuel, oil, and lubricants, which could threaten streams and aquatic organisms. Petroleum-based materials, such as diesel fuel and oil, contain polycyclic aromatic hydrocarbons (PAHs). PAHs can be acutely toxic to salmonids and other aquatic organisms at high exposure levels or can cause sublethal effects at lower exposures (Albers 2003). NRCS requires that refueling and equipment maintenance, as well as storage, occur at least 47.5 m (150 ft) away from a stream. Furthermore, a hazardous material spill kit will be kept at the project site at all times. Careful adherence to NRCS's various requirements related to hazardous materials associated with construction activities should make it highly unlikely that Atlantic salmon would be exposed to harmful chemicals from a spill or accident.

Effects on the Riparian Zone

It is likely that at most project locations some vegetation, including trees, shrubs, or the herbaceous layer, will be removed from the stream banks to allow for construction access, placement of larger crossing structures, or other construction-related activities. Removal of riparian vegetation will be kept to the minimum necessary to access the site and complete construction. After construction, disturbed riparian areas will be re-planted with native shrubs and trees.

Rip-rap may be used to stabilize culvert inlets and outlets and to protect culvert footings from scour. Although rip-rap along stream banks can increase stream water temperatures due to solar radiation, the generally small amounts of rip-rap proposed should not have a measurable effect on water temperature. Furthermore, minor vegetation removal should not result in any input of sediment into the streams, as long as appropriate erosion control BMPs, such as silt fence, are employed before any vegetation is removed. All disturbed areas not covered by rip-rap will be mulched and stabilized following construction.

Effects on Stream Connectivity and Aquatic Organism Passage

Road crossing structures, particularly culverts, can have adverse effects on the passage of aquatic organisms, including Atlantic salmon. Most, if not all, of the stream crossing replacement projects carried out by NRCS will address existing fish passage problems presented by undersized or poorly-placed crossings. NRCS intends that all replacement structures will not restrict aquatic organism passage. Reduced habitat connectivity was identified as a stressor to the GOM DPS when it was listed as endangered, because it prevents salmon from fully using substantial amounts of freshwater habitat and changes fish community structure by preventing access for other native fish (74 FR 29367; June 19, 2009). The new recovery plan for the GOM DPS will provide updated information regarding habitat connectivity, primarily road-stream crossings, which will elevate the significance of this threat to Atlantic salmon. As such, we expect that future recovery efforts for Atlantic salmon will emphasize the replacement or removal of poorly designed road-stream crossing structures to improve freshwater habitat connectivity and quality. Such efforts are likely to be crucial to the future recovery of Atlantic salmon.

During construction, the use of cofferdams will temporarily restrict movements of Atlantic salmon and other aquatic organisms. Cofferdams, however, are a standard conservation measure used for instream construction projects to minimize the overall effects on aquatic life and habitat. The overall benefits of using cofferdams, by minimizing the effects of sedimentation and protecting aquatic life from damage by construction equipment, outweigh the temporary blockage of movements by fish and other organisms. Once cofferdams are removed and normal stream flows are restored to the construction site, aquatic organisms will be able to re-occupy and move through the project site.

All stream crossing replacement projects will be designed using stream simulation techniques (USDA-FS 2008; Bates et al. 2003) that promote natural stream processes, including aquatic organism passage. Stream simulation design seeks to match natural stream width, slope, and substrate within the stream crossing structure. The stream simulation concept is based on the simple premise that fish and other aquatic organisms have evolved to meet the passage challenges of natural stream channels; therefore, when those same characteristics of a structurally diverse and hydraulically rough stream are reproduced within a crossing structure, aquatic organism passage is implied, if not assured (USDA-FS 2008; Barnard 2003). Replacement structures funded by NRCS will either be bottomless (open arch culverts, 3-sided box culverts, and bridges) or will be designed to allow a relatively natural stream bottom inside the structure (4-sided box culverts only). Fish passage, sediment transport, and flood and debris conveyance through the stream crossing structures are intended to mimic natural conditions as much as possible.

Long-term we expect all stream crossing replacement projects to result in improvements in stream habitat connectivity, aquatic organism passage, and maintenance of natural stream processes. This conclusion, however, assumes that projects are carefully planned, designed, and constructed to adhere to stream simulation techniques and project-specific plans. Price et al. (2010) found that of 31 "no-slope" culvert projects constructed in the Puget Sound region of Washington, 84% failed to meet design criteria and 45% presented a fish passage barrier, highlighting the importance of careful project design and implementation. Since 2006, NRCS has contracted 47 projects with the purpose of providing fish passage at existing road-stream

crossings. Many of these projects have been in collaboration with Project SHARE and USFWS (Maine Fisheries Resources Office), focusing on improving aquatic habitat conditions and ecological connectivity in streams used by brook trout and Atlantic salmon. Preliminary monitoring results at these projects are showing improvements in aquatic organism passage and enhancement of stream habitat (Scott Craig, USFWS; pers. comm.).

Restoration of stream connectivity by replacing existing stream crossings that pose a fish passage barrier will aid in the survival and recovery of the GOM DPS of Atlantic salmon. Improving stream access will allow salmon to utilize a wider range of habitats to fulfill their life history requirements for foraging, spawning, and juvenile rearing. The replacement stream crossings are expected to promote the natural resiliency of streams, by allowing for nearly normal sediment and bedload movement and debris conveyance. The performance of these crossings during high precipitation events should be improved (i.e., their capacity to pass flood flows) and consequently result in a substantial reduction in the erosion of road-fill materials and subsequent deposition into streams.

4.1.2 Effects to Atlantic Salmon Critical Habitat

This critical habitat analysis determines whether the proposed action will destroy or adversely modify designated critical habitat for listed species by examining any change in the conservation value of the essential features of that critical habitat. This analysis relies on statutory provisions of the ESA, including those in 1) section 3, which defines "critical habitat" and "conservation"; 2) section 4, which describes the designation process; and 3) section 7, which sets forth the substantive protections and procedural aspects of consultation.

Because location and site-specific information is not available for each project at this time, it is impossible to determine specifics about the occurrence of critical habitat at each stream crossing replacement project. It is assumed, however, that most projects covered by this Opinion will occur within HUC-10 watersheds that are designated as critical habitat. Projects could also occur, however, within HUC-10 watersheds that are excluded from critical habitat, particularly because they are tribal lands, pursuant to Secretarial Order 3206. NRCS does fund projects on tribal lands of the Penobscot Indian Nation and the Passamaquoddy Tribe that are within the geographic range of the GOM DPS but not within designated critical habitat.

Designated critical habitat for Atlantic salmon within the GOM DPS consists of two PCEs as follows: 1) spawning and rearing habitat and 2) migration habitat. Within the GOM DPS, 45 specific areas, or HUC-10 watersheds, are designated as critical habitat. These 45 specific areas were all considered occupied by Atlantic salmon at the time the GOM DPS was listed, although not all water bodies within a given HUC-10 watershed were necessarily occupied by salmon at that time nor are they currently. Critical habitat includes perennial rivers and streams, estuaries, and lakes. The discussion that follows lists the two PCEs for salmon critical habitat and then discusses how stream crossing replacement projects may affect the PCEs and their associated biological and physical features.

Effects to the Spawning and Rearing Primary Constituent Element

Because Atlantic salmon parr use a wide variety of habitat types and can travel considerable distances while making use of these habitats, it is assumed that many NRCS projects that occur in a critical habitat watershed will have some juvenile rearing habitat (spawning and rearing PCE) within the action area. For all stream crossing replacement projects, a section of stream will be completely dewatered (*i.e.*, the entire channel from one bank to the opposite bank), albeit temporarily, within cofferdams to allow construction work to occur in the dry. NRCS estimates that the average dewatered area is about 92.9 m^2 for each stream crossing replacement project. This section of stream would typically be de-watered for about 2 days, during which time all spawning and rearing habitat inside the cofferdam would be unavailable and unsuitable for salmon. Given the July 15 to September 30 instream work window, there will be no effects to habitat during the time that salmon are spawning or when eggs and sac-fry are present in the redd. Once the project is completed, the cofferdams removed, and normal stream flows are restored, the temporarily impacted juvenile rearing habitat should return to its prior condition. Over the course of five years, these projects (estimated at 50 sites for both stream crossing replacements and removals) would result in the temporary loss (about 2 days) of 4645.2 m^2 of stream habitat or about 46.5 units of juvenile habitat.

De-watered parr habitat at the project sites would experience a loss of aquatic invertebrates, which provide food for Atlantic salmon juveniles. This loss of food resources would be temporary; however, as aquatic invertebrates should recolonize the stream once flows are re-established. Since the stream habitat would not be permanently altered in any way, its ability to support aquatic invertebrates after construction activities are completed should not change. In fact, the habitat inside the new crossing structure, which is designed using stream simulation techniques, will likely represent an improvement over existing conditions and provide better aquatic invertebrate habitat. This would be particularly true in situations where the existing crossing structure, such as a corrugated metal pipe that is set to high compared to the natural stream profile, has no natural streambed material inside and therefore provides little, if any, habitat for aquatic organisms. There will likely be a period of time following restoration of stream flows where the parr habitat will immediately regain the habitat elements of space and cool, oxygenated water but will still lack in food resources until aquatic invertebrates are able to recolonize the stream substrate.

All stream crossing replacement projects will be designed using stream simulation techniques that strive to mimic natural stream conditions including hydrology, sediment transport, debris transport, and substrate materials. By aiming to maintain natural channel slope, width, depth, and alignment through a stream crossing, NRCS projects should generally result in an improvement in the condition of the spawning and rearing PCE in the action area (if present) compared to the baseline condition and should improve or fully restore access to upstream salmon habitat as well.

Preliminary monitoring results of stream habitat within bottomless arch culverts in the Machias River watershed installed by Project SHARE indicate stream habitats comparable to that found upstream and downstream of the crossings; a diverse community of aquatic insects; and use by juvenile Atlantic salmon, including upstream movements. Non-spawning tributaries represent an important part of the habitat complex for juvenile Atlantic salmon. Sites occurring furthest upstream, with small cumulative drainage areas, have high survival of fry and age 1+ parr

(juveniles after their first year of life in freshwater) compared to sites lower in a watershed. A likely mechanism for higher survival in stream reaches of small drainage area is that these areas provide more favorable temperatures (Sweka *et al.* 2007). NRCS stream crossing replacement projects are likely to improve access to small, upstream tributaries that offer important habitat for juvenile salmon.

Stream simulation designed road crossings in Maine have also responded favorably to local hydrology. During a December 14, 2010, major flood in Downeast Maine, all of the 100+ culvert replacements completed by Project SHARE (several with technical assistance provided by NRCS) experienced no failures or damage, avoiding downstream damage to streams from road erosion and sedimentation and maintaining good passage conditions for aquatic organisms including Atlantic salmon. During that same flood, at least 20 traditional road-stream crossings (typically under-sized round culverts) failed in the Union, Machias, East Machias, and Dennys river watersheds (Scott Craig, USFWS; pers. comm.).

It is unknown if any of the NRCS project sites will provide habitat for adult salmon, either summer holding habitat or spawning habitat. However, given the generally degraded conditions associated with most existing stream crossing sites, adult habitat is not expected within the stream area that would be temporarily affected by instream construction (e.g., dewatering inside cofferdams). Deep pools with cover and appropriately sized stream substrates for spawning are typically not found associated with poorly designed stream crossings and, therefore, are not expected to be temporarily affected during construction activities. New stream crossings designed with stream simulation techniques should result in local stream habitat improvements that could benefit adult salmon through the natural movement and sorting of sediments and woody debris. Replacement stream crossings are expected to generally improve access of adult salmon to upstream spawning habitat, if present in the subject stream.

Effects to the Migration Primary Constituent Element

Because specific project locations are not known at this time, it is difficult to determine whether or not a particular stream crossing replacement project site will provide migration habitat for Atlantic salmon. It is assumed, however, that most NRCS project sites that occur in a HUC-10 watershed designated as critical habitat will provide the migration PCE for salmon. Any project site that contains the spawning and rearing PCE will also contain the migration PCE, as adult salmon must have access to and from spawning habitat and smolts must have migration access from juvenile rearing habitat downstream to the ocean. Project sites relatively low in a watershed may only offer the migration PCE.

All stream crossing replacement projects will necessitate a temporary blockage of both upstream and downstream fish movements through the work site while cofferdams (which span from one stream bank to the other) are in place. This temporary blockage would occur between July 15 and September 30 and would typically last about two days. Since the summer instream work window occurs after the downstream migration of Atlantic salmon smolts, which is generally during the period from mid-April through mid-June (Baum 1997), these stream blockages will not affect smolt migration. Adult migration, however, could be temporarily affected by instream construction work. This disruption, however, would not prohibit access to spawning habitat

during the spawning season but could temporarily delay access to summer holding areas for adult salmon. Once the cofferdams are removed and normal stream flows returned through the work site, the migration function of the critical habitat would be completely restored for both adults and out-migrating smolts.

As discussed above (pages 60-61) for the spawning and rearing PCE, NRCS stream crossing replacement projects, when designed and installed using stream simulation techniques, are expected to have a long-term positive effect on salmon migration. Adult access to summer holding areas and spawning habitat could be improved, depending on the particular locations of NRCS projects.

4.2 Stream Crossing Culvert Removals with Optional Abutments for Temporary Bridge

Given the nature of this activity and the various requirements of stream crossing removal projects under this programmatic Opinion (e.g., design using stream simulation techniques), these projects should generally result in long-term benefits for Atlantic salmon and critical habitat compared to the existing baseline condition. NRCS often removes stream crossings that are undersized or otherwise poorly designed and don't function well for the landowner (e.g., are damaged or fail during heavy precipitation events). These structures generally impair upstream fish passage, contribute to elevated sediment levels, and result in poorly functioning watershed processes (e.g., sediment transport and bed load movement) both upstream and downstream of the site. Removal of existing stream crossings and restoration of the stream channel to a natural condition will result in better fish passage, decreased sediment inputs, and improved hydrologic processes. Installation of bridge abutments to allow for the use of temporary bridges (e.g., to allow timber harvesting) will occur outside of the stream channel and should not impair the restoration of a natural stream at the site of the former road-stream crossing.

During construction, however, stream crossing removals are likely to have short-term adverse effects to Atlantic salmon or critical habitat due to sedimentation, riparian vegetation removal, stream de-watering, and disturbing or handling fish during instream work activities. NRCS will use various conservation measures to minimize these construction-related adverse effects.

4.2.1. Effects to Atlantic Salmon

During construction activities, stream crossing removal projects will result in short-term adverse effects to Atlantic salmon. Because of the similar nature of stream crossing replacement and stream crossing removal projects, these effects are expected to be the same as those already discussed above in *Section 4.1.1* on pages 50-60. This section of the Opinion is incorporated here by reference. Some removal projects will include the installation of bridge abutments to accommodate the use of temporary bridge at some time in the future. The abutments are typically made with concrete blocks and will always be installed outside the stream channel and bank using appropriate erosion and sediment control devices to ensure sediment does not enter the stream, avoiding effects to salmon.

Effects to Atlantic salmon from construction activities associated with stream crossing removal projects were discussed above in *Section 4.1.1*, together with the effects associated with stream crossing replacement projects. For the 50 anticipated projects (both replacements and removals), the anticipated capture or displacement of juvenile Atlantic salmon associated with worksite isolation activities is a total of 253 salmon. Of these salmon, we estimate that no more than four (4) juvenile salmon will be killed during electrofishing activities. The other salmon will be captured or otherwise temporarily relocated outside of the isolated instream work area. In addition, a small but unknown number of juvenile Atlantic salmon are expected to be stranded in the stream substrate inside of each dewatered cofferdam area at the 50 project sites, resulting in mortality of all stranded salmon within 46.5 units of de-watered juvenile rearing habitat. Although we cannot quantify this number of fish, this lethal mortality would be in addition to the four juvenile salmon anticipated to be killed during electrofishing but still within the total anticipated capture or displacement of 253 juvenile salmon. As discussed above on pages 55-56, no injury or mortality of adult Atlantic salmon is expected associated with stream crossing replacement or removal projects.

The long-term effects of stream crossing removal projects on stream connectivity and aquatic organism passage are expected to be even greater than those of stream crossing replacements. The confining effects of the crossing structure itself will be removed; and the stream should be able to fully interact with the adjacent floodplain and naturally respond to high stream flows, including un-restricted movement of large woody debris.

4.2.2 Effects to Atlantic Salmon Critical Habitat

During construction activities, stream crossing removal projects will result in short-term adverse effects to Atlantic salmon critical habitat. Because of the similar nature of stream crossing replacement and stream crossing removal projects, these effects are expected to be the same as those already discussed above in *Section 4.1.2* on pages 60-63. This section of the Opinion is incorporated here by reference. The long-term effects of stream crossing removal projects on Atlantic salmon critical habitat are expected to be even greater than those of stream crossing replacements since a natural stream channel will be restored using stream simulation principles and there will be no channel-confining effects from the stream crossing structure. Improvements in spawning, rearing, and migration habitats could all be achieved, depending on the specific project location, and increase the functional suitability of critical habitat to support Atlantic salmon. The surface height of optional abutments for a temporary bridge will be designed, at a minimum, to pass a 25-year flow event when a temporary bridge is in place, which should allow relatively natural stream processes to occur and have little, if any, effect on critical habitat. For those stream crossing removal projects where use of the road is permanently discontinued (i.e., no provision for use of a temporary bridge), re-growth of native riparian vegetation along the streambank will benefit salmon critical habitat by offering shade, organic matter inputs, and a future source of large woody debris. Erosion associated with the road and subsequent sedimentation in the stream will be reduced over time as the road footprint near the stream becomes vegetated, which should benefit salmon critical habitat by eliminating a source of finer sediments.

4.3 Streambank and Shoreline Stabilization

In some riparian areas anthropogenic activities have led to degraded streambanks and accelerated erosion. Loss of riparian vegetation and increased input and accumulation of fine sediments in streams can negatively affect Atlantic salmon and their habitat. NRCS proposes to stabilize eroding stream banks and other shorelines using streambank soil bioengineering methods as specified above in *Section 1.1.3*. These bioengineering methods are intended to accelerate the stabilization and re-vegetation of eroding banks without interfering with the natural channel-forming processes of streams and rivers. To avoid the deleterious effects of hard-armored bank stabilization (such as rock rip-rap) on natural stream processes, these techniques are not allowed under this programmatic Opinion.

During construction, bank stabilization projects will have short-term effects to salmon and their habitat related to work on the stream bank or shoreline and, in some limited cases, work in the stream channel along the toe of the slope. Some bank stabilization projects can be completed with only hand tools and hand labor, while others will require the use of heavy construction equipment like excavators.

4.3.1. Effects to Atlantic Salmon

Many of the proposed stabilization techniques can be accomplished using only hand labor and hand tools. Some projects, however, will require the use of heavy construction equipment operating either from the top of the bank in most situations or rarely in the stream. Construction equipment will generally be used to re-shape the bank, excavate the bank to install rootwad revetments, or excavate trenches necessary to install other stabilization measures. Shaping the bank or excavating at the toe of the bank will produce sediment that is likely to be mobilized in the stream for some short period of time and affect salmon present in the project area. Limiting construction to low stream flows during the summer, however, will minimize the effects of sedimentation because much of this work will be accomplished outside of the stream flow and, therefore, the opportunity for sediment to move downstream will be minimized. Atlantic salmon, however, could be temporarily displaced from the general work area and any downstream areas that experience elevated sediment levels during excavation activities. The required instream work window of July 15 to September 30 will avoid all effects to salmon spawning activity or the time period when eggs and fry are present in the stream substrate from late fall through late spring.

If construction equipment needs to enter the stream channel, salmon in the area would be at risk of injury or mortality. However, applicable conservation measures limit operation of equipment in the stream to instances where no other option is available and also require efforts to temporarily displace fish from the work area before equipment enters the water. The risk to salmon from exposure to hazardous materials, like fuel and lubricants, is minimized by 1) cleaning equipment before use, 2) having a hazardous material spill kit on site, and 3) performing all equipment refueling and maintenance at least 47.5 m (150 ft) from a water body.

Much of the discussion related to the effects of sedimentation, hazardous materials, and other construction activities on Atlantic salmon in *Section 4.1.1* above (stream crossing replacements) is also applicable to bank stabilization activities and is incorporated here by reference. NRCS

does not propose the use of cofferdams for bank stabilization projects, so there is no need for fish evacuation activities, other than attempts to disturb fish out of the work area by wading through the stream before construction equipment enters the stream.

NRCS has not provided specific information on the construction-related effects of the proposed bioengineering bank stabilization projects to inform our analysis of whether or not effects to Atlantic salmon are likely to result in death or injury of individual fish. Furthermore, USFWS does not have experience with construction of these specific types of projects in Maine and their likely effects on Atlantic salmon. Because many of the techniques will involve only work on the stream bank (above the active stream channel) and the use of only hand labor and hand tools, these projects are not likely to have effects that injure or kill salmon.

Those projects that involve construction equipment either working in the stream channel or excavating in the water (i.e., at the toe of the bank slope) could adversely affect Atlantic salmon either by causing injury or death of individual fish. We would expect such adverse effects to only occur to juveniles whose territory is in the immediate work area; adult salmon would be expected to move away from the active work area and avoid injury or death. Although sedimentation from excavation activities may cause salmon to temporarily move away from the work area and some area downstream, we do not have specific information or experience related to bank stabilization projects to determine whether this sedimentation will actually cause injury or death of Atlantic salmon.

During the subsequent review of each individual bank stabilization project, we will assess the likelihood of adverse effects in light of the specific project details and the likely occurrence of Atlantic salmon in the project area. At that time, we will determine if Atlantic salmon are likely to be injured or killed during construction activities. Given that NRCS only anticipates constructing five (5) bank stabilization projects under the five-year term of this Opinion, we expect that a relatively small number of juvenile Atlantic salmon would be adversely affected by construction activities that result in injury or death.

4.3.2 Effects to Atlantic Salmon Critical Habitat

By using only bioengineering methods to stabilize stream banks, these projects are not expected to restrict channel migration or the ability of the stream to otherwise form and maintain aquatic habitat. If heavy construction equipment is needed or the stream bank needs to be re-shaped, some riparian vegetation may need to be removed during construction. All disturbed areas will be re-vegetated. Furthermore, all projects are intended to promote the natural re-vegetation of shorelines, particularly with woody species, which will enhance salmon critical habitat in the long-term by providing shade and a source of woody debris for the stream.

Those projects that involve bank re-shaping or excavation with construction equipment will result in some fine sediments being mobilized into the stream during construction (a few hours to a few days). Limiting work below the OHWM to summer low flow periods will minimize the opportunity for construction-related sediments to effect salmon critical habitat. These bank stabilization projects, by addressing on-going erosion, should result in a long-term reduction of finer sediments reaching the water body and adversely affecting salmon habitat by embedding coarser substrates and degrading water quality. Certain techniques, such as rootwad or brush and tree revetments, may also add complexity to stream habitat and improve conditions for Atlantic

salmon by providing overhead cover or promoting the development of pools. Overall, construction-related effects to critical habitat should be relatively minor in duration and spatial scale if all appropriate conservation measures outlined in *Section 1.2* are fully implemented.

4.4 Low-Water Crossings

NRCS proposes to install low-water crossings in streams only in situations where an existing crossing (with or without a structure) is causing problems, such as chronic degradation of water quality from erosion and sedimentation, damage to stream banks, or damage to riparian vegetation. These problems can be caused both by livestock, particularly when they have unconfined access to a stream, and by motorized vehicles. Hardened low-water crossings will be designed to conform to the natural shape and slope of the stream channel and to allow for fish passage through the crossing. All crossings associated with livestock will include fencing to limit animal access through the riparian and stream habitats.

4.4.1. Effects to Atlantic Salmon

During construction activities, low-water crossing projects will result in short-term adverse effects to Atlantic salmon from construction activities on the stream bank and directly in the stream channel. These effects will be very similar in nature and spatial scope to those associated with stream crossing replacement projects, as discussed above in *Section 4.1.1* on pages 50-60. This section of the Opinion is incorporated here by reference.

Capture and relocation of Atlantic salmon associated with the installation of low-water crossings will occur during worksite isolation and de-watering within cofferdams, as discussed previously on pages 50-56. NRCS estimates that 50 low-water crossings will be installed over the five-year period of this programmatic Opinion. For the purposes of analyzing effects associated with worksite isolation and fish evacuation activities, we assume that the average stream width will be 4.57 m (15 ft) and the average stream length isolated within cofferdams will be 15.24 m (50 ft). Therefore, the average stream area de-watered inside a cofferdam will be 69.6 m^2 (750 ft^2). For the total of 50 low-water crossing projects, this will represent 3,480 m^2 or 34.8 units of salmon habitat.

Using the same reasoning as discussed on pages 52-53 for stream crossing replacement projects, we expect that as many as 190 juvenile Atlantic salmon (10.88 parr/100 m^2 x 34.8 habitat units x 0.5 = 189.3; rounded up to 190 fish) could be displaced or captured inside cofferdams and subsequently relocated upstream or downstream of the isolated work areas for the 50 low-water crossing projects. Of these salmon, we estimate that no more than three (3) juvenile salmon will be killed during electrofishing activities. The other salmon will be captured or otherwise temporarily relocated outside of the isolated instream work area. In addition, a small but unknown number of juvenile Atlantic salmon are expected to be stranded in the stream substrate inside of each dewatered cofferdam area at the 50 project sites, resulting in the death of all stranded salmon within 34.8 units of de-watered juvenile rearing habitat. Although we cannot quantify this number of fish, this lethal mortality would be in addition to the three juvenile salmon anticipated to be killed during electrofishing but still within the total anticipated capture

or relocation of 190 juvenile salmon. As discussed above on pages 55-56, no injury or death of adult Atlantic salmon is expected associated with low-water crossing projects.

Although the installation of low-water crossings and associated riparian fencing for livestock are expected to result in overall net benefits to Atlantic salmon, some minor adverse effects can still occur at the crossing site as it continues to be used by animals and vehicles. The riparian zone at the immediate crossing location will remain unvegetated, some fine sediment will still be introduced to the stream, and vehicles may leak hazardous materials into the water. While crossing the stream, livestock and vehicles can startle rearing juvenile salmon and cause them to leave the area; unless use of the crossing is frequent, this effect would be temporary and juveniles could return to the area. Because livestock will be confined by fencing to a single stream crossing location, their opportunity to startle salmon away from an area will be minimized compared to situations where animals have free access to a stream. Because low-water crossings will not be installed in areas known or suspected to be used by spawning salmon, eggs or fry will not be at risk.

NRCS intends to design all low-water crossings to allow for fish passage whenever passage is possible in the adjacent, un-disturbed stream channel. Given NRCS's design criteria and our very limited experience with existing low-water crossings in Maine, we expect these projects will not impede fish passage for any life stages of Atlantic salmon. However, given our collective lack of experience with these specific design criteria for low-water crossings and their long-term effects on fish passage, if any, this issue may warrant further attention over the term of this programmatic Opinion and any subsequent renewals.

4.4.2 Effects to Atlantic Salmon Critical Habitat

Overall, the installation of low-water crossings should result in a considerable reduction in adverse effects to salmon habitat compared to the existing, problematic crossings. Confining the crossing location and installing riparian fencing should allow restoration of riparian vegetation. Conservation measures associated with the crossing approaches will minimize the amount of sediment reaching the stream. The footprint of the crossing, which will consist of gravel, rock, concrete slab, or aggregate placed in geocells or geowebs, may be less suitable or unsuitable as juvenile rearing habitat compared to the natural stream substrate in the general project area. However, the existing crossing site is likely already degraded; so installation of the crossing may have little, if any, additional negative effect on the habitat. The extent of stream degradation will be minimized spatially with the new crossings and less sediment will be discharged downstream into critical habitat.

4.5 Large Woody Debris and Boulder Supplementation

To assist in addressing the lack of habitat complexity in many Maine streams, NRCS proposes to add LWD or boulders in appropriate locations. The lack of LWD and boulders in Maine streams is often associated with the historic effects of log drives and timber harvesting. Many streams within the range of the GOM DPS have been identified by biologists as lacking habitat complexity due to the absence of LWD and boulders, and there are on-going efforts to address this issue by fisheries agencies and conservation organizations.

NRCS intends to either dislodge or fell large trees, sometimes with their associated root wads, into or across streams or streambanks. Anchoring will **not** be used to secure LWD to the stream bank or bed. High stream flows will be allowed to naturally arrange the large wood and freely distribute it downstream. NRCS also proposes to add individual large boulders or boulder clusters to streams, without anchoring or streambed excavation. During installation of LWD and boulders, there will be some minor, short-term effects to Atlantic salmon and their habitat from work in the riparian zone and in the stream.

4.5.1. Effects to Atlantic Salmon

The installation of LWD and boulders will create temporary disturbances in the riparian zone and the stream channel which could affect Atlantic salmon present in the project area. Work on the stream bank and in the stream to place large wood and boulders can result in small amounts of fine sediments being mobilized in the stream, which in turn could cause salmon to temporarily leave the area. Activity in the stream, either hand labor or construction equipment, could temporarily startle salmon out of the immediate work zone. Use of erosion control BMPs should minimize the amount of sediment reaching the stream; and given the nature of this work, sediment events should be very short in duration (minutes). NMFS (2009c) notes that the increase in suspended solids in streams from the placement of LWD and boulders for stream restoration abates almost immediately. The potential effects to salmon from hazardous material spills related to the use of construction equipment near a stream is similar to that already discussed on page 58. Overall, the placement of LWD and boulders in streams where these materials were historically removed should result in long-term positive effects to adult and juvenile Atlantic salmon due to improvements in their habitat, as discussed further below.

The placement of LWD and boulders is likely to have some short-term effects to Atlantic salmon, particularly in-water disturbance that could cause salmon to temporarily move away from the immediate work area. We do not have information to indicate if such effects would result in harming Atlantic salmon by injuring or killing individuals. In general, we do not believe that placement of LWD and boulders using hand labor and hand tools (e.g., chain saws, Griphoist®, etc.) or construction equipment operating from the top of the stream bank (e.g., an excavator reaching out to place a boulder on the streambed) would result in effects to salmon that would cause injury or death. If construction equipment needed to enter the stream channel and juvenile salmon were resident in the immediate work area, injury or death of salmon could result.

While NRCS has estimated that they will implement ten (10) LWD or boulder supplementation projects over the five-year term of this programmatic Opinion, they did not clearly indicate the likelihood of using construction equipment in the stream channel for each project. As such, we assume at this time that some projects will involve construction equipment working in the stream channel, which could result in injury or death of Atlantic salmon. As each individual project is submitted to USFWS for review with details on project location, local occurrence of Atlantic salmon, and proposed construction details (particularly whether construction equipment will need to enter the stream channel), we will make a project-specific determination of whether or not Atlantic salmon are likely to be injured or killed during construction activities. Based on the best available scientific information, however, we believe that the number of juvenile salmon likely to be injured or killed in association with placement of LWD and boulders is very small.

This conclusion is based on the assumption that relatively small numbers of salmon would be present in a given work area and that the spatial extent of stream exposure to construction equipment working in the channel will be relatively small. Because juvenile salmon tend to be highly territorial, however, they might be injured or killed by construction equipment operating on the stream bed within occupied territories.

4.5.2 Effects to Atlantic Salmon Critical Habitat

During the installation of large wood and boulders, Atlantic salmon habitat could be disturbed by removal of vegetation in the riparian zone for construction access and temporary mobilization of small amounts of sediment in the stream while materials are placed in the water. Construction BMPs, such as working during summer low flows, using erosion control devices, and re-vegetating temporary access paths with native shrubs and trees, will keep negative effects to salmon habitat short-term and limited in spatial scope.

Forested alluvial streams, which are common in Maine, are usually heavily dependent on physical interactions with large wood for channel development and stability and the many habitat features used by various aquatic organisms (Saldi-Caromile et al. 2004). Removal of large wood from a stream can negatively affect the ability of the stream to capture and hold sediment, resulting in erosion of the stream bed to bedrock and substantial changes in the character of the habitat for fish, invertebrates, and many other organisms. Purposely placing LWD back into streams should be viewed as a short-term habitat enhancement effort while long-term efforts are pursued to restore natural recruitment of large wood through riparian forest regeneration and management (Saldi-Caromile et al. 2004). Replenishing large wood to a stream may have either immediate or long-term results in terms of creating aquatic habitat complexity and is best viewed as part of a long-term strategy for river restoration at the system level (Saldi-Caromile et al. 2004).

Restoring LWD to Atlantic salmon streams will most noticeably affect spawning and rearing critical habitat by positively contributing to habitat complexity. Scour associated with LWD can create pools that offer depth as cover for both adult and juvenile salmon. The LWD itself can provide hiding cover from predators for salmon and a refuge from high flow velocities, allowing salmon to expend less energy. LWD traps smaller vegetation debris (twigs and leaves), which decay rapidly and then contribute nutrients to support the aquatic invertebrate food web. Salmon parr rely heavily on aquatic invertebrates for food. Large wood helps to maintain salmon spawning habitat by dissipating the energy of peak stream flows and minimizing the mobilization of streambed sediments that provide spawning habitat. Adding LWD with intact branches and root wads will likely provide the greatest benefit to salmon habitat because such pieces will have more stability in the stream and provide more complex living space and refuge habitat for salmon.

As with additions of LWD, adding boulders and boulder clusters provides another element of stream habitat complexity. Boulders can provide cover and velocity refuges for juvenile salmon. Boulders add hydraulic complexity to stream flow, which in turn creates habitat complexity such as the scouring of pools. Boulder additions may provide additional stream substrate chambers that are used by juvenile salmon as over-wintering habitat (Rimmer et al. 1983). In the long-

term, addition of LWD and boulders will benefit Atlantic salmon critical habitat by restoring stream habitat complexity.

4.6 Side Channel or Off-channel Reconnection

NRCS proposes to reconnect existing natural stream side channels that have been artificially blocked with boulders, wood, gravel, and soil. In Maine, side channels were often historically blocked to facilitate log drives by confining stream flows to the main river channel. There is limited published scientific literature on the importance of side channel habitats to salmonids in the Northeastern United States. Side channels are frequently cited as an important component of west coast salmonid habitat, particularly as refuge habitat for juveniles during high stream flows (Saldi-Caromile et al. 2004). Project SHARE and the USFWS have identified blocked side channels within the GOM DPS that are believed would provide valuable juvenile rearing habitat for Atlantic salmon and brook trout if re-connected to the main stream channel. A small number of restoration projects have been initiated or are planned, and on-going monitoring should help identify benefits for Atlantic salmon (Project SHARE 2010).

This activity only involves removal of artificial blockages and does not allow grading or other work in the side channel. Excavated materials that were likely removed from the main stream channel (e.g., boulders) can be placed back in the stream to provide habitat complexity; other materials (e.g., soil) will be removed off-site away from the stream channel and its floodplain. Excavation may be accomplished with hand labor and hand tools or with heavy construction equipment like excavators.

4.6.1. Effects to Atlantic Salmon

During excavation of the side channel blockage, there is likely to be a short-term increase in suspended sediment both at the project site and downstream. Restricting work to the summer work window, however, will minimize the amount of excavation in the water because stream flows are typically lower and therefore reduce this temporary increase in sedimentation. This short-term increase in turbidity could cause salmon to temporarily move away from the work site. If construction equipment has to access the stream channel to permit removal of the side channel blockage, there could be effects to Atlantic salmon from physical injury or death or from hazardous materials spilled into the stream, as discussed previously.

NRCS and USFWS do not have specific experience with implementation of side channel and off-channel reconnection projects in Maine. As such, we do not have specific information to inform our analysis of the likely effects to salmon, including the likelihood of injury or death from instream construction work. For those projects that would be constructed with hand labor and hand tools or with construction equipment operating from the top of the stream bank, we do not believe that salmon are likely to be injured or killed. If construction equipment needed to enter the stream channel and juvenile salmon were resident in the immediate work area, injury or death of salmon could result.

While NRCS has estimated that they will implement five (5) side channel or off-channel reconnection projects over the five-year term of this programmatic Opinion, they did not clearly

indicate the likelihood of using construction equipment in the stream channel for each project. As such, we assume at this time that some projects could involve construction equipment working in the stream channel, which could result in the injury or death of Atlantic salmon. As each individual project is submitted to USFWS for review with details on project location, local occurrence of Atlantic salmon, and proposed construction details (particularly whether construction equipment will need to enter the stream channel), we will make a project-specific determination of whether or not Atlantic salmon are likely to be injured or killed during construction activities. Based on the best available scientific information, however, we believe that the number of juvenile salmon likely to be injured or killed is very small. Because juvenile salmon tend to be highly territorial, however, they might be injured or killed by construction equipment operating on the stream bed within occupied territories.

4.6.2 Effects to Atlantic Salmon Critical Habitat

Although removal of side channel blockages will have some short-term effects on Atlantic salmon critical habitat (e.g., temporary increase in suspended sediment), these projects are expected to have a long-term benefit by restoring access to spawning and rearing critical habitat. These side channels are thought to be particularly valuable as rearing habitat for juvenile Atlantic salmon, and restoring natural hydrology and fish access to this habitat will increase the amount of available spawning and rearing critical habitat. Side channels may provide refuge habitat for juveniles during high stream flows in the main river channel (NMFS 2008b). Restoring water to these side channels (at least at certain flows) should improve aquatic habitat diversity in a given reach of river and provide more options for salmon, particularly juveniles.

Achieving adequate construction access to the project site may require the removal of some riparian vegetation. Conservation measures, however, require NRCS to minimize the removal of vegetation for access and to revegetate all disturbed areas following construction. Loss of riparian vegetation associated with these projects is expected to be very minor, and most vegetation should be replaced over time.

4.7 Remnant Dam Removals

Given the nature of this activity, which should restore natural stream hydraulic processes, these projects should generally result in long-term benefits for Atlantic salmon and critical habitat compared to the existing baseline condition. NRCS proposes to remove remnant dam structures that have been identified as fragmenting stream habitat and interfering with natural stream processes, both of which are adversely affecting salmon and their habitat. During demolition, however, there are likely to be short-term adverse effects to Atlantic salmon or critical habitat due to sedimentation, stream de-watering, and disturbing or handling fish during instream work activities. NRCS will use various conservation measures to minimize these construction-related adverse effects.

4.7.1: Effects to Atlantic Salmon

During demolition activities, remnant dam removals will result in short-term adverse effects to Atlantic salmon from activities on the stream bank and directly in the stream channel. Many of these effects will be similar in nature to those associated with stream crossing replacement projects, as discussed above in *Section 4.1.1* on pages 50-60. This section of the Opinion is incorporated here by reference.

Juvenile Atlantic salmon may be temporarily excluded from rearing habitat if fish are herded out of the work site and block nets are installed or if small sections of rivers and streams in the action area are isolated (e.g., cofferdammed) from flowing water to complete restoration activities. Because of the relatively small footprints and short duration of these planned instream activities, minor negative effects to individual salmon are also anticipated in the form of a temporary increase in sediment and a reduction in the overall prey base at a given site.

Capture and relocation of Atlantic salmon associated with remnant dam removals will occur during worksite isolation and de-watering within cofferdams, as discussed previously on pages 50-56. NRCS estimates that 15 remnant dams will be removed over the five-year term of this programmatic Opinion. However, NRCS and USFWS are currently unable to identify how many, if any, of these projects might require worksite isolation and associated fish relocation activities due to unknown site specifics. As such, we are unable to quantify the average area of stream habitat that is likely to be isolated, as we did for stream crossing replacements and removals and low-water crossings.

During the second tier review, we will determine if worksite isolation is necessary and then calculate the area of stream habitat to be dewatered. That information will be used to estimate the number of juvenile Atlantic salmon likely to be relocated from the work area and the number of juveniles likely to be killed, as discussed above on pages 50-56. As discussed on pages 55-56, no injury or death of adult Atlantic salmon is expected associated with remnant dam removals. Adverse effects to listed fish will be avoided or minimized by adhering to work windows, restricting the location and timing of in-water activities, using passive herding techniques, and adhering to Maine-established protocols for the use of backpack electrofishing equipment. However, a small number of juveniles may be injured or killed if present when electrofishing or other fish relocation activities occur. The magnitude of adverse effects to Atlantic salmon from fish removal activities are expected to be minor and without impact to the larger GOM DPS.

Eroded watershed materials that enter river systems and remain in suspension (e.g., sand, silt, and clay) or dissolve in water (e.g., organic and inorganic particulates) contribute to turbidity, a measure of the degree to which light penetrates water (Waters 1995). Numerous conservation measures proposed by NRCS will significantly decrease the amount of fine sediment entering watercourses in the action area and should yield effects that are difficult to measure and evaluate as to their impact on listed aquatic resources. Still, short-term minor effects to Atlantic salmon are likely to occur as a result of in- and near-stream construction activities. The effects of sediments and turbidity on salmon are expected to be similar to those already discussed above on pages 56-58.

Overall, remnant dam removals are expected to have long-term beneficial effects on Atlantic salmon. While most remnant dams do not pose substantial barriers to salmon movements, some may present a barrier at certain flows. Removal, therefore, could benefit all life stages of Atlantic salmon by removing at least a partial barrier and improving access to upstream habitat. Most of the long-term benefits of remnant dam removals are associated with improvements to salmon habitat, as discussed below. Based on the information provided by NRCS and the best available science, the adverse effects of this action to Atlantic salmon are anticipated to be minimal and short-term.

4.7.2 Effects to Atlantic Salmon Critical Habitat

Although project location information is not available at this time, it is likely that most remnant dam removal projects covered by this Opinion will be located in Atlantic salmon critical habitat. The action areas are likely to include both the spawning and rearing and migration PCEs for Atlantic salmon. During dam removal activities, critical habitat will be temporarily disturbed by work in the stream channel and on the stream bank. If the worksite is to be isolated by cofferdams and dewatered, the temporary effects to critical habitat would be similar to those already discussed above for stream crossing replacements on pages 60-62. Projects involving cofferdams will only result in a short-term migration barrier, as the instream dam removal operation will typically only affect the river ranging from a few hours to one or two days at most.

Dam removal projects may affect downstream sediment dynamics. Remnant dam removals, because the majority of the dam structure has already been removed, typically do not involve large amounts of sediment storage behind the structure. Given the minor amount of stored sediment typically associated with these projects, effects to critical habitat from changes in downstream sediment dynamics would be minimal, both short-term and long-term. Any project where large-scale sediment transport is anticipated following dam removal will likely require separate consultation with NMFS (NMFS has the ESA section 7 lead for all dam-related activities).

Instream activities are likely to result in some minor mobilization of fine sediments, which could affect downstream salmon habitat. The quantity of such sediment is expected to be relatively small and not result in permanent degradation or loss of critical habitat, for example by embedding spawning gravels. Given the summer work window, sediments will not affect spawning habitat at a time when eggs or sac-fry are present. Permanent adverse effects to critical habitat are not anticipated because worksite isolation practices will not alter habitat from baseline conditions; isolation materials and structures will be placed on the streambed or slightly into the streambed with minimal disturbance of habitat.

Impounded waters above remnant dams often have elevated water temperatures, lower water velocities, and flooded riparian woody vegetation, all of which degrade salmon habitat. Remnant dam removals should result in overall improvements to both the spawning and rearing and migration PCEs by restoring natural stream flow and allowing natural riparian vegetation to become re-established. Although remnant dams typically do not present a substantial barrier to salmon movements, removal should allow for unimpeded access for all salmon life stages comparable to natural conditions. Based on the information provided and best available science,

the adverse effects of this action on critical habitat are anticipated to be minimal and short-term while overall effects are expected to be beneficial and long-term.

4.8 Installation/Repair/Replacement of Existing Denil and Alaskan Steeppass Fishways

Considering the scope of this activity, which will result in improvements to upstream fish passage, these projects should generally result in long-term benefits for Atlantic salmon and critical habitat compared to the existing baseline condition. NRCS proposes to install or repair fishways in locations where fragmented stream habitat is adversely affecting salmon and their ability to access spawning and rearing habitat. During repair or installation activities, however, there are likely to be short-term adverse effects to Atlantic salmon or critical habitat due to sedimentation, temporary blockage of fish passage, stream de-watering, and disturbing or handling fish during instream work activities. NRCS will use various conservation measures to minimize these construction-related adverse effects.

4.8.1. Effects to Atlantic Salmon

The installation of a new fishway may require instream construction to secure the fishway exit to the barrier and to properly position the fishway entrance in the water body. Worksite isolation and fish removal may be needed to facilitate this activity. Alaska Steeppass fishways are commonly assembled onsite and may require minimal instream disturbance to install. Generally, a boom truck or crane will be used to lower the fishway into place, where it will then be attached to the passage barrier.

During construction activities, fishway repairs and installations will result in short-term adverse effects to Atlantic salmon from activities on the stream bank and directly in the stream channel. Many of the effects will be similar in nature to those associated with stream crossing replacement projects, as discussed above in *Section 4.1.1* on pages 50-60. This section of the Opinion is incorporated here by reference.

In those instances where worksite isolation and dewatering are necessary, cofferdams would likely only affect a portion of the stream channel rather than isolating and dewatering the entire channel from bank to bank. While the effects to Atlantic salmon from worksite isolation and fish relocation activities would be similar to those already described on pages 50-56, the footprint of these activities is likely to be smaller than those needed for stream crossing replacements.

Adverse effects to Atlantic salmon will generally be minor and will be avoided or minimized by adhering to work windows, restricting the location and timing of in-water activities, using passive herding techniques, and adhering to Maine-established protocols for the use of backpack electro-fishing equipment. However, fish removal and relocation activities, where needed, will result in some adverse effects to Atlantic salmon if they are present in the action area.

The repair of an existing fishway will require denying access to the fishway prior to and during repairs. For some existing fishways, the state of disrepair may be to such an extent that fish passage is already precluded through the structure. While a barrier to migration (even a temporary one during construction) is undesirable for any length of time, the long-term effects of

enhanced fish passage are a major benefit to salmon habitat restoration and connectivity. Installation of new fishways will restore access to salmon spawning and rearing habitat that is currently not accessible and may have been so for many decades. New fishways may also lessen the predation of Atlantic salmon congregated below a previously impassable dam. Repair of existing fishways should restore access for salmon to the full capacity of that structure and promote better connectivity to upstream spawning and rearing habitat.

4.8.2 Effects to Atlantic Salmon Critical Habitat

Although project location information is not available at this time, it is likely that most fishway projects covered by this Opinion will be located in Atlantic salmon critical habitat.
The action areas are likely to include both the spawning and rearing and migration PCEs for Atlantic salmon. During fishway repair or installation activities, critical habitat will be temporarily disturbed by work in the stream channel and on the stream bank. If the worksite is to be isolated by cofferdams and dewatered, the temporary effects to critical habitat would be similar to those already discussed above for stream crossing replacements on pages 60-63. Fishway repair projects will only result in a short-term migration barrier while the fishway is temporarily closed, likely a few hours or few days at most.

Instream activities for both repair and installation of fishways are likely to result in some minor mobilization of fine sediments, which could affect downstream salmon habitat. The quantity of such sediment is expected to be relatively small and not result in permanent degradation or loss of critical habitat, for example by embedding spawning gravels. Given the summer work window, sediments will not affect spawning habitat at a time when eggs or sac-fry are present.

Although having short-term adverse effects on habitat, fishway repairs will have a long-term beneficial effect on salmon critical habitat by enhancing access to upstream spawning and rearing habitat and migration habitat. Likewise, fishway installations will have short-term effects on salmon habitat but will restore access to spawning and rearing habitat and migration habitat. New fishways will substantially improve upon the baseline conditions by providing access to previously unavailable habitat and offering more options for Atlantic salmon to complete their life cycle requirements. Providing improved or restored access to Atlantic salmon critical habitat will contribute to recovery of the GOM DPS. Based on the information provided and best available science, the adverse effects of this action on critical habitat are anticipated to be minimal and the overall effects are expected to be beneficial.

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future federal actions that are unrelated to the proposed action are not considered in this section, because they require separate consultation pursuant to section 7 (a)(2) of the ESA.

Given that the overall action area encompasses the entire geographic range of the GOM DPS and an extensive area of land (45,980 km^2) associated with many rivers, stream, ponds, and lakes,

there is potential for a vast array of future state, tribal, local, and private actions to occur in this area. Individual project action areas will be much more limited in scope, however, and overall the additive action areas over the five year period of this Opinion will not begin to approach the geographic area of the entire GOM DPS.

There is very little federal land within the GOM DPS watersheds. In a broad sense, future activities would include (but not be limited to) agriculture, forestry, residential and commercial/industrial development, energy projects, and recreational fishing. Within each of these broad categories are a variety of actions that could affect Atlantic salmon and their habitat including water withdrawal to irrigate crops, logging roads and stream crossings, non-point source pollution from residential development, and loss of forest and other natural habitats within a stream or lake ecosystem from residential and commercial development. Irrigation of blueberry and cranberry fields from both surface water withdrawals and wells is an ongoing activity, generally with no federal nexus, that could expand, particularly for blueberries, if crop acreages increase. Reduction in stream flows from irrigation practices during the summer is of concern for Atlantic salmon at a time when stream flows are naturally low in most years. The Services continue to work with state regulatory agencies to address impacts to Atlantic salmon from irrigation.

Because many activities that impact streams, ponds, and wetlands require federal permits from the ACOE under the Clean Water Act and the Rivers and Harbors Act, at least some future actions (whether state, tribal, local, or private in nature) that would affect Atlantic salmon and their critical habitat would be subject to ESA section 7 (a)(2) consultation. Indeed, even some of the activities mentioned above, such as residential development, could be subject to a federal action if impacts to wetlands or streams would occur.

Maine's total population in 2009 was 1,318,301 people, compared to 1,125,043 people in 1980 (17.2% growth over 29 years). The U.S. Census Bureau projected Maine's population growth from 2000 to 2030 and noted an overall aging of Maine's general population. Maine's population is expected to grow by 10.7% through 2030, indicating a reduced growth rate (USCB 2010). Subsequently, patterns and types of land use and development are not expected to dramatically change compared to trends seen over recent decades. Activities that have affected Atlantic salmon and their habitat in recent years are expected to continue relatively unchanged, although various efforts at salmon conservation have and will continue to benefit Atlantic salmon (*e.g.*, dam removals and riparian conservation easements).

VI. CONCLUSION

This Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

After considering the current status of Atlantic salmon and its designated critical habitat, the environmental baseline, the effects of the proposed action, and the potential for future cumulative effects in the action area, it is the USFWS's biological opinion that the proposed action by NRCS - implementation of eight specific conservation activities - is not likely to jeopardize the continued existence of the GOM DPS of Atlantic salmon throughout all or a significant portion of its range. Furthermore, the proposed action is not expected to result in the

destruction or adverse modification of critical habitat. In reaching these conclusions, the USFWS considered the best available scientific and commercial information regarding Atlantic salmon and the likely effects of the eight NRCS conservation activities on salmon and their critical habitat.

The programmatic nature of this Opinion precludes an exact analysis at this time of each project that will eventually be funded and carried out under this Opinion. Each project, however, will be designed and constructed according to specific criteria and conservation measures, as analyzed in this Opinion, to ensure that adverse effects are short-term and localized and that long-term effects are generally beneficial to salmon and their critical habitat. Furthermore, each proposed project will undergo an individual review by NRCS and USFWS or NMFS to ensure its consistency with the requirements of this Opinion.

While some short-term and spatially limited adverse effects, including project-related injury and mortality of juvenile salmon, will occur from implementation of these projects, the overall effects will not jeopardize the long-term survival and recovery of the species or the function and conservation role of designated critical habitat as needed by Atlantic salmon. Adverse effects are expected to be short-term and should be effectively minimized by the proposed work window, the small footprint of each project, project design criteria, and completion of much of the instream work activities in the dry. Projects are expected to be distributed throughout the GOM DPS and designated critical habitat, so that additive adverse effects are unlikely to be concentrated in one particular location.

The adverse effects of the proposed action on ESA-listed fish and designated critical habitats are expected to be outweighed by long-term conservation benefits that address a currently degraded environmental baseline by 1) improving access to upstream habitat, 2) enhancing stream habitat complexity, 3) enhancing natural stream processes, and 4) correcting erosion and sedimentation problems. NRCS's proposed action is expected to contribute to the recovery of the GOM DPS from its endangered status.

USFWS has identified that the most significant direct effects to individuals from this proposed action will be injury and death that result from stream channel dewatering, fish salvage operations, and use of construction equipment in the stream channel. Effects to individual fish may, in turn, affect the attributes associated with a viable population (levels of abundance, productivity, spatial structure, and genetic diversity that support the species' ability to maintain itself naturally at a level to survive environmental stochasticity). In-water portions of all projects will occur between July 15 and September 30, when juvenile Atlantic salmon could be present in the action areas. Most juveniles are likely to be captured and relocated during salvage operations but some may also be injured or killed (e.g., as a result of electrofishing). A small number of salmon are likely to be killed during stream dewatering due to stranding, and some juveniles may be killed or injured during instream construction activities, including the operation of construction equipment in the flowing stream channel. Because of the generally small project areas, reduced stream flows associated with time of year, and the short time work would occur below ordinary high water; only a small portion of the GOM DPS would be exposed to the adverse effects of these projects over the five year term of this Opinion.

Our conclusions regarding the GOM DPS of Atlantic salmon and its critical habitat are based on the following considerations:

- Adverse effects to Atlantic salmon habitat are largely temporary during various instream construction activities. Habitat will generally be returned to its previous condition after construction is completed (e.g., after removal of cofferdams and restoration of stream flows) and will continue to function to support Atlantic salmon, either as spawning and rearing habitat or migration habitat.
- Some of the activities (stream crossing replacements, stream crossing removals, fishways repairs) will result in improved access to upstream spawning and rearing habitat and should result in a conservation benefit to Atlantic salmon by making more critical habitat accessible. NRCS projects that improve habitat connectivity and promote more natural stream processes (e.g., stream crossings designed using stream simulation techniques) will help address identified threats to the GOM DPS and its critical habitat.
- Improvements in the condition of and access to Atlantic salmon habitat could contribute to increases in population productivity and abundance in the GOM DPS. However, other factors, such as marine survival, will continue to influence the GOM DPS population.
- NRCS will ensure that appropriate sediment and erosion control practices are in place for each project to protect Atlantic salmon and their habitat. Projects should result in minor amounts of sediment being released into rivers and streams during construction. Sedimentation is not expected to affect the long-term function of any spawning and rearing or migration habitat for salmon. Some of the activities will address on-going erosion issues that are negatively affecting streams. Projects should result in a long-term reduction in erosion and sedimentation and, therefore, a conservation benefit to critical habitat.
- Instream work is scheduled during the standard summer work window when stream flows and precipitation are typically low, minimizing the likelihood that erosion and sedimentation will affect salmon and their habitat during construction activities. Furthermore, the summer work window avoids particularly sensitive times of the Atlantic salmon's life cycle, such as spawning, egg incubation, and downstream smolt migration.
- Take of Atlantic salmon juveniles is expected to be largely non-lethal and is mainly associated with capture and removal from cofferdams. Capturing and relocating salmon during instream construction activities will avoid the more serious effects to salmon from temporarily dewatering habitat inside a cofferdam or not using a cofferdam at all during construction. The lethal take of a small number of juvenile fish is too small to influence the productivity, spatial structure, or genetic diversity of the GOM DPS.
- Take of adult Atlantic salmon is not authorized and any effects to adults are expected to be relatively minor and short-term, such as temporary avoidance of the work area. Therefore, the current reproductive potential of the GOM DPS will not be affected.

VII. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species without special exemption. The term take is defined to include harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by USFWS to include an act that actually kills or injures wildlife. Such acts may include significant habitat modification or degradation that results in death or injury to a listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. The term

harass is further defined by USFWS as intentional or negligent actions that create the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. 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 taking under the ESA, provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement (ITS).

A. Amount or Extent of Take

In this programmatic Opinion, we have determined the amount of expected incidental take for some of the eight conservation activities over the five-year term Opinion. For some of the activities, however, we have deferred the determination of incidental take until NRCS submits project-specific information to USFWS or NMFS. All projects will be reviewed individually and a specific amount of incidental take will be authorized, including those where an activity-wide determination of take is made in this Opinion. For these later projects, the expected amount of incidental take will be adjusted, if necessary, in light of project location and details (e.g., the size of the de-watered area inside a cofferdam differs substantially from that anticipated in this Opinion). Authorized take for each individual project will be cumulatively tracked over the five-year term of this Opinion to ensure that the overall level of authorized incidental take is not exceeded.

The USFWS anticipates that there will be both lethal and non-lethal take of juvenile Atlantic salmon as a result of the proposed programmatic action addressed in this Opinion. Incidental take caused by the adverse effects of the proposed action will include the following: (1) the capture and relocation of juvenile fish during work area isolation and dewatering; (2) the mortality of juvenile salmon as a result of electrofishing; (3) the stranding deaths of juveniles inside of de-watered cofferdams; and (4) the injury and death of juveniles as a result on instream construction work where equipment is operating in the stream channel or excavating in flowing water.

The following summarizes the anticipated amount of incidental take associated with each of the eight conservation activities, as derived from the analysis and discussion above in **Section IV EFFECTS OF THE ACTION**:

1) Stream Crossing Replacements and
2) Stream Crossing Culvert Removals (50 projects total) –
    - 253 juvenile Atlantic salmon displaced or captured and temporarily relocated during worksite isolation activities
    - Of the 253 juveniles, as many as four (4) juvenile mortalities are expected from electrofishing
    - Of the 253 juveniles, all individuals left stranded inside the cofferdams after fish removal activities will be killed in association with de-watering (i.e., all individuals left within 46.5 units of salmon habitat)

3) Streambank and Shoreline Stabilization (5 projects) –

- Incidental take will be authorized as needed after review of project-specific information submitted by the NRCS.
- Incidental take is most likely to be associated with operation of construction equipment in the stream channel or excavation in the water, which may not occur with every project.
- The amount of incidental take is expected to be relatively small (i.e., no more than a few juveniles for each project).

4) Low-water Crossings (50 projects) -
    - 190 juvenile Atlantic salmon displaced or captured and temporarily relocated during worksite isolation activities
    - Of the 190 juveniles, as many as three (3) juvenile mortalities are expected from electrofishing
    - Of the 190 juveniles, all individuals left stranded inside the cofferdams after fish removal activities will be killed in association with de-watering (i.e., all individuals left within 34.8 units of salmon habitat)

5) Large Woody Debris and Boulder Supplementation (10 projects) –
    - Incidental take will be authorized as needed after review of project-specific information submitted by the NRCS.
    - Incidental take is most likely to be associated with operation of construction equipment in the stream channel, which may not occur with every project.
    - The amount of incidental take is expected to be relatively small (i.e., no more than a few juveniles for each project).

6) Side Channel or Off-Channel Reconnection (5 projects) –
    - Incidental take will be authorized as needed after review of project-specific information submitted by the NRCS.
    - Incidental take is most likely to be associated with operation of construction equipment in the stream channel, which may not occur with every project.
    - The amount of incidental take is expected to be relatively small (i.e., no more than a few juveniles for each project).

7) Remnant Dam Removals (15 projects) -
    - Incidental take may be authorized as needed after project-specific review.
    - Incidental take is most likely to be associated with fish removal and exclusion activities, including electrofishing or stranding resulting from a dewatered cofferdam.
    - The amount of incidental take is expected to be relatively small (i.e., no more than a few juveniles for each project).

8) Installation/Repair/Replacement of Denil and Alaska Steeppass Fishways (5 projects) -
    - Incidental take may be authorized as needed after project-specific review.
    - Incidental take is most likely to be associated with temporary closure of a fishway, electrofishing, or stranding resulting from a dewatered cofferdam.

- The amount of incidental take is expected to be relatively small (i.e., no more than a few juveniles for each project).

This ITS specifically does **not** authorize the take (lethal or non-lethal) of any adult Atlantic salmon associated with any of the eight activities covered by this Opinion. If take of an adult salmon becomes a concern at any particular project, all activities that might be contributing to this concern should immediately cease and USFWS should be contacted to discuss next steps. Reinitiation of section 7 consultation may be necessary depending on the particular circumstances at hand.

B. Reasonable and Prudent Measures

Conservation measures designed to avoid and minimize effects on listed species and critical habitat are integral components of the proposed action, and all proposed projects are expected to be completed consistent with these measures. We have completed our effects analysis accordingly. The measures described below are nondiscretionary and must be implemented by the NRCS (or their clients and contractors) in order for the exemption in section 7(o)(2) to apply. The NRCS has a continuing duty to regulate the activities covered by this incidental take statement. The protective coverage of section 7(o)(2) will lapse if the NRCS fails to require adherence to all the terms and conditions of the incidental take statement or fails to exercise that discretion as necessary to retain the oversight to ensure compliance with these terms and conditions. Further consultation may be required to determine what effect any modified action may have on listed species or designated critical habitats.

The USFWS considers full application of 1) conservation measures included as part of the proposed action and 2) the following reasonable and prudent measures to be necessary and appropriate to minimize the likelihood of incidental take of the Atlantic salmon associated with the eight conservation activities covered by this programmatic Opinion. Any deviation from the following reasonable and prudent measures will be beyond the scope of this consultation and will not be exempted from the prohibition against take as described in this incidental take statement:

- Minimize the adverse effects to and incidental take of Atlantic salmon by employing construction techniques that avoid or minimize adverse effects to water quality, aquatic and riparian habitats, and all aquatic organisms.
- Provide adequate project-specific information to USFWS or NMFS to ensure that projects are designed and constructed according to the terms of this Opinion and that adverse effects and incidental take are avoided and minimized.
- Ensure completion of a reporting program to confirm that all projects are effective in minimizing incidental take from funded activities and that the quantification of incidental take is not exceeded.

C. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the NRCS, their clients, and all contractors must comply with the following terms and conditions, which implement the reasonable and prudent measure described above, and outline the required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. All Atlantic salmon mortalities from electrofishing or other related activities will be reported to the USFWS (Wende Mahaney at 866-3344, Ext. 118; FAX 866-3351; or wende_mahaney@fws.gov) within 48 hours of occurrence. Mortalities associated with remnant dam removals and repair or installation of fishways should also be reported to the NMFS (Max Tritt at 866-3756; FAX 866-7342; or max.tritt@noaa.gov). Salmon mortalities shall be immediately preserved (refrigerate or freeze) for delivery to the USFWS office in Orono, Maine. If USFWS is not available, contact NMFS in Orono (Max Tritt; 866-3756) to arrange for delivery.
2. All projects carried out under this programmatic Opinion must adhere to the specifications contained in *Sections 1.1 – 1.3* of this Opinion.
3. All cofferdams shall be removed from the stream immediately following completion of construction, allowing for minor delays due to high stream flows following heavy precipitation, so that fish and other aquatic life passage is not unnecessarily restricted. If a project is not completed but there will be substantial delays in construction, cofferdams will need to be at least partially removed to allow unobstructed passage of Atlantic salmon until construction resumes.
4. NRCS staff shall carefully monitor the actions described in this Opinion and document the level of incidental take to ensure that all projects are minimizing the take of Atlantic salmon. NRCS will provide the USFWS (Attn: Wende Mahaney, 17 Godfrey Drive, Suite 2, Orono, ME 04473) and NMFS (Attn: Max Tritt, 17 Godfrey Drive, Suite 1, Orono, ME 04473) with an annual report summarizing the work done under this Opinion and accounting for incidental take associated with each project. This report will provide a basis for evaluating the effectiveness of conservation measures in reducing effects to and take of Atlantic salmon and minimizing effects on critical habitat. Each annual report will include a cumulative accounting of all take of Atlantic salmon authorized under this Opinion. This annual report will be submitted as soon as possible after the conclusion of each field season.
5. Unforeseen circumstances encountered during project implementation (e.g., equipment damage, broken hoses, equipment failure, streambank failure) will be noted and reported to the Services in the annual report discussed above. If the problem results in unauthorized take of Atlantic salmon or creates effects that were not analyzed in this Opinion, project activities must immediately cease and the USFWS must be notified to discuss next steps and the need for re-initiation of consultation.
6. NRCS and the Services will hold an annual coordination meeting to discuss the annual monitoring report and any potential actions that could improve conservation of Atlantic salmon or make the program more efficient.

VIII. 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.

- NRCS should explore options for follow-up inspections or monitoring of each project carried out under this programmatic Opinion to help determine and document effects on Atlantic salmon and their critical habitat, especially beneficial effects. Priority should be given to monitoring stream crossing replacement projects, particularly documentation of upstream passage of Atlantic salmon and other fish species and general passage of aquatic organisms.
- NRCS should conduct monitoring of stream turbidity levels associated with various construction activities at several different project locations, preferably representing as much variation in site conditions as possible. Collecting this data will be useful for future section 7 consultations regarding NRCS projects when assessing the effects of construction projects on Atlantic salmon habitat and their habitat.
- NRCS should work with USFWS, NMFS, and other partners to accomplish recovery actions identified in the new Recovery Plan for the GOM DPS.

IX. REINITIATION NOTICE

This concludes formal consultation for the NRCS's proposed funding of eight conservation activities on various water bodies throughout the geographic range of the GOM DPS of Atlantic salmon. As provided in 50 CFR 402.16, reinitiation of formal consultation is required when discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; or (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation.

X. Literature Cited

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APPENDIX A

ME-ECS-1 Form to Provide Site-specific Information for Proposed NRCS Actions