DEPARTMENT OF INTERIOR

Fish and Wildlife Service

50 CFR Part 17

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 224

[Docket No. 0808191116–9709–02]

RIN 0648–XJ93

Endangered and Threatened Species; Determination of Endangered Status for the Gulf of Maine Distinct Population Segment of Atlantic Salmon

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce; United States Fish and Wildlife Service (USFWS), Interior.

ACTION: Final rule.

SUMMARY: We (NMFS and USFWS, collectively referred to as the Services) have determined that naturally spawned and conservation hatchery populations of anadromous Atlantic salmon (*Salmo salar*) whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, including those that were already listed in November 2000, constitute a distinct population segment (DPS) and hence a ‘‘species’’ for listing. We have determined that the Gulf of Maine (GOM) DPS warrants listing as endangered under the Endangered Species Act (ESA). Critical habitat for the GOM DPS will be designated in a subsequent **Federal Register** notice.

DATES: This rule is effective July 20, 2009.

ADDRESSES: Comments and materials received, as well as supporting scientific information used in the preparation of this rule, will be available for public inspection, by appointment, during normal business hours at: National Marine Fisheries Service, Northeast Regional Office, 55 Great Republic Drive, Gloucester MA 01930. An electronic copy of this final rule is available at: *http://www.nero.noaa.gov/prot_res/altsalmon/*. Public comments received can be viewed at *http://www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT: Rory Saunders, NMFS, at (207) 866–4049; Jessica Pruden, NMFS, at (978) 282–8482; Marta Nammack, NMFS, at (301) 713–1401; Lori Nordstrom, USFWS, at (207) 827–5938 ext. 13. Persons who use a Telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339, 24 hours a day, 7 days a week.

SUPPLEMENTARY INFORMATION:

Background

We issued a final rule listing the GOM DPS of Atlantic salmon as endangered on November 17, 2000 (65 FR 69469). The GOM DPS was defined as all naturally reproducing wild populations and those river-specific hatchery populations of Atlantic salmon having historical, river-specific characteristics found north of and including tributaries of the lower Kennebec River to, but not including, the mouth of the St. Croix River at the U.S.-Canada border. In the final rule listing the GOM DPS, we did not include fish that inhabit the mainstem and tributaries of the Penobscot River above the site of the former Bangor Dam, the upper Kennebec River, or the Androscoggin River within the GOM DPS (65 FR 69469; November 17, 2000).

In late 2003, we assembled the 2005 Biological Review Team (BRT) composed of biologists from the Maine Atlantic Salmon Commission (now the Maine Department of Marine Resources Bureau of Sea-run Fisheries and Habitat (MDMR)), the Penobscot Indian Nation, and both Services. The 2005 BRT was charged with reviewing and evaluating all relevant scientific information relating to the current DPS delineation (including a detailed genetic characterization of the Penobscot population and data relevant to the appropriateness of including the upper Kennebec and Androscoggin rivers as part of the DPS), determining the conservation status of the populations not included in GOM DPS listed in 2000, and assessing their relationship to the GOM DPS as it was listed in 2000. The findings of the 2005 BRT, which are detailed in the 2006 Status Review for Anadromous Atlantic Salmon in the United States (Fay *et al.*, 2006), addressed: the DPS delineation, including whether populations that were not included in the 2000 listing should be included in the GOM DPS; the extinction risks to the species; and the threats to the species. The 2006 Status Review (Fay *et al.*, 2006) underwent peer review by experts in the fields of Atlantic salmon biology and genetics to ensure that it was based on the best available science. Each peer reviewer independently affirmed the major conclusions presented in Fay *et al.* (2006).

Policies for Delineating Species Under the ESA

Section 3 of the ESA defines ‘‘species’’ as including ‘‘any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.’’ The term ‘‘distinct population segment’’ is not recognized in the scientific literature. Therefore, the Services adopted a joint policy for recognizing DPSs under the ESA (DPS Policy; 61 FR 4722) on February 7, 1996. The DPS policy requires the consideration of two elements when evaluating whether a vertebrate population segment may be considered a DPS under the ESA: (1) The discreteness of the population segment in relation to the remainder of the species or subspecies to which it belongs; and (2) the significance of the population segment to the species or subspecies to which it belongs.

A population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions: (1) It is markedly separated from other populations of the same taxon (an organism or group of organisms) as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation; or (2) it is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the ESA (*i.e.*, inadequate regulatory mechanisms).

If a population segment is found to be discrete under one or more of the above conditions, its biological and ecological significance to the taxon to which it belongs is evaluated. This consideration may include, but is not limited to: (1) Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon; (2) evidence that the loss of the discrete population segment would result in a significant gap in the range of a taxon; (3) evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; and (4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

Listing Determinations Under the ESA

The ESA defines an endangered species as one that is in danger of extinction throughout all or a significant portion of its range, and a threatened species as one that is likely to become endangered in the foreseeable future throughout all or a significant portion of its range (sections 3(6) and 3(20), respectively). The statute requires us to determine whether any species is endangered or threatened because of any of the following five factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; or (5) other natural or manmade factors affecting its continued existence (section 4(a)(1)(A–E)). We are to make this determination based solely on the best available scientific and commercial data available after conducting a review of the status of the species and taking into account any efforts being made by states or foreign governments to protect the species.

Atlantic Salmon Life History

Anadromous Atlantic salmon are a wide ranging species with a complex life history. The historic range of Atlantic salmon occurred on both sides of the North Atlantic: from Connecticut to Ungava Bay in the western Atlantic and from Portugal to Russia's White Sea in the Eastern Atlantic, including the Baltic Sea.

For Atlantic salmon in the United States, juveniles typically spend 2 years rearing in freshwater. Freshwater ecosystems provide spawning habitat and thermal refuge for adult Atlantic salmon; overwintering and rearing areas for eggs, fry, and parr; and migration corridors for smolts and adults (Bardonnet and Bagliniere, 2000). Adult Atlantic salmon typically spawn in early November. During spawning, the female uses its tail to scour or dig a series of nests in the gravel where the eggs are deposited; this series of nests is called a redd. The eggs remain in the redd until they hatch in late March or April. At this stage, they are referred to as alevin or sac fry. Alevins remain in the redd for about 6 more weeks and are nourished by their yolk sac until they emerge from the gravel in mid-May. At this time, they begin active feeding and are termed fry. Within days, the fry enter the parr stage, indicated by vertical bars (parr marks) on their sides that act as camouflage. Atlantic salmon parr are territorial; thus, most juvenile mortality is thought to be density dependent and mediated by habitat limitation (Gee *et al.*, 1978; Legault, 2005). In particular, suitable overwintering habitat may limit the abundance of large parr prior to smoltification (Cunjak *et al.*, 1998). Smoltification (the physiological and behavioral changes required for the transition to salt water) usually occurs at age 2 for most Atlantic salmon in Maine. The smolt emigration period is rather short and lasts only 2 to 3 weeks for each individual. During this brief emigration window, smolts must contend with rapidly changing osmoregulatory requirements (McCormick *et al.*, 1998) and predator assemblages (Mather, 1998). The freshwater stages in the life cycle of the Atlantic salmon have been well studied; however, much less information is available on Atlantic salmon at sea (Klemetsen *et al.*, 2003).

Gulf of Maine Atlantic salmon migrate vast distances in the open ocean to reach feeding areas in the Davis Strait between Labrador and Greenland, a distance over 4,000 km from their natal rivers (Danie *et al.*, 1984; Meister, 1984). During their time at sea, Atlantic salmon undergo a period of rapid growth until they reach maturity and return to their natal river. Most Atlantic salmon (about 90 percent) from the Gulf of Maine return after spending 2 winters at sea; usually less than ten percent return after spending 1 winter at sea; roughly one percent of returning salmon are either repeat spawners or have spent 3 winters at sea (3 sea winter, or 3SW salmon) (Baum, 1997).

In addition to anadromous Atlantic salmon, landlocked Atlantic salmon have been introduced to many lakes and rivers in Maine, though they are only native to four watersheds in the State: The Union, including Green Lake in Hancock County; the St. Croix, including West Grand Lake in Washington County; the Presumpscot, including Sebago Lake in Cumberland County; and the Penobscot, including Sebec Lake in Piscataquis County (Warner and Havey, 1985). There are certain lakes and rivers in Maine where landlocked salmon and anadromous salmon co-exist. Recent genetic surveys have confirmed that little genetic exchange occurs between these two life history types (Spidle *et al.*, 2003; NMFS unpublished data).

Delineation of the Gulf of Maine Distinct Population Segment

Fay *et al.* (2006) concluded that the DPS delineation that resulted in the 2000 listing designation (65 FR 69469; November 17, 2000) was largely appropriate, except in the case of large rivers that were excluded in the previous listing determination (Section 6.2.4 of Fay *et al.*, 2006). As described below in the analyses of discreteness and significance of the population segment, 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 (Spidle *et al.*, 2003), have similar life history characteristics, and occur in the same zoogeographic region (section 6.3 of Fay *et al.*, 2006). 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) (section 6.3.1.4 and 6.3.2.4) concluded that this group of populations (population segment) met both the discreteness and significance criteria of the DPS Policy and, therefore should be considered a DPS. Fay *et al.* (2006) recommended that the new GOM DPS include all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, including all associated conservation hatchery populations used to supplement these natural populations; currently, such conservation hatchery populations are maintained at Green Lake National Fish Hatchery (GLNFH) and Craig Brook National Fish Hatchery (CBNFH).

Delineating Geographic Boundaries

Determining the precise boundary of the GOM DPS is difficult. In the case of the GOM DPS, we use a wide array of independent sources of information to make this determination. These sources of information include recent genetic analyses, life history, and zoogeography, among others. Recent genetic analyses, in particular, have clarified these distinctions, and we rely on them heavily in the following analysis. When using genetic data to make these delineations, it is important to note that extant populations must exist in order to make meaningful comparisons. In the case of determining the northern boundary of the GOM DPS, extant populations were used in genetic analyses and thus inform the determination. However, in the case of the determination of the southern boundary of the GOM DPS, many populations south of the Androscoggin are extirpated, and thus there are no genetic data available to make these comparisons. For this reason we rely on additional information to delineate the southern boundary of the GOM DPS below.

We relied on genetic data to inform our determination on the northern terminus of the GOM DPS. At a broad scale, it is clear that there are substantial differences in genetic structure between U.S. and Canadian populations of Atlantic salmon (Spidle *et al.*, 2003). However, there are no genetic data on the wild salmon that once occurred in the St. Croix watershed along the U.S.-Canada border. As listed in 2000, the northern terminus of the GOM DPS was the U.S.-Canada border at the St. Croix River, but as described on page 54 of Fay *et al.* (2006), the best available science suggests that the St. Croix groups with other Canadian rivers. Genetic analyses found that salmon in the Dennys River are more similar to populations in the United States than to Canadian salmon populations that are geographically proximate to the Dennys (Spidle *et al.*, 2003). Therefore, we find that the northern terminus of the GOM DPS is the Dennys River watershed, rather than the St. Croix.

We determined the southern terminus of the GOM DPS to be the Androscoggin River based on zoogeography rather than genetics because there are extremely few Atlantic salmon in the rivers on which to base genetic analyses as one moves southward. Due to the combination of low numbers of Atlantic salmon in some rivers (*e.g.*, Androscoggin) and the complete extirpation of the native stock in other rivers to the south (*e.g.*, Merrimack), complete genetic data are not and may never be available for the Services to be able to genetically characterize these populations. In the absence of clear genetic data, we used ecological factors to define the southern boundary of the GOM DPS. The Androscoggin River lies within the Penobscot-Kennebec-Androscoggin Ecological Drainage Unit (EDU) (Olivero, 2003) and the Laurentian Mixed Forest Province (Bailey, 1995), which separates it from more southern rivers that were historically occupied by Atlantic salmon. EDUs are aggregations of watersheds with similar zoogeographic history, physiographic conditions, climatic characteristics, and basic geography (Olivero, 2003). The substantial changes in physiographic conditions south of the Androscoggin drainage are reflected in the southern terminus of both the Laurentian Mixed Forest Province and the Penobscot—Kennebec—Androscoggin EDU occurring in that area. Basin geography, climate, groundwater temperatures, hydrography, and zoogeographic differences between the Penobscot—Kennebec—Androscoggin EDU and the EDUs to the south (*e.g.*, Saco-Merrimack-Charles, Lower Connecticut, Middle Connecticut, and Upper Connecticut) likely had a strong effect upon Atlantic salmon ecology and production. These differences would influence the structure and function of aquatic ecosystems (Vannote *et al.*, 1980; Cushing *et al.*, 1983; Minshall *et al.*, 1983; Cummins *et al.*, 1984; Minshall *et al.*, 1985; Waters, 1995) and create a different environment for the development of local adaptations than rivers, such as the Saco and Merrimack, to the south.

In the proposed rule, we proposed to include the entire Androscoggin, Kennebec, and Penobscot Watersheds within the GOM DPS boundary. Some comments from the public appropriately highlighted several impassable falls that limited the upstream extent to which anadromous salmon inhabited the rivers of Maine. NMFS also evaluated historical occupancy at the watershed scale for the process of proposing critical habitat for the GOM DPS. There is also considerable information provided in the 2006 Status Review pertaining to impassable falls as well. We are, therefore, using these information sources (and others cited therein) to delimit the upstream extent of anadromy for GOM salmon in this final rule.

We have identified seven impassable falls that substantially limited the upstream extent of the freshwater range of GOM salmon. These include 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 Falls 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 (Table 1).

TABLE 1—IMPASSABLE FALLS THAT LIMIT THE UPSTREAM EXTENT OF THE FRESHWATER RANGE OF GOM SALMON

Name of falls	Town	River	Basin
Rumford Falls	Rumford	Androscoggin River	Androscoggin.
Snow Falls	West Paris	Little Androscoggin River	Androscoggin.
Grand Falls	Township 3 Range 4 BKP WKR	Dead River	Kennebec.
Un-named	Indian Stream Township	Kennebec River	Kennebec.
Big Niagara Falls	Township 3 Range 10 WELS	Nesowadnehunk Stream	Penobscot.
Grand Pitch	Trout Brook Township	Webster Brook	Penobscot.
Grand Falls	Grand Falls Township	Passadumkeag River	Penobscot.

As a result, we have modified the geographic boundaries of the freshwater range of GOM salmon in the Androscoggin, Kennebec, and Penobscot Basins in the following ways: all freshwater bodies in the Androscoggin Basin are included up to Rumford Falls on the Androscoggin River and up to Snow Falls on the Little Androscoggin River; all freshwater bodies in the Kennebec Basin are included up to Grand Falls on the Dead River and the unnamed falls (currently impounded by Indian Pond Dam) immediately above the Kennebec River Gorge; and all freshwater bodies in the Penobscot Basin are included up to Big Niagara Falls on Nesowadnehunk Stream, Grand Pitch on Webster Brook, and Grand Falls on the Passadumkeag River.

We recognize that many other potentially impassable waterfalls exist throughout the range of GOM salmon. While other impassable falls may exist throughout the range, we did not exclude any other areas (other than the areas above the seven falls mentioned above) for the following reasons: (1) Their occurrence is typically in headwater areas that preclude access from relatively small portions of a given watershed; (2) identifying every impassable falls is impractical given current information; and (3) no other impassable falls were brought to our attention during the public comment period.

In addition, we recognize that within every watershed, there is an upstream extent of anadromy. However, it is impossible to define that specific point in every watershed. The upstream extent of anadromy is ultimately limited by the incremental narrowing of a given river or stream. While a stream may be too small for an adult salmon to swim up any further, juveniles may ascend further than that point in search of suitable rearing habitat. In fact, upstream movement of even fry can be quite substantial. As such, we include all the freshwater bodies as part of the freshwater range of GOM salmon unless above one of the impassable falls mentioned in the text above.

Discreteness and Significance of the GOM DPS

With respect to the ''discreteness'' of this population segment, section 6.3.1 of Fay *et al.* (2006) considered ecological, behavioral, and genetic factors under the first discreteness criterion of the DPS Policy to examine the degree to which it is separate from other Atlantic salmon populations. Gulf of Maine salmon are behaviorally and physiologically discrete from other members of the taxon because they return to their natal GOM rivers to spawn (a process called homing), which leads to the separation in stocks that has been observed between the Gulf of Maine and other segments of the taxon. River-specific adaptation is an important mechanism that allows anadromous salmon to occupy diverse environments throughout their range. River-specific adaptation is facilitated by homing and is characteristic of all other anadromous salmonids (Klemetsen *et al.*, 2003; Utter *et al.*, 2004). Baum and Spencer (1990) found that roughly 98 percent of all tagged salmon returned to their natal rivers to spawn. As described below, these strong homing tendencies have led to the formation and maintenance of river-specific adaptations for GOM salmon as well.

Ecologically, GOM salmon are discrete from other members of the taxon. The core of the riverine habitat of this population segment lies within the Penobscot-Kennebec-Androscoggin EDU (Olivero, 2003) and the Laurentian Mixed Forest Province (Bailey, 1995). These environmental conditions have shaped life history characteristics of GOM salmon. In particular, GOM salmon life history strategies are dominated by age 2 smolts and 2SW adults, whereas populations to the north of this population segment are generally dominated by age 3 or older smolts and 1SW adults (called grilse). Smolt age reflects growth rate (Klemetsen *et al.*, 2003), with faster growing parr emigrating as smolts earlier than slower growing ones (Metcalfe *et al.*, 1990). Smolt age is largely influenced by temperature (Symons, 1979; Forseth *et al.*, 2001) and can therefore be used to compare and contrast growing conditions across rivers (Metcalfe and Thorpe, 1990). For GOM populations, smolt ages are quite similar across rivers with naturally-reared (result of either wild spawning or fry stocking) returning adults predominantly emigrating at river age 2 (88 to 100 percent) with the remainder emigrating at river age 3 (Fay *et al.*, 2006). Smolt ages from naturally-reared returning adults in rivers south of the Penobscot-Kennebec-Androscoggin EDU are also dominated by river age 2 smolts with some emigrating at river age 3, but a substantial proportion of river age 1 smolts are also present (See Table 6.3.1.1 in Fay *et al.*, 2006).

The strongest evidence that GOM salmon are discrete from other members of the taxon is genetic. Fay *et al.* (2006) described genetic structure of this population segment and other stocks in detail in section 6.3.1.3. In summary, three primary genetic groups of North American populations (Spidle *et al.*, 2003; Spidle *et al.*, 2004; Verspoor *et al.*, 2005) are evident. These include the anadromous GOM populations (including salmon in the Kennebec and Penobscot Rivers) (Spidle *et al.*, 2003), non-anadromous Maine populations (Spidle *et al.*, 2003), and Canadian populations (Verspoor *et al.*, 2005). Because of these behavioral, physiological, ecological and genetic factors, we conclude that the GOM anadromous population is discrete from other Atlantic salmon populations under the provisions of the DPS Policy.

With respect to the ''significance'' of this population segment, Fay *et al.* (2006) found that there are three attributes which are described as evidence for ''significance'' in the DPS policy that are applicable to the GOM DPS (section 6.3.2 of Fay *et al.*, 2006). Fay *et al.* (2006) (section 6.3.2.1) concluded that this population segment has persisted in an ecological setting unusual or unique to the taxon for several reasons. First, GOM salmon live in and migrate through a unique marine environment. The marine migration corridor for GOM salmon begins in the GOM that is known for unique circulation patterns, thermal regimes, and predator assemblages (Townsend *et al.*, 2006). Gulf of Maine salmon undertake extremely long marine migrations to feeding grounds off the West Coast of Greenland because the riverine habitat they occupy is at the southern extreme of the current North American range. While such vast marine migrations are more common for stocks on the northeast side of the Atlantic, the combination of the long migration distances and the unique setting of the GOM, described above, make the oceanic life history of the GOM DPS quite different from those of other stocks (ICES, 2008). In addition, the core of the riverine habitat of this population segment lies within the Penobscot-Kennebec-Androscoggin EDU (Olivero, 2003) and the Laurentian Mixed Forest Province (Bailey, 1995). The importance of this setting is evidenced by the tremendous production potential of its juvenile nursery habitat that allows production of proportionately younger smolts than Canadian rivers to the north (Myers, 1986; Baum, 1997; Hutchings and Jones, 1998). Thus, the combination of the unique rearing conditions in the freshwater portion of its range combined with the unique marine migration corridor led Fay *et al.* (2006) to conclude that this population segment has persisted in an ecological setting unusual or unique to the taxon.

Fay *et al.* (2006) also concluded that the loss of this population segment would result in a significant gap or constriction in the range of the taxon (Section 6.3.2.2 of Fay *et al.*, 2006). The extirpation of this population segment would represent a significant range reduction for the entire taxon *Salmo salar* because this population segment represents the southernmost native Atlantic salmon population in the western Atlantic. The temperature regimes in these southern rivers made possible the tremendous growth and production potential which resulted in the historically very large populations in these areas. Historic attempts to enhance salmon populations (in GOM rivers) using Canadian-origin fish failed. This further illustrates the importance of conserving native, river-specific populations and the difficulties of restoration if they are lost.

Fay *et al.* (2006) concluded that this population segment differs markedly from other populations of the species in its genetic characteristics (Section 6.3.2.3 of Fay *et al.*, 2006). While genetic differences were used to examine the ''discreteness'' of this population segment, Fay *et al.* (2006) suggested that the ''significance'' of these observed genetic differences is that they provide evidence of local adaptation. That is, low returns of exogenous smolts (*i.e.*, Canadian-origin smolts stocked in Maine) and lower survival of smolts from these Maine rivers stocked outside their native geographic range (*e.g.*, into the Merrimack River) indicate that this population segment is adapted to its native environment. Based on this information related to significance, Fay *et al.* (2006) concluded that this population segment is significant to the Atlantic salmon species, and therefore, qualifies as a DPS (the new GOM DPS) under the provisions of the DPS Policy.

Fay *et al.* (2006) (section 6.3.4) explicitly considered whether to include hatchery populations in the GOM DPS and concluded that all conservation hatchery populations (currently maintained at GLNFH and CBNFH) should be included in the GOM DPS. This determination was based on the fact that there is a low level of genetic divergence between conservation hatchery populations and the rest of the GOM DPS because: (1) The river-specific hatchery programs collect wild parr or sea-run adults annually (when possible) for inclusion into the broodstock programs; (2) broodstocks are used to stock fry and other life stages into the river of origin, and, in some instances, hatchery-origin individuals represent the primary origin of Atlantic salmon due to low adult returns; (3) there is little evidence of introgression from Canadian-origin populations; and (4) there is minimal introgression from aquaculture fish because of a rigorous genetic screening program in the hatchery. Because the level of divergence is minimal, in Section 6.3.4 Fay *et al.* (2006) suggested that hatchery populations should be considered part of the GOM DPS. However, Fay *et al.* (2006) also noted the dangers of reliance on hatcheries. In short, genetic risks from hatcheries include artificial selection, inbreeding depression, and outbreeding depression, in addition to other risks such as the potential for disease outbreaks, loss of funding, or other catastrophic failure at one or more hatcheries. The reader is directed to ‘‘Population Status of the GOM DPS’’ section of this final rule and Section 8.5.1 of Fay *et al.* (2006) for an in depth discussion of these risks.

For the reasons described in Section 6 of Fay *et al.* (2006), we conclude that the GOM DPS as described above warrants delineation as a DPS (*i.e.*, it is discrete and significant). Specifically, we conclude that the GOM DPS is comprised of all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, including all associated conservation hatchery populations used to supplement these natural populations; currently, such populations are maintained at GLNFH and CBNFH. We consider the conservation hatchery populations that are maintained at CBNFH and GLNFH essential for recovery of the GOM DPS because the hatchery populations contain a high proportion of the genetic diversity remaining in the GOM DPS (Bartron *et al.*, 2006). Excluded are those salmon raised in commercial hatcheries for aquaculture and landlocked salmon because they are genetically distinguishable from the GOM DPS. The marine range of the GOM DPS extends from the Gulf of Maine to feeding grounds off Greenland. The freshwater range of the GOM DPS includes all freshwater bodies in the watersheds from the Androscoggin to the Dennys, except those watersheds excluded because of natural barrier falls as described in the ‘‘Delineating Geographic Boundaries’’ section of this final rule. The most substantial difference between the GOM DPS as listed in 2000 and the GOM DPS described in this final rule is the inclusion of the majority of the Androscoggin, Kennebec, and Penobscot Basins as well as the associated conservation hatchery population at GLNFH.

Several rivers outside the range of the GOM DPS in Long Island Sound and Central New England contain Atlantic salmon (Fay *et al.*, 2006; section 6.4). The native Atlantic salmon of these areas south of the GOM DPS were extirpated in the 1800s (Fay *et al.*, 2006). Efforts to restore Atlantic salmon to these areas (*e.g.*, Connecticut, Merrimack, and Saco Rivers) involve stocking Atlantic salmon that were originally derived from the GOM DPS. Atlantic salmon whose freshwater range occurs outside the range of GOM DPS do not interbreed with salmon within the GOM DPS, are not considered a part of the GOM DPS, and are not protected under the ESA.

Population Status of the GOM DPS

In evaluating the status of Atlantic salmon, we considered four basic attributes that contribute to a viable population: abundance, productivity, genetic diversity, and spatial distribution. The importance of considering each of these factors is briefly described below. However, it is important to note that our ability to conduct such analyses for Atlantic salmon is often limited by the availability of sufficient data. It is also important to note that the most recent data available at the time of writing of this final rule was from 2007. We consider the U.S. Atlantic Salmon Assessment Committee (USASAC) reports to be the data of record with respect to Atlantic salmon counts. USASAC reports are generally not available until several weeks after their annual meeting in March. Thus, 2008 data are considered only preliminary at the time of writing this final rule.

Considering abundance levels of a given species is critical to evaluating extinction risks. All else being equal, small populations are at greater risk of extinction than larger populations because, generally, larger populations are better able to withstand the effects of environmental variation, genetic processes, demographic stochasticity, ecological feedback, and catastrophes (Shaffer, 1981).

Population growth rate (productivity) provides information regarding how a population is performing in the habitat it occupies. In evaluating extinction risks, we ideally measure average productivity at different life stages and estimates of variance to describe the level of uncertainty inherent in the measurements. An example of life stage-specific data could be smolt emigration estimates which represent: (a) The population’s potential to increase or (b) the population’s ability to weather periods of poor marine conditions. Measuring productivity rates over time is quite difficult and resource intensive. Therefore, simple measures such as spawner population size and replacement rates may be used to provide more rapid detection of changes in conditions affecting population growth rates.

For small populations, spatial distribution is important to reduce extinction risks from genetic risks and demographic stochasticity. A population’s spatial distribution depends on habitat quality (including accessibility), population dynamics, and dispersal characteristics of individuals in the population. Analysis of spatial distribution focuses primarily on spawning group distribution (even though spatial distribution is important at all life stages) and connectivity of populations. Since freshwater habitat is often quite heterogeneous, spawning habitat may be distributed as discrete patches. Straying is an important component contributing to spatial distribution and, typically, straying rates are higher at smaller scales (*e.g.*, occurring within subpopulations rather than between populations (Quinn, 1997)).

Genetic diversity allows species to adapt to a variety of environments that provide for the needs of the species and protects against short-term environmental change while also providing the raw genetic material necessary to survive long-term environmental change. Natural demographic and evolutionary processes (patterns of mutation, selection, drift, recombination, migration, etc.) are important to maintaining a species' genetic diversity.

The influence of hatcheries on the GOM DPS must be carefully considered in evaluating the status of the species. The influence of hatcheries can be both positive and negative; we describe these effects in some detail below in this section of this final rule. It is important, however, to first describe the general operation of conservation hatcheries in Maine.

The USFWS operates two hatcheries in support of Atlantic salmon recovery efforts in Maine. Together, Green Lake National Fish Hatchery (GLNFH) and Craig Brook National Fish Hatchery (CBNFH) raise and stock over 600,000 smolts and 3.5 million fry annually within the range of the GOM Atlantic salmon DPS. The primary focus of the conservation hatchery program for the GOM Atlantic salmon DPS is to conserve the genetic legacy of Atlantic salmon in Maine until habitats can support natural, self-sustaining populations (Bartron *et al.,* 2006). As such, a great deal of consideration is given to broodstock collection, spawning protocols, genetic screening for aquaculture escapees, and other considerations as outlined by Bartron *et al.* (2006). The current program started in 1992, when a river-specific broodstock and stocking program was implemented for rivers in Maine (Bartron *et al.,* 2006). This strategy complies with the North Atlantic Salmon Conservation Organization (NASCO) guidelines for stock rebuilding (USASAC, 2005). The stocking program was initiated for two reasons: (1) Runs were declining in every river in Maine, and numerous studies indicated that restocking efforts are more successful when the donor population comes from the river to be stocked (Moring *et al.,* 1995); and (2) the numbers of returning adult Atlantic salmon to the rivers were very low, and artificial propagation had the potential to increase the number of juvenile fish in the river through fry and other early life stage stocking.

Current practices of fry, parr, and smolt stocking as well as recovery of parr for hatchery rearing are designed to ensure that river-specific brood stock is available for future production. Atlantic salmon from the Narraguagus, Pleasant, Sheepscot, Machias, East Machias, and Dennys populations are maintained at CBNFH in East Orland, Maine. These populations are augmented by annual collections of parr from their respective natal river; this program is described in detail by Bartron *et al.* (2006). Additionally, returning adult Atlantic salmon are trapped at the Veazie Dam on the Penobscot River throughout the duration of the run, transferred to CBNFH, and held until spawning in the fall of each year. In addition, domestic adults (*i.e.,* offspring of the sea-run adults representing all sea-run spawned families) from the Penobscot River are maintained at GLNFH in the event that insufficient sea-run adults return to the Veazie trap or in the event of a fish loss at CBNFH. Adult Atlantic salmon (with the exception of the Penobscot River) are maintained in one of six river-specific broodstock rooms at CBNFH. Within each broodstock room, adults are maintained separately by capture year. Capture year is defined as the year parr were collected from a river. Each capture year may represent one to two year classes. In addition, fully captive lines, or ''pedigree lines,'' are implemented when the recovery of parr from the river environment is expected to be too low to ensure future spawning stock is available (Bartron *et al.,* 2006). Pedigree lines are established at the time of stocking, where a proportional representation of each family from a particular river-specific broodstock is retained in the hatchery while the rest of the fry are stocked into the river. If parr are recovered from the fry stocking for the pedigree lines, individuals are screened to determine origin and familial representation and are integrated into the pedigree line to maintain some component of natural selection while maintaining a broad representation of the genetic diversity observed in the broodstock.

The goals of the captive propagation program include maintenance of the unique genetic characteristics of each river-specific broodstock and maintenance of genetic diversity within each broodstock (Bartron *et al.,* 2006). Evaluation of estimates of genetic diversity within captive populations, such as average heterozygosity, relatedness, and allelic richness are monitored within the hatchery broodstocks according to the CBNFH Broodstock Management Plan (Bartron *et al.,* 2006). Estimates of allelic richness within each broodstock have thus far, revealed consistent estimates over the brief time series available (generally 1994 to 2004; Bartron *et al.,* 2007). Information from genetic monitoring is used to evaluate management practices to reduce the potential for artificially reducing overall genetic diversity. Further details of annual genetic monitoring are described by Bartron *et al.* (2007).

The current low abundance of adult returns, integration of the majority of adult returns into the hatchery for the Penobscot, and recapture of parr from the wild for broodstock makes the wild and hatchery populations interwoven. In the following sections of this final rule, we describe the four population attributes of interest (abundance, productivity, spatial structure, and genetic diversity) and attempt to apply them first to the wild population and then discuss the impact the hatchery has on that attribute. For the reasons noted above, however, it is rarely possible to completely separate the wild and hatchery population in this analysis.

Abundance

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) in Figure 7.3.1 present a comprehensive time series of adult returns to the GOM DPS dating back to 1967. It is important to note that contemporary abundance levels of Atlantic salmon within the GOM DPS are several orders of magnitude lower than historical abundance estimates. For example, Foster and Atkins (1869) estimated that roughly 100,000 adult salmon returned to the Penobscot River alone before the river was dammed, whereas contemporary estimates of abundance for the entire GOM DPS have rarely exceeded 5,000 individuals in any given year since 1967 (Fay *et al.,* 2006).

Contemporary abundance estimates are informative in considering the conservation status of the GOM DPS today. After a period of population growth in the 1970s, adult returns of salmon in the GOM DPS have been steadily declining since the early 1980s and appear to have stabilized at low levels since 2000 (Figure 1). The population growth observed in the 1970s is likely attributable to favorable marine survival and increases in hatchery capacity, particularly at GLNFH, which 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 when marine survival rates decreased, leading to the declining trend in adult abundance observed in the early 1990s.

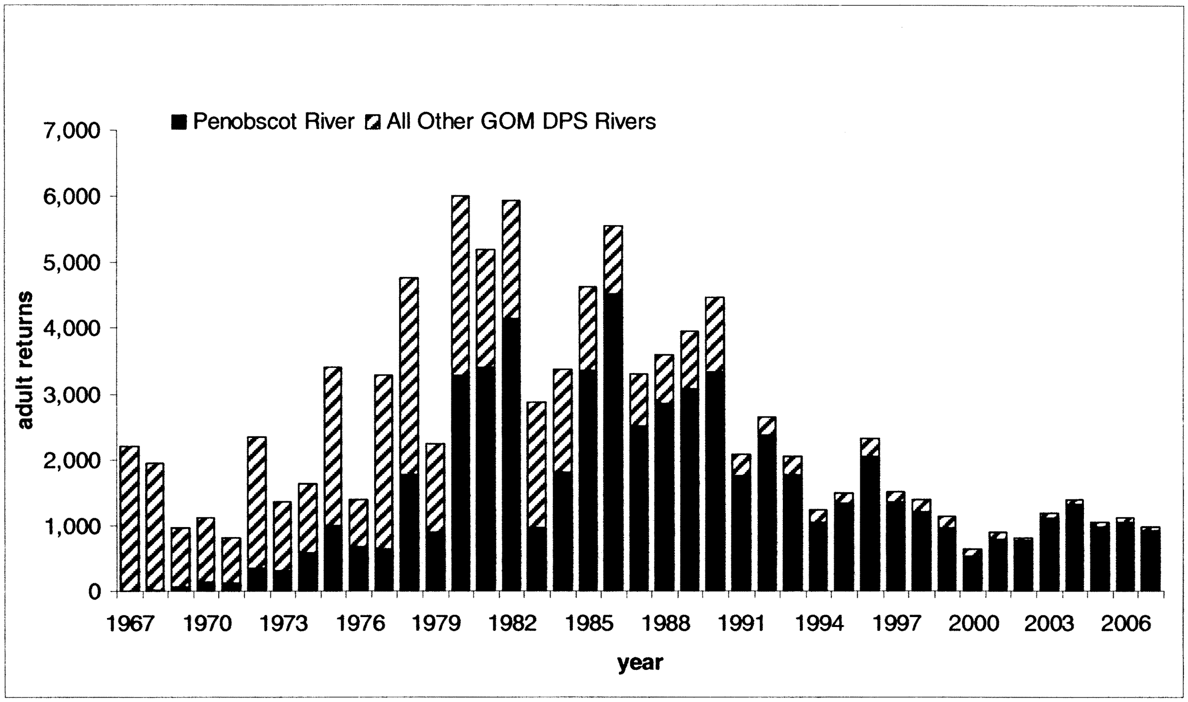

Figure 1. Total adult returns (spawners and catch) for the GOM DPS. Figure reproduced using data sets and similar methodology described by Fay et al. (2006).

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 return to a single river, the Penobscot, which accounted for 91 percent of all adult returns to the GOM DPS in 2007 (Table 2). As illustrated by Table 3, of the 925 adult returns to the Penobscot in 2007, 802 were the result of smolt stocking and only the remaining 123 were naturally-reared. The term ''naturally-reared'' includes fish originating from natural spawning and hatchery fry (USASAC, 2008). Hatchery fry are included because hatchery fry are not marked; therefore, they cannot be distinguished from fish produced from natural spawning. Because of the extensive amount of fry stocking that takes place in an effort to recover the GOM DPS, it is likely that a substantial number of fish counted as naturally-reared were actually stocked as fry. The term ''hatchery-origin'' includes those fish stocked as either parr or smolt from either CBNFH or GLNFH.

The proportion of naturally reared fish that is attributed to fry stocking cannot be determined. Preliminary adult return data for 2008 (*http://www.maine.gov/dmr/searunfish/trapcounts.html*) indicated higher returns than in previous years, but remain well below conservation spawning escapement (CSE) goals that are widely used (*e.g.*, 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 rivers in Maine, current Atlantic salmon populations (including hatchery contributions) are well below CSE levels required to sustain themselves (Fay *et al.*, 2006) (section 7.1), which is further indication of their poor population status. Furthermore, calculation of returns relative to CSE for Atlantic salmon include salmon of fry-stocked origin; because these fish are not spawned in the wild, displaying returns as a percentage of CSE overestimates the degree to which the population is achieving self-sustainability.

TABLE 2—ADULT RETURNS TO THE SMALL COASTAL RIVERS, THE PENOBSCOT RIVER, THE KENNEBEC RIVER, AND THE ANDROSCOGGIN RIVER FROM 2001 TO 2007. THESE DATA ARE SUMMARIZED FROM TABLE 3.2.1.2 AND TABLE 16 IN THE UNITED STATES ATLANTIC SALMON ASSESSMENT COMMITTEE REPORT (USASAC, 2008)

Year	Small coastal rivers	Penobscot River trap count	Kennebec River trap count [a]	Androscoggin River trap count	Total known returns
2001	103	785	....	5	893
2002	37	780	....	2	819
2003	76	1112	....	3	1191
2004	82	1323	....	11	1416
2005	71	985	....	10	1066
2006	79	1044	15	6	1144

TABLE 2—ADULT RETURNS TO THE SMALL COASTAL RIVERS, THE PENOBSCOT RIVER, THE KENNEBEC RIVER, AND THE ANDROSCOGGIN RIVER FROM 2001 TO 2007. THESE DATA ARE SUMMARIZED FROM TABLE 3.2.1.2 AND TABLE 16 IN THE UNITED STATES ATLANTIC SALMON ASSESSMENT COMMITTEE REPORT (USASAC, 2008)—Continued

Year	Small coastal rivers	Penobscot River trap count	Kennebec River trap count[a]	Androscoggin River trap count	Total known returns
2007	53	925	16	20	1014

[a] Counts not conducted on the Kennebec until 2006.

TABLE 3—ADULT RETURNS TO RIVERS WITHIN THE FRESHWATER RANGE OF THE GOM DPS BY ORIGIN IN 2007. THESE DATA ARE SUMMARIZED FROM TABLE 1 IN THE UNITED STATES ATLANTIC SALMON ASSESSMENT COMMITTEE REPORT (USASAC, 2008)

River	Hatchery-origin	Naturally-reared	Total
Androscoggin	17	3	20
Kennebec	9	7	16
Dennys	2	1	3
Narraguagus	0	11	11
Other GOM DPS	0	39	39
Penobscot	802	123	925
Total	830	184	1014

Declines in both hatchery-origin and naturally reared salmon are evident in the Penobscot River (Table 4). Declines in hatchery-origin adult returns are less sharp because of the effects of hatcheries. In short, hatchery supplementation over this time period has been relatively constant, generally fluctuating around 550,000 smolts per year (USASAC, 2008). In contrast, the number of naturally-reared smolts emigrating each year is likely to decline following poor returns of adults. 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 wild. Thus, wild smolt production would suffer 3 years after there were low adult returns, because the progeny of adult returns typically emigrate 3 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 decline of naturally reared components of the GOM DPS observed over the last 2 decades.

TABLE 4—ADULT RETURNS, BY ORIGIN (HATCHERY-ORIGIN AND NATURALLY REARED) AND AGE (1SW INDICATES THE INDIVIDUAL SPENT ONE WINTER AT SEA; 2SW INDICATES THE INDIVIDUAL SPENT TWO WINTERS AT SEA; 3SW INDICATES THE INDIVIDUAL SPENT THREE WINTERS AT SEA; AND REPEAT INDICATES THE INDIVIDUAL WAS A REPEAT SPAWNER) TO THE PENOBSCOT RIVER FROM 1996 TO 2007

Year	Hatchery-origin				Naturally reared				Total
	1sw	2sw	3sw	Repeat	1sw	2sw	3sw	Repeat	
1996	484	1,218	6	18	11	303	3	1	2,044
1997	243	934	4	14	4	153	2	1	1,355
1998	238	793	0	10	31	133	1	4	1,210
1999	223	568	0	11	49	108	0	9	968
2000	167	265	0	15	16	69	0	2	534
2001	195	466	0	3	21	98	2	0	785
2002	363	344	0	15	14	41	1	2	780
2003	196	847	1	4	6	56	0	2	1,112
2004	276	952	10	16	5	59	3	2	1,323
2005	269	678	0	8	6	22	0	2	985
2006	338	653	1	4	15	33	0	0	1,044
2007	226	575	0	1	35	88	0	0	925

The influence of CBNFH and GLNFH on abundance of the GOM DPS is positive, thus reducing short-term extinction risks to the GOM DPS. Below, we briefly describe the three mechanisms by which the conservation hatchery programs positively affect the abundance of the GOM DPS:

1. Stocking of large numbers of smolts (Penobscot beginning in 1974, Dennys beginning in 2001, and Narraguagus beginning in 2008) increases adult returns, thus reducing demographic risks (*i.e.*, extinction risks) to populations that would otherwise be smaller.

2. Stocking large numbers of smolts also reduces the risks of catastrophic loss because at least one cohort is always at sea and could be collected as broodstock in case of a catastrophic event in freshwater (*e.g.*, a large contaminant spill) or in a hatchery (*e.g.*, disease outbreak).

3. Rivers without large scale fry stocking efforts have even fewer adult returns than those rivers with large scale stocking efforts. Further, rivers that lack significant hatchery contributions (fry stocking) have not experienced stable

levels of adult returns since the decline in marine survival in the early 1990s. For example, redd counts in the Ducktrap River (a river which is not stocked) have been steadily declining since the 1990s to a point where no redds were found in the Ducktrap River in 2007, a year with favorable conditions for redd counting and over 90 percent of spawning habitat surveyed (USASAC, 2008).

As illustrated by the above data, the abundance of Atlantic salmon in the GOM DPS is low and either stable or declining. The proportion of fish that are of natural origin is very small (approximately 10 percent) and is continuing to decline. The conservation hatchery has assisted in slowing the decline and helped 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.

Productivity

The historic productivity of the GOM DPS is unknown. Over long time frames, it is expected that productivity fluctuated widely according to a diverse range of biotic factors such as food availability and abiotic factors such as temperature regime and sea level.

Contemporary productivity rates for the GOM DPS can be inferred from replacement rates. In short, populations with a replacement rate of 1.0 or higher are stable or increasing while populations with a replacement rate less than 1.0 are declining. The USASAC has estimated the replacement rate for the GOM DPS (as listed in 2000) over the last several years. Replacement rate for the GOM DPS (as listed in 2000) had been below 1.0 for several generations until 2007, when replacement rate for the 2002 spawning cohort was 1.47. This translates to on average, every adult returning in 2002 replacing itself with 1.47 adults in 2007. While this increase is promising, it only represents 1 year; thus, it is premature to conclude that this is indicative of an increasing trend.

Replacement rate is a fairly imprecise measurement of productivity for several reasons. First, tracking adult to adult return rates of naturally reared fish necessarily includes those fish that result from stocking. Thus, it is not true replacement of fish in the wild because each river with substantial returns of adults is stocked with fry, or smolts as in the case of the Penobscot, Narraguagus, and Dennys Rivers. This situation results in an overestimation of productivity (because it does not account for the contribution that stocking makes to adult returns) and also emphasizes the importance of hatcheries to the security of the GOM DPS. Without stocking of hatchery fry and smolts, adult returns would presumably be lower and would result in even lower replacement rates.

The influence of hatcheries on productivity is not known with certainty, but overall productivity (even with hatchery supplementation) is quite low. The first goal of the captive broodstock program is to facilitate the recovery of the natural populations and minimize the risk of further decline or loss of individual populations (Bartron *et al.*, 2006). Over time, more adult returns should successfully spawn in the wild and result in replacement rates above 1.0. However, insufficient data exist to determine whether adult returns from hatchery contributions result in more spawners and ultimately more truly wild-origin adult returns. The National Research Council (NRC, 2004) and the Sustainable Ecosystems Institute (SEI, 2007) identified this as a key limitation in available data on the recovery efforts for salmon in Maine. Without this information, it is impossible to estimate, with any certainty, the effect of hatcheries on this key population attribute (productivity). Overall, however, replacement rates less than 1.0 (as has been the case most years since the early 1990s) are indicative of low productivity.

As illustrated by the above, productivity of the GOM DPS is low and has not consistently had a replacement rate above 1.0 such that population growth would be expected. There is no current evidence that hatcheries have increased or will increase productivity in the wild.

Spatial Distribution

The historic distribution of Atlantic salmon in Maine has been described extensively by Baum (1997) and Beland (1984), among others. In short, substantial populations of Atlantic salmon existed in nearly every river that was large enough to maintain a spawning population. The upstream extent of anadromy extended far into the headwaters of even the largest rivers. For example, Atlantic salmon were found throughout the West Branch of the Penobscot River as far as Penobscot Brook, a distance over 350 river km inland (Atkins, 1870). In the Kennebec River, Atlantic salmon ranged as far inland as the Kennebec River Gorge and Grand Falls on the Dead River, 235 km inland (Foster and Atkins, 1867; Atkins, 1887).

Today, the spatial structure of Atlantic salmon is limited by obstructions to passage and also by low abundance levels. Fish passage obstructions caused the decline of many salmon populations (Moring, 2005). Within the range of the GOM DPS, the Kennebec, Androscoggin, Union, and Penobscot Rivers contain dams that severely limit passage of salmon to significant amounts of spawning and rearing habitat.

In addition, the low abundance of salmon within the range of the GOM DPS serves to concurrently limit spatial distribution through two mechanisms: (1) Lack of sufficient source populations, and (2) hatchery limitations. First, in properly functioning salmon populations, some areas have relatively abundant salmon populations such that they may serve as ''source'' populations. Fish from source populations may seek out areas with fewer or no competitors. This is an important dispersal mechanism for all anadromous salmonids. Over evolutionary timescales, this process led to the colonization of nearly every river in Maine by Atlantic salmon. Because the abundance of salmon is so low today, this dispersal mechanism is likely not operating and will likely not operate until trends in productivity and abundance are reversed. Second, spatial distribution is limited today by hatchery capacity. The Penobscot River alone would require 12.5 million fry in order to properly seed all presently accessible rearing habitat (Trial, 2006), while GLNFH and CBNFH can only produce roughly 3.5 million fry annually (Barton *et al.*, 2006). Thus, hundreds of thousands of otherwise suitable habitat units are currently unoccupied (NMFS, 2008). The Sheepscot, Narraguagus, Dennys, Machias, East Machias, and Pleasant Rivers are usually stocked with as many fry as are needed to properly seed the habitat, although no stocking occurs within a 50-meter buffer around areas known to have spawning activity the previous year in order to reduce competition between potentially wild and hatchery fry (described in detail by Trial, 2006). Hatchery space for the Penobscot population is limited by hatchery capacity, such that only 2.5 million fry are typically allocated and stocked into the Penobscot River annually. Other rivers within the freshwater range of the GOM DPS have been stocked to a very limited degree in some years, usually with Penobscot-origin fry (see section 5 of Fay *et al.*, 2006, for a detailed review).

The influence of hatcheries on spatial structure of the GOM DPS is positive. Without hatchery contributions, fewer juveniles would inhabit the rivers of Maine. In section 7.2., Fay *et al.* (2006)

examined recent MDMR electrofishing data, which demonstrated that rivers with large scale stocking efforts have much higher juvenile densities compared to those rivers without large scale stocking efforts. The hatchery, therefore, has allowed for maintenance of the current spatial structure of the GOM DPS. Without the hatcheries, there likely would have been a greater reduction in spatial distribution. In summary, spatial distribution of the GOM DPS is positively influenced by the Atlantic salmon conservation hatchery supplementation program in the following ways:

1. The use of captive broodstock from seven separate populations reduces the risks of random environmental and demographic events;
2. Stocking maintains the spatial distribution of the GOM DPS;
3. Stocking has been used to repopulate unoccupied areas, when determined to be an appropriate management action.

As illustrated above, the spatial distribution of the GOM DPS has been significantly reduced from historic levels and is currently limited by low abundance of Atlantic salmon. However, we conclude that spatial distribution would have experienced even greater reductions without the influence of hatcheries.

Genetic Diversity

In general, large populations have higher levels of genetic diversity than small populations. As population sizes decrease, and the potential for mating related individuals increases, the threat of inbreeding in a population also increases. Inbreeding has been documented to decrease overall fitness of a population (Spielman *et al.*, 2004; Lynch and O'Hely, 2001), reducing the long-term population viability. Thus, maintaining sufficient levels of genetic variability and structure is of utmost importance to endangered and threatened species.

Historical salmon populations within the range of the GOM DPS were several orders of magnitude higher than they are today and occupied a greater diversity of habitats. As such, genetic diversity levels of the GOM DPS are likely to have been higher historically as well. Lage and Kornfield (2006) demonstrated significant reductions in diversity and effective population size in the Dennys River from 1963 to 2001. This raises concern that diversity levels today are lower than historical levels.

However, results from genetic surveys conducted by the USFWS suggest that, overall, the GOM DPS is not currently suffering significant negative effects due to inbreeding. Estimates of genetic diversity (*e.g.*, average heterozygosity, relatedness coefficients, and allelic diversity and frequency) within captive populations are evaluated within the hatchery broodstocks according to the CBNFH Broodstock Management Plan (Bartron *et al.*, 2006). Broodstock management is evaluated annually and is revised as needed to minimize the potential for inbreeding and maintain genetic diversity (Bartron *et al.*, 2006).

The effects of hatcheries on genetic diversity of the GOM DPS are both positive and negative; however, the positive effects outweigh the negative effects at this time. Below, we describe the positive and negative effects of hatcheries on diversity levels of the GOM DPS. Genetic diversity of the GOM DPS is positively influenced by the Atlantic salmon conservation hatchery supplementation program in the following ways:

1. A rigorous genetic screening program reduces the risks of outbreeding depression that may otherwise result from aquaculture escapees or their progeny being integrated into the hatchery program;
2. The effective use of spawning protocols preserves genetic variation inherent in each of the genetically unique river populations maintained at CBNFH, ensures the long-term maintenance of genetic variation, and minimizes the potential for inbreeding or domestication selection and associated reductions in fitness in the wild;
3. The use of pedigree lines for those populations most at risk reduces the chance of catastrophic loss of an entire population;
4. Stocking of juveniles into rivers significantly reduces the risks of catastrophic loss at CBNFH. That is, if a catastrophic loss of one or more captive broodstock lines occurred at CBNFH, a component of the genetic variability lost could be recovered by collecting parr for broodstock.

There are significant risks associated with the current reliance on hatcheries for the persistence of the GOM DPS. As mentioned previously, these risks include artificial selection, inbreeding depression, and outbreeding depression.

Over the long term, artificial selection for the hatchery environment is considered a threat to survival. If parr are not recovered in numbers sufficient for broodstock and spawning requirements, it becomes necessary to establish pedigree lines, which means that natural selection from fry to parr stage may no longer be incorporated into the life cycle (details of pedigree line management are in Fay *et al.*, 2006, and Bartron *et al.*, 2006). Establishment of pedigree lines is only resorted to in instances when one of the following criteria is met:

1. The number of broodstock for a particular population is low (less than collection target);
2. There is a threat of few or no hatchery or wild spawned parr being recovered; or
3. Loss of family variation through general parr collection practices is projected to cause appreciable losses in local population diversity in the near future.

In recent years, pedigree lines have been established for broodstock from the Pleasant River (due to insufficient parr collection) and the Dennys River (due to a large aquaculture escape event). Over time, this process could result in a population that is well adapted to the artificial environment and poorly adapted to the natural environment; this form of artificial selection is widely known as domestication selection (Hey *et al.*, 2005).

Both inbreeding depression and outbreeding depression are widely accepted as potential risks in artificial propagation programs. As population sizes decrease, and the potential for mating related individuals increases, the threat of inbreeding in a population also increases. Inbreeding may also decrease overall fitness of a population (Spielman *et al.*, 2004; Lynch and O'Hely, 2001), reducing the long-term population viability and, therefore, inhibiting the success of restoration and recovery efforts. Of similar concern is the threat of outbreeding depression and decreased fitness resulting from the mating of individuals from populations with significantly different genetic composition.

Over time, these risks will increase and more negative effects may appear. At this time, however, results from USFWS genetic screening programs suggest that domestication, inbreeding depression, and outbreeding depression do not appear to be negatively impacting the GOM DPS.

Summary

In summary, all available metrics of abundance, productivity, spatial distribution, and genetic diversity are cause for concern for the GOM Atlantic salmon DPS. Contemporary abundance estimates of adult spawners are several orders of magnitude lower than historical abundance. Estimates of productivity are well below those required to sustain a viable population over the long term. The spatial distribution of the GOM DPS has been severely reduced relative to historical distribution patterns. Genetic diversity levels, though apparently stable, are likely much lower than they were historically (Lage and Kornfield, 2006) and lower than more abundant populations in Canada (Spidle *et al.*, 2003). Finally, while conservation hatcheries positively influence several of these metrics, they have not yet been able to reverse the observed declines in wild adult spawners. In the following sections of this final rule, we use this information combined with recent population viability analyses to analyze the current conservation status of the GOM DPS.

Population Viability Analyses

Statistical methods can be used to quantitatively estimate population growth, and more importantly, extinction probabilities for a species. The simplest type of model to perform this can be referred to as a simple Population Viability Analysis (PVA). A simple PVA quantitatively estimates population growth and extinction probabilities for a single population (Dennis *et al.,* 1991). A simple PVA is a stochastic exponential growth model of population size. These types of models are best used with census data where the sampling variability is small compared to the population or environmental variability (Dennis *et al.,* 1991).

More complex versions of PVAs have been developed where life history characteristics, such as the age distribution within abundance measures, are accounted for within the model. In addition, a modified approach has been developed where different life history processes are compartmentalized within the model allowing for the incorporation of such things as juvenile survival rates, adult survival rates, habitat limitations/degradation, age-specific fecundity, or migration rates (Brook *et al.,* 1999; Marmontel, 1997; Ratner *et al.,* 1997; Zhang and Wang, 1999). Other complex PVAs have been developed to help managers decide between competing management regimes, whereby population growth (or conversely extinction probability) can be predicted based on changes to survival at one or more life stages. Thus, PVA models can vary widely in complexity.

Some general caveats are associated with the use and interpretation of PVAs. It is particularly important to recognize that PVAs are merely projections about what might happen in the future based on the data used to compile the model and assumptions made to address uncertainties (Ralls *et al.,* 2002; Legault, 2005). Because PVAs do not account for all potential sources of future environmental variation and because of the uncertainty inherent in predicting future conditions, especially over longer timeframes, we use PVA results cautiously and consider them as just one of the pieces of information we evaluate in determining a species' conservation status.

For the purpose of considering the risks of extinction for Atlantic salmon, we have two PVAs to consider: the simple PVA conducted by Fay *et al.* (2006), and the SalmonPVA (Legault, 2004; Legault, 2005). Both are instructive in considering the relative extinction risks to the GOM DPS. They also help clarify the importance of marine survival and hatchery supplementation in considering extinction risks. It is important to note that the Services look at estimates of how extinction probability changes over multiple timeframes and not at only a single estimate of the extinction probability for a single time period. This is consistent with the cautions noted by Fay *et al.* (2006) and Legault (2005).

Fay *et al.* (2006) used a simple PVA to assess the extinction risk to the GOM DPS as defined in this final rule. This PVA examined a number of different scenarios and provided a wide range of alternative outputs. In particular, it included three different endpoints: 1 individual, 50 individuals, and 100 individuals. An endpoint greater than zero, referred to as a quasi-extinction threshold or QET, reflects the point at which the population is considered to be functionally extinct, that is, non-recoverable due to loss of fitness of individuals, inability of individuals to carry out essential population functions, or other problems. Compared with use of an extinction threshold of zero, use of a QET would produce a higher probability of extinction over the same time period or the same probability of extinction over a shorter time period. An extinction threshold of one individual, which recognizes that there is no longer a population to model, is not typically referred to as a QET; compared to a threshold of zero individuals, it will not materially affect a model's results. Although a model's results using different extinction thresholds are not directly comparable, they do provide useful information about the condition of the population over time.

Fay *et al.* (2006) presented a range of estimated extinction risks for a variety of time horizons (0 to 100 years, with 20-year intervals). This analysis used adult return data from two time series (1980–2004 and 1991–2004) to estimate population growth and extinction probabilities for the GOM DPS. The two time series were separated because of the regime shift in marine survival observed for Atlantic salmon throughout the North Atlantic that began in 1991 (ICES, 2005). This regime shift represents a change in productivity and marine survival of Atlantic salmon in the Northwest Atlantic that has persisted to date. In short, projections for the time period 1980 to 2004 are more ''optimistic'' because those data include roughly 10 years of higher marine survival; projections for the time period 1991 to 2004 are more ''pessimistic'' because they only include observations during the recent period of lower marine survival. Using this method, Fay *et al.* (2006) provided a wide range of extinction risks, but all scenarios considered clearly trended toward extinction. Comparing the two time series clearly shows the importance of marine survival; extinction risks are more severe for the 1991 to 2004 time series (Figure 3) compared to the 1980 to 2004 time series (Figure 2).

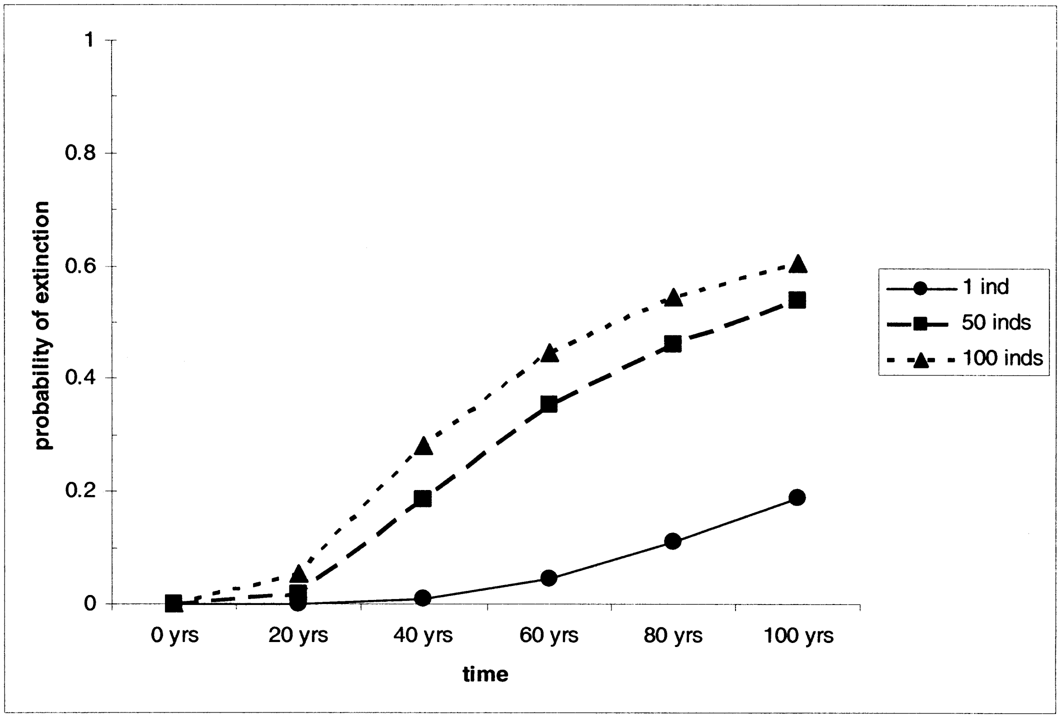

Figure 2. Estimated extinction risks based on the 1980-2004 dataset for the GOM DPS. Quasi-extinction thresholds of 1, 50, and 100 individuals were calculated at 20-year intervals (Fay et al., 2006).

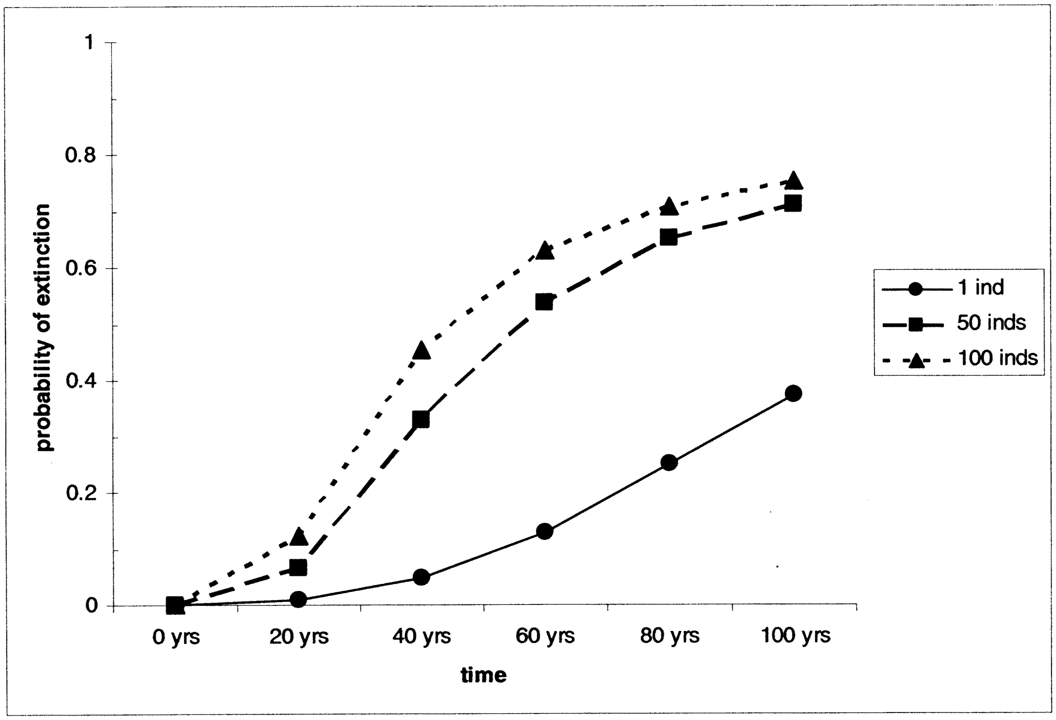

Figure 3. Estimated extinction risks based on the 1991-2004 dataset for the GOM DPS. Quasi-extinction thresholds of 1, 50, and 100 individuals were calculated at 20-year intervals (Fay et al., 2006).

The results of the Fay *et al.* (2006) PVA are based solely on the dynamics of the population during the timeframes examined (1980 to 2004) and are dependent on the following assumptions: (1) Hatchery supplementation continues into the future for up to 100 years at current levels with similar survival rates, and (2) similar threats to the species remain operative into the future (*i.e.*, environmental conditions remain unchanged). The Fay *et al.* (2006) PVA does not include the risk of disruptions to hatchery operations (*e.g.*, due to disease outbreak) or the risk of genetic effects (such as inbreeding and domestication selection described above) of hatchery supplementation.

The SalmonPVA (Legault, 2004) was developed for the GOM DPS of Atlantic salmon as listed in 2000 and does not include the Penobscot population. Given that smaller initial population sizes exacerbate the extinction process (Holmes, 2001), the probability of extinction for any given time period for the GOM DPS as defined in this final rule, which includes the Penobscot population, might be lower than the estimates produced by the model for the GOM DPS as listed in 2000. However, the Penobscot population is also in decline and subject to many of the same, as well as additional, environmental stressors. Thus, the model results are still generally instructive for this analysis. The SalmonPVA model was developed to aid in the formation of delisting criteria for the GOM DPS as listed in 2000 and to assess the efficacy of different management strategies towards this delisting goal.

The SalmonPVA (Legault, 2004, 2005) incorporates all salmon life stages, different survival rates for each stage, four different marine survival scenarios, freshwater habitat capacity, harvest, straying rates, and hatchery stocking as inputs into the model. Extinction in the SalmonPVA was defined as no fish alive at any life stage; this model, unlike the Fay *et al.* (2006) PVA, does not use QETs (*i.e.*, it does not identify an earlier point in decline at which the population would become functionally extinct).

The SalmonPVA (Legault, 2004, 2005) demonstrates that current levels of hatchery supplementation may reduce extinction risk to the GOM DPS as listed in 2000 depending on the rate of marine survival. In simulations where current low marine survival estimates increased to the mean of the last 30 years, the SalmonPVA estimated that the extinction risk in the next 100 years (for the GOM DPS as listed in 2000) was approximately 1 percent in simulations where hatchery supplementation continued for 50 years, 72 percent if continued hatchery supplementation was reduced from 50 years to 30 years, and near 100 percent if hatchery supplementation ceased in 10 years. Furthermore, in simulations using a constant low marine survival scenario representing the current environment, there was a 100 percent chance of extinction within 100 years regardless of the number of years of stocking, and extinction occurred within 20 years of the last stocking event.

Like the results of the Fay *et al.* (2006) PVA, the results of the SalmonPVA (Legault 2004, 2005) are dependent on assumptions about future conditions remaining the same. These assumptions include the level of hatchery supplementation (*i.e.*, number of fish stocked), freshwater survival, freshwater carrying capacity, and straying rates of adult fish among rivers. Also like the Fay *et al.* (2006) PVA, the SalmonPVA (Legault 2004, 2005) does not include the risk of disruptions to hatchery operations (*e.g.*, due to disease outbreak) or the genetic risks (such as inbreeding and domestication selection described above) of hatchery supplementation. It is expected that extinction would proceed much faster than indicated by the model's simulation results if and when these effects become operative in the GOM DPS. The SalmonPVA does include scenarios where hatchery operations cease (without attributing that to a cause which could be lack of funding, disease outbreak or evidence of significant genetic risks), and those scenarios illustrate that declines rapidly follow the elimination of the hatchery.

Both the Fay *et al.* (2006) and Legault (2004, 2005) PVAs assumed that hatchery supplementation would continue at its present level even when there were 100 or fewer returning adults in the Penobscot. However, hatchery supplementation (in particular, smolt stocking) could not continue at the same level in the future if returning adults fell below 150 because that is the number of adults necessary to make full use of the current conservation hatchery capacity for the smolt stocking program that currently sustains the Penobscot population (section 5.2.1 of Fay *et al.*, 2006). Smolt stocking increases the number of returning adults, so if the full number of smolts could not be produced and stocked, there would be fewer adults returning which would result in an even smaller population. Adult returns to the Penobscot constitute a substantial proportion of the total returns to the GOM DPS (Table 2).

Additional problems would arise if there were 150 or fewer adult returns to the Penobscot. If there were only 150 adult returns, it is likely all of their production would be used for smolt production (M. Bartron, USFWS, pers. comm., 2009). Fry production for the Penobscot would have to come from domestic broodstocks. If the domestic broodstocks (at GLNFH and other sources) were not able to be sustained because all the adult production was being used for smolt production, then there would be no fry production for the Penobscot. If the total production from 150 fish were used to produce smolts, and not to replenish domestic broodstocks, then those backup broodstocks for the Penobscot would no longer exist (M. Bartron, USFWS, pers. comm., 2009). Fry production in the other rivers (those maintained at CBNFH) would continue.

If there were 150 or fewer adults in the Penobscot, or if smolt stocking and fry stocking was curtailed, there would be an increased risk of genetic problems because the rate of loss of genetic diversity (and the potential for inbreeding) is inversely proportional to the effective population size (number of individuals reproducing). As the number of individuals reproducing decreases, the rate of loss of genetic diversity increases, as does the potential for inbreeding. The potential for loss of genetic diversity further increases when populations remain low for extended periods of time. A faster population decline and genetic impacts would increase the probability of extinction beyond the predictions of the two PVAs.

In addition to providing estimates of extinction probability, the Fay *et al.* (2006) and Legault (2004, 2005) PVAs also provide useful projections regarding the condition of the population over time. For example, the results of the Legault (2004, 2005) PVA demonstrate that, while the estimated extinction probability may be low under certain scenarios of long-term hatchery supplementation and improved marine survival, the population can continue to decline to extinction. For the model scenario producing an extinction probability estimate of 1 percent in 100 years if marine survival increased to the 30-year average and hatchery supplementation continued for 50 years, the replacement rate was still less than 1, indicating the simulated GOM DPS was still in decline. Also under this scenario, the model predicted that three of the eight river populations would be extirpated.

In summary, PVA results must be interpreted carefully. The two PVAs considered here do not include risks associated with other sources of environmental variation (*e.g.*, aquaculture escapement and disease outbreak in the wild) identified in the Summary of Factors Affecting the Species section. Because these PVAs do not account for all potential sources of future environmental variation, and because of the uncertainty inherent in predicting future conditions, especially over longer timeframes, we do not consider the numerical estimates of extinction probabilities in the PVA of Fay *et al.* (2006) and the SalmonPVA (Legault 2004, 2005) to be the actual extinction probabilities of the newly defined GOM DPS.

We have no information to indicate that marine survival will significantly improve. We find that, based on the available trend information, it is most reasonable to assume that marine survival will continue at approximately its current low level. Therefore, we conclude that the results of the Fay *et al.* (2006) PVA and the Legault (2004, 2005) PVA that are based on marine survival values above the current low level are unrealistic.

Also, based on information on diseases (see Factor C in the Factors Affecting the Species section of this final rule), or concerns such as catastrophic loss to water supply or feed contamination (P. Santavy, USFWS, pers. comm., January 23, 2009), there is a risk of disruptions to hatchery operations. Based on the information on long-term hatchery operations (NRC, 2004; Fay *et al.*, 2006, at section 8.5.1; SEI, 2007), there is a risk of genetic problems from hatchery supplementation. At present, these risks are not quantifiable, and are therefore not accounted for in either PVA. However, we find that these risks are substantial in the long term because of the dependence on the conservation hatchery program.

Because the models do not include the risk of disruptions to hatchery operations, the risk of genetic effects of hatchery supplementation, and risks associated with other sources of environmental variation, we conclude that all of the results of the Fay *et al.* (2006) PVA and the Legault (2004, 2005) PVA may considerably underestimate the probability of extinction. Nevertheless, the Fay *et al.* (2006) PVA and the Legault (2004, 2005) SalmonPVA do tell us much about certain factors affecting the status of the GOM DPS as defined in this rule, especially the significance of hatchery supplementation and marine survival, and we use this information to provide important context for evaluating threats in the following sections of this rule.

Previous Federal Actions

In 1991, the FWS designated Atlantic salmon in five rivers in Downeast Maine (the Narraguagus, Pleasant, Machias, East Machias, and Dennys Rivers) as Category 2 candidate species under the ESA (56 FR 58804; November 21, 1991). Both Services received identical petitions in October and November of 1993 to list the Atlantic salmon (*Salmo salar*) throughout its historic range in the contiguous United States under the ESA. On January 20, 1994, the Services found that the petition presented substantial scientific information indicating that the petitioned action may be warranted (59 FR 3067).

The Services conducted a joint review of the species in January 1995, and found that the available biological information indicated that the species described in the petition, Atlantic salmon throughout its range in the United States, did not meet the definition of ''species'' under the ESA. Therefore, the Services concluded that the petitioned action to list Atlantic salmon throughout its historical United States range was not warranted (60 FR 14410; March 17, 1995). In the same notice, the Services determined that a DPS consisting of populations in seven rivers (the Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot Rivers) did warrant listing under the ESA. On September 29, 1995, after reviewing the information in the status review, as well as state and foreign efforts to protect the species, the Services proposed to list the seven rivers DPS as a threatened species under the ESA (60 FR 50530; September 29, 1995). The proposed rule contained a special rule under section 4(d) of the ESA which would have allowed for a State plan, approved by the Services, to define the manner in which certain activities could be conducted without violating the ESA. In response to that special provision in the proposed rule, the Governor of Maine convened a task force that developed a Conservation Plan for Atlantic Salmon in the seven rivers. That Conservation Plan was submitted to the Services in March 1997.

The Services reviewed information submitted from the public, current information on population levels, and assessed the adequacy of the Maine Atlantic Salmon Conservation Plan, and, on December 18, 1997, withdrew the proposed rule to list the seven rivers DPS of Atlantic salmon as threatened under the ESA (62 FR 66325). In that withdrawal notice, the Services redefined the species under analysis as the GOM DPS to acknowledge the possibility that other populations of Atlantic salmon could be added to the DPS if they were found to be naturally reproducing and to have wild stock characteristics. NMFS maintained the GOM DPS as a candidate species to acknowledge ongoing concern over the species' status. In the 1997 withdrawal notice, the Services outlined three circumstances under which the process for listing the GOM DPS of Atlantic salmon under the ESA would be reinitiated: (1) An emergency which poses a significant risk to the well-being of the GOM DPS is identified and not immediately and adequately addressed; (2) the biological status of the GOM DPS is such that the DPS is in danger of extinction throughout all or a significant portion of its range; or (3) the biological status of the GOM DPS is such that the DPS is likely to become endangered in the foreseeable future throughout all or a significant portion of its range.

The Services received the State of Maine 1998 Annual Progress Report on implementation of the Conservation Plan in January 1999. On January 20, 1999, the Services invited comment from the public on the first annual report and other information on protective measures and the status of the species. The comment period remained open until March 8, 1999 (64 FR 3067). The Services reviewed all comments submitted by the public and provided a summary of those, along with their own comments, to the State of Maine in March 1999. The State of Maine responded to the Services' comments on April 13, 1999.

In order to conduct a comprehensive review of the protective measures in place and the status of the species, as was committed to in the 1997 withdrawal notice, the BRT was reconvened to update the January 1995 Status Review for Atlantic salmon. The 1999 Status Review was made available on October 19, 1999 (64 FR 56297). On November 17, 1999, the Services published a proposed rule to list as endangered the GOM Atlantic salmon DPS, which was defined to include all naturally reproducing remnant populations of Atlantic salmon from the Kennebec River downstream of the former Edwards Dam site northward to the mouth of the St. Croix River at the United States-Canada border. At that time, the Services stated that, to date, they had determined that these populations were found in the Dennys, East Machias, Machias, Pleasant, Narraguagus, Sheepscot, and Ducktrap Rivers and in Cove Brook, all in eastern Maine. On November 17, 2000 (65 FR 69459), the Services published a final rule listing the GOM Atlantic salmon

DPS as endangered. In that final rule, we noted that a determination as to the appropriateness of adding the mainstem and upper tributaries of the Penobscot River to the DPS would be made upon completion of genetic analyses.

The 2006 Status Review for Anadromous Atlantic Salmon (*Salmo salar*) in the United States (Fay *et al.*, 2006) assessed genetic and life history information and concluded that the GOM DPS as defined in 2000 should be redefined to encompass the Penobscot, Kennebec, and Androscoggin Rivers.

We received a petition to list the ''Kennebec River population of anadromous Atlantic salmon'' as an endangered species under the ESA on May 11, 2005. NMFS published a notice in the **Federal Register** on November 14, 2006 (71 FR 66298), concluding that the petitioners (Timothy Watts, Douglas Watts, the Friends of Merrymeeting Bay, and the Maine Toxics Action Coalition) presented substantial scientific information indicating that the petitioned action may be warranted.

On September 3, 2008 (73 FR 51415), we proposed to revise the extent of the GOM DPS and list the DPS as endangered; we also announced our 12-month finding that listing was warranted for the petition to list Atlantic salmon in the Kennebec River as endangered. On September 5, 2008 (73 FR 51747), NMFS proposed to designate critical habitat for the revised GOM DPS of Atlantic salmon.

The Services jointly administer the ESA as it applies to anadromous Atlantic salmon. In 2006, the USFWS Region 5 and NMFS Northeast Region entered into a Statement of Cooperation to divide responsibility for ESA implementation with respect to Atlantic salmon in order to enhance efficiency and effectiveness. Experience implementing this agreement, changes in structure of the recovery program, and anticipated increases in workload associated with this listing action caused the Services to revisit the 2006 agreement. A new Statement of Cooperation has been signed which clarifies roles and responsibilities between the Services. The Statement of Cooperation assigns the following responsibilities to NMFS: critical habitat designation; section 7 consultations (for both the species and critical habitat) on activities within estuaries and marine waters; ESA activities and actions to address dams; assessment activities in the estuary and marine environment; and international science and management. The Statement of Cooperation assigns the following responsibilities to USFWS: Administrative lead for development of a new recovery plan; section 10 recovery permits; section 10 habitat conservation plans (for all activities except dams); section 7 consultations (for both the species and critical habitat) on activities in freshwater (except dams); and the conservation hatchery program.

Summary of Comments

With the publication of the proposed listing determination for the GOM DPS on September 3, 2008, we announced a 90-day public comment period extending through December 2, 2008. We held two public hearings at two different locations to provide additional opportunities and formats to receive public input as announced on October 21, 2008 (73 FR 62459). A joint NMFS/FWS policy requires us to solicit independent expert review from at least three qualified specialists, concurrent with the public comment period (59 FR 34270; July 1, 1994). In December 2004, the Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review establishing minimum peer review standards, a transparent process for public disclosure, and opportunities for public input. The OMB Peer Review Bulletin, implemented under the Information Quality Act (Pub. L. 106–554), is intended to provide public oversight on the quality of agency information, analyses, and regulatory activities, and applies to information disseminated on or after June 16, 2005. We solicited technical review of the proposed listing determination from four independent experts, and received reviews from two of these experts. The independent expert review under the joint NMFS/FWS peer review policy collectively satisfies the requirements of the OMB Peer Review Bulletin and the joint NMFS/FWS peer review policy.

Comments were submitted from interested individuals; state, Federal and tribal agencies; fishing groups; environmental organizations; industry groups; and peer reviewers with scientific expertise. The summary of comments and our responses below are organized into seven general categories: (1) Tribal comments (2) peer review comments; (3) comments on the delineation of the GOM DPS; (4) comments on the conservation status of the GOM DPS; (5) comments on the Services' identification and consideration of specific threats; (6) comments on the consideration of conservation efforts in general as well as in relation to the conservation status of the GOM DPS; and (7) comments on the Federal management of the GOM DPS.

During the public comment period, the Services met with a number of groups to address specific concerns and questions on the proposed listing decision. The hydropower industry, agriculture industry, and various state agencies were among the groups with which the Services met. These discussions focused on clarification of information in the proposed rule and the potential implications of the listing decision on Atlantic salmon management and the ongoing operations of industry. These meetings were not held to solicit or receive comments on the proposed rule, but rather to provide clarification. Meeting participants were instructed to submit comments on the proposed rule through the regular means, and those are identified and addressed in the comments section of this rule. The Services also met with representatives from some of the Maine Tribes, including the Penobscot Indian Nation, The Houlton Band of Maliseets, the Aroostook Band of Micmacs, and the Passamaquoddy Tribe. The Services appreciate the importance of our Federal trust responsibilities and the spirit of government-to-government consultation embodied in Secretarial Order 3206 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act) and Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments). The focus of the government-to-government consultation was on the implications of the listing decision on Atlantic salmon management and exploring options to further enhance our cooperation on Atlantic salmon recovery.

Tribal Comments

Comment 1: The Penobscot Indian Nation commented that it maintains its right to directly take Atlantic salmon for sustenance purposes. Penobscot Indian Nation members have not lethally taken an Atlantic salmon since 1988 at which time two Atlantic salmon were harvested for ceremonial purposes. The Penobscot Indian Nation has not exercised its right to take any Atlantic salmon for traditional purposes since that time based upon concerns about the health of the Penobscot Atlantic salmon population. The Penobscot Indian Nation stated that it will continue to abstain from taking any Atlantic salmon until the status of the Penobscot population is healthy enough to be able to sustain some level of harvest.

Response: The Services appreciate the importance of Atlantic salmon to the Penobscot Indian Nation in particular as well as other Maine Tribes. The Services recognize both the Penobscot Indian

Nation's tribal rights and the Services' responsibility to implement the ESA. Given that Penobscot Indian Nation has not exercised its right to take Atlantic salmon since 1988 on a voluntary basis, the Services believe that there is no conflict provided the Penobscot Indian Nation continues to voluntarily abstain from taking based upon continued concerns about the conservation status of the Penobscot population.

Comment 2: The Penobscot Indian Nation commented that it would not take any position on whether the species should be listed as threatened or endangered. The Penobscot Indian Nation defers to the Services' expertise to make that determination.

Response: The Services have provided justification for the listing decision in this final rule.

Peer Review Comments

Comment 3: Both reviewers agreed with the delineation of the GOM DPS of Atlantic salmon. However, both reviewers felt there were parts of the text that could be further clarified, specifically consideration of available genetic data for the northern and southern boundaries in relation to the zoogeographic information used.

Response: The Services received comments from both peer reviewers and the general public regarding necessary clarification of the data used to support the southern boundary delineation in particular. The Services have clarified the text in the DPS delineation section of this final rule.

Comment 4: One of the peer reviewers stated that the discussion of the population PVA was perhaps overemphasized and could be simplified while still communicating extinction risk. The reviewer notes that there are simpler deterministic equilibrium models that could have been used to more simply state extinction risk.

Response: The Services have clarified the text of the rule addressing PVAs and the projections. The Services acknowledge that there are a number of different types of models that could have been used to project extinction risk or demonstrate the conservation status of the species. The Services chose the PVA models because they are useful in assessing extinction risks. Further, the Atlantic salmon conservation and management community in Maine are more familiar with them than with other models, given the public's previous exposure to them during the recovery planning process and the development of the 2006 Status Review. We agree with the peer reviewer that the PVA is just one piece of information considered in the listing determination; in the text of this final rule, we have clarified our findings with respect to the PVAs and how they factor into the biological status of the species.

Comment 5: Both reviewers noted that the proposed rule lacked necessary description for how threats were categorized as either primary or secondary threats. Neither felt that this was an incorrect way to communicate the magnitude of the threat; rather, the basis for this determination should be better explained and supported in the text.

Response: The Services agree that the description of threats as primary or secondary could have been better explained in the proposed rule. Upon review, the Services decided to take a different approach to describing the magnitude of the threat and its influence on the conservation status of the GOM DPS under the ESA. Rather than comparing the magnitude of the threats to each other, we have identified the relative impact of each of the threats on the species and its habitat. The text has been modified accordingly.

Comment 6: One of the reviewers had concerns about the discussion of artificial propagation under Factor E (Other Natural or Manmade Factors Affecting its Continued Existence). While the reviewer agrees with the Services' conclusion that the conservation hatchery program is reducing the risk of extinction of the GOM DPS, he highlighted areas where the text should be clarified. Specifically, the short- and long-term goals of the conservation hatchery program should be better described in relation to how the program is currently being conducted.

Response: Upon closer review and in response to the peer review, the Services have changed the way in which artificial propagation and specifically the conservation hatchery program are described and considered. While there are both positive and negative effects resulting from any artificial propagation program, the Services have determined that it would be more appropriate to move the discussion of the role of the conservation hatchery program and its influence on the current status of the species and recovery to the section of the rule describing the status of the species rather than describing it in the section pertaining to the threats. The Services have also revised the description of the program and its role in recovery of the GOM DPS in response to comments received from both peer reviewers and the general public.

Comment 7: One reviewer recommended minor clarifications to the text in Factor E addressing diadromous fish communities, marine survival, and competition.

Response: The Services have clarified the text in these sections to be responsive to comments from both peer reviewers and the general public.

Comment 8: Both reviewers commented that the section applying the *Policy for Evaluation of Conservation Efforts when making Listing Decisions (PECE)* to conservation actions was unclear and seemed incomplete. They questioned the analysis of only one conservation initiative, the Penobscot River Restoration Project (PRRP).

Response: The Services agree that analysis of conservation efforts under PECE is more transparent if a complete analysis of a variety of efforts is included in the rule. We have revised the section addressing analysis of conservation actions.

Comment 9: Both reviewers commented that the determination to list the GOM DPS of Atlantic salmon as endangered was sound and only suggested minor clarifications to the text.

Response: The Services have made minor changes and clarified the text in this section.

Public Comments

Comment 10: Many commenters believe that certain river systems, particularly the Androscoggin and the Union, should not be included within the GOM DPS boundaries. They argue that we erred in using different criteria (zoogeographic and genetic) to delineate the southern and northern boundaries of the DPS and that we should delay the decision to include the Androscoggin in the DPS until the naturally reared population in Androscoggin can be genetically characterized. Commenters also suggest that river systems where the species has been extirpated, such as the Union, should not be included within the DPS range.

Response: The 1996 Interagency Policy Regarding the Recognition of Distinct Vertebrate Populations Under the Endangered Species Act (61 FR 4722) (DPS Policy) states that a population segment may be considered discrete in relation to the remainder of the species to which it belongs if ''it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.'' The DPS Policy does not restrict the Services to using only one measure to define discreteness of a population segment. In fact, the introduction to the second element (significance) that must be met in evaluating whether a population qualifies as a DPS says that a population segment may be considered discrete based on ''one or more'' of the discreteness conditions.

As more thoroughly described in the ''Review of Species Delineation'' section of this final rule, genetic data were available for us to delineate the northern boundary of the GOM DPS. These data show clear genetic differentiation between populations inhabiting rivers in Maine and rivers in New Brunswick, with the Dennys River population clustering more closely with the Maine population and the St. Croix River population clustering more closely with populations in New Brunswick. Therefore, we used the Dennys watershed as the northern boundary of the DPS. However, because of the combination of low numbers of Atlantic salmon in some rivers (*e.g.*, only three naturally reared adult returns to the Androscoggin River (Table 3)) and the complete extirpation of the native stock in other rivers (*e.g.*, Merrimack River), complete genetic data are not, and may never be, available for us to genetically characterize these populations.

In the absence of clear genetic information to define the southern boundary of the GOM DPS, we used ecological factors in addition to the genetic factors described above. In particular, we used the zoogeographic boundary (the Penobscot-Kennebec-Androscoggin EDU and the Laurentian Mixed Forest Province) that ecologically separates the Androscoggin watershed from watersheds to the south (*e.g.*, Saco, Merrimack, and Connecticut watersheds). EDUs, defined by Olivero (2003), are aggregations of watersheds with similar zoogeographic history, physiographic conditions, climatic characteristics, and basin geography. EDUs generally have similar physiographic and climatic conditions (Higgins *et al.*, 2005). These differences would influence the structure and function of aquatic ecosystems (Vannote *et al.*,1980; Cushing *et al.*, 1983; Minshall *et al.*, 1983; Cummins *et al.*, 1984; Minshall *et al.*, 1985; Waters, 1995) and create a different environment for the development of local adaptations than rivers to the south. Therefore, we believe this zoogeographic boundary sufficiently satisfies the criteria to define discreteness for the southern edge of the GOM DPS.

In listing the GOM DPS, our goal is ultimately to recover the species so it no longer requires the protection of the ESA. Therefore, we have delineated boundaries for the GOM DPS that include all the areas of current and historical occupation of Atlantic salmon where those salmon would be identified as belonging to the GOM DPS. During recovery planning, we will further evaluate the recovery needs of the GOM DPS. It is likely that different levels of attention will be paid to the recovery of the DPS in different watersheds, based in part on the threats within a particular watershed and the habitat potential within a watershed. Delineating the entire GOM DPS conserves this ecosystem for Atlantic salmon survival and recovery, in addition to supporting straying, providing refugia, and buffering against catastrophic events.

Comment 11: Some commenters suggest that the boundaries of the DPS delineation should not extend into watersheds that were historically unoccupied by Atlantic salmon because they are upstream of historical, natural barriers (*e.g.*, waterfalls).

Response: Based on the comments received, analyses by NMFS (2008), and information contained in the 2006 Status Review, we delimited the freshwater range of the GOM DPS to include only those areas downstream of substantial barrier falls. For this final rule, we have modified the geographic boundaries of the freshwater range of the GOM DPS in the Androscoggin, Kennebec, and Penobscot Basins in the following ways: All freshwater bodies in the Androscoggin Basin are included up to Rumford Falls on the Androscoggin River and up to Snow Falls on the Little Androscoggin River; all freshwater bodies in the Kennebec Basin are included up to Grand Falls on the Dead River and the un-named falls (currently impounded by Indian Pond Dam) immediately above the Kennebec River Gorge; and all freshwater bodies in the Penobscot Basin are included up to Big Niagara Falls on Nesowadnehunk Stream, Grand Pitch on Webster Brook, and Grand Falls on the Passadumkeag River. See the ''Delineating Geographic Boundaries'' section of this final rule.

Comment 12: Many commenters stated that the Services did not accurately determine the conservation status of the GOM DPS. These commenters disagreed with the Services' proposal that the GOM DPS should be listed as endangered under the ESA. Instead, they argued that a threatened listing determination was more appropriate. The definition of endangered is ''in danger of extinction throughout all or a significant portion of its range.'' Several commenters argued the results of the PVA conducted by Legault (2004, 2005) demonstrated that the GOM DPS had a less than one percent chance of extinction provided that hatchery supplementation continued into the future. Thus, some commenters felt that the definition of threatened, ''likely to become endangered * * *'' was more appropriate given the role of hatcheries in preventing extinction. Commenters also cited the success of the conservation hatchery program as evidenced by the status of rivers within the 2000 GOM DPS that were supported by hatchery supplementation versus those that were not. The replacement rate reported by the USASAC was also cited as evidence of the positive contribution of the hatchery program to returns within the GOM DPS.

Response: We agree that the conservation hatcheries (CBNFH and GLNFH) provide a buffer against short-term extinction risks. Without these facilities in place, the status of the GOM DPS would be even more dire. However, as described in the ''Population Status of the GOM DPS'' section of this final rule, only three of the four population attributes of interest (abundance, spatial structure, and genetic diversity) are enhanced by the conservation hatcheries. In particular, the lack of any evidence that hatchery fish have the potential to result in wild returns over successive generations remains a significant concern. While the increase in replacement rate reported in 2007 by the USASAC is a positive sign, the overall trend remains negative when taken together. Further, 1 year of positive population growth is insufficient to justify threatened status.

The extended timeframes for extinction (provided that hatchery supplementation continues) projected by Legault (2005) are further evidence of the buffering effect of hatcheries. However, these projections do not include any consideration of the negative effects of reliance on hatcheries over successive generations. Recent evidence suggests that the negative effects of domestication, inbreeding depression, and outbreeding depression can accrue over just a few generations (Araki *et al.*, 2007). While we do not believe these negative effects are substantially reducing the long-term viability of the GOM DPS at this time, each successive generation will likely have higher risks of reduced fitness because of these effects. These additive risks over time are not modeled or otherwise accounted for in the extinction risks scenarios described by Legault (2005). The PVA results of Legault demonstrate that extinction occurs quickly when the conservation hatchery is eliminated. This provides further evidence that the wild population is currently in danger of extinction.

Finally, the SalmonPVA (Legault 2005) showed that at the constant low marine survival scenario representing the current environment, there was a 100 percent chance of extinction within 100 years regardless of the number of years of stocking, and extinction occurred within 20 years of the last stocking event. Legault (2005) demonstrated that an increase in marine survival substantially decreased the extinction probabilities. The scenario in which Legault found there to be a 1 percent chance of extinction assumed an increase in marine survival to the high of the previous 30 years. Unfortunately, we have no information to indicate that marine survival will significantly improve; therefore, there is no scientifically sound basis for assuming there is only a one percent chance of the GOM DPS going extinct.

Comment 13: One commenter felt that both hatchery-origin and naturally reared Atlantic salmon should be equally weighted in terms of their population contribution to the GOM DPS. This commenter felt that the inclusion of both hatchery-origin and naturally reared Atlantic salmon in the GOM DPS was inconsistent with the way in which the Services weighted the relative contribution of each group to recovery. The Services' determination of the conservation status of the GOM DPS placed a higher weight on naturally reared fish in terms of their contribution to recovery versus hatchery origin fish (fish stocked as parr, smolts, or adults).

Response: The stated purpose of the ESA is ''to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved'' (16 U.S.C. § 1531(b)). Using captive propagation as a recovery tool is clearly warranted when necessary, as in the case of the GOM DPS. However, the intent of the ESA is quite clear: the ultimate goal of species recovery efforts should be recovery in the wild, free from human intervention. While CBNFH and GLNFH clearly reduce the immediate risk of extinction of the GOM DPS, they have not been shown to substantially contribute to recovery in the wild. The influence of hatcheries on productivity is not known with certainty, but overall productivity (even with hatchery supplementation) is quite low. Hatchery fish are included in the GOM DPS because they are essential to recovery, and the sole purpose of the conservation hatchery is recovery. But, recovery means recovery in the wild, so the goal of the hatchery is to, over time, increase the percentage of returns that are of wild origin to the point that the GOM DPS becomes self-sustaining and is no longer dependent on the hatchery. Over time, more adult returns should successfully spawn in the wild, resulting in replacement rates above 1.0. However, the idea that adult returns from hatchery contributions result in more spawners and, ultimately, more truly wild-origin adult returns, remains an untested hypothesis. The National Research Council (NRC, 2004) and the Sustainable Ecosystems Institute (SEI, 2007) identified this as a key limitation in available data on the recovery efforts of salmon in Maine. Without this information, it is impossible to estimate, with any certainty, the effect of hatcheries on this key population attribute (productivity). The conservation hatchery has assisted in slowing the decline and helped stabilize populations at low levels, but has not contributed to an increase in the overall abundance of wild salmon.

Comment 14: Several commenters felt that the Services' listing determination placed too much emphasis on the potential for a catastrophic failure at the conservation hatchery facilities. Commenters acknowledged that this may have been an issue when the Services initially listed the GOM DPS in 2000, given that all broodstock were held at CBNFH. However, the expansion of the GOM DPS to include the Penobscot and other rivers means that there are now several facilities that house broodstock (*e.g.*, GLNFH, the USDA facility, and the Cooke Facility on the Kennebec). Thus, loss of all broodstock due to a catastrophic failure is highly unlikely.

Response: The Services agree that the loss of all potential broodstock would be extremely unlikely. However, it would not take the loss of all broodstock to significantly jeopardize the long-term viability of the GOM DPS. Catastrophic broodstock loss or a catastrophic loss of fry, parr, or smolt cohorts would result in a decrease in effective population size, loss of genetic diversity, and a multi-year lag while life stages rebuild, during which time there would be limited or no hatchery production or stocking.

Domestic broodstock for the Penobscot is currently maintained at facilities in addition to GLNFH. These domestic broodstocks should be viewed as backups. These sources are meant to be replenished annually (*i.e.,* new domestic broodstock lines are created each year) for GLNFH to reduce long-term selection to the hatchery environment. If there was a situation where the numbers of adult returns were reduced to 150 or less, then all production would go toward smolt production and not to fry stocking or to replenish domestic broodstocks. These backup broodstocks would no longer exist (M. Bartron, USFWS, pers. comm., 2009). If these domestic broodstocks were used to propagate future domestic broodstocks, there would be greater concerns about the decreased fitness of their offspring in the wild from successive generations of selection to captivity.

The Services have concluded that the conservation hatcheries significantly contribute to the maintenance of the genetic diversity of the GOM DPS. However, there are both long-term and short-term risks of reliance on hatcheries that have been considered above in the ''Population Status of the GOM DPS'' section of this final rule. In addition, recent events provide additional evidence of the potential for catastrophic events to further exacerbate extinction risks. In January 2009, significant mortality occurred to eggs of Penobscot origin at CBNFH. Low egg survival rates in the Penobscot population required the use of the domestic line for smolt production (50,000) for the first time ever. The relative fitness rate of the sea-run line has not been compared to the domestic line, so the demographic effects are unpredictable. The cause for the low egg survival rate is unknown, but is being investigated at the time of writing of this rule.

Comment 15: Several commenters felt that by increasing the geographic scope of the GOM DPS to include additional populations, one being the Penobscot, which has the highest returns to the DPS, the extinction risk is substantially reduced. Therefore, these commenters felt that a threatened listing determination is warranted.

Response: All things being equal, larger populations do have lower extinction risks. However, the inclusion of the Penobscot population in the GOM DPS does not alter the trends in abundance, which are pointing toward extinction. The addition of the Penobscot population does provide some measure of security from immediate extinction risks, but does not reverse the long-term trend which is toward extinction.

Comment 16: At least one commenter argued that a threatened listing determination could be justified based upon the returns to both the Penobscot and Downeast Salmon Habitat Recovery Units (SHRU). These two SHRUs, according to the commenter, satisfy the minimum recovery criteria by having at least 500 (naturally reared and hatchery origin) salmon within each SHRU.

Response: In developing its draft recovery criteria for use in the critical habitat designation process, NMFS specifically noted that in order to be eligible for recovery, SHRUs would not only need to meet a minimum population size of 500 individuals, but also show a positive population growth rate for at least two generations (10 years). Further, only wild-origin salmon are included in these measures because the goal of recovery is to achieve a self-sustaining population; a population that relies on hatchery stocking is not self-sustaining and therefore does not contribute to achievement of the recovery criteria. These criteria have clearly not been met in either case given the long-term downward trends in abundance and preponderance of hatchery-origin salmon composing the GOM DPS as described throughout this final rule. NMFS' draft recovery guidelines (2008) also state that in order to delist the GOM DPS, the threats identified at the time of listing must be addressed.

Comment 17: Many commenters argued that the PVA results of Legault (2004, 2005) and Fay *et al.* (2006), coupled with low returns and poor marine survival, demonstrate that the Services are correct in their proposal to list the GOM DPS as endangered under the ESA. These commenters felt that the intent behind the ESA is to recover wild populations and that hatchery origin fish are only a temporary option until the wild population recovers.

Response: We concur. We also recognize the long-term risks of reliance on hatcheries that are not accounted for in either PVA. Therefore, we are issuing this final rule to list the GOM DPS of Atlantic salmon as endangered.

Comment 18: A small number of commenters argued against listing the expanded GOM DPS at all. They argued that the rivers included in the expansion are heavily stocked and do not represent self-sustaining populations. They also stated that existing regulatory mechanisms are sufficiently protective, and thus, listing under the ESA is not necessary.

Response: Many endangered species are currently not self-sustaining. In fact, this is a key factor in determining whether a species should be listed; self-sustaining populations are generally less likely to need the protection of the ESA, depending on the threats facing the species. The Services do recognize the long history of stocking to support Atlantic salmon recovery in Maine. We describe both the positive and negative effects of hatchery supplementation in the ''Population Status of the GOM DPS'' section of this final rule. The weight of the available genetic, life history, and ecological data clearly indicates that the GOM DPS (including conservation hatchery populations used to supplement natural populations) satisfies both the discreteness and significance criteria of the DPS Policy, and therefore, is a DPS. The fact that the GOM DPS is not self-sustaining with the existing regulatory mechanisms and is trending toward extinction indicates it warrants the protection of the ESA.

Comment 19: Several commenters felt that the threat posed by dams was overstated. Specifically, they disagree with the Services' assertion that current fish passage technology results in a high level of mortality and that dams contribute to significant changes in fish assemblages and predation. One commenter stated that in focusing on the threat posed by dams, the Services failed to recognize hydropower as a clean source of energy production.

Response: The Services disagree that the threat posed by dams is overstated. The National Research Council stated in 2004 that the greatest impediment to self-sustaining Atlantic salmon populations in Maine is obstructed fish passage and degraded habitat caused by dams. There are many studies that support this conclusion that are reviewed and cited in Section 8 of Fay *et al.* (2006). Dams result in direct loss of production habitat, alteration of hydrology and geomorphology, interruption of natural sediment and debris transport, and changes in temperature regimes (Wheaton *et al.,* 2004). Riverine areas above impoundments are typically replaced by lacustrine habitat following construction. Dramatic changes to both upstream and downstream habitat directly result in changes in the composition of aquatic communities, predator/prey assemblages, and species composition (NRC, 2004; Fay *et al.,* 2006; Holbrook, 2007). Upstream changes in habitat are known to create conditions that are ideal for known predators of Atlantic salmon such as chain pickerel, smallmouth bass, and avian predators like double crested comorants (Fay *et al.,* 2006). Furthermore, dams not only change predator-prey assemblages, but dam passage also negatively affects predator detection and avoidance in salmonids (Raymond, 1979; Mesa, 1994). Adults may also be susceptible to predation when they are attempting to locate and pass an upstream passage facility at a dam when stressed by higher summer temperatures (Power and McCleave, 1980).

Even highly effective passage facilities cause Atlantic salmon mortality. Passage inefficiency and delays occur at biologically significant levels, resulting in incremental losses of pre-spawn adults, smolts, and kelts (a life stage after Atlantic salmon spawn). Dams are known to typically injure or kill between 10 and 30 percent of all fish entrained at turbines (EPRI, 1992). With rivers containing multiple hydropower dams, these cumulative losses could compromise entire year classes of Atlantic salmon. Studies in the Columbia River system have shown that fish generally take longer to pass a dam on a second attempt after fallback compared to the first (Bjornn *et al.,* 1999). Thus, cumulative losses at passage facilities can be significant and are an important consideration.

The Services do recognize that hydropower does not contribute to air pollution as do many other energy sources. However, dams remain a direct and significant threat to Atlantic salmon.

Comment 20: Several commenters stated that existing recreational fishing regulations in the State of Maine are sufficiently protective of Atlantic salmon. Specifically, minimum and maximum length limits are cited for landlocked salmon and brown trout, as well as gear restrictions, area closures, and outreach programs to educate anglers on identification and mandatory regulations. Several of these commenters highlighted the importance of the support of the angling community to the conservation and recovery effort. They encouraged the Services to coordinate with the angling community prior to enacting regulations to ensure that unnecessary regulations are not enacted and that angling opportunities are made available when biologically appropriate and that any changes are consistent with the *1996 Policy for Conserving Species Listed or Proposed for Listing Under the ESA While Providing and Enhancing Recreational Fishing Opportunities.* Several commenters directly stated that the health of the Penobscot population could indeed support a directed catch and release fishery.

Response: There are a number of minimum and maximum length limits that help reduce the threat of take of juvenile and adult anadromous Atlantic salmon. Similarly, closures have been enforced in certain areas where anadromous Atlantic salmon may be particularly susceptible to take. However, the Services believe that many of these regulations are still not sufficiently protective of outmigrating smolts and of adults. Minimum and maximum length limits should be adjusted to be more protective, specifically, the maximum length limit of 25 inches (63.5 cm) for landlocked salmon should be decreased to 16 inches (40.6 cm) in certain areas. Closures should be prompted by the presence of adult Atlantic salmon in certain areas such as thermal refugia, overwintering areas, and holding pools. Some closures mandated by the State have been the result of emergency action following the lethal take of Atlantic salmon. A proactive approach to closures and regulation implementation will be more effective in terms of salmon recovery.

The Services recognize that the angling community has lent significant support to the conservation and recovery of Atlantic salmon in the GOM DPS. We believe that we have been very inclusive and transparent with respect to the angling community and issues of concern. We invited representatives of angler organizations to participate as members of the Atlantic Salmon Recovery Team and have been engaged and participated in critical discussions in other forums such as the Maine Atlantic Salmon Technical Advisory Committee and NASCO. We will continue to coordinate and collaborate with the angling community as we move forward with recovery and management of the GOM DPS. We believe that we have been consistent with the *1996 Policy for Conserving Species Listed or Proposed for Listing Under the ESA while Providing and Enhancing Recreational Fishing Opportunities* in our communication and coordination with the angling community, and we will continue to be consistent in the future.

It is not biologically appropriate, at this time, to allow a directed catch and release fishery on the Penobscot River. The Atlantic salmon population in the Penobscot River is highly dependent on hatchery stocking; broodstock goals have not been met in most recent years; and the population is less than 10 percent of its spawning escapement target. Given these low numbers, it is important to meet broodstock goals and also to allow some returning adults to spawn naturally in the river. Decreasing the chances of reaching both of these goals by allowing targeted fishing on returning adults does not further the conservation of the species. There also are legal restrictions on targeted fishing for a listed species.

Comment 21: Maine's Department of Inland Fish and Wildlife (MIFW) stocks a variety of fish species to provide angling opportunities to Maine citizens. The bulk of the comments on MIFW stocking programs were submitted as comments on Factor B (Overutilization for Commercial, Recreational, Scientific and Educational Purposes). While stocking programs do cause take of Atlantic salmon due to angling, they also can have a negative impact on Atlantic salmon due to competition, particularly from non-native species. Factor E (Other Natural or Manmade Factors Affecting Its Continued Existence) addresses the issue of competition. Thus, comments related to stocking and potential competition issues are addressed in the section of the response to comments under Factor E.

Comments that were directly related to the impact of stocking programs on Atlantic salmon as a result of the expansion or increase in angling opportunities cite coordination with the MDMR as evidence that measures are taken to minimize any harmful effects of stocking practices on Atlantic salmon. Commenters also stated that in some areas where the habitat is not fully seeded with Atlantic salmon, informal agreements between MDMR and MIFW have been reached to allow for a certain level of fish stocking to enhance angling opportunities without creating a significant threat to salmon that may be in the area. One commenter also cited guidelines that are in the process of being finalized that will be used to manage rainbow trout stocking. Several commenters disagree with the Services' conclusion that these stocking programs are harmful to Atlantic salmon.

Response: MIFW stocking practices that create more angling opportunities in areas occupied or used by Atlantic salmon contribute to the potential for take to occur as a result of misidentification, bycatch, or poaching. MIFW stocking programs are not directed to Atlantic salmon recovery or ecosystem restoration. They are intended to create and enhance angling opportunities, and, where these overlap with salmon, there is increased risk to salmon. MIFW currently stocks landlocked Atlantic salmon, brown trout, brook trout, rainbow trout, and splake in Atlantic salmon drainages, posing a threat to Atlantic salmon in the GOM DPS (Fay *et al.,* 2006). The information presented by commenters with respect to angling regulations and stocking program management does not change our conclusion that angling and stocking programs associated with increased angling opportunities pose an ongoing threat to Atlantic salmon in the GOM DPS. While coordination may reduce or minimize exposure of Atlantic salmon to increased angling pressure, the fact remains that angling pressure is higher than it would be in the absence of these stocking programs.

Comment 22: One commenter was concerned that the text on the threat of disease did not reflect the State of Maine's effort to attain Class A fish health ratings for the hatcheries managed by MIFW.

Response: The text has been changed to reflect the effort on behalf of the State of Maine to achieve the Class A fish health rating. With this effort, disease issues still pose a threat to Atlantic salmon as described in Factor C below.

Comment 23: One commenter felt that the text in the predation threat analysis did not acknowledge the restoration efforts of the State of Maine, specifically the Penobscot River Multi-species Management Plan and the Penobscot Interagency Technical Committee.

Response: The Services believe that these two conservation actions are more appropriately described and evaluated in the analysis of conservation efforts under the Policy for Evaluating Conservation Efforts. We have revised that analysis to incorporate information on both of these efforts.

Comment 24: Many commenters disagree with the Services' conclusion that the regulatory mechanisms to address the threat posed by dams are inadequate. These commenters stated that a number of laws directly (*e.g.*, Federal Power Act (FPA)) and indirectly (*e.g.*, ESA, National Environmental Policy Act) allow Federal resource agencies to influence passage issues and hydropower agreements. They state that the Federal Energy Regulatory Commission (FERC) process is very transparent and allows for public involvement. For non-FERC dams, commenters cited the oversight of the State of Maine Department of Environmental Protection (MDEP) in addressing fish passage, flow regimes, and water quality.

Response: Notwithstanding the ESA, the current state and Federal regulatory mechanisms in place to address operation of dams were not designed to address survival or recovery of endangered species. The Services recognize that there are a number of laws that create a process whereby industry, Federal resource agencies, the public, state agencies and other groups are involved in relicensing, brokering settlement agreements, or prescribing fish passage. However, as described in the section of this rule that addresses Factor D, there are substantial shortcomings associated with these processes. First, most of these processes require a ''balancing'' of energy and environmental resources. Under the ESA, deference is given to the species.

The FERC process is extremely lengthy, and any contentious fishway prescriptions could potentially take years to agree on and implement. Furthermore, neither upstream nor downstream fish passage measures are 100 percent efficient. Their limitations contribute to juvenile and adult injury and mortality, as well as habitat alterations that affect the health and survival of all life stages of Atlantic salmon. Sections 10(a) and 10(j) of the FPA could be used by the Services to address the impact of dams on habitat; however, these regulatory mechanisms are often discretionary and not necessarily required by FERC (Fay *et al.*, 2006). Section 4(e) of the FPA may also be used to recommend fisheries enhancements; however, this section is only applicable to certain Federal lands which are a rare occurrence in Maine (Fay *et al.*, 2006).

It is also important to recognize that, while settlement agreements can be a very useful tool to address passage issues, they are not necessarily removing the issue of passage mortality or in some cases, even ensuring passage facilities. For example, the Kennebec Hydro Developers Accord uses biological triggers to establish sequential upstream passage. If these biological triggers are not met, upstream passage could be suspended further into the future.

The majority of dams within the GOM DPS range do not require a FERC license or water quality certificate from the MDEP. These non-jurisdictional dams are usually small, non-generating dams that were historically used for flood control, water storage, and other purposes. Virtually none of these dams have fish passage facilities, and almost all of them are impacting historical salmon habitat. While there is a process whereby the public can petition the State of Maine to set minimum flows and water levels, the State has no authority to prescribe fishery enhancements without public request or petition. To our knowledge, no fishways have ever been installed at any dam in the State of Maine using the fishway petition process outlined pursuant to 12 Maine Revised Statutes Annotated (MRSA) § 12760. Therefore, significant issues are ongoing with respect to the current mechanisms in place to address the threat of both FERC and non-FERC licensed dams.

While regulations exist, these regulations have not proven effective in preventing impacts or quickly responding to remove impacts. In fact, the most progress on fish passage issues has been accomplished by working outside of these regulatory mechanisms in the negotiation of fish passage agreements. Aspects of the current regulations we find inadequate include the time delays experienced, extensive resource requirements, and inability to prescribe a solution which eliminates the impacts from dams.

Comment 25: Some commenters stated that Maine's existing water quality standards and criteria and its antidegradation policy under the Clean Water Act (CWA) as administered by the State of Maine (Maine Pollutant Discharge Elimination System (MPDES)) are sufficiently protective of all life stages of Atlantic salmon. Furthermore, commenters state that lack of requests by the Services to condition permits to avoid substantial impairment to Atlantic salmon is evidence that the present standards and criteria are protective of Atlantic salmon.

Response: Maine's water classification program, of which the State's antidegradation policy is a part, provides for different water quality standards for different classes of waters (*e.g.*, there are four classes for freshwater rivers, all of which are found within the GOM DPS range). Some portions of the GOM DPS are in the highest water quality classification where water quality standards are the most stringent. These standards become progressively less stringent with each lower water classification. These standards were not defined specifically for Atlantic salmon. Additionally, permits allow an area of initial dilution or mixing zone where water quality requirements are reduced. Salmon in or passing through such zones would be exposed to discharges below water quality standards.

Even where water quality standards are believed to be sufficiently protective when met, there are circumstances and conditions where discharges do not meet water quality standards. There are documented cases where minimum dissolved oxygen standards were not met in class C waters (MDEP, 2008). Adequate dissolved oxygen concentrations are necessary for fish health (Decola, 1970). The observed incidents of low dissolved oxygen were potentially harmful to any salmon present.

The fact that the Services have not requested that permits be conditioned to protect Atlantic salmon does not mean that water quality standards are sufficiently protective of Atlantic salmon. Currently, the Services review only permits that may affect salmon where listed in 2000, and the number of permits issued in this area has been relatively small. Expansion of the DPS as a result of this final rule will encompass rivers for which there are many more activities requiring Maine Pollutant Discharge Elimination System (MPDES) permits, and where water classifications and associated water quality standards are lower, which causes us to be concerned about potential impacts to salmon. See Factors A and D, below, for our analysis of the impact of water quality on the GOM DPS.

Comment 26: Some commenters stated that we inaccurately emphasized the effects of Overboard Discharges (OBD) on Atlantic salmon. They explain that the number of OBDs, the volume of discharge, and the treatment requirements result in a negligible effect on water quality within the range of the GOM DPS.

Response: In the proposed rule, we stated that we were concerned about the potential negative impacts of OBDs on water quality and identified OBDs as a threat to the GOM DPS. While we remain concerned about the potential for OBDs to impact Atlantic salmon, we have determined that we have insufficient information to determine whether OBDs are currently causing or will cause harm to the GOM DPS. Therefore, we have removed OBDs as an identified stressor under Factors A and D below.

Comment 27: Commenters emphasized the importance of Maine's water rule (MDEP Chapter 587 Rule) in protecting in-stream flows and habitat for aquatic life.

Response: We agree that the Water Rule represents substantial progress toward limiting negative impacts on in-stream flows due to water withdrawals, particularly for class AA waters. However, there are aspects of the water rule that are not sufficiently protective of Atlantic salmon. Because the flow standards for class A, B, and C waters are based on the seasonal base flow (the average flow over an entire season), withdrawals would be allowed that maintain flow above the seasonal base flow but reduce flow below the median monthly flow. During times when flows are naturally low, allowing withdrawals to reduce flows further, to levels below the median monthly flow, would negatively impact Atlantic salmon. See Factors A and D, below, for our analysis of the impacts of water withdrawals under Maine's water rule on the GOM DPS.

Comment 28: Some commenters noted Maine's forestry-related regulations and standards that are protective of Atlantic salmon.

Response: We concur that activities conducted in compliance with the Shoreland Zoning Act, Maine Forest

Practices Act, Natural Resource Protection Act, Protection and Improvement of Waters Act, Erosion and Sedimentation Control Law, and the Statewide Standards for Timber Harvesting and Related Activities in Shoreland Areas reduce threats to Atlantic salmon from sedimentation and other impacts related to forestry activities. The State's compliance monitoring and enforcement of these regulations and standards will assist in evaluating and confirming that forestry-related impacts to salmon are minimized. We discuss forestry activities and other potential non-point sources of pollution under Factors A and D below.

Comment 29: Several commenters indicated that the threat of poor marine survival was understated. They felt that considering that poor marine survival was characterized as one of the primary threats to the GOM DPS, the Services have failed to adequately address it in either the proposed rule or the 2006 Status Review.

Response: The Services agree and have incorporated additional information on marine survival into the final rule to properly reflect the significance of the threat of poor marine survival to the recovery of the GOM DPS. Marine survival and climate change are both addressed through analysis of the five factors specified in section 4(a)(1) of the ESA.

Comment 30: One commenter disagreed with the identification of depleted diadromous fish communities as a threat to the GOM DPS. The commenter felt that the State of Maine is making strides in implementing management actions aimed at restoration of diadromous fish communities. These programs will need time to achieve success; however, the commenter argues that the threat need not be considered given that there are programs in place to address diadromous fish restoration.

Response: The Services acknowledge the efforts by the State of Maine at diadromous species restoration in the analysis of State protective efforts. While the goal of these efforts is to restore the full suite of diadromous fishes, that goal is far from being realized. Further, there is not a high level of certainty that these actions will be implemented and effective. It is very encouraging that the role of restored diadromous fish communities is recognized; however, significant coordination, effort, and commitment are necessary to achieve the goal. Thus, the threat of depleted diadromous fish communities remains. The PECE analysis section of this rule contains the Services' evaluation of these programs as well as other conservation efforts.

Comment 31: One commenter disagreed that MIFW sport fish stocking programs pose a threat to Atlantic salmon. These comments were submitted under Factor B, but in large part were directed at the way the Services characterized the threat of competition due to stocking under Factor E. The commenter stated that coordination between MIFW and MDMR is evidence that measures are taken to minimize any harmful effects of stocking practices on Atlantic salmon. In some areas where the habitat is not fully seeded with Atlantic salmon, informal agreements allow for a certain level of stocking without adversely affecting Atlantic salmon. The commenter also cited guidelines that are in the process of being finalized that will be used to manage rainbow trout stocking.

Response: The Services disagree with the commenter that the threat posed by MIFW stocking programs is adequately addressed by the current stocking management program. Text has been added to the section of the rule that discusses competition to provide additional detail to clarify the negative impact current stocking programs have in terms of contributing to the threat of competition between other species and Atlantic salmon. The Services do recognize that a Memorandum of Understanding (MOU) exists between MDMR and MIFW that establishes a process for the management and stocking of freshwater salmonid fish species in Atlantic salmon river systems in Maine to ''reduce the effects of competing finfish species on Atlantic salmon populations.'' The MOU states that on an annual basis, at the very least, before April each year, biologists from MDMR and the MIFW will meet as a joint committee to: (1) Identify all current stocking programs for all finfish in identified Atlantic salmon river systems; (2) according to the best available scientific information on species interactions, assess the possible interactions between Atlantic salmon and inland fisheries management proposals; (3) identify and evaluate areas of concern and assess ways to minimize impacts; (4) implement agreed upon management actions or changes (no fish stocking or changes in management programs on these rivers shall take place other than in accordance with this agreement); and lastly, (5) develop recommendations for the Commissioner of Inland Fisheries & Wildlife and the other members of the Board of the Atlantic Salmon Commission for areas of concern that cannot be resolved by the joint committee. While this MOU does provide a process for managing stocking practices, it does not address all of the threats posed by the State's stocking practices. Some of the issues this process does not address include, but are not limited to, the following: (1) Cumulative effects of repeated stockings and multi-species stocking on Atlantic salmon; (2) competition for suitable over-wintering areas; (3) threats from introduction of parasites or disease from stocking; (4) the threats posed by Atlantic salmon/brown trout hybrids; and (5) management of other fish species (smallmouth bass, chain pickerel, etc.). Because these and other issues still have not been addressed fully, state stocking programs continue to pose a threat to the GOM DPS as is described in this rule.

Comment 32: Several commenters felt that the Services did not give enough consideration to ongoing conservation efforts in the GOM DPS. Commenters used specific examples, including, but not limited to, the Penobscot River Restoration Project, the Kennebec Hydro Agreement, and Project SHARE (Salmon Habitat and River Enhancement). Many commenters felt that the PECE was not appropriately applied. Commenters suggested that the Services may need to use the PECE to reevaluate projects like the Penobscot River Restoration Project for which funding and certainty of implementation may have changed since publication of the proposed rule.

Response: The Services agree that analysis of conservation efforts under PECE is more transparent if a more complete analysis of major efforts is included in the rule. We have revised the section addressing analysis of conservation efforts.

Comment 33: Some commenters are concerned that having two Federal agencies (NMFS and USFWS) share jurisdiction of Atlantic salmon is inefficient, which is detrimental to the overall conservation of Atlantic salmon. As a result, some recommended that NMFS be assigned the lead Federal agency for management of Atlantic salmon.

Response: Joint jurisdiction of Atlantic salmon was first established in 1994, when the Services worked together jointly to respond to a listing petition for Atlantic salmon. While we acknowledge that sharing jurisdiction for an endangered species is challenging, we believe that both agencies can contribute positively to recovery. Therefore, we will continue to share jurisdiction for Atlantic salmon. The goal of both agencies is the recovery of Atlantic salmon; to that end we will strive to work cooperatively and effectively to conserve Atlantic salmon. To clarify roles and responsibilities of each agency and help resolve potential differences, we have developed a Statement of Cooperation (NMFS and USFWS, 2009). The preamble to this rule identifies how roles and responsibilities have been divided between the two agencies.

Comment 34: Some commenters were concerned about the lack of resources to fulfill the requirements of the ESA for Federal agencies, the State, Tribes, or the regulated community as will be required by listing the Atlantic salmon in a larger area.

Response: As required by section 4(b)(1)(A) of the ESA, listing decisions are to be made solely on the basis of the best scientific and commercial data available. We fully recognize that resources are limited and intend, through our collaborative partnership with the State and Tribes, to make most efficient use of our collective resources to conserve and recover Atlantic salmon. The challenge of addressing high workload with limited resources is one of the reasons the Services have divided responsibility for ESA implementation by activity as noted in the response above. We will work within the ESA's flexible framework to achieve the regulatory requirements of the ESA.

Comment 35: Several commenters suggested that listing determinations should consider the likelihood of future cooperation and collaboration toward recovery.

Response: Under the ESA, the Services must make each listing determination solely on the best available data on the status of the species, the five factors specified in section 4(a)(1) of the ESA, and the efforts being made to protect the species. The possibility of enhanced cooperation in future recovery actions is not one of the five statutory factors. While we recognize the importance of cooperation in achieving recovery, it is not one of the factors identified by the ESA for making listing determinations. Therefore, we have not considered it in this determination.

Summary of Factors Affecting the GOM DPS

Section 4 of the ESA (16 U.S.C. 1533) and implementing regulations at 50 CFR part 424 set forth procedures for adding species to the Federal List of Endangered and Threatened Species. Under section 4(a) of the ESA, we must determine if a species is threatened or endangered because of any of the following five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.

We have described the effects of various factors leading to the decline of Atlantic salmon in previous listing determinations (60 FR 50530, September 29, 1995; 64 FR 62627, November 17, 1999; 65 FR 69459, November 17, 2000) and supporting documents (NMFS and USFWS, 1999; NMFS and USFWS, 2005). The reader is directed to section 8 of Fay *et al.* (2006) for a more detailed discussion of the factors affecting the GOM DPS. In making this finding, information regarding the status of the GOM DPS of Atlantic salmon is considered in relation to the five factors specified in section 4(a)(1) of the ESA.

In making this evaluation, we have carefully considered the relative demographic effects of each threat to the GOM DPS. In particular, there are large distinctions between marine survival and freshwater survival that are important to characterize the current status of the GOM DPS. From a demographic viewpoint, incremental increases in marine survival have a much greater impact on the population than do increases in freshwater survival; although, increases in marine survival may be more difficult to achieve. It is important to note that marine survival is calculated from the last time smolts are counted in a river until adults return to spawn. Thus, marine survival estimates may include some portion of freshwater, estuarine, and near-shore mortality in addition to open ocean mortality.

The historical range of freshwater survival for U.S. populations is estimated to be approximately 0.13 to 6.09 percent (Legault, 2005). These estimates are based on numerous studies on different life stages of the freshwater phase across a wide spatial and temporal scale. Current marine survival (smolt to adult) for U.S. populations is estimated to range from 0.09 to 1.02 percent based on total smolt cohort return rates for the Penobscot (hatchery smolt returns, 1995 to 2004) and Narraguagus Rivers (naturally reared smolt returns, 1997 to 2004) (ICES, 2008). For the reasons mentioned above, marine survival estimates of hatchery smolts in the Penobscot also include dam-related mortality.

Improvements in these survival rates are necessary to reach the point where each fish is replacing itself and to eventually result in population growth toward recovery. Increases in freshwater survival will enhance the probability of recovery; however, improvements in marine survival are necessary to achieve stability and growth. While numerous natural and anthropogenic factors during the freshwater phase influence Atlantic salmon populations (Baum *et al.*, 1983; McCormick *et al.*, 1998; Parrish *et al.*, 1998), the effects of marine survival are thought to have a greater influence on population levels (Friedland *et al.*, 2003; Jonsson and Jonsson, 2004; Chadwick, 1987) in part because the annual variation in marine survival is nearly four times greater than that in freshwater (Bley, 1987; Reddin *et al.*, 1988). Thus, marine survival has a significant impact on adult production. As a result, marine survival must improve in order to recover the GOM DPS (Legault, 2005), and, thus, low marine survival is one of the most important threats contributing to the poor status of the species. Other factors affecting the freshwater stages of salmon within the range of the GOM DPS can be quite pervasive (*e.g.*, poor connectivity due to improperly sized culverts). Below, these factors are described as stressors that collectively contribute to the poor status of the GOM DPS; however, those factors that affect later life stages (typically considered as marine survival) have the greatest demographic effect.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Changes to the GOM DPS's natural environment are ubiquitous. Both contemporary and historic land and water use practices such as damming of rivers, forestry, agriculture, urbanization, and water withdrawal have substantially altered Atlantic salmon habitat by: (1) Eliminating and degrading spawning and rearing habitat, (2) reducing habitat complexity and connectivity, (3) degrading water quality, and (4) altering water temperatures. These impacts and their effects on salmon are described in detail by Fay *et al.* (2006). Here, we summarize the stressors that are having the greatest impact on the GOM DPS.

Dams

Dams are among the leading causes of both historical declines and contemporary low abundance of the GOM DPS of Atlantic salmon (NRC, 2004). Dams directly limit access to otherwise suitable habitat. Prior to the construction of mainstem dams in the early 1800s, the upstream migrations of salmon extended well into headwaters of large and small rivers alike, unless a naturally impassable waterfall existed. For example, Atlantic salmon were found throughout the West Branch of the Penobscot River (roughly 350 km inland) and as far as Grand Falls (roughly 235 km inland) on the Dead River in the Kennebec Drainage (Foster and Atkins, 1867; Atkins, 1870). Today, however, upstream passage for salmon on the West Branch of the Penobscot is nonexistent and on the Kennebec is limited to trapping and trucking salmon above the first mainstem dam. Dams also change hydraulic characteristics of rivers. These changes, combined with reduced, non-existent, or poor fish passage, influence fish community structure. Specifically, dams create slow-moving impoundments in formerly free-flowing reaches. Not only are these altered habitats less suitable for spawning and rearing of Atlantic salmon, they may also favor nonnative competitors such as smallmouth bass (*Micropterus dolomieu*) over native species such as brook trout (*Salvelinus fontinalis*) and American shad (*Alosa sapidissima*). Fish passage inefficiency also leads to direct mortality of Atlantic salmon, including both smolts and adults; these later life stages are particularly important from a demographic perspective as described above. Upstream passage effectiveness for anadromous fish species never reaches 100 percent, and substantial mortality and migration delays occur during downstream passage through screen impingement and turbine entrainment. The cumulative losses of smolts incrementally diminish the productive capacity of all freshwater rearing habitat above hydroelectric dams. The demographic consequences of low marine survival (described above) are similar to those of the cumulative losses of adults at dams. Comprehensive discussions of the impacts of dams are presented in sections 8.1, 8.3, and 8.5.4 of Fay *et al.* (2006) and NRC (2004).

In short, dams directly and substantially reduce survival rates of salmon through the following ways:

1. Dams directly limit access to otherwise suitable habitat. This has reduced spatial distribution of the GOM DPS over the last 200 years.

2. Dams also directly kill and injure a significant number of salmon on both upstream and downstream migrations. Injury and mortality due to dams occurs at the smolt and adult life stages. These older life stages are particularly important from a demographic perspective (similar to marine survival) since slight changes in survival rates at older life stages can drive demographic trends.

3. Dams also degrade the productive capacity of habitats upstream by inundating formerly free-flowing rivers, reducing water quality, and changing fish communities.

Dams are also one of three primary factors that led to the declining abundance trends that began in the 1800s. The other two factors (pollution and overfishing), though still operative, have been greatly reduced in severity (Moring, 2005). Dams, however, represent a significant threat during the current period of decline (1800s to present) and are generally more pervasive (over 300 within the freshwater range of the GOM DPS today) over that same time period. These effects have led to a situation where salmon abundance and distribution have been greatly reduced, and thus, the species is more vulnerable to extinction through processes such as demographic and environmental stochasticity, natural catastrophes, and genetic drift inherent in all small populations (Shaffer, 1981).

As stated above, dams directly limit access to otherwise suitable habitat, directly kill and injure a significant number of salmon during both upstream and downstream migration, and degrade the productive capacity of habitats upstream by inundating formerly free-flowing rivers, reducing water quality, and changing fish communities. Dams affect multiple life stages in multiple ways, particularly by preventing or impeding access to spawning habitat for returning adult salmon; impacts at this late life stage have the greatest demographic effect. Therefore, dams represent a significant threat to the survival and recovery of the GOM DPS.

Habitat Complexity

Some forest, agricultural, and other land use practices have reduced habitat complexity within the range of the GOM DPS of Atlantic salmon. Large woody debris (LWD) and large boulders are currently lacking from many rivers because of historical timber harvest practices. When present, LWD and large boulders create and maintain a diverse variety of habitat types. Large trees were harvested from riparian areas; this reduced the supply of LWD to channels. In addition, any LWD and large boulders that were in river channels were often removed in order to facilitate log drives. Historical forestry and agricultural practices were likely the cause of currently altered channel characteristics, such as width-to-depth ratios (*i.e.*, channels are wider and shallower today than they were historically). Channels with large width-to-depth ratios tend to experience more rapid water temperature fluctuations, which are stressful for salmon, particularly in the summer when temperatures are warmer. Further discussions of the impacts of reduced habitat complexity are presented in section 8.1.2 of Fay *et al.* (2006). Reduced habitat complexity acts as a stressor on the GOM DPS by reducing spaces for hiding from predators and increasing water temperature.

Habitat Connectivity

Over the last 200 years, habitat connectivity within the freshwater range of the GOM DPS has been reduced because of dams and poorly designed road crossings. Further discussions of the impacts of reduced habitat connectivity are presented in section 8.1.2 of Fay *et al.* (2006). As a highly migratory species, Atlantic salmon require a diverse array of well-connected habitat types in order to complete their life history. Impediments to movement between habitat types can limit access to potential habitat and, therefore, directly reduce survival in freshwater. In some instances, barriers to migration may also impede recovery of other diadromous fishes as well. For example, alewives (*Alosa pseudoharengus*) require free access to lakes to complete their life history. To the extent that salmon require other native diadromous fishes to complete their life history (see ''Depleted Diadromous Communities'' in ''Factor E'' of this final rule), limited connectivity of freshwater habitat types may limit the abundance of salmon through diminished nutrient cycling, and a reduction in the availability of co-evolved diadromous fish species that provide an alternative prey source and serve as prey for GOM DPS Atlantic salmon. Restoration efforts in the Machias, East Machias, and Narraguagus Rivers have improved passage at road crossings by replacing poorly-sized and poorly-positioned culverts. However, many barriers of this type remain throughout the range of the GOM DPS. Reduced habitat connectivity is a stressor to the GOM DPS because it prevents salmon from fully using substantial amounts of freshwater habitat and changes fish community structure by preventing access for other native fish.

Water Quantity

Water withdrawals can directly impact salmon spawning and rearing habitat (Fay *et al.*, 2006). Survival of eggs, fry, and juveniles is also mediated by stream flow. Low flows constrain available habitat and limit populations.

Water quantity can be affected by the withdrawal of water for irrigation or other consumptive water uses as described in section 8.1.1.2 of Fay *et al.* (2006). The potential for water withdrawals reducing in-stream flows to levels that may impact Atlantic salmon is a concern in rivers classified under Maine's ''In-stream flow and water level standards'' as class A, B, or C. The flow standards for class A, B, and C waters are based on seasonal base flows (the average flow over an entire season) rather than median monthly flows. Because these flow standards are based on the seasonal base flow, withdrawals would be allowed that, while not reducing flow below the seasonal base flow, reduce flow below the median monthly flow. In some months, flows are naturally low (*e.g.*, late summer months), which is stressful to fish because habitat is more limited, water temperature increases, and dissolved oxygen decreases. During times when flows are naturally low, allowing withdrawals to reduce flows further, to levels below the median monthly flow, would negatively impact Atlantic salmon. Therefore, water withdrawal that reduces the instream flow below the median monthly flow is a stressor on the GOM DPS because it may reduce habitat, increase water temperature, and decrease dissolved oxygen during the months of naturally low flow.

Water Quality

Atlantic salmon likely are impacted by degraded water quality caused by point and non-point source discharges. The MDEP administers the National Pollutant Discharge Elimination System (NPDES) program under the CWA and issues permits for point source discharges from freshwater hatcheries, municipal facilities, and other industrial facilities. Maine's water classification system provides for different water quality standards for different classes of waters (*e.g.*, there are four classes for freshwater rivers, all of which are found within the GOM DPS range); however, these standards were not developed specifically for Atlantic salmon. Some portions of the GOM DPS are in areas with the highest water quality classification where water quality standards are the most stringent. These standards become progressively less stringent with each lower water classification. Additionally, permits allow an area of initial dilution or mixing zone where water quality requirements are reduced. Salmon in or passing through such zones would be exposed to discharges below water quality standards. The impacts to salmon passing through these zones are unknown. We are concerned that water quality standards for Class A, B, and C waters and mixing zones may not be sufficiently protective of all life stages of Atlantic salmon, particularly the more sensitive salmon life stages (*e.g.*, smolts).

Even where water quality standards are believed to be sufficiently protective, there are circumstances and conditions where discharges do not meet water quality standards. For example, there are documented cases in class C waters where dissolved oxygen standards (the lower bound of which is 5.0 ppm) were not met. This occurred in portions of the mainstem Androscoggin River, and in the East Branch of the Sebasticook River and Sabattus River (MDEP, 2008). When dissolved oxygen concentrations are less than 5.0 ppm, adult salmon breathing functions become impaired, embryonic development is delayed, and parr growth and health are impacted; conditions become lethal for salmon at dissolved oxygen concentrations less than 2.0 ppm (Decola, 1970). When water quality reaches levels that are harmful to salmon, it is a stressor to the GOM DPS.

Non-point source discharges such as elevated sedimentation from forestry, agriculture, urbanization, and roads can reduce survival at several life stages, especially the egg stage. Sedimentation can alter in-stream habitat and habitat use patterns by filling interstitial spaces in spawning gravels, and adversely affect aquatic invertebrate populations that are an important food source for salmon. Acid rain reduces pH in surface waters with low buffering capacity, and reduced pH impairs osmoregulatory abilities and seawater tolerance of Atlantic salmon smolts. A variety of pesticides, herbicides, trace elements such as mercury, and other contaminants are found at varying levels throughout the range of the GOM DPS. The effects of chronic exposure of Atlantic salmon, particularly during sensitive life stages such as fry emergence and smoltification, to many contaminants is not well understood. Fay *et al.* (2006) provide a discussion of water quality concerns in section 8.1.3. For these reasons, non-point source pollution, particularly sedimentation and acid rain, is a stressor to the GOM DPS.

In summary, we have determined that degraded water quality is a stressor on the GOM DPS because of the known situations when water quality did not meet standards and was at levels that negatively impact salmon and because of the impacts of non-point source pollution, particularly sedimentation and acid rain.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The GOM DPS of Atlantic salmon has supported important tribal, recreational, and commercial fisheries. In the past, these fisheries have been conducted throughout nearly all of the GOM DPS' habitats, including in-river, estuarine, and off-shore (section 8.2 of Fay *et al.* (2006)).

Atlantic salmon are an integral part of the history of Native American tribes in Maine, particularly the Penobscot Indian Nation. The species represents both an important resource for food, and perhaps more importantly, a cultural symbol of the deeply engrained connection between the Penobscot Indian Nation and the Penobscot River. In accordance with the Maine Indian Land Claims Settlement Act, the Penobscot Indian Nation retains the right of its members to harvest Atlantic salmon for sustenance purposes, and to self-regulate that harvest. The Penobscot Indian Nation harvested two salmon under these provisions in 1988, and has voluntarily chosen not to harvest any Atlantic salmon since then because of the depleted status of the species (Francis, Penobscot Indian Nation in litt., 2009).

Recreational fisheries for Atlantic salmon in Maine date back to the early to mid-1800s. Since 1880, over 25,000 Atlantic salmon have been landed in Maine rivers, roughly 14,000 in the Penobscot River alone (Baum, 1997). Historically, Atlantic salmon sport anglers practiced very little catch and release. Beginning in the 1980s as runs decreased, the Maine Atlantic Sea Run Salmon Commission imposed increasingly restrictive regulations on the recreational harvesting of Atlantic salmon in Maine. The allowable annual harvest per angler was reduced from 10 salmon in the 1980s to one grilse in 1994. Angling was closed on the Pleasant River from 1986 to 1989. In 1990, a one-year catch and release fishery was allowed on the Pleasant River. In 1995, regulations were promulgated for catch and release fishing for sea-run Atlantic salmon throughout all other Maine salmon rivers, closing the last remaining recreational harvest opportunities for sea run Atlantic salmon in the United States. In 2000, all directed recreational fisheries for sea run Atlantic salmon in Maine were closed until 2006 when a short experimental catch and release fishery was opened on the Penobscot River below Veazie Dam. The 30-day angling season began on September 15, 2006, and resulted in one Atlantic salmon being caught and released on September 20, 2006. This fishery was opened again on September 15, 2007. In 2008, the Maine Atlantic Salmon Commission Board authorized a 30-day catch and release fishery for the spring of 2008. This fishery poses a risk to returning sea-run Atlantic salmon because it occurs at a time of year before broodstock have been collected; broodstock are essential to maintaining current levels of conservation hatchery supplementation, and lack of broodstock would further reduce the likelihood of achieving the scientifically sound and mutually-agreed goals set forth in the Broodstock Management Plan (P. Kurkul, NOAA, in litt. February 1, 2008).

Poaching and incidental capture remain concerns to the status of Atlantic salmon in Maine. Incidental capture of parr and smolts, primarily by trout anglers, and of adult salmon, primarily by striped bass anglers, has been documented. Targeted poaching for adult salmon occurs at low levels as well. Low returns of adult salmon to Maine rivers highlight the importance of continuing to reduce any source of mortality, particularly at later life stages. While current state regulations for recreational angling do include minimum and maximum size limits for certain species (*e.g.*, landlocked salmon), area closures, and outreach and education programs, there is still a threat of take of Atlantic salmon from recreational angling.

Commercial fishing for Maine Atlantic salmon historically occurred in rivers, estuaries, and on the high seas. While most directed commercial fisheries for Atlantic salmon have ceased, the impacts from past fisheries are important in explaining the present low abundance of the GOM DPS. Also, the continuation of offshore fisheries for Atlantic salmon, albeit at reduced levels, influences the current status of the GOM DPS.

Nearshore fisheries for Atlantic salmon in Maine were quite common in the late 1800s. In 1888, roughly 90 metric tons (mt) of salmon were harvested in the Penobscot River alone. As stocks continued to decline through the early 1900s, the Maine Atlantic Sea Run Salmon Commission closed the nearshore commercial fishery for Atlantic salmon after the 1947 season when only 40 fish (0.2 mt) were caught. Any future opportunities for directed fisheries for Atlantic salmon in U.S. territorial waters were further limited by regulations implementing the Atlantic Salmon Fishery Management Plan (FMP) in 1987 (NEFMC, 1987). These regulations prohibit possession of Atlantic salmon in the U.S. Exclusive Economic Zone. While nearshore fisheries for Atlantic salmon have ceased, the impacts from past fisheries are important in explaining the present low abundance of the GOM DPS.

Directed fishing for other species has the potential to intercept salmon as by-catch. Beland (1984) reported that fewer than 100 salmon per year were caught incidental to other commercial fisheries in the coastal waters of Maine. Recent investigations also suggest that by-catch of Atlantic salmon in herring fisheries is not a significant source of mortality for U.S. stocks of salmon (ICES, 2004).

Offshore, directed fisheries for Atlantic salmon continue to affect the GOM DPS, though these fisheries have been substantially reduced in recent years. The combined harvest of 1SW Atlantic salmon of U.S. origin in the fisheries off West Greenland and Canada averaged 5,060 fish, and returns to U.S. rivers averaged 2,884 fish from 1968 to 1989 (ICES, 1993). We estimate that roughly 87 percent of all U.S. adult returns during the time period 1968 to 1989 originated from the GOM DPS as defined in this rule, and thus, roughly 2,519 of the 2,884 U.S. returns were GOM DPS fish. ICES (1993) estimated that adult returns to U.S. rivers could have potentially been increased by 2.5 times in the absence of the West Greenland commercial fishery (closed in 2001) and Labrador fisheries (closed in 1998) during that time period. The United States joined with other North Atlantic nations in 1982 to form NASCO for the purpose of managing salmon through a cooperative program of conservation, restoration, and enhancement of North Atlantic stocks. NASCO achieves its goals by managing the exploitation by member nations of Atlantic salmon that originated within the territory of other member nations. The United States' interest in NASCO stemmed from its desire to ensure that intercept fisheries of U.S. origin fish did not compromise the long-term commitment by the states and Federal government to rehabilitate and restore New England Atlantic salmon stocks. Since the establishment of NASCO in 1982, commercial quotas for the West Greenland fishery have steadily declined, as has the abundance of most stocks that make up this mixed stock fishery (including the GOM DPS). The West Greenland fishery has been restricted to an internal use fishery (*i.e.*, no fish were exported) in the following years: 1998–2000; 2003–2008. From 2002 to 2005, the internal-use fishery harvested between 19 and 25 mt (reported and estimated unreported catch) annually. Genetic analysis performed on samples obtained from the 2002 to 2004 fisheries estimated the North American contribution at 64–73 percent, with the U.S. contributing between 0.1 and 0.8 percent of the total. The 90 percent confidence interval for the U.S. estimates are 0 to 141 salmon in 2002, 5 to 132 salmon in 2003, and 0 to 64 salmon in 2004 (ICES, 2006).

In addition, a small commercial fishery occurs off St. Pierre et Miquelon, a French territory south of Newfoundland. Historically, the fishery was very limited (2 to 3 mt per year). There is great interest by the United States and Canada in sampling this catch to gain more information on stock composition. In recent years, there has been a reported small increase in the number of fishermen participating in this fishery. A small sampling program was initiated in 2003 to obtain biological data and samples from the catch. Genetic analysis on 134 samples collected in 2004 indicated that all samples originated from North America, and approximately 1.9 percent were of U.S. origin. The 90-percent confidence interval around this estimate was 0–77 U.S.-origin salmon (ICES, 2006), and since roughly 87 percent of all U.S. returns originated from the GOM DPS (as defined in this rule) in 2004 (USASAC, 2005), we estimate that up to 67 fish harvested in this fishery originated from the GOM DPS. Efforts to continue and increase the scope of this sampling program are ongoing through NASCO. These data are essential to understanding the impact of this fishery on the GOM DPS.

A multi-year conservation agreement was established in 2002 between the North Atlantic Salmon Fund and the Organization of Hunters and Fishermen in Greenland, effectively buying out the commercial fishery for Atlantic salmon for a 5-year period. The internal-use fishery was not included in the agreement. In June 2007, the agreement was extended and revised to cover the 2007 fishing season. The agreement may continue to be extended on an annual basis through 2013.

In summary, overutilization for recreational and commercial purposes was a factor that contributed to the historical declines of GOM DPS. Intercept fisheries in West Greenland and St Pierre et Miquelon, bycatch in recreational fisheries, and poaching act as stressors on the GOM DPS because they result in direct mortality or cause stress reducing reproductive success and survival.

Factor C. Disease or Predation

Disease

Fish diseases have always represented a source of mortality to Atlantic salmon in the wild (for a more thorough discussion see section 8.3.2 of Fay *et al.* (2006)). Atlantic salmon are susceptible to numerous bacterial, viral, and fungal diseases. Bacterial diseases common to New England waters include Bacterial Kidney Disease (BKD), Enteric Redmouth Disease (ERM), Cold Water Disease (CWD), and Vibriosis (Mills, 1971; Gaston, 1988; Olafsen and Roberts, 1993; Egusa, 1992). To reduce the likelihood of disease outbreaks or epizootic events, cultured salmon used for aquaculture purposes routinely receive vaccinations for these pathogens prior to stocking into marine sites. Fungal diseases such as furunculosis can affect all life stages of salmon in both fresh and salt water, and the causative agent (*Saprolignia* spp.) is ubiquitous to most water bodies. The risk of an epizootic occurring during fish culture operations is greater because of the increased numbers of host animals reared at much higher densities than would be found in the wild. In addition, stressors associated with intensive fish culture operations (*i.e.*, handling, stocking, tagging, and sea-lice loads) may increase susceptibility to infections. Disease from fish culture operations may be spread to wild salmon directly through effluent discharge or indirectly from either escapes of cultured salmon, or through smolts and returning adults passing through embayments where pathogen loads are increased to a level such that infection occurs and diseases may be transferred.

A number of viral diseases that could affect wild populations have occurred during the culture of Atlantic salmon, such as Infectious Pancreatic Necrosis, Salmon Swimbladder Sarcoma Virus, Infectious Salmon Anemia (ISA), and Salmon Papilloma (Olafsen and Roberts, 1993). In 2007, the Infectious Pancreatic Necrosis virus was isolated in sea run fish in the Connecticut River program. These fish most likely contracted the disease during their time at sea, and it was detected in the hatchery due to the rigorous fish health monitoring and assessment protocols. ISA is of particular concern for the GOM DPS because of the nature of the pathogen and the high mortality rates associated with the disease. Most notably, a 2001 outbreak of ISA in Cobscook Bay led to an emergency depopulation of all commercially cultured salmon in the Bay. In addition to complete depopulation of all cultured salmon, the MDMR ordered all cages be thoroughly cleaned and disinfected, all sites be fallowed for 3 months, and subsequent re-stocking of cages occur at lower densities with only a single year class. These measures were initially successful; however, subsequent testing for ISA revealed additional detections of the virus in Cobscook Bay (Maine) sites in 2003, 2004, 2005, and 2006.

In summary, the MIFW, MDMR, and the federally managed conservation hatcheries all must adhere to rigorous disease prevention and management regulations and protocols; despite these protocols there remains a risk of disease outbreaks. Additionally, there is a risk of a disease outbreak in the wild. While disease(s) can have devastating population-wide effects when they occur, there are efforts in place to prevent and manage disease outbreaks in conservation hatcheries and aquaculture facilities. Disease is not presently impacting the GOM DPS. However, the efforts in place to manage this risk cannot completely eliminate the potential for disease outbreak. Further, if a large outbreak were to occur, it could have significant impacts on the GOM DPS.

Predation

Predation is a natural and necessary process in properly functioning aquatic ecosystems (for a comprehensive discussion see section 8.3.1 of Fay *et al.* (2006)). Native freshwater fishes known to prey on Atlantic salmon include brook trout, burbot, American eel, fallfish, and common shiners. In estuarine and marine environments Atlantic salmon are prey to striped bass, Atlantic cod, pollock, porbeagle shark, Greenland shark, Atlantic halibut, and many other species. Many species of birds, mink, and several species of seal also prey on Atlantic salmon. Thus, predation levels may contribute to the low marine survival regimes currently experienced by the GOM DPS.

Atlantic salmon have evolved a suite of strategies that allow them to co-exist with the numerous predators they encounter throughout their life cycle. However, natural predator-prey relationships in aquatic ecosystems in Maine have been substantially altered through the spread of nonnative fish species (*e.g.*, smallmouth bass); habitat alterations; site specific and cumulative delay, injury, or stress experienced during migration and passage over/through dams; and the decline of other diadromous species that would otherwise serve as an alternative prey source for fish that feed on Atlantic salmon smolts and adults. For example, in the estuarine environment, cormorants are an important predator of outmigrating smolts. However, the abundance of alternative prey sources such as alewives likely minimized the impact of cormorant predation on the GOM DPS historically. Similarly, changes in fish assemblages due to stocking of non-native species have resulted in predator species inhabiting many of the same areas used by Atlantic salmon. This is particularly true of smallmouth bass and brown trout (van de Ende, 1993; MASC and MIFW, 2002). The threat posed by these predator species is simply compounded in areas where Atlantic salmon are experiencing physiological stress due to obstructions to passage (Raymond, 1979; Mesa, 1994; Blackwell *et al.*, 1997) and poor habitat quality and complexity (Cunjak, 1996; Blackwell and Krohn, 1997; Larinier, 2000).

In summary, the impact of predation on the GOM DPS of Atlantic salmon is important because of the imbalance between the very low numbers of adults returning to spawn and the increase in population levels of some native predators such as double-crested cormorants, striped bass, and several species of seals as well as non-native predators, such as smallmouth bass. Predation acts as a stressor on the GOM DPS because of high levels of predators and low numbers of Atlantic salmon.

Factor D. Inadequacy of Existing Regulatory Mechanisms

A variety of state and Federal statutes and regulations directly or indirectly address potential threats to Atlantic salmon and their habitat. These laws are complemented by international actions under NASCO and many interagency agreements and state-Federal cooperative efforts specifically designed to protect Atlantic salmon. Implementation and enforcement of these laws and regulations could be strengthened to further protect Atlantic salmon.

Dams

As stated previously, Atlantic salmon require a diverse array of well connected habitat types in order to complete their life history. Present conditions within the range of the GOM DPS only allow salmon to access a fraction of the habitat that was historically accessible. Even where salmon can presently access suitable habitat, they must often pass several dams to reach their natal spawning habitat.

Hydroelectric dams: Hydroelectric dams in the GOM DPS are licensed by the FERC under the FPA. Currently, within the historical range of Atlantic salmon in the GOM DPS there are 19 hydroelectric dams in the Androscoggin watershed, 18 in the Kennebec watershed, and 23 in the Penobscot watershed. In the Androscoggin watershed 16 hydroelectric dams within the range of the GOM DPS are impassable due to the lack of fishways. In the Kennebec watershed, 15 dams are impassable, along with 12 dams in the Penobscot watershed. Presently, 15 dams in the Androscoggin, 7 dams in the Kennebec, and 9 dams in the Penobscot are FERC-licensed without any specific fish passage requirements.

1. Mechanisms Available at Hydroelectric Dams Outside of FERC (Re)licensing

Several mechanisms exist within the framework of the FPA that could potentially be used to address impacts of dams. However, many of these mechanisms are only available in relicensing. Of the 70 dams licensed by FERC in Maine, 3 are currently in relicensing, 3 are covered by the Penobscot River Restoration Project with plans to remove them before expiration of their licenses, and 8 will be up for relicensing in the 2010s, 22 in the 2020s, 19 in the 2030s, 11 in the 2040s, and 4 in the 2050s. Thus, the bulk of these projects will not be up for relicensing for 10 to 20 years or more. The current licenses for many, though by no means all, of these projects contain reservations of FPA section 18 authority that could allow fishways to be prescribed by the Services (16 U.S.C. 811). However, exercise of that authority requires administrative proceedings before the FERC and the Services which could themselves take several years, and the outcome is far from certain. As to the remainder of the projects whose licenses contain no reserved authority, reopening of these licenses may be dependent upon the success of a petition to the FERC to exercise its own reserved authority. This is not a dependable recourse as the decision to even consider such a petition is subject to FERC's discretion. Additional avenues may be available, consistent with the Interagency Task Force Report on Improving Coordination of ESA Section 7 Consultation with the FERC Licensing Process, but these remain largely untested.

Furthermore, lack of fish passage is not the only threat to salmon caused by hydroelectric dams. The effects of habitat degradation and the altered environmental features that favor nonnative species pose an equal or even greater impediment to Atlantic salmon recovery via reduction in production capacity of freshwater rearing areas above dams. These threats may not be addressed by the Services' reserved authority under Section 18 of the FPA; the only mechanism available outside of relicensing is a petition to FERC to exercise its own discretionary authority.

2. Mechanisms Available at Hydroelectric Projects in FERC (Re)licensing

Even in relicensing, the regulatory mechanisms for protection of salmon are inadequate to remove the significant threat to the survival of the species posed by dams. First, fish passage may be addressed by the Services in relicensing pursuant to their mandatory authority under Section 18 of the FPA (16 U.S.C. 811). However, as noted above, this requires a lengthy administrative proceeding before the Services and FERC, and the outcome is not certain. Moreover, the result is a FERC license containing a requirement to construct and operate fish passage. However, a substantial amount of mortality and passage inefficiency may occur even with fishways in place, given that fish passage facilities are never 100 percent efficient. Further, enforcement of FERC licenses can be done only by FERC, is subject to administrative processes with uncertain outcome, and has frequently, in the Services' view, been less than prompt where fish passage or fish habitat issues have been at stake.

The other threats posed by dams to Atlantic salmon, besides lack of fish passage, may also be addressed in relicensing by the Services, via Sections 10(a) and 10(j) of the FPA (16 U.S.C. sections 797 and 803). However, these are mechanisms for making recommendations to the FERC, which factors them into the balancing of factors in its public interest determination under Section 10(a) of the FPA. There is no guarantee that species protection would be a controlling factor in the FERC's decision. In practice, such recommendations are often not required by the FERC (Black *et al.*, 1998).

The Services recognize that they and the FERC are not the only authorities with a role to play in protecting fish in hydropower relicensing. For a hydropower project to be relicensed by the FERC, the State of Maine must first certify that continued operation of the project will comply with Maine's water quality standards pursuant to Section 401 of the CWA. The MDEP is the certifying agency for all hydropower project licensing and relicensing in the State of Maine, except for projects in unorganized territories subject to permitting by the Land Use Regulation Commission (LURC). Through the water quality certification process, the State of Maine can require fish passage and habitat enhancements at FERC licensed hydroelectric projects (See *S.D. Warren* v. *Maine Board of Environmental Protection* 547 U.S. 370, 126 S.Ct. 1843 (2006)). As with Section 18 authority, though section 401 authority is binding on the FERC, it requires administrative proceedings with uncertain outcomes. Also, it is not clear that this mechanism is available except in relicensing, or where MDEP has specifically reserved authority to alter the terms of its prior certification. Authority under section 401 of the CWA permits the certifying state to certify that the discharge will comply with the terms of the CWA, including any state water quality standards. It is not clear that section 401 permits regulation of conditions in the reservoirs above dams, except indirectly where the water quality of the reservoir is controlled by the quality of discharges from an upstream dam.

Finally, in other parts of the country, mandatory conditioning authority under section 4(e) of the FPA is often used by the Services in relicensing to recommend fisheries enhancements. However, this authority is only available to a Federal agency where there are Federal lands under its jurisdiction within the project boundary, and acts as a mechanism to protect the ''reservation.'' Federal lands where Section 4(e) could be applied are rare in Maine, and 4(e) does not provide an adequate mechanism for protection of Atlantic salmon throughout the GOM DPS.

Non-hydroelectric dams: The vast majority of dams within the range of the GOM DPS do not require either a FERC license or MDEP water quality certificate. These dams are typically small dams historically used for a variety of purposes, including flood control, storage, and process water (for industries such as blueberry harvesting). Because they do not generate electricity, they are not subject to the jurisdiction of the FERC under the FPA. Practically none of these dams within the range of the GOM DPS have fish passage facilities, and all impact historical Atlantic salmon habitat. Many of these non-jurisdictional dams are no longer used for their intended purposes; however, many smaller dams maintain water levels in lakes and ponds. Lack of fish passage and other impacts to salmon may currently be addressed only through the mechanisms of State law.

Fish passage may be required by the State of Maine under 12 M.R.S.A section 12760. However, this requires an administrative process and a hearing, if one is requested by the dam owner. An order to construct fish passage under this statute requires a finding that fish can be restored ''in substantial numbers'' and that habitat above the dam ''is sufficient and suitable to support a substantial commercial or recreational fishery.'' These are very different considerations from the ESA's focus on prevention of extinction. Furthermore, this statute has never been used to require fish passage at any dam in Maine, and, despite the one hearing ongoing at this time, the statute remains untested in the courts and at the administrative level. Nor, of course, does it address threats beyond lack of fish passage.

Finally, although the MDEP can be petitioned by the public to set minimum flows and water levels at the dams not under FERC jurisdiction, the MDEP has no direct statutory authority under Maine law to require fisheries related enhancements without public request or petition. Removal of non-hydropower generating dams in Maine may require a permit under the Maine Natural Resources Protection Act or the Maine Waterway Development and Conservation Act. Owners of non-hydroelectric dams can petition the MDEP to be released from ownership; however, the MDEP does not have the authority to require dam removal without the consent of the owner.

In summary, the inadequacy of existing regulatory mechanisms for dams significantly affects the GOM DPS because dams pose a significant threat. Existing regulatory mechanisms do not provide a timely and dependable means to eliminate the effects of dams on salmon and their habitat.

Water Withdrawals

The State of Maine has made substantial progress in regulating water withdrawals. In 2007, it finalized a new rule (Chapter 587 of the Code of Maine Rules ''In-stream flow and water level standards'') that establishes river and stream flows and lake and pond water levels to protect aquatic life and other designated uses in Maine's waters. The new standards are based on maintaining natural variation of flows and water levels, but allow variances if water use will still be protective of applicable state and Federal water quality classifications. The flow standards are based on seasonal aquatic base flows. We believe that the water rules for class AA waters will be protective of Atlantic salmon because the flow standards are based on natural flows, and exceptions are allowed only under clearly defined limits. However, the flow standards for class A, B, and C waters are based on seasonal base flows, which allow withdrawals when flow is at or below median monthly flow. These standards are not sufficiently protective of Atlantic salmon because they allow reduced in-stream flows that reduce habitat, increase water temperature, and decrease dissolved oxygen (as described in Factor A, above).

Water withdrawals that reduce flow below the median monthly flow are a stressor on the GOM DPS (see Factor A). These withdrawals are allowed under the Maine flow standards; therefore, the existing regulatory mechanisms for water quantity are inadequate.

Water Quality

As described above in Factor A, the MDEP administers the NPDES program under the CWA (known as the MPDES program). MDEP issues permits for point source discharges from freshwater hatcheries, municipal facilities, and other industrial facilities. Maine's water classification system provides for different water quality standards for different classes of waters (*e.g.*, there are four classes for freshwater rivers all of which are found within the GOM DPS range). However, these standards are not based on water quality requirements of Atlantic salmon. Also, as described under Factor A above, there have been cases when water quality did not meet standards and was at levels that negatively impact salmon. Therefore, we are concerned that water quality standards may not be sufficiently protective of Atlantic salmon and that lack of compliance with existing standards may continue to harm salmon.

Factor A also describes concerns we have regarding non-point source discharges. Sedimentation and other non-point source discharges related to forestry activities are regulated by the Shoreland Zoning Act, Maine Forest Practices Act, Natural Resource Protection Act, Protection and Improvement of Waters Act, Erosion and Sedimentation Control Law, and the Statewide Standards for Timber Harvesting and Related Activities in Shoreland Areas. Non-compliance with these regulatory mechanisms has resulted in impacts to Atlantic salmon habitat and continues to pose a risk to the GOM DPS (Fay *et al.*, 2006, page 83).

In summary, the MPDES program and the associated water quality standards do not regulate all potential water quality problems for salmon. We have determined that lack of compliance with existing water quality standards and with regulations to reduce sedimentation from forestry activities may continue to impact Atlantic salmon. Therefore, we find that inadequacy of existing regulatory mechanisms for water quality is a stressor to the GOM DPS.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Artificial Propagation

In the proposed rule we included a discussion of artificial propagation under Factor E. However, because of the essential role of conservation hatcheries in currently sustaining the GOM DPS of Atlantic salmon, in this final rule we evaluated the positive and negative effects of hatcheries in the status of the species section. We find that, in the short-term, conservation hatcheries are a benefit to the GOM DPS. The role of the conservation hatchery program is discussed above in the ''Status of the GOM DPS'' section.

Aquaculture

Atlantic salmon that escape from farms and commercial hatcheries pose a threat to native Atlantic salmon populations (Naylor *et al.*, 2005) because captive-reared fish are selectively bred to promote behavioral and physiological attributes desirable in captivity (Hindar *et al.*, 1991; Utter *et al.*, 1993; Hard *et al.*, 2000); for further discussion of the threat of aquaculture see section 8.5.2 in Fay *et al.* (2006)). Experimental tests of genetic divergence between farmed and wild salmon indicate that farming generates rapid genetic change as a result of both intentional and unintentional selection in culture and those changes alter important fitness-related traits (McGinnity *et al.*, 1997; Gross, 1998). Consequently, aquaculture fish are often less fit in the wild than naturally produced salmon (Fleming *et al.*, 2000). Annual invasions of escaped adult aquaculture salmon can disrupt local adaptations and reduce genetic diversity of wild populations (Fleming *et al.*, 2000). Bursts of immigration also disrupt genetic differentiation among wild Atlantic salmon stocks, especially when wild populations are small (Mork, 1991). Natural selection may be able to purge wild populations of maladaptive traits but may be less able to if the intrusions occur year after year. Under this scenario, population fitness is likely to decrease as the selection from the artificial culture operation overrides wild selection (Hindar *et al.*, 1991; Fleming and Einum, 1997), a process called outbreeding depression. The threat of outbreeding depression is likely to be greater in North America where aquaculture salmon have been based, in part, on European strain. To minimize these risks, the use of non-North American strains of salmon has been phased out in the United States.

In addition to genetic effects, escaped farmed salmon can disrupt redds of wild salmon, compete with wild salmon for food and habitat, transfer disease or parasites to wild salmon, and degrade benthic habitat (Windsor and Hutchinson, 1990; Saunders, 1991; Youngson *et al.*, 1993; Webb *et al.*, 1993; Clifford *et al.*, 1997). Farmed salmon have been documented to spawn successfully, but not always at the same time as wild salmon (Lura and Saegrov, 1991; Jonsson *et al.*, 1991; Webb *et al.*, 1991; Fleming *et al.*, 1996). Late spawning aquaculture fish could limit wild spawning success through redd superimposition. There has also been recent concern over potential interactions when wild adult salmon migrate past closely spaced cages, creating the potential for behavioral interactions, disease transfer, or interactions with predators (Lura and Saegrov, 1991; Crozier, 1993; Skaala and Hindar, 1997; Carr *et al.*, 1997; DFO, 1999). In Canada, the survival of wild postsmolts moving from Passamaquoddy Bay to the Bay of Fundy was inversely related to the density of aquaculture cages (DFO, 1999).

Atlantic salmon aquaculture has developed and expanded in the North Atlantic since the early 1970s. Production of farmed Atlantic salmon in 2007 was estimated at over 1.27 million metric tonnes worldwide, 859,103 metric tonnes in the North Atlantic, and 8.16 metric tonnes in Maine (ICES, 2008). The Maine Atlantic salmon aquaculture industry is concentrated in Cobscook Bay near Eastport, Maine. The industry in Canada, just across the border, is approximately twice the size of the Maine industry. Five freshwater commercial hatcheries in the United States have provided smolts to the sea cages and produce up to four million smolts per year.

Three primary broodstock lines have been used for farm production. The lines include fish from the Penobscot River, St. John River, and historically an industry strain from Scotland. The Scottish strain was imported into the United States in the early 1990s and is composed primarily of Norwegian strains, frequently referred to as Landcatch. Milt of Norwegian origin was also imported by the industry from Iceland (Baum, 1998). However, placement of reproductively viable non-North American origin Atlantic salmon into marine cages in the United States has been eliminated.

Escaped farmed salmon are known to enter Maine rivers. For example, at least 17 percent (14 of 83 fish) of the rod catch in the East Machias River were captive-reared adults in 1990. In addition to the frequency and magnitude of escape events that drive annual variability, returns of captive-reared adults to Maine rivers are influenced by the amount of production and proximity of rearing sites in adjacent bays. About 60 percent of commercial salmon production in Maine occurs at sites on Cobscook and Passamaquoddy Bays, into which the Dennys River flows; 35 percent on Machias Bay and the estuary of the Little River, within 11.26 kilometers of the Machias and East Machias Rivers; and the remainder on the estuaries of the Pleasant and Narraguagus Rivers, or adjacent to Blue Hill Bay. The percentage of captive-reared fish in adult returns is highest in the St. Croix (not a part of the GOM DPS) and Dennys Rivers and lowest in the Penobscot River (less than 0.01 percent in the years 1994 to 2001), with the Narraguagus runs having low and sporadic proportions of captive-reared salmon.

A large escape event occurred in 2005 when four marine salmon aquaculture sites in Western New Brunswick, Canada, were vandalized from early May through November 2005, resulting in approximately 136,000 escaped farmed salmon. Most escapees were unmarked 1SW salmon of similar size (2 to 5 kg). Escaped aquaculture-origin salmon from these vandalism events entered the Dennys River and possibly other Eastern Maine rivers in 2005. The Services and MDMR cooperated to implement a program to minimize genetic and ecological risks from this escape (Bean *et al.*, 2006).

Aquaculture escapees and resultant interactions with native stocks are expected to continue to occur within the range of the GOM DPS given the continued operation of farms. While recent containment protocols have greatly decreased the incidence of losses from hatcheries and pens, the risk of large escapes occurring is still significant. Escaped farmed fish are of great concern in Maine because, even at low numbers, they can represent a substantial portion of the returns to some rivers. Wild populations at low levels are particularly vulnerable to genetic intrusion or other disturbance caused by escapees (Hutchings, 1991; DFO, 1999).

Despite the concerns with aquaculture described above, recent advances in containment and marking of aquaculture fish limit the negative impacts of aquaculture fish on the GOM DPS. Permits issued by the Army Corps of Engineers (ACOE) and MDEP require: genetic screening to ensure that only North American strain salmon are used in commercial aquaculture; marking to facilitate tracing fish back to the source and cause of the escape; containment management plans and audits; and rigorous disease screening.

In summary, aquaculture is a stressor to the GOM DPS. If the current regulatory measures were no longer in place, were less protective, or less effective, the threat from aquaculture would be much greater.

Low Marine Survival

As noted previously, Atlantic salmon leave Maine rivers as smolts, and the majority spend 2 years at sea before returning to spawn. Survival during the time at sea directly influences the number of adults that return to spawn. During this extensive marine migration, U.S. Atlantic salmon can be affected directly and indirectly by commercial fisheries (discussed in Factor B) and natural mortality. Given significant reductions in commercial intercept fisheries, the continued low marine survival rates indicate that natural mortality is having a significant impact. Natural mortality in the marine environment can be attributed to four general sources: predation (Factor C), starvation, disease/parasites (Factor C), and abiotic factors (*e.g.*, ocean conditions). While our understanding of the marine ecology of Atlantic salmon has increased substantially in the past decade, the specific role or contribution of the four sources identified above remains unclear.

In general, return rates for Atlantic salmon across North America have declined over the last 30 years (ICES, 1998). Chaput *et al.* (2005) reported on the possibility of a phase (or regime) shift of productivity for Atlantic salmon in the Northwest Atlantic. A phase or regime shift refers to a large and sudden change in abundance (Beamish *et al.*, 1999). Evidence is presented that the productivity of North American Atlantic salmon in the Northwest Atlantic Ocean has decreased since the early 1990s, likely the result of reduced marine survival (Chaput *et al.*, 2005). Specifically, there has been a decrease in the recruit-per-spawner relationship for these populations, which likely occurred over several years in the late 1980s into the early 1990s. This has resulted in a similar number of lagged spawners (index of the parental stock that produced the pre-fishery abundance) resulting in a 2–3 fold decrease in the number of pre-fishery abundance fish (number of North

American 2SW salmon in the ocean at a specific time) when comparing pre-early 1990s to post-early 1990s. The concept of phase shift has previously been documented and discussed for Pacific salmon populations (Beamish *et al.*, 1999). Chaput *et al.* (2005) did not speculate on the causes of the reduced marine survival.

The phase shift described above resulting in lower survival of salmon in the Northwest Atlantic beginning in the 1990s is supported by documented low marine survival rates since 1991 for U.S. stocks of Atlantic salmon, (see section 8.5.3 of Fay *et al.* (2006)). For the period 2003 to 2007, 2SW return rates for wild Narraguagus River smolts ranged from 0.54 to 0.94 percent. Return rates for this same period for 2SW hatchery Penobscot River smolts ranged from 0.11 to 0.17 percent (ICES, 2008). Data for 2007, which is based on the 2005 and 2006 smolt cohorts, showed that 1SW and 2SW adult returns for hatchery and wild populations in many rivers in Newfoundland, Quebec, Scotia-Fundy, and the United States were the lowest in the available time series (1971–2000) (ICES, 2008).

North American stocks have experienced greater declines than European stocks, and southern stocks have experienced greater declines than northern stocks. Bley and Moring (1988) have suggested that Atlantic salmon with longer migration routes typically suffer from lower marine survival rates. Stock abundances and management regimes are highly variable throughout the range. The synchronous population declines on both sides of the North Atlantic despite diverse management regimes suggests that large scale processes in the common marine environment are affecting Atlantic salmon in the ocean and are at least partially responsible for the negative trends in abundance (Friedland *et al.*, 2003; Jonsson and Jonsson, 2004; Friedland *et al.*, 2005; Spares *et al.*, 2007). Furthermore, sonic telemetry studies of emigrating smolts in southern European and North American rivers suggest that smolt mortality in estuaries, though variable, is broadly similar in both regions (ICES, 2008). Numerous ultrasonic tracking studies have begun to provide estimates of nearshore mortality for a number of different populations (Dieperink *et al.*, 2002; Lacroix *et al.*, 2005; Kocik *et al.*, 2008), and it has been suggested that nearshore survival has a particularly large influence on overall marine survival (Ritter, 1989; Dieperink *et al.*, 2002; Potter *et al.*, 2003). These and other studies demonstrate that poor marine survival is being experienced throughout the Atlantic Ocean and is heavily influenced by nearshore survival in addition to open ocean survival and that patterns of decline are most evident in southern stocks (ICES, 2008). Higher freshwater productivity in southern populations may offset poorer marine survival; however, as mentioned above, marine survival is much more variable and has a highly significant impact on adult production regardless of freshwater production.

Efforts to understand marine survival are being undertaken at national and international levels. NMFS is specifically engaged in activities at the national level (*e.g.*, smolt trapping and telemetry studies, and post-smolt trawl surveys) in an effort to understand migration/survival dynamics of smolts, survival estimates by ecological zone, smolt health and behavior during transition to the marine environment, and environmental conditions/ ecosystem health during smolt migration. Data collected from these studies inform salmon management at the national levelands contribute to international efforts. As stated previously, the United States is a member of NASCO, an international treaty organization. Through NASCO, the United States participates in high seas sampling, marine research, and the sampling program for the West Greenland fishery. NMFS is also currently participating in an effort supported by NASCO called Salmon At Sea (SALSEA), an initiative to develop international scientific collaboration to understand marine survival issues. SALSEA is geared towards understanding marine survival issues on the high seas. Ongoing SALSEA work includes, but is not limited to, efforts to merge genetics and ecology data to try and understand marine migration and distribution patterns, trawl surveys, and fishery sampling.

Marine survival is thus critical to shaping recruitment patterns in Atlantic salmon, with low marine survival causing the low abundance of adult salmon; however, the mechanisms of the observed persistent decline in marine survival remain unknown. It is clear that marine survival has to improve dramatically in the future in order to reverse the GOM DPS decline.

It is important to note that the above discussion focuses primarily on survival at sea, beyond the territorial waters of any one country. Mortality of outmigrating smolts in the estuaries and bays of the GOM DPS is also affecting the population. Tagging and tracking studies conducted by NMFS indicate that approximately half of the smolts leaving our rivers do not enter the open ocean. Improvements in survival in this transition zone could ultimately result in improvements in marine survival. It is also likely that if we are able to identify the factors affecting survival of outmigrating smolts in our estuaries and bays, we will have a greater chance of influencing those factors than the factors that may be affecting salmon survival at sea. In summary, the observed, persistent decline in marine survival is directly responsible for the low abundance of adult salmon. Low marine survival poses a significant threat to the GOM DPS because it is driving population status and projections for recovery. Recovery of the species is dependent on increases in marine survival. The mechanisms driving low marine survival remain unknown.

Depleted Diadromous Communities

The ecological setting in which Maine Atlantic salmon evolved is considerably different than what exists today. Ecological changes that have occurred over the last 200 years are ubiquitous and span a wide array of spatial and temporal scales. Of particular concern for Atlantic salmon recovery efforts within the range of the GOM DPS is the dramatic decline observed in the diadromous fish community. At historic abundance levels, Fay *et al.* (2006) and Saunders *et al.* (2006) hypothesized that several of the co-evolved diadromous fishes may have provided substantial benefits to Atlantic salmon through at least four mechanisms: serving as an alternative prey source for salmon predators; serving as prey for salmon directly; depositing marine-derived nutrients in freshwater; and increasing substrate diversity of rivers. A brief description of each mechanism is provided below.

Fay *et al.* (2006) and Saunders *et al.* (2006) hypothesized that the historically large populations of clupeids (*i.e.*, members of the family Clupeidae, such as alewives, blueback herring, and American shad) likely provided a robust alternative forage resource (or prey buffer) for opportunistic native predators of salmon during a variety of events in the salmon's life history. First, pre-spawn adult alewives likely served as a prey buffer for migrating Atlantic salmon smolts. Evidence for this relationship includes significant spatial and temporal overlap of migrations, similar body size, numbers of alewives that exceeded salmon smolt populations by several orders of magnitude (Smith, 1898; Collette and Klein-MacPhee, 2002), and a higher caloric content per individual (Schulze, 1996). Thus, alewives were likely a substantial alternative prey resource (*i.e.*, prey buffer) that protected salmon smolts from native predators such as cormorants, otters, ospreys, and bald eagles within sympatric migratory corridors (Mather, 1998; USASAC, 2004). Second, adult American shad likely provided a similar prey buffer to potential predation on Atlantic salmon adults by otters and seals. Pre-spawn adult shad would enter these same rivers and begin their upstream spawning migration at approximately the same time as adult salmon. Historically, shad runs were considerably larger than salmon runs (Atkins and Foster, 1869; Stevenson, 1898). Thus, native predators of medium to large size fish in the estuarine and lower river zones could have preyed on these 1.5 to 2.5 kg size fish readily. Third, juvenile shad and blueback herring may have represented a substantial prey buffer from potential predation on Atlantic salmon fry and parr by native opportunistic predators such as mergansers, herons, mink, and fallfish. Large populations of juvenile shad (and blueback herring, with similar life history and habitat preferences to shad) would have occupied mainstem and larger tributary river reaches through much of the summer and early fall. Juvenile shad and herring would ultimately emigrate to the ocean, along with juvenile alewives from adjacent lacustrine habitats, in the late summer and fall. Recognizing that the range and migratory corridors of these juvenile clupeids would not be precisely sympatric with juvenile salmon habitat, there nonetheless would have been a substantial spatial overlap amongst the habitats and populations of these various juvenile fish stocks. Even in reaches where sympatric occupation by juvenile salmon and juvenile clupeids may have been low or absent, factors such as predator mobility and instinct driven energetic efficiency (*i.e.*, optimal foraging theory) need to be considered since the opportunity for prey switching would have been much greater than today, and the opportunity for prey switching may produce stable predator-prey systems with coexistence of both prey and predator populations (Krivan, 1996).

At historical abundance levels, other diadromous species also represented significant supplemental foraging resources for salmon in sympatric habitats. In particular, anadromous rainbow smelt are known to be a favored spring prey item of Atlantic salmon kelts (Cunjak *et al.* 1998). A 1995 radio tag study found that Miramichi River (New Brunswick, Canada) kelts showed a net upstream movement shortly after ice break-up (Komadina-Douthwright *et al.*, 1997). This movement was concurrent with the onset of upstream migrations of rainbow smelt (Komadina-Douthwright *et al.*, 1997). In addition, Moore *et al.* (1995) suggested that the general availability of forage fishes shortly after ice break-up in the Miramichi could be critical to the rejuvenation and ultimate survival of kelts as they prepared to return to sea. Kelts surviving to become repeat spawners are especially important, from a demographic perspective, due to higher fecundity (Baum, 1997; NRC, 2004). The historical availability of anadromous rainbow smelt as potential kelt forage in lower river zones may have been important in sustaining the viability of this salmon life stage. Conversely, the broad declines in rainbow smelt populations may be partially responsible for the declining occurrence of repeat spawners in Maine's salmon rivers.

Historically, the upstream migrations of large populations of adult clupeids, sea lamprey, and salmon themselves, provided a conduit for the import and deposition of biomass and nutrients of marine origin into freshwater environments. Mechanisms of direct deposition included discharge of urea, discharge of gametes on the spawning grounds, and deposition of adult carcasses (Durbin *et al.*, 1979). Migrations and other movements of mobile predators and scavengers of adult carcasses likely resulted in further distribution of imported nutrients throughout the freshwater ecosystem. Conversely, juvenile outmigrants of these sea-run species represented a massive annual outflux of forage resources for Gulf of Maine predators, while also completing the cycle of exporting base nutrients back to the ocean environment. These types of diffuse mutualism are only recently being recognized (Hay *et al.*, 2004). Sea lampreys also likely played a role in nutrient cycling. Lampreys prefer spawning habitat that is very similar (location and physical characteristics) to that used by spawning Atlantic salmon (Kircheis, 2004). Adult lampreys spawn in late spring, range in weight from 1 to 2 kg, and experience 100 percent post-spawning mortality on spawning grounds (semelparous). This results in the deposition of marine-origin nutrients at about the same time that salmon fry would be emerging from redds and beginning to occupy adjacent juvenile production habitats. These nutrients would likely have enhanced the primary production capability of these habitats for weeks or even months after initial deposition, and would gradually be transferred throughout the trophic structure of the ecosystem, including those components most important to juvenile salmon (*e.g.*, macroinvertebrate production).

Sea lampreys likely provide an additional benefit to Atlantic salmon spawning activity in sympatric reaches. In constructing their nests, lamprey carry stones from other locations and deposit them centrally in a loose pile within riffle habitat and further utilize body scouring to clean silt off stones already at the site (Kircheis, 2004). Ultimately, a pile of silt-free stones as deep as 25 cm and as long as a meter is formed (Leim and Scott, 1966; Scott and Scott, 1988), into which the lamprey deposit their gametes. The stones preferred by lampreys are generally in the same size range as those preferred by spawning Atlantic salmon. Thus, lamprey nests can be attractive spawning sites for Atlantic salmon (Kircheis, 2004). Kircheis (2004) also notes the lamprey's silt-cleaning activities during nest construction that may improve the ''quality'' of the surrounding environment with respect to potential diversity and abundance of macroinvertebrates, a primary food item of juvenile salmon.

Depleted diadromous fish communities are a stressor to the GOM DPS. Because diadromous fish populations have been significantly reduced, ecological benefits from marine derived nutrient deposition, prey buffering, and alternative sources of food for Atlantic salmon are likely significantly lower today compared to historical conditions. These impacts may be contributing, at some undetermined level, to decreased marine survival through the reduction of prey for reconditioning kelts, through increased predation risks for smolts in lower river and estuarine areas, and through increased predation risks to adults in estuarine and lower river areas. Although these impacts do not occur in the open ocean, the demographic impact to the species occurs after smolt emigration, and is thus a component of the marine survival regime.

Competition

Prior to 1800, the resident riverine fish communities in Maine were relatively simple, consisting of brook trout, cusk (burbot), white sucker, and a number of minnow species. Today, Atlantic salmon co-exist with a diverse array of nonnative resident fishes, including brown trout, largemouth bass, smallmouth bass, and northern pike

(MIFW, 2002). The range expansion of nonnative fishes is important, given evidence that niche shifts may follow the addition or removal of other competing species (Fausch, 1998). For example, in Newfoundland, Canada, where fish communities are simple, Atlantic salmon inhabit pools and lakes that are generally considered atypical habitats in systems where there are more complex fish communities (Gibson, 1993). Use of lacustrine (or lake) habitat, in particular, can increase smolt production (Matthews *et al.*, 1997). Conversely, if salmon are excluded from these habitats through competitive interactions, smolt production may suffer (Ryan, 1993). Even if salmon are not completely excluded from a given habitat type, they may select different, presumably sub-optimal, habitats in the presence of certain competitors (Fausch, 1998). Thus, competitive interactions may limit Atlantic salmon production through niche constriction (Hearn, 1987).

The range expansion of nonnative species (*e.g.*, smallmouth bass, brown trout, and rainbow trout) is of particular concern since these species often require similar resources as salmon and are, therefore, expected to be competitors for food and space. MIFW currently stocks landlocked Atlantic salmon, brown trout, brook trout, rainbow trout and splake in Atlantic salmon river drainages, posing a threat to Atlantic salmon in the GOM DPS (Fay *et al.*, 2006). The range of northern pike has also been expanded through stocking, and they now exist in at least 16 lakes within the Kennebec and Androscoggin drainages as well as Pushaw Lake that drains into Lower Penobscot River (MIFW, 2001). Yellow perch, white perch, and chain pickerel were historically native to Maine, though their range has been expanded by stocking and subsequent colonization (MIFW, 2002).

Brown trout, rainbow trout, and splake are all non-native species known to prey on Atlantic salmon and have been stocked throughout the range of the GOM DPS by the MIFW (Fay *et al.*, 2006). The species most likely to compete for food and habitat with Atlantic salmon in the GOM DPS include brown trout, land locked Atlantic salmon, brook trout, and smallmouth bass (Fay *et al.*, 2006). Atlantic salmon and rainbow trout juveniles require similar resources; therefore, competition is expected to be significant in areas of overlap (Fay *et al.*, 2006). Rainbow trout would be important competitors if they overlapped with Atlantic salmon to a greater extent (Fay *et al.*, 2006). Rainbow trout are present in at least three reaches of the Kennebec River and in the Androscoggin (Fay *et al.*, 2006). Illegal introductions and legal stocking programs continue to expand their range (Pellerin, 2002). Atlantic salmon and rainbow trout juveniles require similar resources; therefore, competition is expected to be significant in areas of overlap (Fay *et al.*, 2006).

There are some areas within the range of the GOM DPS where landlocked Atlantic salmon spawn successfully and rear in sympatry with anadromous Atlantic salmon (Fay *et al.*, 2006). For these populations, competitive interactions for food and habitat are expected to be very high given the nearly identical early life history requirements of the two ecotypes (Fay *et al.*, 2006). Competition between brown trout and Atlantic salmon is expected to be significant in areas where they co-occur given similarities in their life history requirements (Fay *et al.*, 2006). Brown trout currently inhabit the Androscoggin, Kennebec Rivers, and the Piscataquis River in the upper Penobscot watershed, as well as many lakes and ponds (Boland, 2001; MIFW, 2002). Most evidence suggests that brown trout will displace or otherwise outcompete Atlantic salmon from pool habitats in both summer and winter (Kennedy and Strange, 1986; Harwood *et al.*, 2001). The ability of brown trout to outcompete Atlantic salmon has significant negative effects on Atlantic salmon, including changes in habitat use and behavior that may limit salmon production through niche constriction when the two species co-occur (Hearn, 1987; Fausch, 1988). In summary, competition is a stressor to the GOM DPS because it can exclude salmon from preferred habitats, reduce food availability, and increase predation.

Climate Change

Since the 1970s there has been a historically significant change in climate (Greene *et al.*, 2008). Climate warming has resulted in increased precipitation, river discharge, and glacial and sea-ice melting (Greene *et al.*, 2008). The past 3 decades have witnessed major changes in ocean circulation patterns in the Arctic, and these were accompanied by climate associated changes as well (Greene *et al.*, 2008). Shifts in atmospheric conditions have altered Arctic ocean circulation patterns and the export of freshwater to the North Atlantic (Greene *et al.*, 2008; IPCC, 2006). With respect specifically to the North Atlantic Oscillation (NAO), changes in salinity and temperature are thought to be the result of changes in the earth's atmosphere caused by anthropogenic forces (IPCC, 2006). The NAO impacts climate variability throughout the northern hemisphere (IPCC, 2006). Data from the 1960s through the present show that the NAO index has increased from minimum values in the 1960s to strongly positive index values in the 1990s and somewhat declined since (IPCC, 2006). This warming extends over 1000 m deep and is deeper than anywhere in the world oceans and is particularly evident under the Gulf Stream/North Atlantic Current system (IPCC, 2006). On a global scale, large discharges of freshwater into the North Atlantic subarctic seas can lead to intense stratification of the upper water column and a disruption of North Atlantic Deepwater (NADW) formation (Greene *et al.*, 2008; IPCC, 2006). There is evidence that the NADW has already freshened significantly (IPCC, 2006). This in turn can lead to a slowing down of the global ocean thermohaline (large-scale circulation in the ocean that transforms low-density upper ocean waters to higher density intermediate and deep waters and returns those waters back to the upper ocean), which can have climatic ramifications for the whole earth system (Greene *et al.*, 2008).

The changes in freshwater export and circulation patterns have resulted in significant salinity changes (IPCC, 2006), leading to two main ecological shifts (Pershing *et al.,* 2005; Greene and Pershing 2007; Greene *et al.,* 2008). The first major ecological shift is the biogeographic range expansion by Boreal Plankton, including trans-Arctic exchanges of Pacific species with the Atlantic (Greene *et al.,* 2008). The second ecological shift had mainly affected the Northwest Atlantic where, during the early 1990s, a dramatic shift in shelf ecosystems occurred (Pershing *et al.,* 2005; Greene and Pershing, 2007; Greene *et al.,* 2008). The major shifts observed specifically in the GOM and Scotian shelf ecosystems in the early 1990s are specifically linked to these changes in salinity and lower trophic level communities (Pershing *et al.,* 2005; Greene and Pershing, 2007; Greene *et al.,* 2008). These changes may be related to changes in higher trophic level consumer populations as well (Greene *et al.,* 2008). Shifts in ecological communities in the Northwest Atlantic include commercially harvested fish and crustacean populations, both of which underwent large changes in abundance during the 1990s (Frank *et al.,* 2005; Pershing *et al.,* 2005; Vilhjalmsson *et al.,* 2005). While overfishing was the predominant cause of the collapse of cod in particular, the cold, low-salinity Arctic waters entering the northern portion of the range of cod, seem to have hampered their subsequent recovery (Rose *et al.,* 2000; Vilhjalmsson *et al.,* 2005). Other species, such as shrimp and snow crab, have increased in abundance in the absence of cod predation (Frank *et al.,* 2005).

With respect to the GOM DPS, Greene *et al.* (2008) describe that changes in salinity can result in more localized effects on ocean circulation patterns and climate that are confined to the North Atlantic basin and the adjacent landmasses. For example, these changes specifically affect thermal regimes within the range of the GOM DPS (see section 8.1.4 of Fay *et al.* (2006)). Within the range of the GOM DPS, the spring runoff occurs earlier; water content in snow pack for March and April has decreased; and the duration of river ice has been reduced (Dudley and Hodgkins, 2002). Several studies indicate that small thermal changes may substantially alter reproductive performance, smolt development, species distribution limits, and community structure of fish populations (Van Der Kraak and Pankhurst, 1997; McCormick *et al.,* 1997; Keleher and Rahel, 1996; McCarthy and Houlihan, 1997; Welch *et al.,* 1998; Schindler, 2001). For Atlantic salmon specifically, Juanes *et al.* (2004) suggest that observed changes in adult run timing may be a response to global climate change. Friedland *et al.* (2005) summarized numerous studies that suggest that climate mediates marine survival for Atlantic salmon as well as other fish species. Recent analyses of bottom water temperatures found that negative NAO years are warmer in the north and cooler in the Gulf of Maine (Petrie, 2007). Positive NAO years are warmer in Gulf of Maine and colder in the north (north of 45° N) (Petrie, 2007). Strength of NAO is related to annual changes in diversity of potential predators: at southern latitudes, there are more species during positive NAO years (Fisher *et al.,* 2008). The effect is system-wide where 133 species showed at least a 20 percent difference in frequency of occurrence in years with opposing NAO states (Fisher *et al.,* 2008).

This is currently leading to different hypotheses regarding the effect these changes may be having on Atlantic salmon. One hypothesis is that salmon migrating during positive NAO years confront a steeper gradient of cooler to warmer water. This gradient may be resulting in changes in the composition of species as Atlantic salmon undertake their marine migration, potentially increasing the vulnerability of Atlantic salmon to predators (Gibson, 2006; NMFS Nearshore Workshop #2, 2009). Other hypotheses being explored relate to potential linkages between ocean climate and effects on wind velocities and nearshore wind driven currents and adverse impacts on post smolt migration, as well as the potential influence of air temperatures and sea surface temperature and potential impacts on migration cues (NMFS Nearshore Workshop #2, 2009). These current efforts to understand changes in ocean productivity are focused on whether environmental changes could be contributing, whether there are any other species where similar shifts in productivity have had negative effects, and whether there are correlations between this particular phase shift and population dynamics of other species.

While some physiological changes at the individual level are quite predictable when changes in temperature are known, we do not understand how or to what degree climate change may affect the freshwater and marine environment of the GOM DPS. At this time, we do not have enough information to determine whether the GOM DPS is threatened or endangered because of the effects of climate change.

Efforts Being Made To Protect the Species

Section 4(b)(1)(A) of the ESA requires the Secretary of Commerce to make listing determinations solely on the basis of the best scientific and commercial data available after taking into account efforts being made to protect a species. Therefore, in making a listing determination, we first assess a species' level of extinction risk and identify factors that have led to its decline. We then assess existing efforts being made to protect the species to determine if these conservation efforts improve the status of the species such that it does not meet the ESA's definition of a threatened or endangered species.

In judging the efficacy of existing protective efforts, we rely on the Services' joint ''Policy for Evaluation of Conservation Efforts When Making Listing Decisions'' (''PECE;'' 68 FR 15100; March 28, 2003). PECE provides direction for the consideration of protective efforts identified in conservation agreements, conservation plans, management plans, or similar documents (developed by Federal agencies, state and local governments, tribal governments, businesses, organizations, and individuals) that have not yet been implemented, or have been implemented but have not yet demonstrated effectiveness. The policy articulates several criteria for evaluating the certainty of implementation and effectiveness of protective efforts to aid in determining whether a species should be listed as threatened or endangered. Evaluation of the certainty that an effort will be implemented includes whether: (1) The conservation effort, the party(ies) to the agreement or plan that will implement the effort, and the staffing, funding level, funding source, and other resources necessary to implement the effort are identified; (2) the legal authority of the party(ies) to the agreement or plan to implement the formalized conservation effort, and the commitment to proceed with the conservation effort are described; (3) the legal procedural requirements (*e.g.* environmental review) necessary to implement the effort are described, and information is provided indicating that fulfillment of these requirements does not preclude commitment to the effort; (4) authorizations (*e.g.,* permits, landowner permission) necessary to implement the conservation effort are identified, and a high level of certainty is provided that the party(ies) to the agreement or plan that will implement the effort will obtain these authorizations; (5) the type and level of voluntary participation (*e.g.,* number of landowners allowing entry to their land, or number of participants agreeing to change timber management practices and acreage involved) necessary to implement the conservation effort is identified, and a high level of certainty is provided that the party(ies) to the agreement or plan that will implement the conservation effort will obtain that level of voluntary participation (*e.g.,* an explanation of how incentives to be provided will result in the necessary level of voluntary participation); (6) regulatory mechanisms (*e.g.,* laws, regulations, ordinances) necessary to implement the conservation effort are in place; (7) a high level of certainty is provided that the party(ies) to the agreement or plan that will implement the conservation effort will obtain the necessary funding; (8) an implementation schedule (including incremental completion dates) for the conservation effort is provided; and (9) the conservation agreement or plan that includes the conservation effort is approved by all parties to the agreement or plan. The evaluation of the certainty of an effort's effectiveness is made on the basis of whether the effort or plan meets the following elements: (1) The nature and extent of threats being addressed by the conservation effort are described, and how the conservation effort reduces the threats is described; (2) explicit incremental objectives for the conservation effort and dates for achieving them are stated; (3) the steps necessary to implement the conservation effort are identified in detail; (4) quantifiable, scientifically valid parameters that will demonstrate achievement of objectives, and standards for these parameters by which progress will be measured, are identified; (5) provisions for monitoring and reporting progress on implementation (based on compliance with the implementation schedule) and effectiveness (based on evaluation of quantifiable parameters) of the conservation effort are provided; and (6) principles of adaptive management are incorporated.

PECE also notes several important caveats. Satisfaction of the above mentioned criteria for implementation and effectiveness establishes a given protective effort as a candidate for consideration, but does not mean that an effort will ultimately change the risk assessment for the species. The policy stresses that, just as listing determinations must be based on the viability of the species at the time of review, so they must be based on the state of protective efforts at the time of the listing determination. PECE does not provide explicit guidance on how protective efforts affecting only a portion of a species' range may affect a listing determination, other than to say that such efforts will be evaluated in the context of other efforts being made and the species' overall viability. There are circumstances where threats are so imminent, widespread, and/or complex that it may be impossible for any agreement or plan to include sufficient efforts to result in a determination that listing is not warranted.

Outlined below are current and future protective efforts that may minimize threats facing the GOM DPS. Each of these efforts or projects is measured against the PECE criteria to evaluate the certainty of implementation and effectiveness to determine the relative contribution of the efforts to reducing extinction risk.

Fish Passage, Dams, and Hydropower

The Services are involved in hydroelectric project relicensing and other fish passage issues. Fisheries agencies in Maine continue to work to establish and improve upstream and downstream fish passage, and to remove dams and other blockages to habitat connectivity. The majority of fish passage work in the range of the GOM DPS focuses on FERC licensed dams on the Penobscot, Kennebec, and Androscoggin watersheds and on opportunities to enhance passage throughout historical Atlantic salmon habitat. This includes participating in the Penobscot River Restoration Project, negotiating improved passage on a number of dams on the Kennebec River pursuant in part to the 1998 Lower Kennebec River Comprehensive Hydropower Settlement Accord, replacing culverts on highways and logging roads, and removing dams. The Services, in coordination with other state and Federal agencies, are also making efforts to improve fish passage on the Narraguagus and Sheepscot Rivers. Information regarding some of the most notable efforts made to improve passage for Atlantic salmon in the GOM DPS is summarized below.

(1) Lower Kennebec River Comprehensive Hydropower Settlement Accord (KHDG Accord, May 26th, 1998): The KHDG Accord addresses fish passage issues at eight hydroelectric projects on the Kennebec River and Sebasticook River. The 1998 Accord was signed by various state and Federal fishery agencies and approved by the FERC. In addition, the Anson and Abenaki Offer of Settlement (January 30, 2002), also signed by various state and Federal fishery agencies and approved by FERC, addresses fish passage provisions on two hydroelectric projects within the middle reaches of the Kennebec River (Anson and Abenaki Projects). On the Kennebec River, fish passage agreements were reached at the lower four hydroelectric projects including the Lockwood, Hydro-Kennebec, Shawmut, and Weston as part of the KHDG Accord. The lowermost hydroelectric project, Edwards Dam, was removed as part of the KHDG Accord. On the Sebasticook River, fish passage agreements were reached on the Benton and Burnham Projects, and in 2008, the Fort Halifax dam was breached pursuant to the passage agreement.

During the spring of 2006, upstream fish passage facilities were installed at the Lockwood Dam, the lowermost dam in the Kennebec, pursuant to the KHDG Accord. Fish passage at the Lockwood Dam currently consists of a fish lift with trap and truck facilities. Atlantic salmon captured at the Lockwood Dam are transported upstream to suitable habitat in the Sandy River. In 2006, upstream fish passage, in the form of a fish lift, was also installed at the Benton Falls and Burnham facilities on the Sebasticook River, a tributary to the Kennebec. Currently on the Kennebec, only the Lockwood Dam has upstream fish passage facilities for Atlantic salmon (FPL Energy Maine Hydro LLC, 2008). While some salmon rearing habitat is now available in the restored reach below Lockwood, the vast majority of salmon habitat (nearly 90 percent) in the Kennebec River watershed is located above Lockwood.

The KHDG Accord and Anson-Abenaki Settlement contain biological triggers for implementing upstream passage on the Kennebec River. Based upon the KHDG biological triggers, the next mainstem dam upstream of Lockwood (Hydro-Kennebec) may not have upstream fish passage facilities installed until 2010 at the earliest, and the last dam with upstream habitat may not have fishways until 2020. The main biological trigger to sequential implementation of upstream passage at the remaining KHDG dams is the establishment of a large run of shad in the Kennebec that will be trapped at Lockwood. The shad program in the Kennebec is supported by stocking; however, that program is limited by funding and production capabilities. Funding was secured through 2008; however, funding for the stocking program for 2009 and beyond is highly uncertain. The KHDG Accord does offer one other alternative to state and Federal resource agencies to trigger fishway installation. Text in the Accord states the alternative approach is available to state and Federal resource agencies ''should the growth of salmon or river herring runs make it necessary to adopt an alternative approach for triggering fishway installation.'' However, this process would have to be handled through FERC, and the Licensee would have to agree to the proposed alternative triggers. Even after fish passage facilities are installed in the Kennebec River in accordance with this plan, Atlantic salmon will need to pass at least six mainstem dams (Lockwood, Hydro-Kennebec, Shawmut, Weston, Abenaki, and Anson).

The KHDG Accord and Anson-Abenaki Settlement are legally binding, requiring all parties to fulfill their obligations as stated in the agreement. When all of the conditions in the Accord and Settlement have been fulfilled, passage on the Kennebec River and some of the tributaries will be improved, allowing Atlantic salmon and other diadromous species access to important habitat. However, neither the Accord nor the Settlement is likely to recover Atlantic salmon in the Kennebec watershed in the foreseeable future. The legal procedural requirements in the agreements are based upon biological triggers that currently are contingent upon the success of a shad stocking program for which production capacity and funding are uncertain for 2009 and beyond. Therefore, the second, third and seventh criteria in the PECE for certainty of implementation are not satisfied. Under PECE, the effectiveness of the agreements to fully address passage issues for Atlantic salmon in the Kennebec River, or the entire GOM DPS, also can not be fully guaranteed at this time, given that all objectives and project parameters are based upon biological triggers that are uncertain. Thus, while the Accord and the Settlement have time tables associated with implementation, monitoring components, and project objectives (effectiveness criteria two, three, and five), these are contingent upon biological triggers being met.

(2) Penobscot River Restoration Project (PRRP): Perhaps the most significant of the agreements mentioned above is the PRRP. The PRRP is the result of many years of negotiations between Pennsylvania Power and Light (PPL), U.S. Department of the Interior (*i.e.,* USFWS, Bureau of Indian Affairs, National Park Service), Penobscot Indian Nation, the state of Maine (*i.e.,* Maine State Planning Office, Inland Fisheries and Wildlife, MDMR), and several non-governmental organizations (NGOs; Atlantic Salmon Federation, American Rivers, Trout Unlimited, Natural Resources Council of Maine, among others). If implemented, the PRRP would lead to the removal of the two lowermost mainstem dams on the Penobscot River (Veazie and Great Works) and would decommission the Howland Dam and construct a nature-like fishway around it. This initiative would improve habitat accessibility for all diadromous species. For example, less than 7 percent of post-project salmon habitat will be above four or more dams, and at least 43 percent of the habitat would require, at most, one dam passage in each direction with conventional passage facilities. At least 15 percent of salmon habitat would have no intervening dams remaining, compared to 2.5 percent presently (see section 8.1 in Fay *et al.,* 2006).

In addition to improved habitat accessibility for Atlantic salmon and other diadromous species, the PRRP will also provide an opportunity to study the ecological linkages between Atlantic salmon and the 11 other diadromous species with which they co-evolved. The linkage between other diadromous species and Atlantic salmon may be crucial to recovering Atlantic salmon to self-sustaining levels. As stated previously, this co-evolution likely provided ecological benefits to the diadromous species complex (*e.g.,* marine-derived nutrient deposition and prey buffering), which may enhance Atlantic salmon survival at key life stages. Therefore, a full understanding of these benefits and a multi-species approach is required for the successful recovery of Atlantic salmon to the Penobscot system.

In June 2004, the Parties to the negotiations signed the Penobscot Multiparty Settlement Agreement (MPA). The MPA includes a 5-year option period during which time the ''Penobscot River Restoration Trust'' raised the necessary funds to purchase the dams. In addition, another $25–30M is required for decommissioning and removal. NOAA's budget for the 2008 fiscal year contained $10M to support the PRRP.

There is a significant effort on behalf of the Parties to the MPA and other Federal and non-Federal bodies to secure funds for the purchase, decommissioning, and removal of the dams. However, as stated above, the certainty of that funding is not known at this time. While the necessary funding has been committed by the government and other private donors to achieve the purchase of the dams, a significant amount of money still must be acquired in order for the parties to exercise the option to decommission and remove the dams as well as construct a nature like fishway. While significant progress has been made in fundraising and permitting, staffing, funding level, funding source and other resources necessary to fully implement the PRRP are not identified at this time. There is not currently a high level of certainty that the necessary funding will be obtained. Therefore, at this time, the PRRP does not satisfy criteria one and seven in the certainty of implementation of the PECE. Permitting and regulatory requirements are also uncertain at this stage because they are contingent upon the ability of the parties to raise the full amount of funds necessary, FERC approval of the Trust's permit to surrender the dams, and completion of required environmental review. Thus, the PRRP does not satisfy criterion four of the PECE, which requires that all authorizations (*e.g.,* permits, land owner permission) necessary to implement the conservation effort are identified and that there is a high certainty that the parties to the agreement will obtain all necessary authorizations. If proper funding is acquired to fulfill the MPA and the project undergoes the appropriate environmental and regulatory review and permitting, Atlantic salmon in the Penobscot River will clearly benefit. However, it is not possible to state at this time with a high level of certainty that this project will be fully implemented, especially in light of the present economic conditions and energy issues facing the United States. If the removal option is not exercised, fishway prescriptions issued by the Services will be implemented.

The PRRP provides unique opportunities for restoration efforts. Many species will benefit from the PRRP directly, but many other passage impediments exist in the basin. Some diadromous fish species, such as Atlantic salmon, alewife, and shad, may require additional habitat improvements (barrier removal, fishways, etc.) or stocking. Thus, additional active restoration measures may be required to realize the full potential of the PRRP. Due to the high profile of the project and the high costs involved, there is a need to prioritize restoration efforts in the basin to increase the probability for project success. There are many ways to determine what a ''successful'' PRRP would look like. In March 2008, the Penobscot Interagency Technical Committee (PNITC) was formed to develop operational management plans for diadromous fish within the basin. Members of the PNITC include managers and scientists from MDMR, MIFW, NMFS, the Penobscot Indian Nation, and FWS. The PNITC has been tasked with developing one set of restoration goals and priorities for the basin. To help facilitate this goal, we have begun developing an ecologically-based GIS tool to help set goals and to help identify and prioritize various restoration efforts. The outputs of this tool will help to ensure that achievable goals are established, and that funding and restoration efforts are applied in the most appropriate manner. The PNITC, in conjunction with NMFS, are making strides towards defining the scope of restoration efforts and operational plans for diadromous species including Atlantic salmon. Despite these efforts, the effectiveness of the PRRP is still uncertain given that explicit incremental objectives and an implementation plan still need to be identified (criteria two and three); quantifiable, scientifically valid parameters by which to measure progress have yet to be established (criterion four); and provisions for reporting and monitoring have not been established (criterion five).

(3) New England Atlantic Salmon Committee (NEASC): In addition to these efforts, NEASC requested that the USASAC provide a list of the top priority fish passage projects in New England. NEASC hopes to use this information to leverage funding from a

variety of sources to implement these projects. The prioritized list was developed by soliciting information from representatives from each of the New England states responsible for managing Atlantic salmon. NEASC hopes that this initiative will result in a large scale effort to improve passage and remove obstructions for salmon and other diadromous fish species throughout New England. This effort may result in gaining both support and resources for improved passage. However, the outcome of this effort is highly uncertain in terms of both implementation and effectiveness. Therefore, the NEASC effort to prioritize fish passage projects in hopes to leverage funding for implementation does not satisfy any of the six effectiveness and nine implementation criteria of the PECE.

Adaptive Management Initiatives

(1) Habitat Connectivity: In 2006, 18 stream habitat connectivity projects were completed in 3 of the Downeast Rivers. The principal funding sources were Natural Resources Conservation Service-Wildlife Habitat Improvement Program, USFWS, Maine Atlantic Salmon Conservation Partnership-Student Career Experience Program, Project Salmon Habitat and River Enhancement, Washington County Soil and Water Conservation District, and private landowner contributions. Four stream-road crossings (culverts) were completely removed in the Machias River watershed. The remaining 14 projects replaced undersized culverts with open bottom arches that spanned 1.2 times bankfull stream width in the Machias, Narraguagus, and East Machias watersheds. These restoration projects are effectively contributing to salmon recovery by improving access to habitat for Atlantic salmon and other diadromous species. These types of restoration initiatives are likely to continue; however, they are contingent upon the continued availability of funding sources, voluntary participation of landowners and other groups, and identification of specific implementation dates. Therefore, while the aforementioned projects are deemed to be effective, the certainty of implementation of additional projects is unknown and the future initiatives do not satisfy certainty of implementation criteria one, five, seven and eight.

(2) Watershed Councils: Watershed councils are actively engaged in cooperative Atlantic salmon conservation activities. Local watershed councils, formed under the auspices of the Maine Atlantic Salmon Conservation Partnership, continue to play an important role in recovery activities in their respective watersheds, particularly the planning and implementation of watershed-specific habitat protection and restoration. Watershed councils have representatives from state and Federal agencies, conservation groups, industries, towns, landowners and other interested groups or individuals. These groups coordinate their efforts with those of local groups with similar goals. The councils continue to review the status of threats in each watershed and determine the need for continued or new efforts to further minimize any potential threat to Atlantic salmon from future activities present in the watershed. The process ensures that all stakeholders in the watersheds have the opportunity to participate in decisions concerning conservation actions. The activities of watershed councils are largely voluntary and vary by council, depending on the level of participation from members. Many of the efforts undertaken by watershed councils have been and continue to be extremely effective at contributing to salmon recovery. Future efforts will likely continue to make positive contributions as well, provided that voluntary participation within each council continues. There is no overarching management plan that outlines the collective work or goals of the councils into the future; therefore, it is uncertain what projects will be implemented on an annual basis, and whether the necessary resources will be available to implement the projects in terms of both funding sources and voluntary participation. PECE criteria one, five, seven and eight require a high level of certainty that: the necessary resources are identified and secured; the necessary voluntary participation and permissions to implement conservation plan have been obtained; and an implementation schedule for the project is provided. While past activities have been effective in restoring salmon habitat and improving access, the effectiveness of future efforts can not be evaluated in terms of the conservation contribution to the status of the species.

(3) Large Woody Debris Project: Maine's rivers have experienced dramatic changes over the last 300 years. One of the most sweeping is the removal, lack of recruitment, and subsequent attrition of LWD. The result is that the rivers likely have very low loading of LWD, and thus, have less complex fish habitat compared to the past. LWD creates pools, retains gravel and nutrients, supports benthic macroinvertebrates, influences current velocities and water depth, provides cover, and during high water, refugia for fishes. The value of LWD in promoting productive Atlantic salmon habitat is undocumented. In October 2006, a project was implemented to enhance habitat at a scale that will have population-level benefits, with a design that evaluates the effects of LWD additions on stream geomorphology. LWD was added to two sites, each with a paired control site, in Creamer Brook, East Machias Drainage. Streams in the Narraguagus, Machias, and East Machias drainages were also evaluated for potential LWD additions. The Creamer Brook sites were scouted and surveyed for similarity and surveyed for fish populations immediately prior to the habitat work. Each site was electrofished using multiple pass depletion, and fish were weighed, measured, and released into their site. LWD was added at a rate of approximately 12 pieces per 100m by cutting trees in the riparian zone and adjusting their placement to achieve either stability or geomorphologic effect. In addition, all LWD (existing and added) in the treatment sites was tagged with metal numeric tags and marked with spray paint. The site was surveyed before and after LWD placements. Trees were also felled in the riparian zone to increase roughness to minimize channel migration as a result of the LWD additions.

The LWD project directly incorporates the principles of adaptive management. The project is aimed at improving the complexity of fish habitat through the addition of LWD. The project plan lays out explicit objectives, qualitative and quantitative parameters by which progress will be measured, and sites to be monitored, fulfilling two through six of the PECE effectiveness criteria. The effectiveness of this project has not been demonstrated because LWD additions have not been shown to enhance salmon survival. Therefore, it is not yet clear to what extent the LWD project is addressing the threat posed by the loss of habitat complexity; thus, criterion one of the certainty of effectiveness is not satisfied.

(4) The Penobscot Indian Nation Water Quality Monitoring Program: Water quality is a critical issue to the Penobscot Indian Nation, given that many of the fish and other aquatic species serve as an important source of traditional food. Industrial discharge has resulted in the presence of harmful chemicals in the waters that flow through reservation waters. The Penobscot Indian Nation has implemented a rigorous water quality testing program to: ensure that water

quality standards are being met and that licensed discharges are in compliance with permit conditions; upgrade river and tributary classifications; identify and remediate sources of non-point source pollution; and gather data needed to support the role of the tribe in hydroelectric re-licensing. The Penobscot Indian Nation also has a cooperative agreement with the MDEP to share water quality data and technical assistance. The data provided by the Penobscot Indian Nation has led to the revision of water classifications for over 500 rivers and streams and improved water quality. The Penobscot Indian Nation's water quality monitoring program satisfies all of the certainty of effectiveness and implementation criteria. While this program is very important in terms of improving water quality and the health of aquatic organisms, the results of the program in terms of threat abatement across the entire GOM DPS are not sufficient to warrant a change in the listing status of the GOM DPS.

International Efforts

(1) North Atlantic Salmon Conservation Organization: The Convention for the Conservation of Salmon in the North Atlantic Ocean, ratified by the United States in 1982, provides a mechanism for managing the international commercial fishery for Atlantic salmon for the purpose of conserving and restoring salmon stocks. The Convention provides a forum for coordination among members, proposing regulatory measures, and for making recommendations regarding scientific research. The Convention was adopted by the United States, Canada, Greenland (as represented by Denmark), Iceland, Faroes Islands, Norway, and the European Commission. Russia joined later. The NASCO was formed by this Convention. The United States became a charter member of NASCO in 1984. NASCO is charged with the international management of Atlantic salmon stocks on the high seas. NASCO is composed of three geographic Commissions: Northeast Atlantic, West Greenland, and North American. NASCO seeks scientific advice from the International Council for the Exploration of the Seas (ICES) on the status of stocks, the effectiveness of management measures, monitoring and data needs, and catch options. NASCO uses this scientific advice as a basis for formulating biologically sound management recommendations for the conservation of North Atlantic salmon stocks. Providing catch options for the fishery at West Greenland is one area where this advice is specifically applied.

The West Greenland fishery was one of the last directed Atlantic salmon commercial fisheries in the Northwest Atlantic. In 2005, in recognition of the depressed status of the stocks and the fact that the resulting scientific advice was unchanged year-to-year, the NASCO Parties asked ICES for multi-annual regulatory advice. Based on this advice, a provisional multi-annual regulatory measure was adopted at the 2006 annual meeting of NASCO to restrict the fishery in 2006 to internal use only and conditionally also for 2007 and 2008. The provisional multi-annual regulatory measure adopted in 2006 was contingent upon finalization and acceptance of a finalized Framework of Indicators (FWI). ICES provided NASCO with a finalized FWI for the mixed stock off West Greenland that all Parties accepted in 2007. The multi-annual regulatory measure agreed to in 2006 were continued for 2007 and 2008. This measure, like those of recent years, limits harvest in West Greenland to internal use only (estimated to be about 20 mt). Denmark, representing Greenland and the Faroe Islands, stated that it would accept the FWI for a fixed period 2006–2008 and would consider accepting new multi-annual catch advice at the 2009 Annual Meeting in light of further development of the FWI, the continued research of the mortality of salmon stocks, and possible improvement of the stocks.

In 2001, NASCO established an International Atlantic Salmon Research Board (IASRB) to promote collaboration and cooperation on research on the causes of marine mortality of Atlantic salmon and the opportunities to counteract this mortality. The IASRB has made great progress in improving coordination of the existing research and supporting initiation of new research projects. However, there are still substantial gaps in our knowledge of what factors may be affecting salmon at sea. The IASRB, therefore, commissioned the development of an international program of cooperative research on salmon at sea (SALSEA). The SALSEA program has been developed by scientists from all NASCO's Parties. The four areas on which SALSEA is currently focusing are: (1) Supporting technologies to assist in the genetic identification of the origin of salmon sampled at sea, improving efficiency of sampling of salmon at sea, and improving standardized scale analysis of salmon at sea; (2) studying early migration through the inshore zone: fresh waters, estuaries, and coastal waters to specifically understand what factors may be influencing marine mortality; (3) studying the distribution and migration of salmon at sea; and (4) improving communications and public relations. The United States has contributed $150,000 to the IASRB to help fund SALSEA. The United States has also participated in a marking workshop sponsored by SALSEA and actively participates in the West Greenland Sampling Program on an annual basis.

The West Greenland Sampling Program is an international sampling program of the internal use fishery at West Greenland. Scale and tissue samples are taken to allow examination of stock origin, catch composition, and fish health. This sampling program has provided a wealth of information on the extent, location, and origin of the catch. Scale and genetic analyses have allowed for detailed knowledge of the characteristics of the catch, including age and continent of origin. In recent years, approximately 70 percent of the catch has been of North American origin and 30 percent of European origin.

The United States intends to continue to participate fully in NASCO and associated negotiations over the West Greenland Fishery. The legislative authority, funding, authorizations, staffing resources, an approved plan (U.S. Implementation Plan) and associated schedule for implementation of actions, and legal requirements allowing for United States participation in NASCO are certain. Although NASCO does not have any regulatory authority over any of the Parties, it has been successful at influencing salmon management in member states. The West Greenland fishery is a prime example of NASCO facilitating negotiations and ultimately, management, of this fishery for the benefit of salmon as a whole in the North Atlantic Ocean. However, while NASCO has been successful in reducing the threat of directed harvest of Atlantic salmon in the West Greenland fishery, a small, but significant, portion of the catch continues to be Atlantic salmon of U.S. origin. The NASCO guidelines and agreements are contributing to reducing threats to salmon recovery (*e.g.*, fishing, disease, aquaculture, habitat destruction, stocking practices). While the NASCO agreements and guidelines appear to have reduced the threat from direct harvest, the agreements and guidelines are not regulatory. It is incumbent on each Party to NASCO to enforce the actions identified in the Implementation Plan drafted by each country as well as report on their success relative to the health of salmon stocks. Therefore, the effectiveness of specific NASCO guidelines and agreements is not certain. Some parties have failed to develop rigorous Implementation Plans with explicit incremental objectives and dates for achieving the action, scientific parameters, and ability to report under these plans. Thus, effectiveness criteria two through five are not certain at this time. There is also some uncertainty in terms of the implementation of the NASCO guidelines and agreements. There is even more uncertainty about the individual Implementation Plans, given that, in some regions, there is not the necessary voluntary support by landowners, necessary funding to implement the conservation measures, or even the necessary regulatory mechanisms within the jurisdiction of each Party to regulate certain activities. Thus, certainty of implementation criteria four to seven cannot be satisfied for the NASCO guidelines and agreements. It is also unknown to what extent current IASRB and SALSEA activities will abate the threat from poor marine survival.

(2) West Greenland Conservation Agreement: In August 2002, a multi-year conservation agreement with an annual termination date (available to both parties) was established between the North Atlantic Salmon Fund and the Organization of Hunters and Fishermen in Greenland, effectively buying out the commercial fishery for Atlantic salmon for a 5-year period. The internal-use fishery is not included in the agreement. In June 2007, the agreement was extended and revised to cover the 2007 fishing season with a provision which allows the agreement to continue to be extended on an annual basis through 2013. An implementation plan and schedule are already developed as well as the necessary authorizations and legal authority. However, certainty of implementation criteria five, seven, and nine cannot be satisfied, considering the certainty that the necessary funding has not been secured, and it is not known if all parties will agree to extend the Agreement.

Summary of Protective Efforts

The current endangered status of the GOM DPS as listed in 2000 and the desire to restore the Penobscot to a free flowing river have created an incentive for various agencies, groups, and individuals to carry out a number of efforts aimed at protecting and conserving salmon. These actions are being directed at reducing threats faced by Atlantic salmon and could contribute to the recovery and restoration of the GOM DPS and its ecosystem substantially in the future. However, apart from the Penobscot Indian Nation Water Quality Monitoring Program, there is still considerable uncertainty regarding the implementation and effectiveness of these efforts in the future. Therefore, they cannot be considered to affect the listing status of the GOM DPS.

Finding

As stated previously in this final rule, the main difference between the GOM DPS as listed in 2000 and the GOM DPS as finalized in this rule is the inclusion of the majority of the Androscoggin, Kennebec, and Penobscot River basins. The 2000 GOM DPS consisted of only small coastal rivers on either side of the Penobscot River.

The small coastal rivers were subject to similar threats, including water withdrawals, aquaculture escapees, and habitat degradation. Although the rivers to the east and west of the Penobscot are exposed to different stressors, they have more threats in common with each other than with the larger river systems included in the GOM DPS as currently defined. Habitat degradation from poor water quality and water withdrawals still pose a threat to salmon within some of the small coastal rivers. For the most part, the small coastal rivers included within the 2000 GOM DPS boundaries are not dammed for hydroelectric generation (an exception would be the Union River), and, therefore, this threat was not highlighted in the 2000 listing. However, other barriers were identified in the 2000 listing as impacting habitat.

The larger river basins face some additional threats compared to the small coastal rivers because they have higher human population densities, more development, and a significant number of dams and other barriers. Dams are present on all three of the larger rivers within the range of the GOM DPS and impact all salmon moving up and downstream. Given the number of salmon affected by dams and the amount of the habitat within the GOM DPS affected by dams, this threat is a significant factor in this listing determination.

Poor marine survival was identified as one of the most significant threats in our 2000 listing. Since then, we have improved our knowledge and understanding of the impact of marine survival on the GOM DPS. Survival and eventual recovery of the GOM DPS depends on an increase in marine survival, which is why that threat is a significant factor in this listing determination.

There are extremely few naturally-reared, spawning adult salmon present in the GOM DPS (184 in 2007). With the addition of Atlantic salmon in the Penobscot and other large rivers to the GOM DPS, the demographic security is somewhat increased because populations that are geographically widespread are less likely to experience spatially-correlated catastrophes. However, the number of naturally-reared, spawning adults within the GOM DPS is extremely low and the majority of returning adults (whether naturally-reared or smolt-stocked) are found in the Penobscot River, despite the addition of other large rivers to the range of the DPS. In 2007, only 16 adults returned to the Kennebec and 20 returned to the Androscoggin.

The GOM DPS is sustained by a carefully managed hatchery supplementation program. Hatchery supplementation is crucial to the continued existence of the GOM DPS, though we recognize that reliance on artificial propagation carries risks that cannot be completely avoided despite managers' best efforts. We have carefully examined both the positive and negative effects of hatchery supplementation, including the risk of disruptions to hatchery operations (*e.g.*, due to disease outbreak) or the genetic risks (such as inbreeding and domestication selection). Although hatchery supplementation of the GOM DPS is currently important in maintaining genetic diversity levels, these programs have not been successful at recovering or maintaining wild, self-sustaining populations of Atlantic salmon.

Further, at the present time, there is no evidence to suggest that marine survival will increase in the near future. In short, without both conservation hatcheries continuing to operate and an increase in marine survival, the risk of extinction is high.

As described above, the demographic effects of the currently low marine survival on the GOM DPS are severe, dams limit the viability of salmon populations through numerous and sometimes synergistic ways (*e.g.*, blocking up and downstream passage, entrainment, water quality effects, fish community effects), and the existing regulatory mechanisms for dams are inadequate. As a result, we find that low marine survival, dams, and the inadequacy of existing regulatory mechanisms for dams are each significant factors in this listing determination.

We find that threats from reduced habitat complexity, reduced habitat connectivity, and reduced water quantity and degraded water quality within Factor A; overutilization within Factor B; disease and predation within

Factor C; inadequacy of existing regulatory mechanisms for water withdrawals and water quality within Factor D; and aquaculture, depleted diadromous fish communities, and competition within Factor E all act as stressors on the GOM DPS. Collectively, these are significant factors in this listing determination, contributing to the poor status of the GOM DPS. At this time, we do not have enough information to determine whether climate change (within Factor E) is a threat to the long-term persistence of the GOM DPS.

We have considered all the above factors, efforts to protect the species, and the status of the species. We have concluded that the GOM DPS of Atlantic salmon is in danger of extinction. Therefore, we are listing it as endangered.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the ESA include recovery actions, requirements for Federal agencies to avoid jeopardizing the continued existence of the species, and prohibitions against taking the species, as defined in the ESA. Recognition through listing may improve public awareness and encourage conservation actions by Federal, state, and local agencies, private organizations, and individuals. The ESA provides for possible land acquisition and cooperation with the States and provides for recovery actions to be carried out for listed species. The requirement of Federal agencies to avoid jeopardy and the prohibitions against take are discussed below.

Section 7(a) of the ESA, as amended, requires Federal agencies to evaluate their actions with respect to any species that is listed as endangered or threatened and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the ESA are codified at 50 CFR part 402. Section 7(a)(4) requires Federal agencies to confer informally with us on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is subsequently listed, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with us under the provisions of section 7(a)(2) of the ESA.

Several Federal agencies are expected to have involvement under section 7 of the ESA regarding the Atlantic salmon. The Environmental Protection Agency may be required to consult on its permitting oversight authority for the CWA and Clear Air Act. The ACOE may be required to consult on permits it issues under section 404 of the CWA and section 10 of the Rivers and Harbors Act. The FERC may be required to consult on licenses it issues for hydroelectric dams under the FPA. The Federal Highway Administration may be required to consult on transportation projects it authorizes, funds, or carries out.

ESA section 9(a) take prohibitions (16 U.S.C. 1538(a)(1)(B)) apply to all species listed as endangered. Those prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take, import or export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any wildlife species listed as endangered, except as provided in sections 6(g)(2) and 10 of the ESA. It is also illegal under ESA section 9 to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Section 11 of the ESA provides for civil and criminal penalties for violation of section 9 or of regulations issued under the ESA.

The ESA provides for the issuance of permits to authorize incidental take during the conduct of activities that may result in the take of threatened or endangered wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22, 17.23, and 17.32. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in the course of otherwise lawful activities provided that certain criteria are met.

It is our policy, published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify, to the maximum extent practicable at the time a species is listed, those activities that would or would not likely constitute a violation of section 9 of the ESA. The intent of this policy is to increase public awareness of the effects of the listing on proposed and ongoing activities within a species' range.

The Services believe that, based on the best available information, the following actions are unlikely to result in a violation of section 9:

(1) Any incidental take of GOM DPS Atlantic salmon resulting from an otherwise lawful activity conducted in accordance with the conditions of an incidental take permit issued by one of the Services under section 10 of the ESA. Examples of such actions may include operation of dams and fishways, State sport fish stocking programs, State recreational fishing programs for other species, silviculture, agriculture, State programs regulating water quality, and State programs regulating water withdrawals and instream flow;

(2) Any action authorized, funded, or carried out by a Federal agency that is likely to adversely affect the GOM DPS of Atlantic salmon, when the action is conducted in accordance with the terms and conditions of an incidental take statement issued by either of the Services under section 7 of the ESA. Examples of such actions may include dam construction and operation, road construction, discharge of fill material, siting and operation of aquaculture facilities, and stream channelization or diversion; and

(3) Any action carried out for scientific purposes or to enhance the propagation or survival of the species that is conducted in accordance with the conditions of a permit issued by one of the Services under section 10 of the ESA. Examples of such actions may include the river-specific hatchery conservation program at CBNFH and GLNFH, habitat restoration activities, and scientific monitoring programs.

Activities that could lead to violation of section 9 prohibitions against "take" of the GOM DPS of anadromous Atlantic salmon include, but are not limited to, the following:

(1) Unauthorized killing, collecting, handling, or harassing of individual GOM DPS Atlantic salmon. Examples of such actions may include targeted recreational or commercial fishing for GOM DPS salmon, and non-targeted recreational or commercial fishing for other species (bycatch),

(2) Siting or operation of an aquaculture facility without adopting and implementing fish health practices that adequately protect against the introduction and spread of disease or the destruction of habitat;

(3) Unauthorized destruction or alteration of spawning, rearing, or migration habitat. Examples of such activities may include erecting or operating structures that block migration routes (such as dams, culverts, or other barriers); instream dredging, rock removal, operation of heavy equipment, or channelization; riparian and in-river damage due to livestock; discharge of fill material; or manipulation of river flow;

(4) Discharge or dumping of toxic chemicals, silt, or other pollutants (*e.g.,* fertilizers, pesticides, heavy metals, oil, organic wastes) into the aquatic environment of the GOM DPS.

Other activities not identified here will be reviewed on a case-by-case basis to determine if violation of section 9 of the ESA may be likely to result from such activities. When there are questions about the effect of an action on the GOM DPS, the Services are available to provide technical assistance. We do not consider these lists to be exhaustive, and we provide them as general information to the public.

Critical Habitat

Section 4(b)(2) of the ESA requires us to designate critical habitat for threatened and endangered species ''on the basis of the best scientific data available and after taking into consideration the economic impact, the impact on national security, and any other relevant impact, of specifying any particular area as critical habitat.'' This section grants the Secretary of the Interior or of Commerce discretion to exclude an area from critical habitat if the Secretary determines ''the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat.'' The Secretary may not exclude areas if exclusion ''will result in the extinction of the species.'' In addition, the Secretary may not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan under Section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such a plan provides a benefit to the species for which critical habitat is proposed for designation (see section 318(a)(3) of the National Defense Authorization Act, Pub. L. 108–136).

The ESA defines critical habitat under section 3(5)(A) as: ''(i) the specific areas within the geographical area occupied by the species, at the time it is listed * * *, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed * * *, upon a determination by the Secretary that such areas are essential for the conservation of the species.''

Once critical habitat is designated, Section 7 of the ESA requires Federal agencies to ensure they do not fund, authorize, or carry out any actions that will destroy or adversely modify that habitat. This requirement is in addition to the other principal section 7 requirement that Federal agencies ensure their actions do not jeopardize the continued existence of listed species.

The Secretary of Commerce is designating critical habitat in a separate rulemaking.

Peer Review

In December 2004, the Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review, establishing minimum peer review standards, a transparent process for public disclosure of peer review planning, and opportunities for public participation. The OMB Bulletin, implemented under the Information Quality Act (Pub. L. 106–554), is intended to enhance the quality and credibility of the Federal government's scientific information, and applies to influential or highly influential scientific information disseminated on or after June 16, 2005. We obtained independent peer review of the scientific information compiled in the 2006 Status Review (Fay *et al.,* 2006) that supports this proposal to list the GOM DPS of Atlantic salmon as endangered.

On July 1, 1994, the Services published a policy for peer review of scientific data (59 FR 34270). The intent of the peer review policy is to ensure that listings are based on the best scientific and commercial data available. During the public comment period for the proposed rule to list the GOM DPS of Atlantic salmon as endangered, the Services solicited the expert opinions of four qualified specialists. These independent specialists represented expertise from the academic and scientific community. Out of the four reviewers solicited, two individuals completed a critical review of the proposed rule. Peer review comments are summarized and addressed in the public comment section of this rule, and the text of the final rule has been changed where necessary.

References

A complete list of the references used in this final rule is available upon request (see **ADDRESSES**).

Classification

National Environmental Policy Act

ESA listing decisions are exempt from the requirement to prepare an environmental assessment (EA) or environmental impact statement (EIS) under the National Environmental Policy Act of 1969 (NEPA) (NOAA Administrative Order 216–6.03(e)(1); *Pacific Legal Foundation* v. *Andrus,* 675 F. 2d 825 (6th Cir. 1981)). Thus, we have determined that the final listing determination for the GOM DPS of Atlantic salmon described in this notice is exempt from the requirements of NEPA.

Information Quality Act

The Information Quality Act directed the Office of Management and Budget to issue government wide guidelines that ''provide policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by Federal agencies.'' Compliance of this document with NOAA guidelines is evaluated below.

Utility: The information disseminated is intended to describe the species' life history, population status, threats, and risks; management actions; and the effects of management actions. The information is intended to be useful to state and Federal agencies, non-governmental organizations, industry groups and other interested parties so they can understand the listing status of the species.

Integrity: No confidential data were used in the analysis of the impacts associated with this document. All scientific data considered in this document and used to analyze the proposed action, is considered public information.

Objectivity: The NOAA Information Quality Guidelines require disseminated information to be presented in an accurate, clear, complete, and unbiased manner. This document was prepared with these objectives in mind. It was also reviewed by agency biologists, policy analysts, and managers and NOAA and Department of Commerce attorneys.

Administrative Procedure Act

The Federal Administrative Procedure Act (APA) establishes procedural requirements applicable to informal rulemaking by Federal agencies. The purpose of the APA is to ensure public access to the Federal rulemaking process and to give the public notice and an opportunity to comment before the agency promulgates new regulations. These public notice and comment procedures have been completed in this rulemaking.

Coastal Zone Management Act

Section 307(c)(1) of the Federal Coastal Zone Management Act of 1972 requires that all Federal activities that affect any land or water use or natural resource of the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. NMFS has determined that this action is consistent to the maximum extent practicable with the enforceable policies of approved Coastal Zone Management Programs of Maine. A letter documenting NMFS' determination and a copy of the proposed rule was sent to the coastal zone management program office in Maine. The specific state contact and a copy of the letter is available upon request. A copy of the final rule will be sent to the coastal zone management program office in Maine.

Executive Order (E.O.) 13132 Federalism

E.O. 13132, otherwise known as the Federalism E.O., was signed by President Clinton on August 4, 1999, and published in the **Federal Register** on August 10, 1999 (64 FR 43255). This E.O. is intended to guide Federal agencies in the formulation and implementation of ''policies that have Federal implications.'' Such policies are regulations, legislative comments or proposed legislation, and other policy statements or actions that have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government. E.O. 13132 requires Federal agencies to have a process to ensure meaningful and timely input by state and local officials in the development of regulatory policies that have federalism implications. A Federal summary impact statement is also required for rules that have federalism implications.

Pursuant to E.O. 13132, the Assistant Secretary for Legislative and Intergovernmental Affairs provided notice of the action at the proposed rulemaking stage and requested comments from the appropriate official(s) in Maine. Comments were received from Senators Snowe and Collins, Congressman Michaud, and from the State of Maine. Among other concerns, they stated that a threatened listing determination could be justified under the ESA and advocated that the Services suspend a decision on the Androscoggin until further genetic data could be gathered and analyzed. These comments were considered by the Services in preparing this final rulemaking action and are addressed in the Response to Public Comments section above. A Federal summary impact statement has been prepared and sent to the appropriate State officials.

Environmental Justice

Executive Order 12898 requires that Federal actions address environmental justice in decision-making process. In particular, the environmental effects of the actions should not have a disproportionate effect on minority and low-income communities. The final listing determination is not expected to have a disproportionately high effect on minority populations and low-income populations in Maine because the implications of this listing action do not adversely affect the human health of low-income, minority, or other populations or the environment in which these various populations live.

E.O. 12866, Regulatory Flexibility Act, and Paperwork Reduction Act

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts shall not be considered when assessing the status of a species. Therefore, the economic analysis requirements of the Regulatory Flexibility Act are not applicable to the listing process. In addition, this rule is exempt from review under E.O. 12866. This rule does not contain a collection-of-information requirement for the purposes of the Paperwork Reduction Act.

E.O. 13175—Consultation and Coordination With Indian Tribal Governments

E.O. 13175 requires that, if we issue a regulation that significantly or uniquely affects the communities of Indian tribal governments and imposes substantial direct compliance costs on those communities, we consult with those governments or the Federal government must provide the funds necessary to pay the direct compliance costs incurred by the tribal governments. This rule does not impose substantial direct compliance costs on the communities of Indian tribal governments. Accordingly, the requirements of section 3(b) of E.O. 13175 do not apply to this final rule. Nonetheless, we met with tribal governments potentially affected by this listing decision and to solicit their input on the proposed rule. We have given careful consideration to all written and oral comments received and will continue our coordination and discussions with interested tribes as we move forward specifically with implementing this final rule as well as salmon recovery and management in general.

List of Subjects

50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

50 CFR Part 224

Administrative practice and procedure, Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Dated: June 11, 2009.

Samuel D. Rauch III,

Acting Assistant Administrator for Fisheries, National Marine Fisheries Service.

Dated: May 12, 2009.

Stephen Guertin,

Acting Director, U.S. Fish and Wildlife Service.

■ For the reasons set out in the preamble, 50 CFR parts 17 and 224 are amended as follows:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

■ 1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500, unless otherwise noted.

■ 2. In § 17.11(h) revise the entry for ''Salmon, Atlantic'', which is in alphabetical order under FISHES, to read as follows:

§ 17.11 Endangered and threatened wildlife.

(h) * * *

* * * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
* * * * * * *							
Fishes							
* * * * * * *							
Salmon, Atlantic, Gulf of Maine.	*Salmo salar*.	U.S.A., Canada, Greenland, western Europe.	U.S.A., ME, Gulf of Maine Distinct Population Segment. The 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 are all associated conservation hatchery populations used to supplement these natural populations; currently, such conservation hatchery populations are maintained at Green Lake National Fish Hatchery (GLNFH) and Craig Brook National Fish Hatchery (CBNFH). Excluded are landlocked salmon and those salmon raised in commercial hatcheries for aquaculture.	E	....	NA	NA
* * * * * * *							

PART 224—ENDANGERED MARINE AND ANADROMOUS SPECIES

■ 3. The authority citation for part 224 continues to read as follows:

Authority: 16 U.S.C. 1531–1543 and 16 U.S.C. 1361 *et seq.*

■ 4. Amend the table in § 224.101, by revising the entry for ''Atlantic salmon'' in the table in § 224.101(a) to read as follows:

§ 224.101 Enumeration of endangered marine and anadromous species.

* * * * *

(a) *Marine and anadromous fish.*

* * *

Species[1]		Where listed	Citation(s) for listing determination(s)	Citation(s) for critical habitat designation(s)
Common name	Scientific name			
*	*	* * *	*	*
Gulf of Maine Atlantic salmon.	*Salmo salar*	U.S.A., ME, Gulf of Maine Distinct Population Segment. The 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 are all associated conservation hatchery populations used to supplement these natural populations; currently, such conservation hatchery populations are maintained at Green Lake National Fish Hatchery (GLNFH) and Craig Brook National Fish Hatchery (CBNFH). Excluded are landlocked salmon and those salmon raised in commercial hatcheries for aquaculture.	65 FR 69469; November 17, 2000; *74 FR [Insert page number where the document begins]; June 19, 2009*.	NA
*	*	* * *	*	*

---

[1] Species includes taxonomic species, subspecies, distinct population segments (DPSs) (for a policy statement, see 61 FR 4722, February 7, 1996), and evolutionarily significant units (ESUs) (for a policy statement, see 56 FR 58612, November 20, 1991).

* * * * *

[FR Doc. E9–14269 Filed 6–18–09; 8:45 am]

BILLING CODE 3510–22–P