Designation of Critical Habitat for Atlantic Salmon (*Salmo salar*) in the Gulf of Maine Distinct Population Segment

Final ESA Section 4(b)(2) Report

2009

National Marine Fisheries Service
Northeast Region

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INTRODUCTION

This report contains NMFS Northeast Region's analysis pursuant to Section 4(b)(2) of the Endangered Species Act (ESA), which supports the proposed designation of critical habitat for the Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon (*Salmo salar*). In this analysis, we describe the benefits of designating any particular area as critical habitat based upon the biological value of the area to the GOM DPS. (More information on the benefits of designation is provided in a separate biological valuation (NMFS, 2009). We also describe the economic, national security, and other relevant impacts of designating any particular area as critical habitat. (More detailed information on the economic impacts of the proposed designation is provided in a separate economic analysis (IEc, 2009). We then balance the benefits of designation against the impacts of designation and, as a result of this balancing, propose to exclude from the designation a number of particular areas for which we determined that the benefits of exclusion (i.e., the economic, national security, and other relevant impacts that would result if the area were designated) outweighed the benefits of designation. For these areas, we also determined that exclusion would not result in extinction of the GOM DPS.

On November 17, 2000, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) (collectively referred to as the Services) issued a final rule listing the Gulf of Maine Distinct Population Segment of Atlantic salmon as an endangered species under the Endangered Species Act of 1973, as amended (69 FR 69459). The GOM DPS defined in the 2000 listing of Atlantic salmon included 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.

In 2003, a new Biological Review Team (BRT) was convened to re-assess the 2000 listing determination. The BRT considered whether the salmon in other rivers (mainly the Penobscot, Kennebec and Androscoggin Rivers) that were not included in the 2000 listing should be considered part of the GOM DPS. In July 2006, the BRT completed the "Status Review for Anadromous Atlantic Salmon in the United States", which redefined the GOM DPS to include "all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin northward along the Maine coast to the Dennys, including all associated conservation hatchery populations used to supplement natural populations; currently, such populations are maintained at Green Lake and Craig Brook National Fish Hatcheries." The proposed listing rule was subsequently published in September 2008. In response to public comments received on the proposed listing rule, and in review of the critical habitat proposed rule, also published in September 2008, the Gulf of Maine DPS was refined to exclude those areas that were outside the historic range of the species. The final listing rule (74 FR 29344) defines the GOM DPS as 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. The most substantive difference between the 2000 DPS and the new DPS as described in 74 FR 29344 is the inclusion of the large rivers: the Androscoggin River, Kennebec River and Penobscot River.

The timeline for completing the critical habitat designation was established pursuant to litigation between NMFS and the Center for Biological Diversity and the Conservation Law Foundation. Upon reaching a settlement agreement, NMFS has agreed to publish a final rule designating critical habitat for Atlantic salmon no later than April 30, 2009.

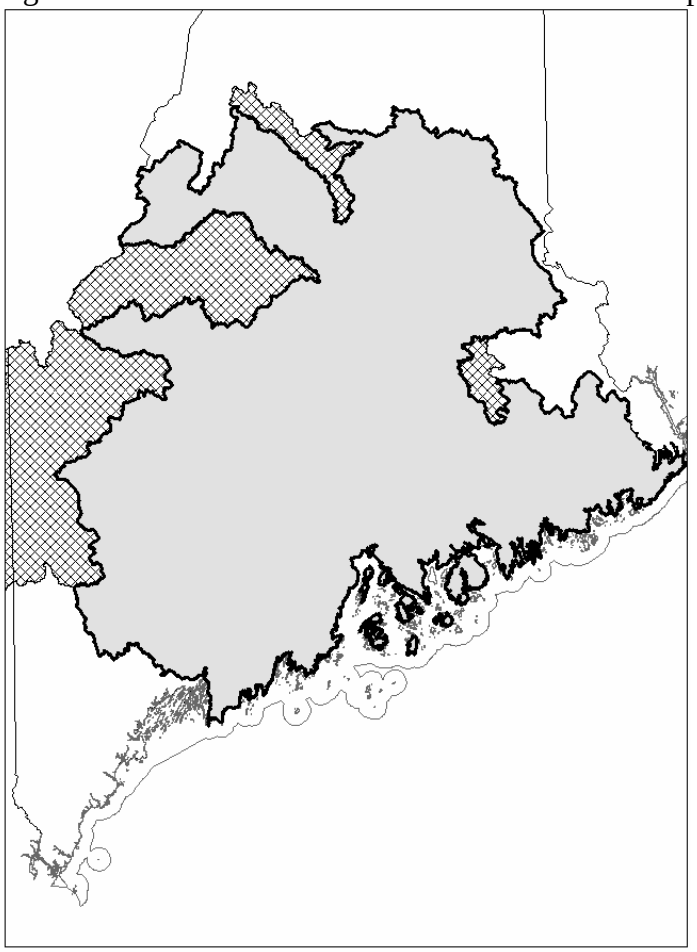

Figure 1: Kennebec, Androscoggin, and Downeast Coastal basins evaluated for critical habitat (checkered) and the historic range of Atlantic salmon (GOM DPS) within those basins (gray) identified through the critical habitat evaluation process and public comments

Review of Section 3 Determinations

Critical habitat designation provides additional protections beyond listing a species as either endangered or threatened by prohibiting the destruction or adverse modification of the physical and biological features essential for that species' continued existence. Any proposed action funded, authorized, or carried out by a Federal agency must not destroy or adversely modify the essential habitat features of the critical habitat.

Section 3(5)(A) of the ESA (16 U.S.C. 1532(5)) defines critical habitat for a threatened or endangered species as:

> (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of [section 4 of the Act], 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 of the geographical area occupied by the species at the time it is listed in accordance with the provisions of [section 4 of the Act], upon a determination by the Secretary that such areas are essential for the conservation of the species.

- **Identify the geographical area occupied by the species and the specific areas within the geographical area**

To designate critical habitat for Atlantic salmon, as defined under Section 3(5)(A) of the ESA, we must identify specific areas within the geographical area occupied by the species at the time it is listed.

The geographic range occupied by the GOM DPS of Atlantic salmon includes all historically accessible freshwater habitat ranging from the Androscoggin River watershed in the south to the Dennys River watershed in the north, as well as the adjacent estuaries and bays that smolts and adults migrate through.

The geographic range occupied by the species extends out to the waters off Canada and Greenland, where post smolts complete their marine migration. However, critical habitat may not be designated within foreign countries or in other areas outside of the jurisdiction of the United States (50 CFR 424.12(h)). Therefore, for the purposes of critical habitat designation, the geographic area occupied by the species will be restricted to areas within the jurisdiction of the United States. This does not diminish the importance of habitat outside of the jurisdiction of the United States for the GOM DPS. In fact, a very significant factor limiting recovery for the species is marine survival and increasing marine survival is a conservation priority in the recovery of the species. Though marine migration routes and feeding habitat off Canada and Greenland are critical to the survival and recovery of Atlantic salmon, the regulations prohibit designation of these areas as critical habitat. In designating critical habitat for Atlantic salmon, the emphasis is two fold: 1) Assuring that critical habitat essential for a recovered population is protected so that when marine conditions improve, sufficient

habitat is available to support recovery; and 2) Enacting appropriate management measures to enhance and improve critical habitat areas that are not fully functional because the features have been degraded from anthropogenic causes.

Atlantic salmon are anadromous and spend a portion of life in freshwater and the remaining portion in the marine environment, therefore, it is conceivable that some freshwater habitat may be vacant for up to 3 years under circumstances where populations are extremely low. While there may be no documented spawning in these areas for that period of time, they would still be considered occupied because salmon at sea would return to these areas to spawn.

Current stock management and assessment efforts also need to be considered in deciding which areas are occupied including the stocking program managed by USFWS and the Maine Department of Marine Resources (MDMR). Furthermore, in addition to stocking programs, straying from natural populations can result in the occupation of habitat.

Hydrologic Unit Code (HUC) 10 (Level 5 watersheds) described by Seaber et al. (1994) are considered the appropriate "specific areas" within the geographic area occupied by Atlantic salmon to be examined for the presence of physical or biological features and for the potential need for special management considerations or protections for these features.

The HUC system was developed by the United States Geological Survey (USGS) Office of Water Data Coordination in conjunction with the Water Resources Council (Seaber et al., 1994) and provides (1) a nationally accessible, coherent system of water-use data exchange; (2) a means of grouping hydrographical data; and (3) a standardized, scientifically grounded reference system (Laitta et al., 2004). The HUC system currently includes six nationally consistent, hierarchical levels of divisions, with HUC 2 (Level 1) "Regions" being the largest (avg. 459,878 sq. km.), and HUC 12 (Level 6) "sub-watersheds" being the smallest (avg. 41-163 sq. km.).

The HUC 10 (level 5) watersheds were used to identify "specific areas" because this scale accommodates the local adaptation and homing tendencies of Atlantic salmon, and provides a framework in which we can reasonably aggregate occupied river, stream, lake, and estuary habitats that contain the physical and biological features essential to the conservation of the species. Furthermore, many Atlantic salmon populations within the GOM DPS are currently managed at the HUC 10 watershed scale. Therefore, we have a better understanding of the population status and the biology of salmon at the HUC 10 level, whereas less is known at the smaller HUC 12 sub-watershed scale.

Specific areas delineated at the HUC 10 watershed level correspond well to the biology and life history characteristics of Atlantic salmon. Atlantic salmon, like many other anadromous salmonids, exhibit strong homing tendencies (Stabell, 1984). Strong homing tendencies enhance a given individual's chance of spawning with individuals having similar life history characteristics (Dittman and Quinn, 1996) that lead to the evolution and maintenance of local adaptations, and may also enhance their progeny's ability to exploit a given set of resources (Gharrett and Smoker, 1993). Local adaptations allow local populations to survive and reproduce at higher rates than exogenous populations

(Reisenbichler, 1988; Tallman and Healey, 1994). Strong homing tendencies have been observed in many Atlantic salmon populations. Stabell (1984) reported that fewer than 3 of every 100 salmon in North America and Europe stray from their natal river. In Maine, Baum and Spencer (1990) reported that 98 percent of hatchery-reared smolts returned to the watershed where they were stocked. Given the strong homing tendencies and life history characteristics of Atlantic salmon (Riddell and Leggett, 1981), we believe that the HUC 10 watershed level accommodates these local adaptations and the biological needs of the species and, therefore, is the most appropriate unit of habitat to delineate "specific areas" for consideration as part of the critical habitat designation process.

Within the United States, the freshwater geographic range that the GOM DPS of Atlantic salmon occupy includes perennial river, lake, stream and estuary habitat connected to the marine environment ranging from the Androscoggin River watershed to the Dennys River watershed. Within this range, HUC 10 watersheds were considered occupied if they contained either of the primary constituent elements (PCEs) (e.g., sites for spawning and rearing or sites for migration, described in more detail below) along with the features necessary to support spawning, rearing and/or migration. Additionally, the HUC 10 watershed must meet either of the following criteria. The area is occupied if:

(a) redds or any life-stage of salmon have been documented in the HUC 10 in the last six years, or the HUC 10 is believed to be occupied and contain the PCEs based on the best scientific information available and the best professional judgment of state and Federal biologists;

(b) the HUC is currently managed by the MDMR and the USFWS through an active stocking program in an effort to enhance or restore Atlantic salmon populations, or the area has been stocked within the last 6 years by MDMR or the USFWS and juvenile salmon could reasonably be expected to migrate to the marine environment and return to that area as an adult and spawn.

One hundred and five HUC 10 watersheds within the Penobscot, Kennebec, Androscoggin and Downeast Coastal basins were examined for occupancy based on the above criteria. Eighteen HUCs were determined to be outside the historic range of the species, and subsequently, these HUCs were removed from the DPS in the final listing rule. Though the HUC 10 watersheds outside the historic range of the species were included in the critical habitat biological valuation and economic analysis, since they are not occupied they were not considered for designation and therefore not included in the critical habitat 4(b)(2) exclusion analysis. Of the remaining 86 HUCs in the GOM DPS as defined in the final rule, we concluded that 48 HUC 10 watersheds within the geographic range are occupied by the species at the time of listing. Estuaries and bays within the occupied HUC 10 watersheds in the GOM DPS are also included in the geographic range occupied by the species.

Occupied areas also extend outside the estuary and bays of the GOM DPS as adults return from the marine environment to spawn and smolts migrate towards Greenland for feeding. We are not able at this time to identify the specific features characteristic of marine migration and feeding habitat within U.S. jurisdictional waters essential to the conservation of Atlantic salmon and are, therefore, unable to identify the specific areas

where such features exist. Therefore, specific areas of marine habitat are not designated as critical habitat.

- **Identify the <u>specific areas</u> within the geographical range occupied by the species on which are found those features essential to the conservation of the species**

Section 3(5)(A) defines critical habitat for a threatened or endangered species, in part, as the specific areas within the geographic area occupied by the species on which are found those features determined to be essential to the conservation of the species.

To determine which features are essential to the conservation of Atlantic salmon, we first define what conservation means for Atlantic salmon. The terms "conserve", "conserving" and "conservation" are defined in the ESA under Section 3(3) of the Act (16 U.S.C. 1532(3)) as to use and the use of all methods and procedures which are necessary to bring any endangered or threatened species to the point at which the measures provided by the ESA are no longer necessary. Conservation, therefore, is intended to describe those activities and efforts undertaken to achieve recovery. For the GOM DPS, we have determined that the successful return of adult salmon to spawning habitat, spawning, egg incubation and hatching, juvenile survival during the rearing time in freshwater, and smolt migration out of the rivers to the ocean are essential to the conservation of Atlantic salmon. In designating critical habitat for Atlantic salmon, we have identified specific physical and biological features essential to creating conditions for successful completion of spawning and rearing activities and freshwater/estuary migration activities (NMFS, 2009). Although successful marine migration is also essential to the conservation of the species, we are not able to identify the essential features of marine migration and feeding habitat at this time. Therefore, marine habitat areas will not be proposed for designation as critical habitat

Hydrologic Unit Code (HUC) 10 (Level 5 watersheds) described by Seaber *et al.* (1994) are proposed as the appropriate "specific areas" within the geographic area occupied by Atlantic salmon to be examined for the presence of physical or biological features and for the potential need for special management considerations or protections for these features. Within the geographic area occupied by the GOM DPS, NMFS has identified 48 specific areas occupied by Atlantic salmon at the time of listing, that contain the physical and biological features essential to the conservation of Atlantic salmon (Figure 2). The HUC 10s are later used to represent the particular areas when considering economic exclusions as described later in the section "*Identify particular areas for possible exclusion from critical habitat"*.

The HUC's were developed by the United States Geological Services (USGS) Office of Water Data Coordination in conjunction with the Water Resources Council (Seaber *et al.*, 1994). The HUC system provides (1) a nationally accessible, coherent system of water-use data exchange; (2) a means of grouping hydrographical data; and (3) a standardized, scientifically grounded reference system (Laitta et al., 2004). The HUC system currently

includes six nationally consistent, hierarchical levels of divisions, with HUC 2 (Level 1) "Regions" being the largest (avg. 459,878 sq. km..), and HUC 12 (Level 6) "sub-watersheds" being the smallest (avg. 106 - 422 sq. km.).

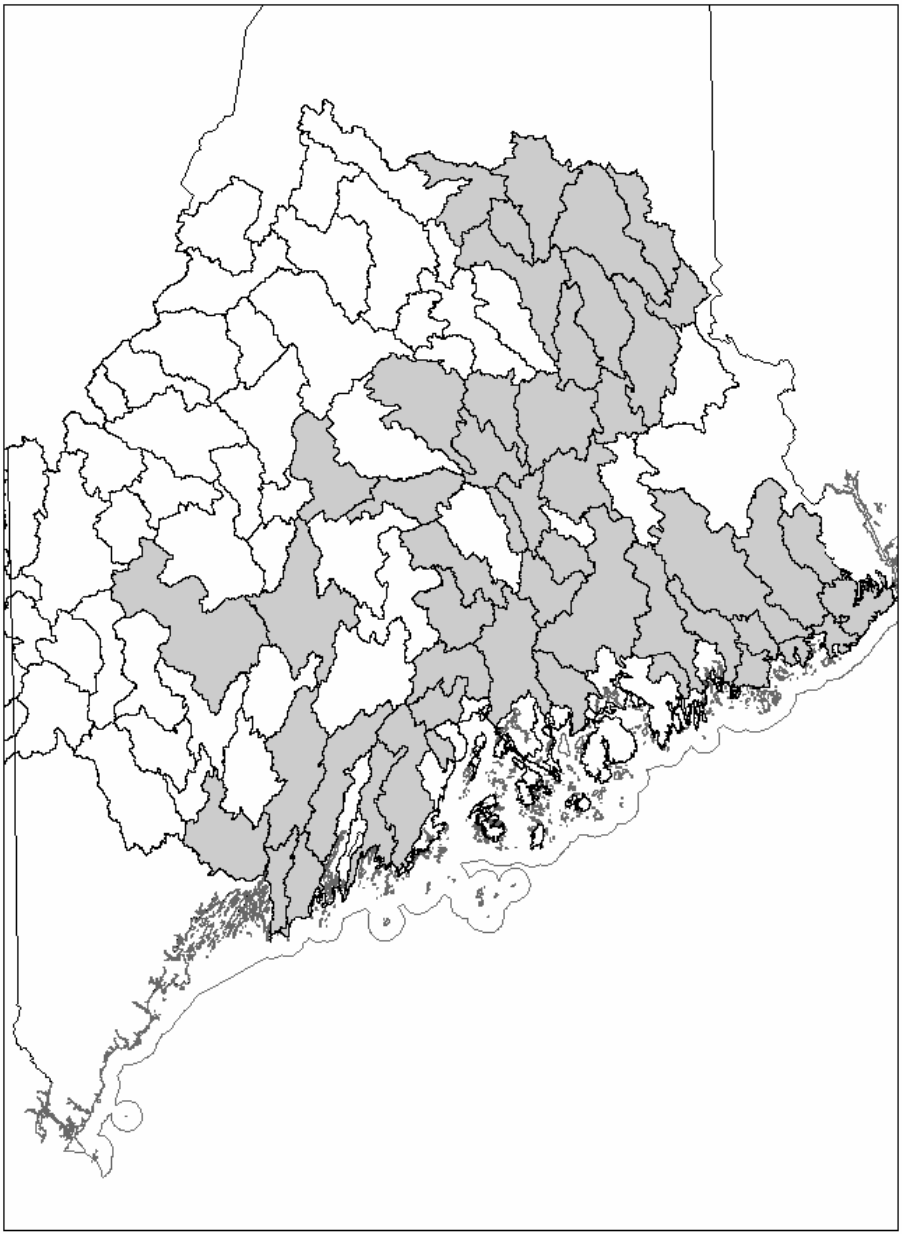

Figure 2: HUC 10 watersheds representing specific areas evaluated for critical habitat and specific areas occupied (in gray) at the time of listing

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- **"Specific areas outside the geographical area occupied by the species…essential to the conservation of the species"**

The ESA 3(5)(A)(ii) further defines "critical habitat" as "specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of [section 4 of this Act], upon a determination by the Secretary that such

areas are essential for the conservation of the species". For the reasons stated above in the discussion of specific occupied areas, we delineated the specific areas outside the geographic area occupied by the species using HUC 10 (level 5) watersheds. To determine whether these unoccupied areas are essential for the conservation of the species, we: 1) established recovery criteria to determine when the species no longer warrants the protections of the ESA (*See Appendix A of Biological valuation of Atlantic salmon habitat within the GOM DPS*) and the amount of habitat needed to support the recovered population; and 2) determined the amount of habitat currently occupied by the species relative to the amount of habitat necessary to achieve recovery.

In developing recovery criteria, we employed a strategy of identifying both geographic and population level criteria, that, if met would protect the DPS from demographic and environmental variation to the extent in which the population would no longer require protection under the ESA. Geographic criteria were established to assure that Atlantic salmon are well distributed across the DPS to accommodate the metapopulation characteristics of species; Atlantic salmon. Atlantic salmon have strong homing characteristics that allow local breeding populations to become well adapted to a particular environment, while at the same time, limited straying does occur as a means to assure population diversity and also allow for population expansion and recolonization of extirpated populations. To accommodate these life history characteristics, we established a geographic framework represented by three Salmon Habitat Recovery Units, or SHRUs, within the DPS (see NMFS 2009 (appendix A)) that would we believe to be reasonably protective of these life history characteristics and to ensure that Atlantic salmon are widely distributed across the DPS to provide protection from demographic and environmental variation. As explained in more detail in the Recovery Criteria (NMFS 2009 (Appendix A)), we determined that all three SHRUs must fulfill the criteria described below for the overall species, the GOM DPS, to be considered recovered.

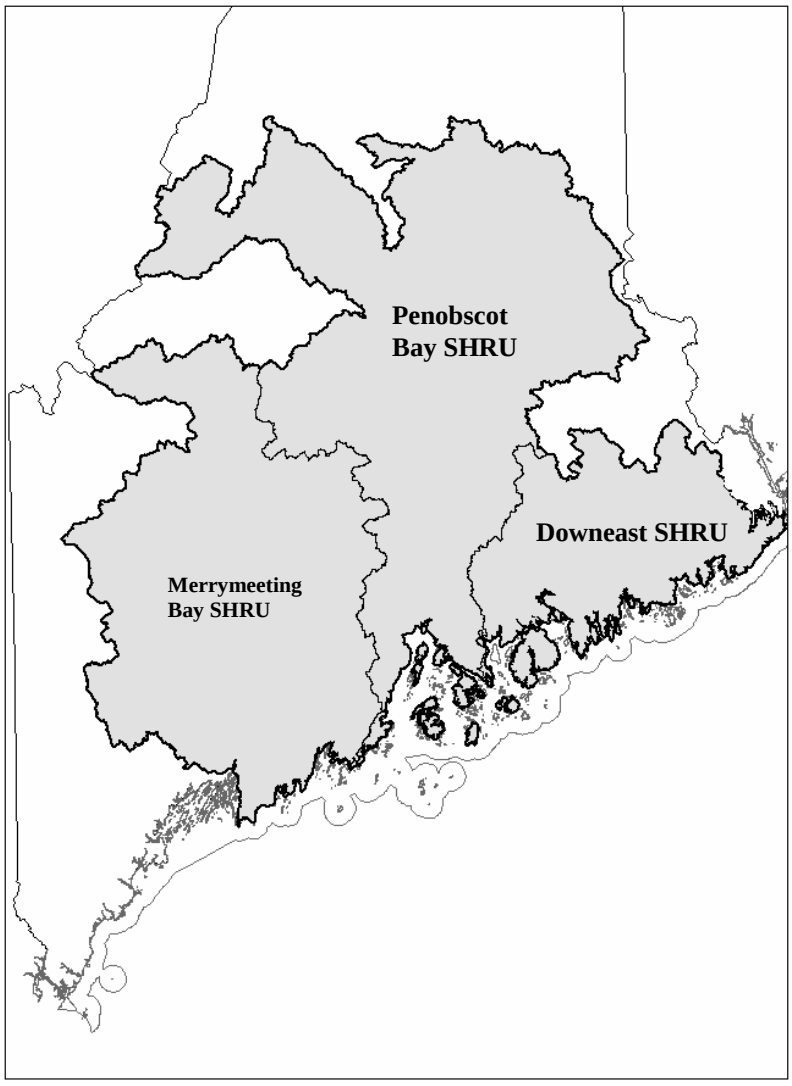

Figure 3. GOM DPS representing three SHRU's

Criteria:

Population level criteria were established to assure that a recovered population is likely to be sufficiently robust to withstand natural demographic variability (eg. periods of low marine survival) and not likely to become an endangered species in the foreseeable future. We concluded that a census population of 500 adult spawners (assuming a 1:1 sex ratio) in each SHRU is to be used as a benchmark to evaluate the population as either recovered or one that requires protection under the ESA. Franklin (1980) introduced 500 as the approximate effective population size necessary to retain sufficient genetic variation and long term persistence of a population.

We have chosen to use a census population (N) of 500 adult spawners (assuming a 1:1 sex ratio) in each SHRU to represent the effective population size and to serve as a benchmark to evaluate the population as either recovered or one that requires protection under the ESA. We used the census number rather than an effective population size for four reasons: 1) The adult census through redd counts or trap catches have been used as the principle indicator of population health in the GOM DPS since Charles Atkins first started estimating returns in the mid to late 1800's. At this time there are not sufficient

resources or time to fully assess the effective population size of the entire Gulf of Maine DPS on annual basis, whereas sufficient resources are already in place to reasonably assess the census population; 2) a census population of 500 spawners per SHRU provides a starting point only for establishing criteria for delisting and does not represent the actual number in which the population warrants delisting. Other pre-decision criteria must also be met for delisting as described in the following paragraph; 3) Atlantic salmon have tremendously complex life histories allowing for great opportunity for extensive cross generational breeding. This is because of salmon's iteroparity and because precocious parr, one-sea winter and multi-sea winter fish can all participate in spawning activity. Having multi-generational participation in spawning activity significantly reduces the effective population to census population ratio, but furthermore, makes determining the actual N_e/N ratios extremely difficult and highly debatable for the natural population. 4) Though there has been much debate in the literature regarding the application of assigning a general number to represent when populations are sufficiently large enough to maintain genetic variation (Allendorf and Luikart, 2007, Waples & Yokota 2007; Reiman & Allendorf 2001), the 500 rule introduced by Franklin (1980) has not been superseded by any other rule and does serve as useful guidance for indicating when a population may be at risk of losing genetic variability (Allendorf and Luikart, 2007).

To evaluate the GOM DPS for recovery, we have determined that five criteria must be met:

1. The adult spawner population of each SHRU must be 500 or greater in an effort to maintain sufficient genetic variability within the population for long term persistence. This is to be determined or estimated through adults observed at trapping facilities or redd counts.

2. The GOM DPS must demonstrate self-sustaining persistence where each SHRU has less than a 50% probability of falling below 500 adult spawners in the next fifteen years based on PVA projections described above. The 50% assurance threshold satisfies the criterion that the population is "not likely" to become an endangered species; while 15 years represents the "foreseeable future" for which we have determined that we can make reasonable projections based on past demographic data available to us.

3. The entire GOM DPS must demonstrate consistent positive population growth for at least two generations (10 years) before the decision to delist is made. Ten years of pre-decision data that reflects positive population trends provides some assurance that recent population increases are not happenstance but more likely a reflection of sustainable positive population growth.

4. A recovered GOM DPS must represent the natural population. Hatchery product cannot be counted towards recovery because a population reliant upon hatchery product for sustainability is indicative of a population that continues to be at risk.

5. In order to delist the GOM DPS, the threats identified at the time of listing must be addressed through any regulatory or other means. These threats

are identified in the five listing factors specified in the ESA as described in the 2006 Status Review (Fay et al. 2006). Methods to address these threats will be addressed in a final recovery plan for the expanded GOM DPS.

- *Calculating habitat currently occupied by the species relative to the amount needed to support a recovered population*

The criteria described above were then applied to aid in determining whether designating unoccupied habitat areas are essential for the conservation of the species by estimating the amount of habitat needed to support a recovered GOM DPS. Using demographic data for the period between 1991 – 2006, a period considered to have had exceptionally low survival, we applied the criteria described above in conjunction with a Population Viability Analysis (PVA) to determine how many adults would be required in each SHRU to weather a similar downturn in survival while having a greater than 50 percent chance of remaining above 500 adult spawners (*see* Appendix B of NMFS, 2009). This analysis projected that a census population of 2,000 spawners (1,000 male and 1,000 female) would be needed in each of the three SHRUs for the GOM DPS to weather a downturn in survival such as experienced over the time period from 1991 – 2006. Based on this analysis, enough habitat is needed in each of the three SHRUs to support the offspring of 2,000 spawners. Using an average fecundity per female of 7,200 eggs (Legault, 2004), and male to female ratio of 1:1, or 1,000 females, and a target number of eggs per one unit of habitat ($100m^2$) of 240 (Baum, 1997) we determined that 30,000 units of habitat is needed across each SHRU (7,200eggs X 1000 females/240 eggs = 30,000) to support the offspring of 2,000 spawners, which represents the quantity of habitat in each SHRU essential to the conservation of the species (NMFS, 2009 appendix B).

In order to calculate the quantity of habitat across the DPS both within the currently occupied range and outside the occupied range we considered the measured quantity of habitat within each HUC 10 as well as the habitat's quality to generate the habitat's functional equivalent. The functional equivalent values the quantity of habitat (expressed in units where 1 unit of habitat is equivalent to $100m^2$ of habitat) within a HUC 10 based on qualitative factors that limit survivorship of juvenile salmon utilizing the habitat for spawning, rearing and migration. For example, a HUC 10 that has smallmouth bass and has high temperatures can limit survivorship of salmon within the HUC 10 compared to a HUC 10 that does not have bass and is not subject to high temperatures. The functional equivalent also accounts for dams within or below the HUC 10 that would further reduce survivorship of juvenile salmon within the HUC 10 as they migrate towards the marine environment. In HUC 10s that are not believed to be limited by qualitative factors or dams, the functional equivalent would be identical to the measured quantity of habitat within the HUC 10. In HUCs where quality and dams are believed to be limiting, the functional equivalent would be less then the measured habitat within the HUC 10. The functional equivalent value is used in the critical habitat evaluation process to determine the quantity of functioning habitat within each HUC 10. It also determines the quantity of functioning habitat within the currently occupied range relative to the amount needed to support the offspring of 2,000 adult spawners.

The functional equivalent was generated by multiplying the units of habitat within each HUC 10 by the habitat quality score divided by 3 (e.g. 1 = 0.33, 2 = 0.66, and 3 = 1; discussed below under *application of ESA section 4(b)(2*). This value was then multiplied by the passage efficiency of FERC dams with turbines raised to the power of the number of dams both within and downstream of the HUC10. Habitat quality scores were divided by 3 to represent their relative values in terms of percentages such that a "1" habitat quality score has a qualitative value roughly 33 percent of habitat that is not limiting, "2" habitat quality score is roughly 66 percent, and a "3" score equals 100 percent habitat quality. In regards to fish passage at dams, we consider 0.85 to represent a coarse estimate of passage efficiency for FERC dams with turbines based on the findings of several studies (GNP, 1995; GNP, 1997; Holbrook, 2007; Shepard, 1991c; Spicer et al. 1995) and therefore roughly equivalent to a 15 percent reduction in functional equivalent. The number of dams present both within and downstream of the HUC10 was used as an exponent in order to account for cumulative effects of dams. A full review of how habitat quantities and habitat qualities were computed is provided in NMFS (2009).

Table 1 represents the total amount of measured habitat within the occupied areas of each SHRU; the habitats functional equivalent for each SHRU; amount of habitat proposed for economic exclusion; the amount of functional habitat (represented as functional equivalent) after exclusion; and the amount of habitat still needed to support the offspring of 2,000 adult spawners within each SHRU.

Table 1. Total habitat and functional habitat for occupied areas among the three SHRUs in the GOM DPS

SHRU	Total Habitat Units	Functional Equivalent	Economic exclusion	Functional habitat after exclusions	Additional habitat needed to support the offspring of 2,000 adult spawners (i.e. 30,000 units)
Merrymeeting Bay	372,639	40,001	0	40,001	0
Penobscot Bay	323,740	66,263	3,205	63,058	0
Downeast Coastal	61,395	29,111	0	29,111	889

- *Determination of critical habitat outside the currently occupied geographical area essential to the conservation of the species*

In both the Penobscot and Merrymeeting Bay SHRUs there are more than 30,000 units of functional habitat within the currently occupied area to support the offspring of adult spawners. In the Downeast SHRU, the amount of functional habitat available to the species is estimated to be 889 units short of what is needed to support 2,000 adult spawners. Nonetheless, we determined that no areas outside the occupied geographical area within the Downeast SHRU are essential to the conservation of the species. This is

because of the 61,395 total habitat units in Downeast Maine, the habitat is predicted to be functioning at the equivalent of 29,111 units because of the presence of dams or because of degraded habitat features that reduce the habitats functional value. Through restoration efforts, including enhanced fish passage and habitat improvement of anthropogenically degraded features (including stream crossing improvement projects like those currently being carried out by Project SHARE in the Downeast SHRU for example), a substantial portion of the approximate 32,000 units of non-functioning habitat may be restored to a functioning state. The Union River, for instance, has over 12,000 units of habitat, though its functional potential is estimated to be equivalent to approximately 4,000 units of habitat. This is largely because of dams with inadequate fish passage that reduces the function of the migratory PCE throughout most of the Union River watershed. Dam removal or improved fish passage has the potential to significantly increase the function of critical habitat in the Union river and therefore the entire Downeast SHRU.

Throughout Maine, there has been substantial effort on behalf of state and Federal agencies and non-profit organizations in partnership with landowners and dam owners to restore habitat through a combination of land and riparian protection efforts, and fish passage enhancement projects. Project SHARE, the Downeast Salmon Federation, watershed councils, Trout Unlimited, and the Atlantic Salmon Federation, for example, have conducted a number of projects designed to protect, restore and enhance habitat for Atlantic salmon ranging from the Kennebec River in south central Maine to the Dennys River in Eastern Maine. Projects include, but are not limited to, dam removals along the Kennebec, St. George, Penobscot, and East Machias Rivers, land protection of riparian corridors along the Machias, Narraguagus, Dennys, Pleasant, East Machias, Sheescot, Ducktrap rivers and Cove Brook; surveying and repair of culverts that impair fish passage; and outreach and education efforts on the benefits of such projects. In 2008 in the Downeast SHRU, Project SHARE replace 7 culverts with open bottom arch culverts to improve fish passage, decommissioned 12 road crossings by removing the culvert or bridge and stabilizing the banks, and removed 6 remnant log drive dams. The Penobscot River Restoration Project is another example of cooperative efforts on behalf of Federal and state agencies, non profit organizations and dam owners. The PRRP goal is to enhance runs of diadromous fish, including Atlantic salmon, through the planned removal of two mainstem dams and enhanced fish passage around several other dams along the Penobscot River. These cooperative efforts can increase the functional potential of Atlantic salmon habitat by both increasing habitat availability as well as increasing habitat quality. Therefore, we do not believe that it is essential to designate critical habitat outside of the currently occupied range.

Military Lands Precluded from Designation by ESA Section 4(a)(3)(B)(i)

The Sikes Act (16 U.S.C. 670a-670f, as amended), enacted on November 18, 1997, required that military installations with significant natural resources prepare and implement an integrated natural resource management plan (INRMP) in cooperation with the U.S. Fish and Wildlife Service (FWS) and State fish and Wildlife agencies, by November 18, 2001. The purpose of the INRMP is to provide the basis for carrying out

programs and implement management strategies to conserve and protect biological resources on military lands. Because military lands are often protected from public access, they can include some of the nation's most significant tracts of natural resources. INRMP's are to provide for the management of natural resources, including fish, wildlife, and plants; allow multipurpose uses of resources; and provide public access where appropriate for those uses, without any net loss in the capability of an installation to support its military mission.

In 2003, the National Defense Authorization Act (Public Law No. 108-136) amended the ESA to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(i) of the ESA (16 U.S.C. 1533(a)(B)(i)) states: "The Secretary shall 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 prepared under section 101 of the Sikes Act (16 U.S.C. 67a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation."

Within the specific areas identified as critical habitat for the Gulf of Maine DPS, there are four military sites; two of which currently have INRMP's and the other two have INRMP's being developed. The Brunswick Naval Air Station has 15,800 acres of real property spread out among the main station in Brunswick and several remote stations across Maine. Military installations that are part of the Brunswick Naval Air Station and that are either partly or entirely within the area where critical habitat is proposed include the 3,091 acre main station in Brunswick; a 12,000 acre Survival, Evasion, Resistance and Escape (SERE) school near Rangeley, Maine, and the 396 acre Great Pond Outdoor Adventure Center located in the town of Great Pond in Hancock County, Maine.

The two military installations within the occupied range of the DPS with INRMP's are excluded from designation in accordance to 4(a)(3)(B)(i) of the ESA. These installations include: 1) the 3,094 acre Brunswick Naval Air Station in Brunswick, Maine, of which 435 acres are within Little Androscoggin HUC 10 watershed in the Merrymeeting Bay SHRU; and 2) the Brunswick Naval Air Stations cold weather survival, evasion, resistance and escape school which occupies 12,000 acres near Rangeley, Maine and occupies 5,328 acres of the Sandy River HUC 10 watershed in the Merrymeeting Bay SHRU. The INRMPs at these two locations specifically provide for water quality protection via erosion and sediment control, wetland protection, monitoring of non point source pollution, protection of watersheds from hazardous materials, use of environmentally beneficial landscaping, monitoring for and responding to forestry management units health problems and management of forests as shoreline buffers.

The two sites with military missions that currently do not have INRMP's and the one non-military facility identified as being essential to national security are being excluded from critical habitat under section 4(b)(2) described below in *Applications of section 4(b)(2).*

Applications of ESA Section 4(b)(2)

Section 4(b)(2) of the ESA states:

> The Secretary shall designate critical habitat and make revisions thereto, under subsection (a)(3) of this section on the basis of the best scientific data available and after taking into consideration the economic impact, impact to national security, and any other relevant impact, of specifying any particular area as critical habitat. The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific and commercial data available, that the failure to designate such areas as critical habitat will result in the extinction of the species concerned (16 U.S.C.§ 1533(b)(2)).

This 4(b)(2) exclusion analysis applies a cost-effectiveness analysis comparing the monetized "benefits of exclusion" against the biological "benefits of inclusion" to support 4(b)(2) decision-making.

- **Impacts of specifying any particular area as critical habitat**

The cost of specifying any particular area as critical habitat occurs primarily through section 7 of the ESA. Once critical habitat is designated, section 7(a)(2) requires that Federal agencies ensure any action they authorize, fund or carry out (this action is called the "Federal nexus") is not likely to result in the destruction or adverse modification of critical habitat (16 U.S.C. 1536(a)(2)). Parties involved in section 7 consultations include NMFS or the USFWS, a Federal action agency, and in some cases, a private entity involved in the project or land use activity. The Federal action agency serves as the liaison with NMFS. Under Section 7(a)(2), when a Federal agency proposes an action that may affect a listed species or its critical habitat, then they must initiate formal consultation with NMFS (or the USFWS, as applicable) or seek written concurrence from the Services that the action is not likely to adversely affect listed species or its' designated critical habitat. Formal consultation is a process between the Services and a Federal agency designed to determine whether a proposed Federal action is likely to jeopardize the continued existence of a species or destroy or adversely modify critical habitat, an action prohibited by the ESA. If the action is likely to destroy or adversely modify critical habitat, then the Federal agency may be required to implement a reasonable and prudent alternative (RPA) to the proposed action to avoid the destruction or adverse modification of critical habitat. Harm avoidance measures may also be implemented to avoid lesser adverse effects to critical habitat that may not rise to the level of adverse modification. Outside of the Federal agencies' obligation to critical habitat and project modifications that may be required to avoid destruction or adverse modification, the ESA imposes no requirements or limitations on entities or individuals as result of a critical habitat designation.

The benefits of designation used for the proposed critical habitat designation for the GOM DPS are the biological values assigned to each HUC 10 that evaluate the quality and quantity of the physical and biological features within each HUC 10 and the current potential of each HUC 10 to support (absent dams) the spawning, rearing, and migration of the GOM DPS (NMFS, 2009).

- **Incremental Impacts of Designating Critical Habitat**

In designating critical habitat for Atlantic salmon, we use an incremental approach to designation. Section 7 of the ESA requires Federal agencies to ensure that their actions will not result in the destruction or adverse modification of critical habitat, in addition to ensuring that their actions are not likely to jeopardize the continued existence of listed species. Incremental impacts of critical habitat designation include the added administrative costs of considering critical habitat in section 7 consultations and the additional impacts of implementing project modifications to protect critical habitat from destruction or adverse modification (IEc 2009).

Incremental impacts can include direct costs associated with any projected, reinitiated or new consultation that may occur specifically because of the designation, or any additional project modifications that otherwise would not be required to avoid jeopardizing the continued existence of the listed species. If impacts would occur even in the absence of a critical habitat designation, as a result of the species listing (and the requirement to avoid jeopardizing the continued existence of the species) or other baseline protections, the impacts are considered co-extensive rather than incremental.

A number of courts have opined on the proper way to consider the economic impacts of critical habitat designation. In *New Mexico Cattle Growers Association v. U.S. Fish and Wildlife Service*, 248 F.3d 1277 (10th cir. 2001) (*Cattle Growers*), the 10th circuit court found the FWS's failure to assess economic impacts in occupied areas inconsistent with the ESA requirement that the Services consider economic impacts in the designation process. The court found that the Services were required to analyze the full impacts of designation, regardless of whether those impacts are co-extensive with other impacts. In contrast, the court in *Cape Hatteras Access Preservation Alliance v. Norton* (*Cape Hatteras*) reasoned that the impact of a regulation should be based on a comparison of the world with and without the action and citing guidance from the Office of Management and Budget in support of that proposition. 344 F. Supp. 2d 1080 (D.D.C. 2004). The *Cape Hatteras* court concluded that the problem with the Service's analysis of economic impacts resulted from its treatment of "adverse modification" and "jeopardy" as being functionally equivalent. Our designation of critical habitat for the GOM DPS is based upon an incremental analysis, consistent with the court's holding in *Cape Hatteras*.

- **Executive order 12866 considerations**

Executive order 12866, "Regulatory Planning and Review" requires Federal agencies to measure the changes in economic efficiency in order to understand how society, as a whole, will be affected by the regulation. The overarching regulatory philosophy established by EO 12866 is:

> [The] Federal agencies should promulgate only such regulations as are required by law, are necessary to interpret the law, or are made necessary by compelling public need, such as material failures of private markets to protect or improve the health and safety of the public, the environment, or the well-being of the American people. In deciding whether and how to regulate, the

> agencies should assess all costs and benefits of available regulatory alternatives, including the alternatives of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but are nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

We designate critical habitat pursuant to the principles established in E.O. 12866 consistent with the requirements for designation of critical habitat set forth in the ESA. For example, in the economic analysis, opportunity costs in terms of changes in producer and consumer surpluses are characterized in affected markets in order to comply with EO 12866 (IEc 2009).

Process for 4(b)(2) exclusion decisions

Specific areas that satisfy the definition of critical habitat are not automatically designated as critical habitat. Section 4(b)(2) (16 U.S.C. 1533(b)(1)(A)) requires the Secretary to first consider the economic, national security, and other relevant impacts of designating any particular area and permits the Secretary to exclude particular areas from designation determines that the benefits of such exclusion outweigh the benefits of specifying such areas as part of the critical habitat, unless he determines that the failure to designate such areas as critical habitat will result in the extinction of the species concerned. The statute does not specify the exact geographic scale of these "particular areas." In considering economic cost the HUC 10 (level 5) standard watershed used to represent specific areas, were also used to represent the “particular areas”. The entire range of the GOM DPS is comprised of 48 “specific areas” (HUC 10 watersheds) occupied by the species on which are found those physical and biological features essential to the conservation of the species. Where we considered impacts on national security, and impacts on Indian Tribes, we delineated particular areas based on land ownership (or control, where relevant for national security impacts). These areas may only account for a small fraction of a HUC 10 watershed or, in some circumstances, may span across all of, or portions of several HUC 10 watersheds. Therefore it would not be practical to consider excluding an entire HUC 10 watershed when considering impacts to national security or Tribal lands.

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Pursuant to these statutory requirements, NMFS undertakes the following steps to implement section 4(b)(2):

- Determine the benefit of designation (biological benefits) of each particular area;
- Determine the benefit of exclusion (economic costs) of each particular area;
- Identify particular areas for possible exclusion from critical habitat designation where the benefits of exclusion of these particular areas outweigh the benefits of designation; and
- Determine whether the exclusions (if any) will result in extinction of the species.

- **Determine the benefit of designation (biological benefits) of each particular area**

To determine the benefits of including an area as critical habitat, we assigned a Final Biological Value to each HUC 10 watershed based on the quantity and quality of Atlantic salmon spawning and rearing habitat and the migratory needs of the species (see NMFS, 2009). The Final Biological Value indicates each areas current value to Atlantic salmon spawning, rearing and migration activities and is applied in the 4(b)(2) exclusion analysis, where it is weighed against the economic, national security, and other relevant impacts to consider whether specific areas may be excluded from designation. The final biological value also aided in determining those areas currently occupied by the species described earlier in the final rule under "Identifying the Geographical Area Occupied by the Species and Specific Areas within the Geographical Area". The variables used to develop the Final Biological Value include a combination of habitat units, habitat quantity, habitat quality, and the value of the HUC 10 to migration of smolts and adults.

A habitat unit represents 100 m^2 of spawning and rearing habitat. A habitat unit is used in North America and Europe to quantify habitat features most frequently used for spawning and juvenile rearing (e.g., riffles and runs). Habitat units for each HUC 10 were calculated using the GIS based habitat prediction model described in NMFS (2009).

Habitat quantity is the estimate of habitat units generated by the model and was calculated separately for each HUC 10. The units of habitat were then binned into four categories for each of the three SHRUs. A HUC 10 with no habitat was assigned a score of "0" and was considered unoccupied. HUC 10s with the lowest 25 percent of total units of habitat across the entire SHRU received a "1" score, the middle 50 percent received a "2" score, and the upper 25 percent received a "3" score. A "3" score represents the highest relative habitat quantity score. This method resulted in the majority of the habitat receiving a score of "2" representing an average habitat quantity. Habitat scores outside the middle 50 percent were considered to have above average habitat quantity or below average habitat quantity.

Habitat quality scores were assigned to HUC 10s based on information and input from fisheries biologists working with the Maine Department of Inland Fisheries and Wildlife, the MDMR, NMFS, and Kleinschmidt Energy and Water Resource Consultants who possess specific knowledge and expertise about the geographic region. For each of the three SHRUs, a minimum of three biologist with knowledge of and expertise in the geographic area were asked to independently assign habitat scores, using a set of scoring criteria developed by Fisheries Biologists from NMFS, to HUC 10s based on the presence and quality of the physical and biological features essential to the conservation of the species (see NMFS, 2009). The scoring criteria ranked qualitative features including temperature, biological communities, water quality, and substrate and cover, as being highly suitable ("3"), suitable ("2"), marginally suitable ("1") or not suitable ("0") for supporting Atlantic salmon spawning, rearing and migration activities. A habitat value of "0" indicates that one or more factors is limiting to the point that Atlantic salmon could not reasonably be expected to survive in those areas; a score of "1", "2" or "3" indicates the extent to which physical and biological features are limiting, with a "1" being most limiting and a "3" being not limiting. In HUC 10s that are and have always

been inaccessible due to natural barriers, the entire HUC 10 was automatically scored as "0" and considered not occupied by the species. Emphasis was placed on identifying whether or not the physical and biological features needed for Atlantic salmon spawning and rearing are present and of what quality the features are. The overall habitat quality score for each HUC 10 was typically an average determined by the compilation of scores. In some instances, not all the biologists were familiar with the HUC 10, so only one or two scores were provided for some HUCs. In some instances where only two scores were provided for a HUC 10 watershed and each biologist scored the watershed differently we relied on a combination of the comments provided on the score sheets, knowledge from fisheries biologist working for NMFS that were familiar with these HUCs, or phone interviews with the commenters to resolve the "tie" score. We resolved "tie" scores based on comments when it was clearly apparent, based on the comments, that one biologist had more knowledge of the HUC 10 then the other biologist who scored the HUC 10.

Final Habitat Values were generated for each HUC 10 by combining habitat quantity and habitat quality scores within each HUC 10. Scores were combined by multiplying the two variables together giving scores of 0, 1, 2, 3, 4, 6, 9. HUC 10s with zero scores received a zero score for Final Habitat Value. Scores of 1 or 2 were valued as low or "1" final habitat value. Scores of 3 or 4 were valued as medium or "2" final habitat value, and scores of 6 or 9 were valued as high or "3" final habitat value.

A final migration value was generated based on the final habitat values and the migratory requirements of adults to reach spawning areas and smolts to reach the marine environment. We determined the final migration value of a HUC 10 to be equal to the highest final habitat value upstream from the HUC 10 as we concluded that access to spawning and rearing habitat was equally as important as the spawning and rearing habitat itself.

The final biological value for each HUC 10, which is the value used in weighing economic cost against the biological value of habitat to salmon, was determined by selecting the higher of the final habitat value and the final migration score of each HUC 10. This approach assures the preservation of spawning and rearing habitat as well as migration habitat. The final biological value for each HUC 10 watershed is summarized in tables 1, 2, and 3 in appendix A of this document.

- **Consider the benefit of exclusion (economic costs) of each particular area**

The economic analysis for Atlantic salmon is designed to provide an economic cost associated with specific areas that can be used in comparison with the biological value of a particular area (IEc 2009). In this section, we provide a summary of our assessment of the benefit of excluding any particular area from critical habitat.

The economic analysis for the Atlantic salmon critical habitat designation employs a cost-effectiveness approach where the "benefits of exclusion" (i.e. the cost of designating critical habitat) are quantified in a dollar amount in the economic analysis, and the benefit

of inclusion are described in the biological valuation. The benefits of exclusion are then weighed against the benefits of inclusion, and possible exclusions are considered.

The economic analysis examines the economic cost that federal activities are likely to incur as a result of the proposed critical habitat designation. The economic analysis first evaluates the state of the world with and without critical habitat for the salmon, describing a baseline economy that would continue absent critical habitat where protections are afforded to salmon only through the federal listing and other federal, state, and local regulations (IEc 2009). The economic analysis then describes the incremental impacts associated with the designation of critical habitat, or those costs that are not likely to occur absent the designation of critical habitat for Atlantic salmon (IEc 2009).

To determine the economic impacts associated with the designation of critical habitat, the economic analysis reviews the existing or potential threats that human activities may have on the species and its habitat and then identifies any modifications to these activities that may need to occur to avoid the destruction or adverse modification of critical habitat. If feasible, the economic analysis quantifies and monetizes the economic impact associated with these modifications (IEc 2009).

For the Gulf of Maine DPS, the economic analysis estimates economic impacts that are reasonably foreseeable, including activities that are currently authorized, permitted, funded or planned for, for each HUC 10 watershed (IEc 2009). Based upon review of activities identified by the federal agencies that may have an adverse impact on the primary constituent elements of critical habitat for Atlantic salmon, the economic analysis assesses the relevant economic impact to dams, agriculture, changing land use and development, transportation and instream construction projects, silviculture, mining, aquaculture, hatcheries and fisheries research (IEc 2009). The economic cost and biological value for each specific area are summarized in Tables 4, 5, and 6 at the end of this document.

- **Identify Particular areas for possible exclusion from Critical Habitat**

The 4(b)(2) exclusion process is conducted for a "particular area," not for the critical habitat as a whole. The statute does not specify the exact geographic scale of these "particular areas." For the purposes of the economic analysis, a "particular area" is defined as a HUC 10 (level 5) standard watershed. The same scale used to represent the 48 “specific areas” occupied by the species on which are found those physical and biological features essential to the conservation of the species. Where we considered impacts on national security, and impacts on Indian Tribes, we delineated particular areas based on land ownership (or control, where relevant for national security impacts). These areas may only account for a small fraction of a HUC 10 watershed or, in some circumstances, may span across several HUC 10 watersheds.

Section 4(b)2 states that the exclusion of particular areas is permitted only if the Secretary determines that the benefits of exclusion outweigh the benefits of designating the area as critical habitat, and if the exclusion will not result in extinction of the species.

Within the GOM DPS, factors that were considered in determining whether or not particular areas could be excluded from designation if the Secretary determined that the benefits of exclusion outweighed the benefits of designation included:

1) The quantity of functional habitat within the area relative to the overall quantity of functional habitat needed to support a recovered population;
2) The relative biological value of a particular area to the conservation of the species measured by the quantity and quality of the physical and biological features with the particular area;
3) The anticipated conservation loss that would be accrued through not designating a particular area based upon the relative biological value of that particular area; and
4) Whether exclusion of a particular area, based upon the best scientific and commercial data, would result in the extinction of the species concerned.

- *Lands excluded from critical habitat for reasons of national security and other relevant impacts in relation to military interests*

As described above under *application of Section 4(a)(3)(B)(i)*, the ESA specifically states: "The Secretary shall 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 prepared under section 101 of the Sikes Act (16 U.S.C. 67a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation." Therefore, the two sites without INRMP's, including the NAS Brunswick OAC in the town of Great Pond, Maine and the NCTAMS in Cutler, Maine, are not eligible for exclusion under section 4(a)(3)(B)(i) of the act because INRMP's are not currently in place.

Section 4(b)(2) of the act states that the Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific and commercial data available, that the failure to designate such areas as critical habitat will result in the extinction of the species concerned (16 U.S.C. § 1533(b)(2)). We are excluding the two sites with military missions without INRMPs from critical habitat under section 4(b)(2) of the ESA as the Secretary has determined that exclusion of these areas outweighs the benefit of inclusion given that upon the completion of the INRMPs, any final rule designating these areas as critical habitat will need to be revised to exclude them in accordance to section 4(a)(3)(B)(i) of the ESA. The Navy has agreed to work cooperatively with NMFS in the development of these INRMP's to assure that the Navy's activities are reasonably protective of Atlantic salmon habitat (Letter to NMFS from the Office of the Chief of Navy Operations (Ser N4/8u156068), December 2, 2008).

Before including areas in a designation, section 4(b)(2) of the ESA requires the Secretary to consider the impact on national security of designation of any particular area as Critical Habitat. Bath Iron Works (BIW) located in Bath, Maine has also been excluded from designation for reasons of National Security as advised by the Navy. BIW is a

premier ship-building facility that provides the design, building, and support of complex navy warships, including the AEGIS Class Destroyers. BIW has been building and servicing the U.S. warships for over 120 years, and their activities are essential to the military mission for the construction, maintenance, and modernization of Navy surface ships. These activities have been identified by the Navy as inherent to national security whereby without BIW's ability to construct and test current and future classes of surface ships, mission readiness and U.S. national security is at risk. The are excluded from designation includes the Kennebec River from the south side of the U.S. Route 1 bridge over the Kennebec River down river to 50 feet below the south side of BIWs dry dock, but does not include any portion of Hanson Bay or the thoroughfare between Hanson Bay and the Kennebec River. The specific area excluded from designation lies within a box between four points with the following coordinates: Point 1: N43 54' 39.8", W069 48"43.5"; Point 2: N43 54'40", W069 48' 17.8; Point 3: N43 54' 0.0", W069 48' 47"; Point 4: N43 54'0.0", W069 48'28".

- *Tribal lands excluded from designation*

Secretarial Order 3206 recognizes that Tribes have governmental authority and the desire to protect and manage their resources in the manner that is most beneficial to them. In keeping with their trust responsibilities, the Services are committed to consulting with the affected Indian Tribes when considering the designation of critical habitat in areas that may impact tribal trust resources, tribally-owned fee lands, or the exercise of tribal rights. The Secretarial order provides that critical habitat in such areas, unless determined as essential to the conservation of the species, shall not be designated.

Both tribes that own lands within the GOM DPS have actively pursued or participated in activities to further promote the health and continued existence of Atlantic salmon and their habitats. The Penobscot tribe has developed and maintained its own water quality standards that state "it is the official policy of the Penobscot Nation that all waters of the Tribe shall be of sufficient quality to support the ancient and historical traditional and customary uses of such tribal waters by members of the Penobscot Nation." The tribe is also currently participating in the Penobscot River Restoration Project that has the intended goal of restoring 11 species of diadromous fish, including Atlantic salmon to the Penobscot River. The Passamaquoddy Tribe has continued to maintain efforts to balance agricultural practices with natural resources. In a tract of land in Township 19, which contains 15 km of rivers and streams on Passamaquoddy land that contain physical and biological features essential to salmon, the tribe has established an ordinance to govern its water withdrawals for these lands. This ordinance states "[i]t is important to the Tribe that its water withdrawals at T. 19 do not adversely affect the Atlantic salmon in any of its life stages, or its habitat," and restricts water withdrawals to avoid adverse impact on the Atlantic salmon.

The Indian lands specifically proposed for exclusion are those defined in the Secretarial Order, including: 1) lands held in trust by the United States for the benefit of any Indian tribe; 2) land held in trust by the United States for any Indian Tribe or individual subject to restrictions by the United States against alienation; 3) fee lands, either within or outside the reservation boundaries, owned by the tribal government; and, 4) fee lands within the reservation boundaries owned by individual Indians.

The Penobscot Indian Nation and the Passamaquoddy Tribe own and conduct activities on approximately 182,000 acres of land within the range of the Gulf of Maine DPS of which approximately 65,000 acres are within the range currently occupied by the species. Activities may include agriculture; residential, commercial, or industrial development; in-stream construction projects; silviculture; water quality monitoring; and hunting and fishing. Some of these activities would likely be affected if these lands were designated as critical habitat for the GOM DPS of Atlantic salmon.

The benefit of designating critical habitat for the GOM DPS in these areas is expressed as a biological value of the habitat, by HUC, as described in the *Biological valuation of Atlantic Salmon habitat in the GOM DPS*). The benefits of excluding tribal lands from critical habitat include recognition of the considerations of Secretarial Order 3206 and acknowledging that tribes have governmental authority and the desire to protect and manage their resources in the manner that is most beneficial for them. Benefits of exclusion also arise from maintaining a meaningful collaborative relationship between the federal agencies and the tribes. NMFS also recognizes the Tribes' continued participation in efforts to protect and restore habitat important to Atlantic salmon, and in an effort to maintain a collaborative working relationship with the Tribes. NMFS believes that the benefits of excluding these areas outweigh the benefits of designating them as critical habitat because the ongoing cooperative efforts between the Tribes and the agencies indicate that exclusion will not reduce the conservation value of these areas. Within the occupied range designated as critical habitat, the Tribes own approximately 65,000 acres of land within 16 HUC 10 watersheds. NMFS has determined that the rivers, streams, lakes and estuaries of 9,571 acres of tribal land within the areas occupied by the GOM DPS be excluded from critical habitat designation based on the principles of the Secretarial Order discussed above. Per request of the Penobscot Nation, 55,180 acres of the Penobscot Nation lands are included as critical habitat.

Within these particular areas, there are approximately 148 km of rivers and streams that contain physical and biological features essential to the conservation of the species.

- *Particular areas recommended for exclusion based on economics*

The most effective way to determine whether a particular area may be excluded based on economic impacts is to weigh the benefit of designating the area against the cost of designating it using a common metric. The Office of Management and Budget states that, in weighing benefits against costs, agencies should first monetize the benefits or convert them to dollars. If the benefits cannot be monetized, they should be quantified. If the benefits can be neither monetized nor quantified, then agencies must describe the expected benefits (OMB 2003).

A benefit-cost analysis (BCA) is a relatively straight forward approach to weighing economic cost against conservation benefit. Such an analysis is a well established procedure for assessing the "best" course or scale of action. To conduct a BCA, however, a single metric, most commonly dollars, is used to gauge both the benefits and the costs (IEc 2009). The BCA approach is often difficult to apply in practice because the data and economic models necessary to estimate the costs are both difficult and costly

to develop, and quantifying the benefits in dollars may not be possible or appropriate; this is the case for the proposed critical habitat designation for Atlantic salmon (IEc 2009).

Recognizing the difficulty of estimating economic values using the BCA approach, OMB has acknowledged cost-effectiveness analysis (CEA) as a reasonable alternative. In conducting a CEA, agencies quantify both the benefits and the costs of the regulatory action, but different metrics are used for each (IEc 2009). For this critical habitat designation, we have developed a modified CEA where the economic costs of designating a particular area are quantified in dollars and the biological benefits are assessed using an ordinal measure (IEc 2009). A biological value (high, medium, low) is assigned relative to the contribution to conservation of a particular area. The ordinal value provides a metric that better represents the state of the science for the geographic scale than a quantified output would. It may not even be possible to provide quantified benefits given currently available information (IEc 2009). Qualitative ordinal evaluations can then be weighed against the estimated monetized economic costs. Areas with high conservation value and low economic cost would be of higher priority for designation, while areas of low conservation and high economic cost may be considered for possible exclusion. The limitations of the CEA are: 1) given that the CEA does not evaluate benefits and costs in the same metric, the analysis cannot assess whether a given change has benefits that, in monetary terms, are greater then costs (IEc 2009); and 2) the inability to discern variation in benefits among those areas that are assigned the same conservation value (IEc 2009).

For the designation of critical habitat for the GOM DPS, economic exclusions within the 48 occupied HUC 10s throughout the DPS were considered by weighing biological value determined in the biological valuation and the economic cost determined in the economic analysis. As described earlier, the Biological Values were assigned a score of 1, 2, or 3, with a "1" being of lowest biological value and a "3" being of highest biological value. Areas could also be assigned a biological value of "0" if the physical and biological features in those areas were so degraded that they were not considered essential to the conservation of salmon. Areas assigned a "0" score were not included in the economic exclusion analysis. As stated above, we consider these areas to be unoccupied, and we determined that no unoccupied areas were essential to the conservation of the GOM DPS.

To compare economic cost with biological value, we used the range of monetized values provided in the economic analysis binned into three categories, with a score of "1" representing low economic cost and a score of "3" representing high economic cost. These categories illustrate economic costs over the range of the GOM DPS. The high, medium and low scores assigned to economic costs were then used to weigh economic cost against the corresponding biological value (also scored as high, medium or low) of each HUC 10. The binning process was designed to describe a range of monetized values in qualitative terms that could be directly compared with the qualitative assessment of the physical and biological habitat features essential to the conservation of the species. The binning was conducted so that the lowest 25 percent of the total economic costs represent costs that were below average. Low economic costs were assigned a score of "1" representing a cost ranging from $71,000 to $388,000. The middle 50 percent represents the average cost across all HUCs containing critical habitat and received a score of "2" with economic cost ranging from $388,001 to $3,42,000. The upper 25 percent

represents those costs that were above average or high and received a score of "3" with economic cost ranging from $3,420,001 to $27,900,000. We binned the economic costs using the same procedures that we used to bin habitat quantity within each HUC 10 with the lower and upper 25 percent of habitat representing those areas as being either above average or below average.

These dollar thresholds do not represent an objective judgment that low-value areas are worth no more than $388,000, medium-value areas are worth no more than $3,420,000 or high value areas are worth no more than $27,900,000. Under the ESA, we are to weigh dissimilar impacts given limited time and information. The statute emphasizes that the decision to exclude is discretionary. Thus, the economic impact level at which the economic benefits of exclusion outweigh the conservation benefits of designation is a matter of discretion and depends on the policy context. For critical habitat, the ESA directs us to consider exclusions to avoid high economic impacts, but also requires that the areas designated as critical habitat are sufficient to support the conservation of the species and to avoid extinction. In this policy context, we selected dollar thresholds representing the levels at which we believe the economic impact associated with a specific area would outweigh the conservation benefits of designating that area. Given the low abundance and endangered status of Atlantic salmon, we exercise our discretion to consider exclusion of specific areas based on three decision rules: (1) specific areas with a biological value of medium ("2") or high ("3") score were not eligible for exclusion regardless of the level of economic impact, because of the endangered status of Atlantic salmon; (2) specific areas with a low biological value ("1") were excluded if the economic costs were greater than $388,000 (economic score of "2" or "3"); (3) specific areas were not considered for exclusion, including those areas having a low biological value ("1"), if the area had no dams both within it or below it given that these areas are not subject to the deleterious effects that dams have on migration of adults and smolts (GNP 1995; GNP 1997; Holbrook 2007; Shepard 1991c; Spicer et al. 1995). These dollar thresholds and decision rules provided a relatively simple process to identify, in a limited amount of time, specific areas warranting consideration for exclusion.

We propose to exclude three particular areas (HUC 10s) in the Penobscot Bay SHRU due to economic impact, out of a total of 48 occupied HUC 10s within the range of the GOM DPS (see Appendix A). Areas excluded from critical habitat for reasons of economics include approximately 1,198 km of river, stream and estuary habitat and 99 sq. km of lakes in all of Belfast Bay (HUC 105000218), Passadumkeag River (HUC 102000503), and Molunkus Stream (HUC 102000306). The combined economic impact of the designation in those particular areas was estimated to be $11,600,000 to $12,600,000 before they were considered for exclusion. The estimated economic impact for critical habitat following exclusions ranges from approximately $117 million to $140 million.

Table 3. Summary of economic impact following exclusions for occupied HUC 10 by SHRU in the GOM DPS.

SHRU	Low estimate	High estimate
Downeast Coastal	$9,710,000	$12,700,000
Penobscot Bay	$23,800,000	$28,700,000

Merrymeeting Bay	$83,400,000	$98,100,000
Total	$116,910,000.00	$139,500,000.00

- **Determine whether or not exclusion will jeopardize the continued existence of the species**

Section 4(b)(2) states that particular areas shall not be excluded from critical habitat if the exclusion will result in extinction of the species. Our decision to only propose for exclusion particular areas based on economic impacts that had low biological value, unless dams were absent from the particular area, led to exclusions only in the Penobscot SHRU. No economic exclusions are in the Downeast or Merrymeeting Bay SHRUs. Given that exclusions based on economic impacts within the Penobscot SHRU were only made in areas considered to have little biological value to Atlantic salmon, those exclusions are not considered to jeopardize the species' continued existence because those areas do not diminish the functional habitat unit below what is needed to support a recovered GOM DPS.

We do not believe that exclusions of Passamaquoddy tribal lands will reduce the conservation value or functional habitat unit of Atlantic salmon habitat within those particular areas given the ongoing cooperative efforts between the Tribe and the agencies. We do not believe that the four military installations that contain critical habitat will further reduce the conservation value of Critical Habitat. We believe that the two INRMPs that are in place, and the written assurance by the Navy that they will include management recommendations that directly benefit Atlantic salmon in the two INRMPs that are being developed are reasonable assurances that activities on these lands will not likely result in the extinction of the species.

The benefits of excluding Tribal lands from critical habitat include maintaining a long term working relationship between the Tribes and government agencies that promote environmental conservation and Atlantic salmon conservation; and the continued promotion of established national policies, our Federal trust obligations and our deference to the tribes in management of natural resources on their lands.

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Appendix A: Tables of biological value and economic exclusions

Table 1. Summary of occupied areas and particular areas excluded in the Merrymeeting Bay SHRU, weighing biological value against economic cost. Areas in GRAY are excluded from designation.

HUC Code	Watershed Name	Dams Present	Final Biological Value	Relative Economic Value	Total Economic Impact		Functional Equivalent
					Low Cost	High Cost	
103000305	Sandy River	Y	3	2	$2,690,000	$3,420,000	15,012
103000306	Kennebec R. at Waterville Dam	Y	3	3	$14,900,000	$15,200,000	13,966
103000312	Kennebec at Merrymeeting Bay	N	3	3	$6,640,000	$7,470,000	0
105000307	Kennebec River Estuary	N	3	3	$15,400,000	$16,900,000	0
104000210	Little Androscoggin River	Y	3	3	$23,200,000	$27,900,000	0
105000301	St. George River	N	2	3	$7,190,000	$11,100,000	4,619
105000306	Sheepscot Bay	N	2	3	$8,700,000	$8,980,000	0
105000305	Sheepscot River	Y	2	2	$1,500,000	$2,220,000	4,295
105000302	Medomak River	N	1	2	$3,140,000	$4,930,000	2,109
			Total Present Value		**$83,400,000**	**$98,100,000**	**40,001**

Table 2. Summary of occupied areas and particular areas excluded in the Penobscot Bay SHRU, weighing biological value against economic cost. Areas in GRAY are excluded from designation.

HUC Code	Watershed Name	Dams Present	Final Biological Value	Relative Economic Value	Total Economic Impact		Functional Equivalent
					Low Cost	High Cost	
102000509	Penobscot R. at Veazie Dam	Y	3	2	$2,140,000	$2,320,000	1,818
102000501	Penobscot R. at Mattawamkeag	Y	3	2	$271,000	$455,000	1,008
102000303	Mattawamkeag River	Y	3	2	$283,000	$476,000	355
102000305	Mattawamkeag River	Y	3	2	$312,000	$645,000	1,747
102000205	East Branch Penobscot River	Y	3	2	$346,000	$543,000	7,029
102000402	Piscataquis River	Y	3	2	$435,000	$583,000	3,365
102000401	Piscataquis River	Y	3	2	$465,000	$626,000	7,133
102000301	W. Branch Mattawamkeag R.	Y	3	2	$888,000	$1,500,000	3,929
102000513	Penobscot River	N	3	2	$922,000	$1,370,000	3,625
102000307	Mattawamkeag River	Y	3	3	$6,300,000	$6,430,000	896
102000502	Penobscot R. at West Enfield	Y	3	3	$4,430,000	$4,720,000	2,453
102000404	Pleasant River	Y	3	1	$192,000	$278,000	7,776
102000506	Penobscot R. at Orson Island	Y	3	1	$272,000	$376,000	2,161
102000406	Piscataquis River	Y	3	2	$309,000	$408,000	1,310
102000512	Marsh River	Y	2	3	$3,640,000	$3,970,000	2,899
102000302	E. Branch Mattawamkeag R.	Y	2	2	$442,000	$768,000	1,383
102000510	Kenduskeag Stream	N	2	2	$856,000	$1,090,000	4,579
102000202	Grand Lake Matagamon	Y	2	1	$25,600	$71,000	1,443
102000203	East Branch Penobscot River	Y	2	1	$34,500	$95,900	1,880
102000204	Seboeis River	Y	2	1	$112,000	$309,000	2,201
102000511	Souadabscook Stream	N	1	2	$543,000	$801,000	1,836
102000405	Seboeis Stream	Y	1	1	$57,000	$154,000	960
102000507	Birch Stream	Y	1	1	$123,000	$165,000	218
102000505	Sunkhaze Stream	Y	1	1	$150,000	$245,000	478
105000219	Ducktrap River	N	1	1	$231,000	$341,000	575
105000218	Belfast Bay	Y	1	3	$10,600,000	-$10,800,000	919
102000503	Passadumkeag River	Y	1	2	$305,000	-$550,000	1,500
102000306	Molunkus Stream	Y	1	2	$506,000	-$881,000	786
			Total Present Value		**$23,800,000**	**$28,700,000**	**63,057**

Table 3. Summary of occupied areas and particular areas excluded within the Downeast Coastal SHRU, weighing biological value against economic cost. Areas in GRAY are excluded from designation.

HUC Code	Watershed Name	Dams Present	Final Biological Value	Relative Economic Value	Total Economic Impact		Functional Equivalent
					Low Cost	High Cost	
0105000205	Machias River	N	3	2	$1,030,000	$1,570,000	9,976
0105000204	East Machias River	N	3	2	$446,000	$817,000	4,086
0105000209	Narraguagus River	Y	3	2	$596,000	$956,000	4,161
0105000212	Graham Lake	Y	2	3	$5,380,000	$6,200,000	1,942
0105000208	Pleasant River	N	2	2	$369,000	$507,000	2,017
0105000201	Dennys River	N	2	1	$257,000	$388,000	1,145
0105000213	Union River Bay	Y	2	2	$177,000	$389,000	2,302
0105000206	Roque Bluffs Coastal	N	1	2	$667,000	$809,000	1,010
0105000203	Grand Manan Channel	N	1	2	$390,000	$555,000	1,035
0105000207	Chandler River	N	1	1	$240,000	$303,000	1,013
0105000210	Tunk Stream	N	1	1	$153,000	$225,000	425
			Total Present Value		**$9,710,000**	**$12,700,000**	**29,112**

<u>Appendix B:</u> Specific areas within the geographical area occupied by the species at the time of listing by SHRU.

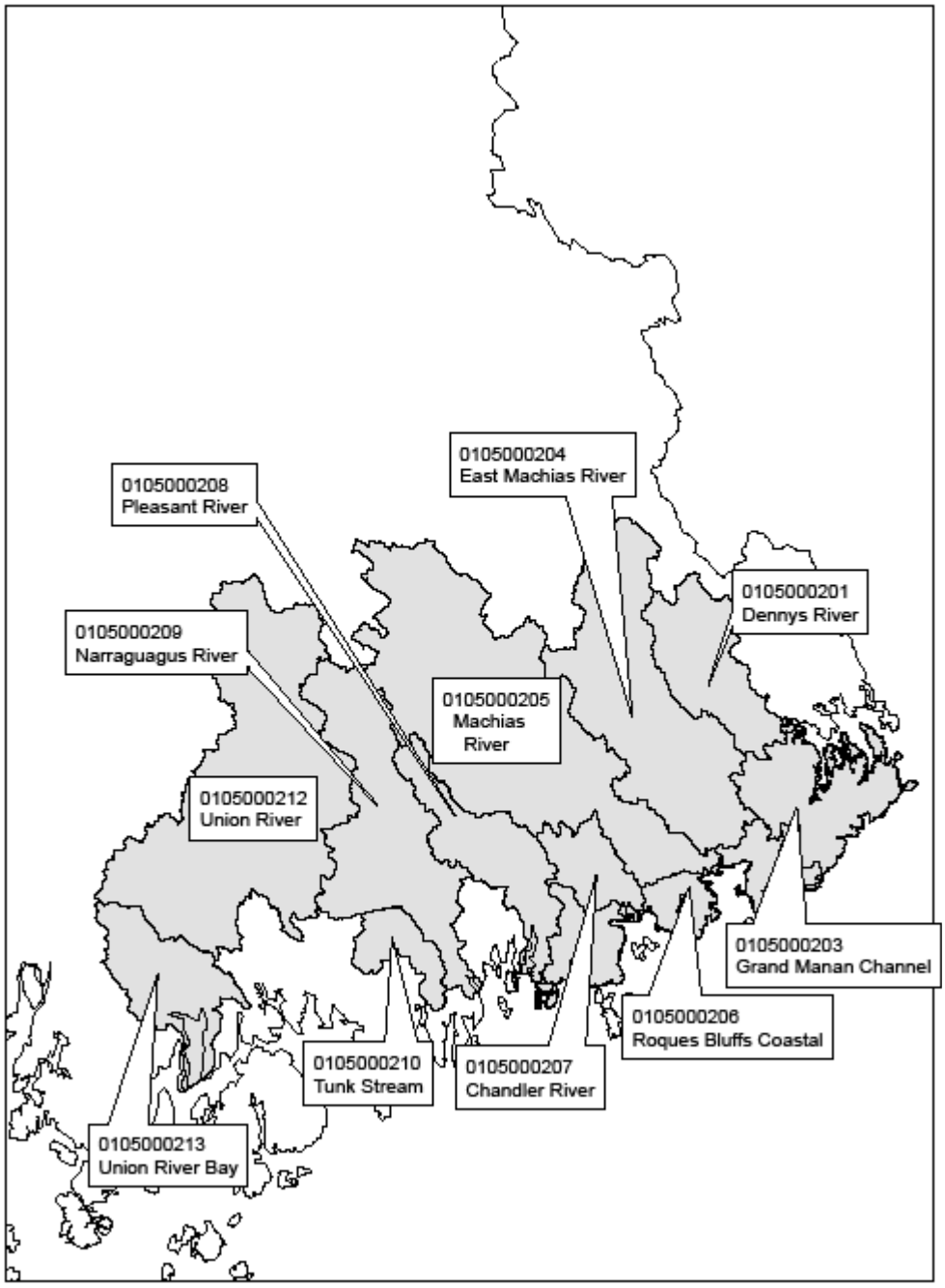

Figure A. Downeast Coastal SHRU HUC 10 name and HUC code

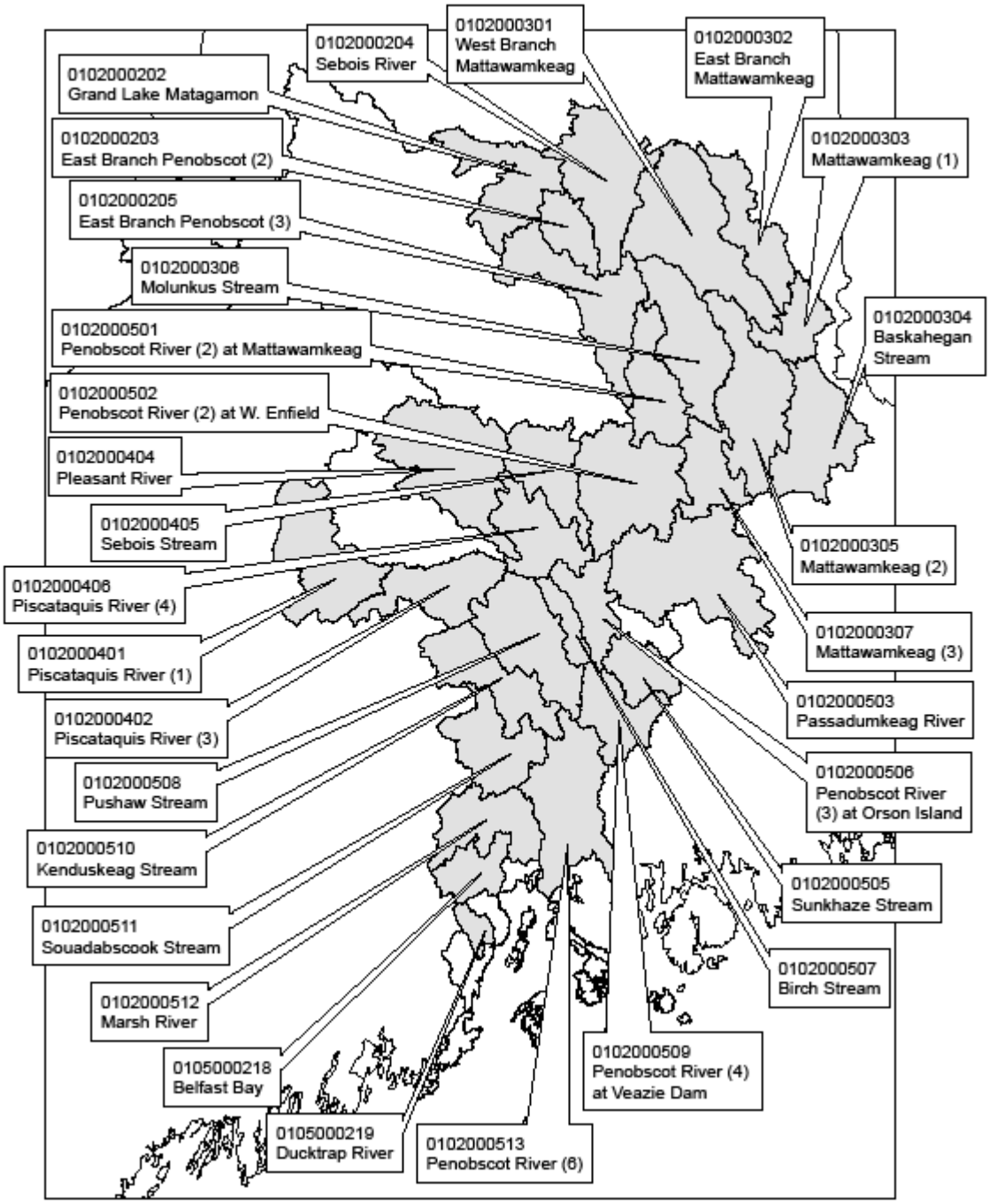

Figure B. Penobscot Bay SHRU HUC 10 Names and HUC code

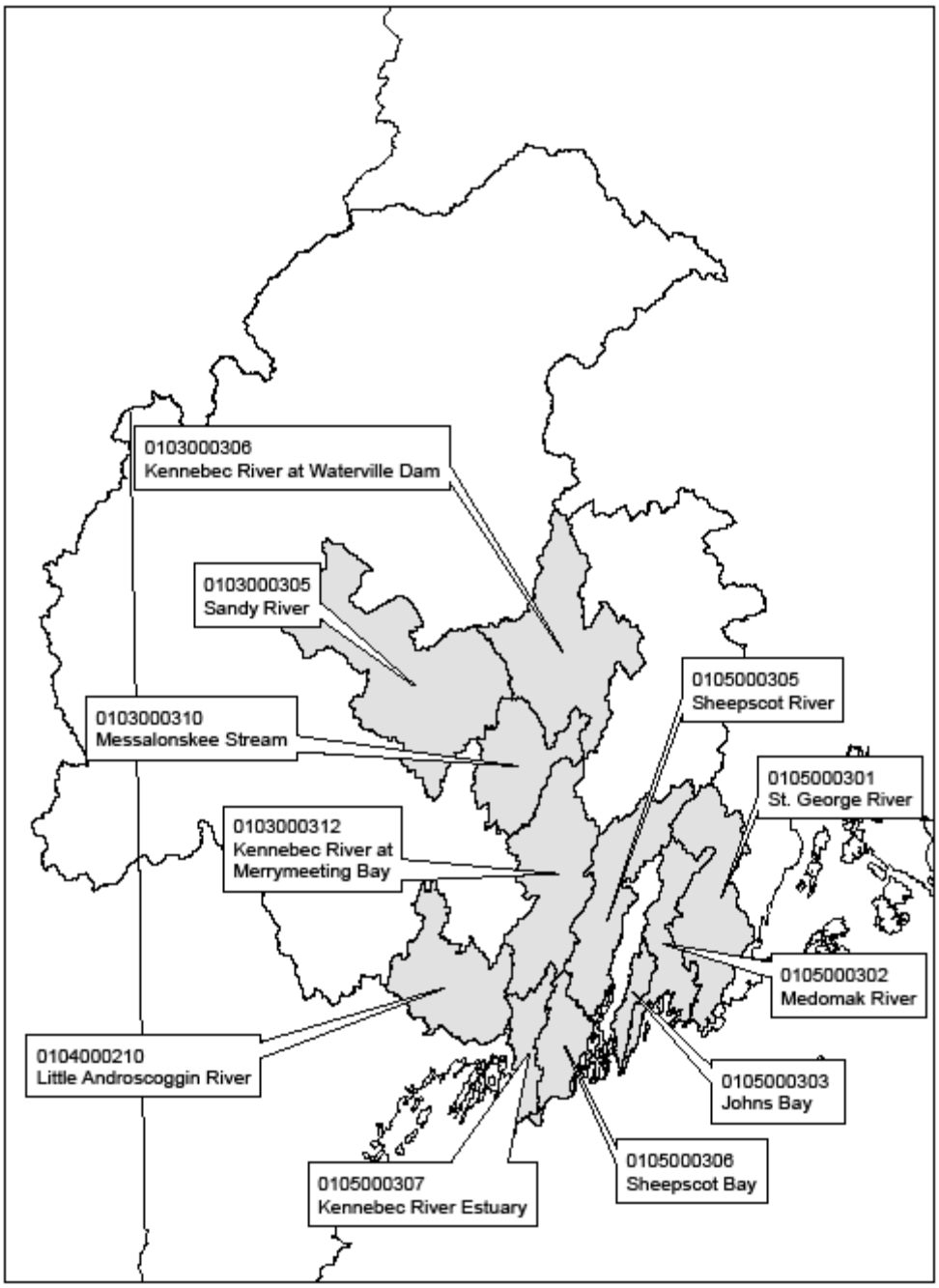

Figure C. Merrymeeting Bay SHRU HUC 10 name and HUC code