EXECUTIVE SUMMARY

Introduction

Leaders in southeast~~ern~~ Washington Snake River region and across the Columbia River Basin have agreed that halting the decline of salmon, steelhead, and bull trout populations and reversing that decline is important to the social, cultural, economic, and environmental well-being of the region.

This Southeast Washington Salmon and Steelhead Recovery Plan is a vital part of a basin-wide effort to protect the future of these valuable and iconic species. The following summary reflects the revisions and updates to a plan originally written in 2005 that was updated in 2011. The full recovery plan is available on-line at http://snakeriverboard.org/wpi/library/recovery-plan/.

Purpose and Context

Since the 19th century, salmon populations have diminished within the Columbia River Basin to the extent that some populations are now listed as threatened or endangered under the federal Endangered Species Act (ESA). Washington State legislated recovery planning in the Salmon Recovery Act of 1998 (RCW 77.85) and defined its planning goals as "developing a state plan in response to a proposed or actual listing under the Endangered Species Act that addresses limiting factors including, but not limited to harvest, hatchery, hydropower, habitat, and other factors of decline."

To guide regional planning groups, the National Marine Fisheries Service (NMFS), Washington Governor's Salmon Recovery Office (GSRO), Idaho's Office of Species Conservation, U.S. Fish and Wildlife Service (USFWS), the Northwest Power and Conservation Council (NWPCC), other local and regional organizations, and tribes agreed to "An Outline for Salmon Recovery Plans." It was endorsed by the Governor's Office of the State of Washington and approved by NMFS in December 2003. The outline establishes the approach to salmon recovery planning and identifies the important components of a plan. Specifically, a plan must include:

- Scientific assessments of the status of species and their habitats
- Factors for decline, threats to viability, and/or factors limiting recovery of the species, and factors supporting current populations
- Measurable goals that describe recovery for the listed species against which the success of actions will be measured
- Actions and commitments for habitat, harvest, hatcheries, and hydropower necessary to reduce or eliminate the limiting factors and recover fish populations
- Implementation components such as time lines, funding, identification of responsible parties and authorities, research needs, monitoring plans, and methods of evaluating actions and adapting the plan

For the purpose of recovery planning for Pacific salmon species, NMFS Northwest Region designated geographically based recovery domains and management units. In each domain, NMFS worked with state, tribal, local, and other federal entities to develop management units that build to the extent possible on ongoing, locally led recovery efforts. NMFS defined management units based on jurisdictional boundaries as well as areas where local planning efforts were underway. They do not always correspond to biological units, such as steelhead populations, but are defined for planning and administrative purposes.

The SEWMU is located in the southeastern corner of the State of Washington (Figure ES-1). The region is bounded by the Washington/Oregon state line on the south, the Columbia River (to the confluence with the Snake River) on the west, the Snake River (includes southern flowing tributaries, including the Palouse River (downstream of the falls), Alkali Flats Creek, Penawawa Creek, and Almota Creek) on the north, and the Snake River on the east.

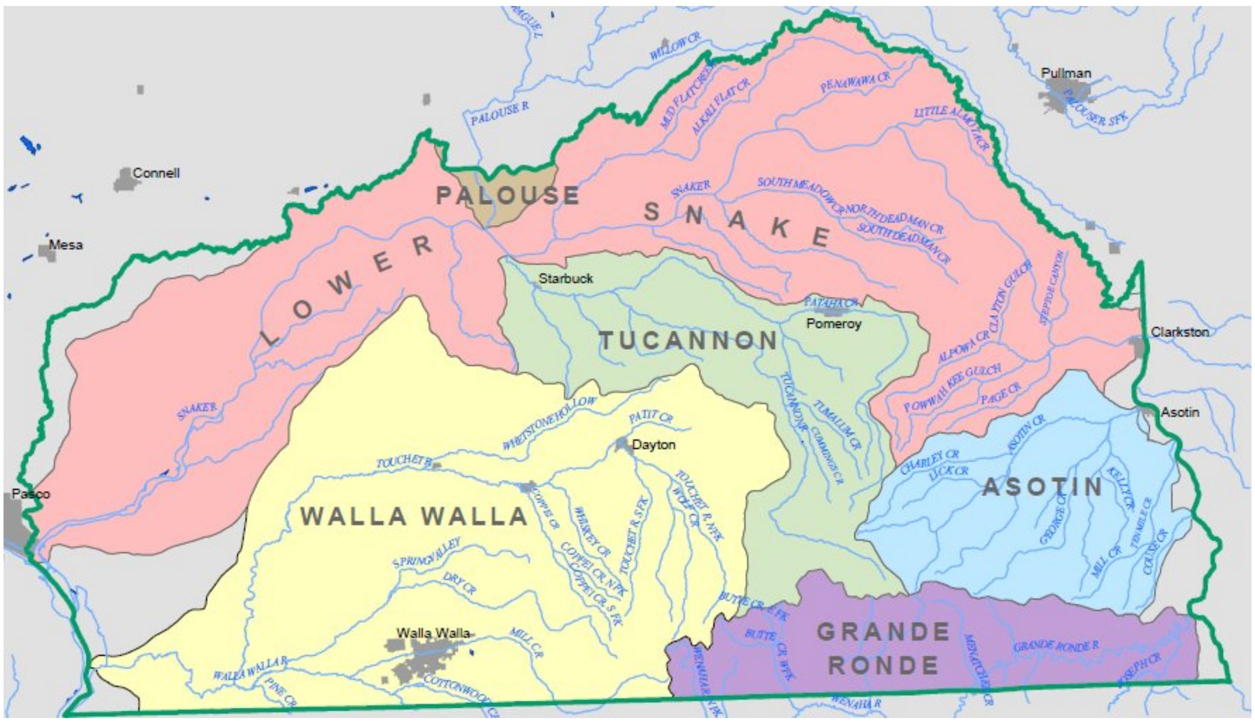

Figure ES-1. Southeast Washington Management Unit

The range of the southeastern Washington Snake River listed species is within the Interior Columbia domain and the sub-domains of the Snake River and the Middle Columbia River (for a steelhead DPS). See Figure ES-2. These two Interior Columbia sub-domains have multiple management units. For the Middle Columbia, there are four management units: Oregon, Yakima, Columbia Gorge, and Southeast Washington (Walla Walla and Touchet). The Snake sub-domain has three management units: Idaho, Oregon and Southeast Washington. The states of Oregon and Idaho have their own Snake River salmon recovery efforts that are being coordinated with Washington’s; a subject covered later in this summary. The USFWS manages the Columbia River bull trout in several designated Washington recovery units.

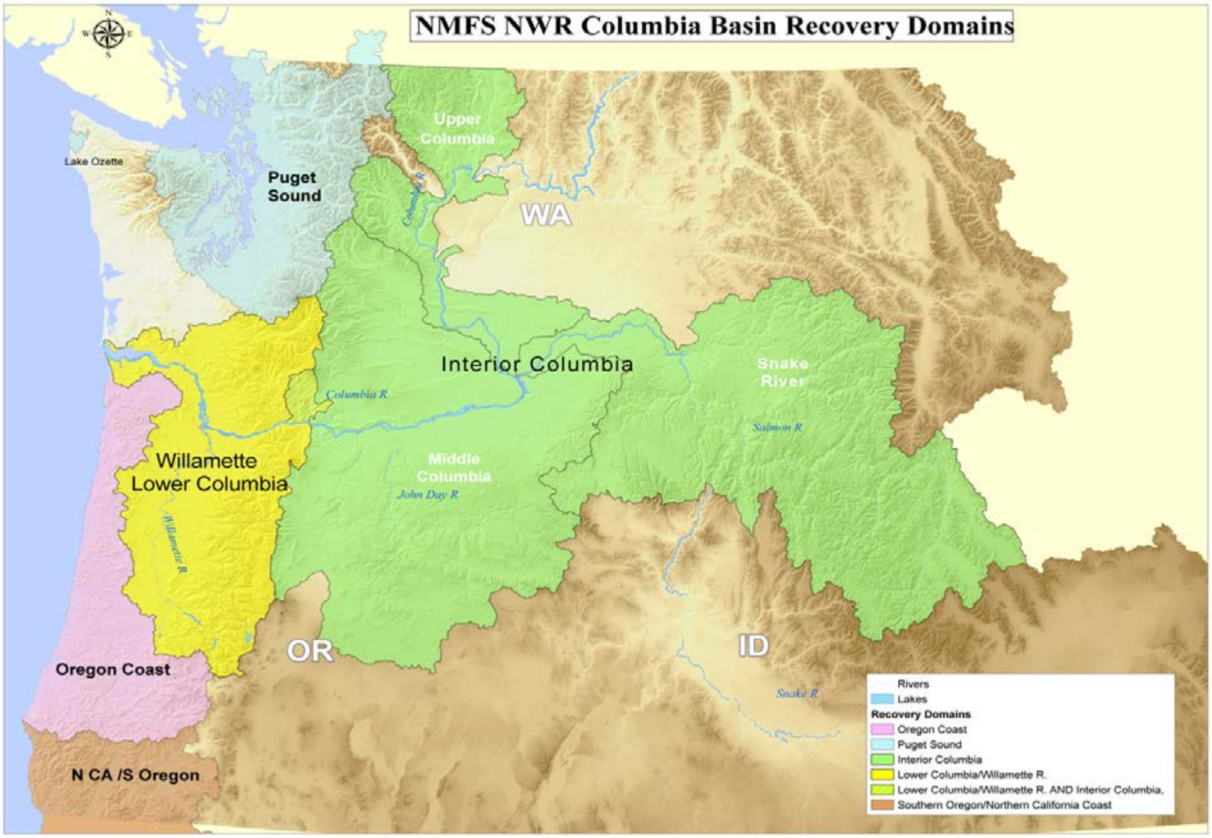

Figure ES-2. Columbia Basin Recovery Domains for NMFS Northwest Region. Note the two Interior Columbia Sub-domains, Middle Columbia and Snake River

ESA Designated Species in Recovery Region

NMFS and the USFWS designated each of the species discussed below as "threatened" between 1992 and 1999 under the ESA. The State of Washington listed them as Species of Concern.

The Snake River Salmon Recovery Board developed the Southeast Washington Salmon and Steelhead Recovery Plan for four key fish species listed under the Endangered Species Act (ESA). Three of the species, Snake River spring/summer Chinook (*Oncorhynchus tshawytscha*), Snake River steelhead (*O. mykiss*), and Middle Columbia River steelhead (*O. mykiss*), are under the jurisdiction of the National Marine Fisheries Service (NMFS). The fourth is the freshwater species Columbia River bull trout (*Salvelinus confluentus*), which is under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS).

Section 4(f) of the ESA requires NMFS and USFWS to develop recovery plans for marine species and freshwater species, respectively, listed under the Act. Recovery plans identify actions needed to restore threatened and endangered species to the point that they are again self-sustaining elements of their ecosystems and no longer need the protections of the ESA.

While Snake River sockeye (*O. nerka*) pass through the SEWMU, they have no spawning or rearing life histories within the management unit and therefore are not included in this plan. Similarly, Snake River fall Chinook (*O. tshawytscha*) migrate through the management unit, but most of the Snake River fall Chinook spawning and rearing, including hatchery production occurs in areas outside southeastern Washington. Snake River fall Chinook are discussed in the comprehensive Snake River salmon recovery plan. NMFS will include descriptions, analyses, and recommend recovery actions for Snake River sockeye and Snake River fall Chinook when the agency consolidates the three Snake River management unit plans into a single basin-wide recovery plan for Snake River salmon species. Also, other aquatic and terrestrial species in the Southeast Washington recovery area are ESA-listed and state Species of Concern but are not directly covered in this plan.

NMFS determined that recovery plans must be developed on an Evolutionarily Significant Unit (ESU) or regional basis. NMFS designated ESUs for different salmon species and areas. An ESU is defined as a group of Pacific salmon that is “substantially reproductively isolated from other stocks and represents an important component of the evolutionary legacy of the species. Later the agency defined steelhead species and areas as Distinct Population Segments [DPSs]. A “population segment” is considered distinct (a DPS and hence a “species” for purposes of conservation under the ESA) if it is discrete from and significant to the remainder of its species based on factors such as physical, behavioral, or genetic characteristics; or if it occupies an unusual or unique ecological setting; or if its loss would represent a significant gap in the species’ range (71 FR 834).

Snake River Salmon Recovery Board (SRSRB)

Washington state law also directed development of a statewide strategy to recover salmon on an ESU basis. Washington designated regional organizations to coordinate development of draft ESU-level recovery plans within Washington. Washington’s Salmon Recovery Funding Board, established by the Salmon Recovery Act, and designated Lead Entities in state recovery regions, including the Snake River. For the Snake River region, the Lead Entity is the Snake River Salmon Recovery Board (SRSRB). The SRSRB established a framework for tribes, counties, landowners, and agencies to collaborate on salmon recovery projects in the region. Washington’s Snake River Recovery Region is located in the state’s southeastern corner as shown in Figure ES-1.

The Snake River Salmon Recovery Board makes decisions using a consensus-driven process and is committed to implementing a recovery strategy that is supported by science and the community. The SRSRB defined its mission as protection and restoration of salmon habitat, consistent with the recovery plan, for current and future generations. The SRSRB established recovery priorities, with the overarching priorities of:

- Habitat Protection: protect existing high-quality salmonid habitat
- Habitat Restoration: restore degraded salmon habitat
- Public Support/Involvement: Facilitate widespread support for salmonid habitat protection and restoration activities among taxpayers, landowners, civic groups, and businesses

Technical Teams

For each domain, NMFS appointed a team of scientists to provide a scientific foundation for recovery plans. The charge of each Technical Recovery Team (TRT) included defining ESU/DPS population structures; characterizing habitat and fish productivity relationships; identifying factors for decline and limiting factors; identifying early factors for recovery; and describing research, monitoring, and evaluation needs. For this plan, the regional TRT is the Interior Columbia TRT (ICTRT), which includes biologists from NMFS, states, tribes, and academic institutions.

In addition, the SRSRB appointed a Regional Technical Team (RTT or Snake River RTT) to review and provide input to the recovery effort from a technical and scientific standpoint. The RTT will be involved in implementation of the plan as well as monitoring and evaluation. Membership in the RTT consists of the following organizations: Confederated Tribes of the Umatilla Indian Reservation (CTUIR), GSRO, WDFW, U.S. Army Corps of Engineers (USACE), U.S. Forest Service (USFS), NRCS, NOAA Fisheries, and the USFWS. Currently, the WDOE and NPT are not represented but are encouraged by the SRSRB to participate

Treaty Rights and Trust Obligation

Treaty tribes with interests in the recovery region are the Nez Perce Tribe and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). Members of these tribes and other Columbia River tribes have legally enforceable reserved rights to fish at all their “usual and accustomed” fishing places, according to 1855 treaties with the U.S. government. Federal courts reaffirmed these rights in numerous court cases, including in *U.S. v. Oregon* and *U.S. v. Washington*. This SEWMU includes areas the Nez Perce Tribe and CTUIR ceded to the United States, while retaining traditional (“usual and accustomed,” according to the treaty language) use rights and interests.

Salmon are of great importance to the tribes for ceremonial, subsistence, and economic purposes. The tribes are co-managers of the resource and as such are active in planning, management, and other efforts aimed at increasing the numbers, viability, and range of salmon within the recovery region.

Ensuring a sufficient abundance of salmon and steelhead to sustain harvest is an important element in fulfilling federal trust responsibilities and treaty rights. ESA and tribal trust responsibilities complement one another. Both depend on a steady upward trend toward ESA recovery and delisting in the near term, while making aquatic habitat, harvest, and land management improvements for the long term.

Snake River Salmon Recovery Board, Approach, and Authority

The SRSRB was formed in 2002 after invitations were submitted to numerous individuals, organizations, tribes, and government bodies. The SRSRB comprises government and tribal representatives, landowners, and private citizens. Table ES-1 shows the list of voting SRSRB members. For more information about the board visit Snake River Recovery Board at (http://snakeriverboard.org).

Table ES-1 Snake River Salmon Recovery Board

Constituency	Affiliation
Landowner	Garfield County
Landowner	Columbia County
Irrigation District	Walla Walla County
Citizen	Garfield County
Landowner	Asotin County
Citizen	Asotin County
Tribal Representative	Confederated Tribes of the Umatilla Indian Reservation
Commissioner	Columbia County
Commissioner	Garfield County
County Representative	Walla Walla County
Commissioner	Asotin County
Citizen	Columbia County
Citizen	Walla Walla County
Citizen	Whitman County
Commissioner	Whitman County

SRSRB Approach

The Snake River Salmon Recovery Board recognizes the importance of a coordinated approach to salmon recovery within its region. To that end, the SRSRB ~~is actively~~has developed~~ing~~ ~~an~~ "interlocal" agreements between itself and the affected counties and other interested parties. The purpose of these agreement are~~is~~ to achieve salmon, steelhead, and bull trout recovery, to the extent possible, through habitat restoration and protection. The SRSRB recognizes that it has no authority or jurisdiction over the land or water within the counties and cannot preempt any jurisdiction or treaty rights, but it intends to work with the counties, the tribes, the State of Washington, NMFS, and the USFWS to achieve the recovery goals. The SRSRB will strive to ensure that the recovery plan is consistent with local watershed plans, the sub basin plans, and the Environmental Protection Agency's Total Maximum Daily Load criteria.

Use of the Plan

Although recovery plans are guidance, not regulatory documents, the ESA clearly envisions recovery plans as the central organizing tool for guiding each species' recovery process. Recovery planning is an opportunity to search for common ground among affected parties, to organize protection and restoration of salmonid habitat, and to secure the economic and cultural benefits that accrue to human communities from healthy watersheds and rivers. While federal, state, and tribal entities can make major contributions to the recovery of Snake River listed fish species, the actions of individuals on their land, as well as city and county codes and ordinances promoting conservation, are also essential.

This plan is to be used to guide federal agencies charged with species recovery. In and of itself, this plan is a non-regulatory document. As such, it is not intended to be nor may it serve as a regulatory document forcing landowner action. The plan may be used to inform state and local agency planning and land use actions, but does not place requirements on such entities. The goal of the plan is to offer options for future actions that strive to secure the survival of species. No mandate on state or local agencies may be construed from the plan, and it may not be cited as creating a need for new regulatory actions at the state or local level unless clear legislative authority is first adopted.

General Description of Southeast Washington Management Unit

The geographical boundaries on the region are described above. Chapter 2 of the recovery plan provides an overview to help readers and interested citizens understand planning for salmon recovery within the broad context of the region's economy, environment, and culture.

Within the SEWMU recovery area, the spawning range of the spring/summer Chinook and steelhead extends over an area of about 4,435 square miles. Most of the region is privately owned (85 percent), with the remaining area under federal (12 percent) and the state and its subdivisions (almost 3 percent).

The SEWMU is generally sparsely populated, with residents scattered throughout the area in communities of less than 1,000 people and clustered in a few larger cities. The human population trend in the area is for moderate growth~~; much of it anticipated in unincorporated areas~~.

Cropland/pastures, mixed rangelands, and forestlands with some wildlife and recreational areas and residential development are the dominant land uses in the recovery region.

The economy of the SEWMU is primarily dependent upon agriculture. The primary agricultural products in the Walla Walla subbasin portion of the SEWMU are spring wheat, winter wheat, and barley. Peas and lentils are grown as well as apples, cherries, asparagus, potatoes, onions, alfalfa, and wine grapes. Walla Walla and Columbia counties support a significant number of cattle. Agricultural products, particularly wheat, are still transported by barge down the Snake and Columbia rivers to Portland, Oregon where they are exported to international markets.

Other economic factors include industry (primarily related to agriculture), education, recreation and tourism, and government. Whitman College, Walla Walla Community College, Washington State University are in the recovery region. In many communities, the largest employers are the school districts and various government entities (State of Washington 2004). Tourism, recreation, hunting, and sport fishing also play a role in the recovery region's economy.

Present in the SEWMU are four large, federally operated dams on the mainstem Snake River—Ice Harbor, Lower Monumental, Little Goose, and Lower Granite. The USACE built the dams to provide hydroelectric power, river transportation, irrigation water, and flood control. Several other dams in the SEWMU include Starbuck Dam along the Tucannon River, Dayton Dam in Dayton, Headgate Dam in Asotin Creek, Burlingame Dam in the Walla Walla River near Walla Walla, and the Mill Creek Project (Bennington Dam) in Mill Creek upstream of the City of Walla Walla. These Snake River mainstem dams and major tributary dams ~~currently~~continue to affect salmonids in the recovery region, but recent improvements to the mainstem dams have reduced mortality and increased both adult and juvenile survival.

Built by USACE in 1982 as part of the Lower Snake River Compensation Plan (LSRCP) to mitigate for the impacts of the four Lower Snake River Dams, Lyons Ferry Fish Hatchery (LFH) is the major hatchery facility in the recovery region. It is located ~~in~~near Starbuck, Washington on the Snake River.

Important Concepts in Salmon and Steelhead Biology

Salmonid species homing propensity (their tendency to return to the locations where they originated) creates unique patterns of genetic variation and connectivity that mirror the distribution of their spawning areas across the landscape. Diverse genetic, life history, and morphological characteristics have evolved over generations, creating runs highly adapted to diverse environments. It is this variation that gives the species as a whole the resilience to persist over time.

Historically, a salmon evolutionary significant unit (ESU) or steelhead distinct population segment (DPS) typically contained multiple populations connected by some small degree of genetic exchange that resulted from some spawners "straying" into neighboring streams.

Thus, the overall biological structure of the ESU/DPS is hierarchical; spawners in the same area of the same stream will share more characteristics than those in the next stream over. Fish whose natal streams are separated by hundreds of miles will have less genetic similarity.

Within an ESU/DPS, independent populations can be grouped into larger populations that share similar genetic, geographic, and/or habitat characteristics (McClure et al. 2003). These major groupings, or "major population groups" (MPGs) are isolated from one another over a longer time scale than that defining the individual populations, but retain some degree of connectivity greater than that between ESUs/DPSs. See Figure ES-3.

McElhany et al. (2000) defined an independent population as:

> "…a group of fish of the same species that spawns in a particular lake or stream (or portion thereof) at particular season and which, to a substantial degree, does not interbreed with fish from any other group spawning in a different place or in the same place at a different season."

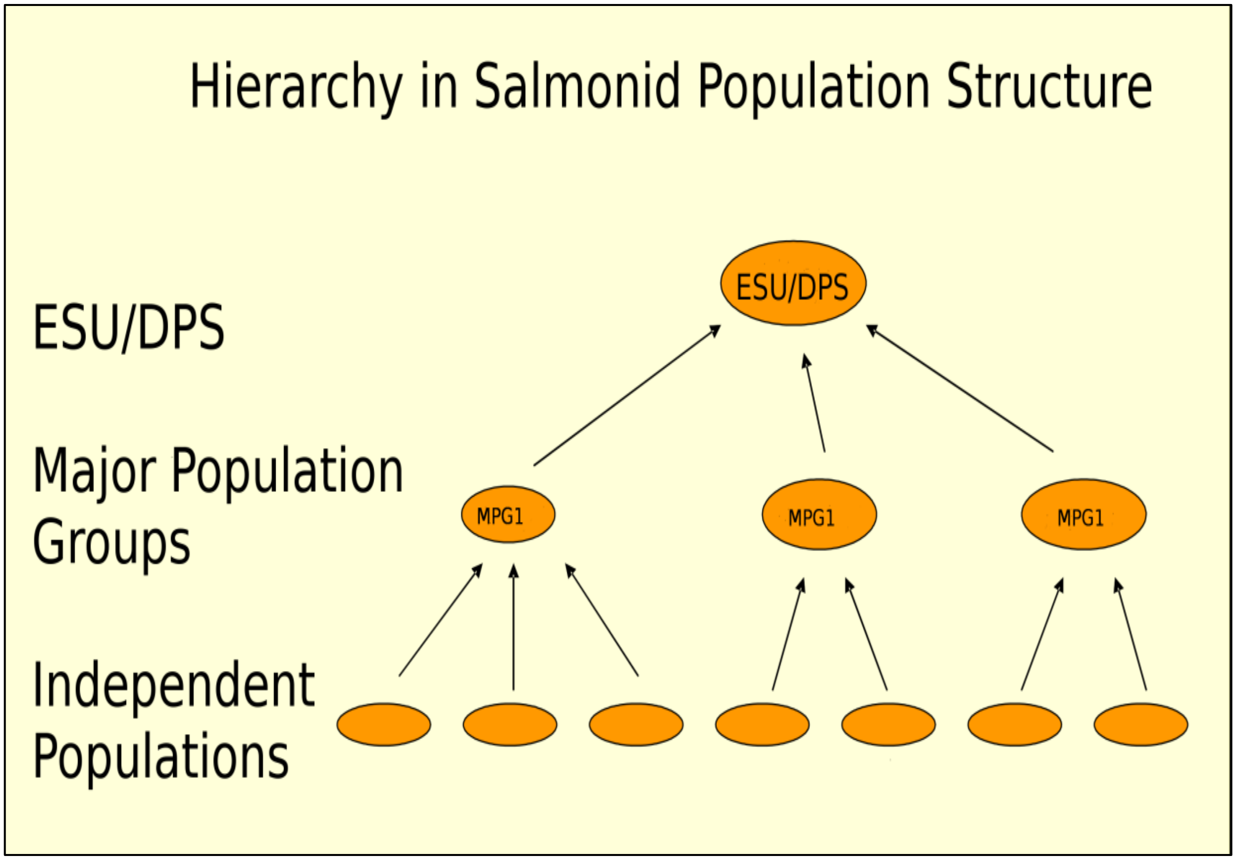

Figure ES-3 Hierarchical levels of salmonid species structure as defined by the TRTs for ESU/DPS recovery planning

The Snake River Salmon Recovery Board developed the Southeast Washington Salmon and Steelhead Recovery Plan for five key ESUs/DPSs listed under the Endangered Species Act (ESA). NMFS reaffirmed the listed status of the salmon species in 2005 and 2006. NMFS designated critical habitat for listed Snake River spring/summer Chinook species in 1999 and for steelhead in 2005; USFWS designated critical habitat for bull trout in 2010. See Table ES-2.

Table ES-2. ESA status of key species and stocks within recovery region

Species	Stock/Race	ESU or DPS	ESA Listing Status	Critical Habitat
Bull trout	NA	Columbia River DPS	Threatened (June 1998)	September 2010
Steelhead	Summer	Snake River DPS	Threatened (August 1997) Reaffirmed 2006	September 2005
	Summer	Mid-Columbia River DPS	Threatened (March 1999) Reaffirmed 2006	September 2005
Chinook	Spring/summer	Snake River ESU	Threatened (April 1992) Reaffirmed 2005	October 1999
	Spring/summer	Mid-Columbia River ESU	Not warranted Reaffirmed 2005	NA
	Fall*	Snake River ESU	Threatened (April 1992) Reaffirmed 2005	December 1993

* Discussed only in the comprehensive Snake River recovery plan.

Bull Trout DPS

The Washington portions of the Snake River, Grande Ronde River and the Umatilla-Walla Walla Bull Trout recovery units are part of the Columbia River Bull Trout DPS. The Snake River Washington Recovery Unit encompasses selected tributaries of the mainstem Snake River from Lower Monumental Dam upstream to the mouth of the Grande Ronde River. The Umatilla-Walla Walla Recovery Unit encompasses the entire drainages of the Umatilla and Walla Walla rivers. The Grande Ronde Recovery Unit includes bull trout from one watershed: the Grande Ronde River. Although most of this watershed is in Oregon, the lower portion of the Grande Ronde River and its tributaries in that portion, including tributaries to the mainstem Wenaha River, are located in Washington.

Steelhead DPSs

Steelhead from the Middle Columbia River DPS have one MPG within the SEWMU, the Washington portion of the Umatilla/Walla Walla MPG, which includes the Touchet River and the Walla Walla.

Steelhead from the Snake River DPS have two MPGs within the SEWMU, the Lower Snake River and the Lower Grande Ronde River. Steelhead populations in the Lower Snake MPG encompass some in the Tucannon and Asotin subbasins and in the Lower Grande Ronde MPG, including Washington portions of the Wenaha and Joseph rivers.

Spring/Summer Chinook ESU

The Snake River Spring/summer Chinook ESU in the Southeast Washington Management Unit have two MPGs. The Lower Snake spring/summer Chinook MPG is composed of independent populations in the Tucannon and Asotin sub-basins and is entirely in SE Washington. The ICTRT (2007) considers the Asotin Creek population functionally extinct. The Wenaha population, part of the Grand Ronde MPG, is partially in the SEWMU.

The ICTRT considers the spring/summer Chinook in the Walla Walla River functionally extinct.

Implications for Determining Recovery

The sub-basins covered in this Southeast Washington recovery plan make up only a small portion of the Snake River and Middle Columbia River ESUs/DPSs. This management unit plan is part of the Middle Columbia Steelhead Recovery Plan and will be part of the comprehensive Snake River recovery plan. It is these comprehensive plans that will be the bases for evaluating ESU-DPS recovery.

NMFS has developed Snake River management unit recovery plans for Idaho and Northeast Oregon as well as Southeast Washington. NMFS will incorporate these three management unit plans into a basin-wide recovery plan for the Snake River DPS and ESUs. From four Mid-Columbia management unit plans, including the 2006 Snake River Salmon Recovery Plan for Southeast Washington, NMFS developed a basin-wide Middle Columbia Steelhead Recovery Plan. The USFWS has a separate process for developing and carrying out a Columbia basin-wide recovery plan for bull trout, but is doing so in coordination with NMFS and other planning entities.

Major and Minor Spawning Areas

One additional level of geographic distinction describes the steelhead and Chinook salmon populations covered in this recovery plan: the identification of Major Spawning Areas (MaSAs) and Minor Spawning Areas (MiSAs). This distinction is necessary because the viability of a population increases with the number of discrete spawning areas and the complexity of their geographic distribution. Local catastrophes are less likely to decimate an entire population if it consists of a large number of spawning clusters located in different watersheds. Such spatially complex populations are more genetically diverse and a hedge against environmental fluctuations.

The plan lists the MaSAs and MiSAs for the steelhead and spring/summer Chinook salmon populations in the SEWMU and compares the designation assigned by the ICTRT and the modifications made by the Snake River RTT. Based on local knowledge, the Snake River RTT reassigned or provided greater detail than the ICTRT did when designating the MaSAs and MiSAs. This is important because the Snake River RTT prioritizes habitat projects based on MaSA and MiSA designations. (See Table 3-4 in the plan.)

General Life History of Salmonids in Southeast Washington

Anadromous Pacific salmonids share similar life histories, even though each species has developed its own variations and geographic preferences that allow them to coexist in the same general environment. Salmon and steelhead in southeastern Washington hatch and rear in freshwater streams but migrate to the ocean to grow and mature. Migration timing appears to be influenced by several factors including distance to the marine environment, stream stability, stream flow and temperature regimes, stream productivity, moon phase, and general weather conditions (Myers et al. 1998, Cheng and Gallinat 2004). Prior to out migrating, juvenile salmonids undergo physiological and morphological changes that prepare them for the transition from a freshwater to a marine existence. This adaptation, known as "smoltification," is the most significant process in the juvenile phase of an anadromous salmonid's life history. Once in the ocean, salmon feed primarily on crustaceans and other species of fish. They grow rapidly and generally attain peak size prior to re-entering freshwater.

Anadromous salmonids complete their life cycle by returning to their natal streams to spawn. The timing of re-entry into freshwater varies widely both among and within species. If flow and temperature conditions are suitable, returning adults typically will hold in their natal stream until they are ready to spawn. If conditions in their natal stream are unsuitable, fish will hold in a nearby river, delaying entry until flows increase and/or temperatures decrease. Adult Pacific salmon generally do not feed during migration and spawning.

All Pacific salmonids spawn in cold, flowing water with high levels of dissolved oxygen. Generally, they prefer pool "tail-outs" with clean gravel and cobble substrates. Snake River Chinook salmon spawn in the fall, while steelhead spawn in the late winter and spring. With the exception of bull trout and steelhead, all Pacific salmon die shortly after spawning.

Bull trout exhibit both resident and migratory life-history strategies. Resident bull trout complete their entire life cycle in the tributary streams in which they spawn.

Salmon and bull trout require good water quality, high concentrations of dissolved oxygen, cool or cold water temperatures, sufficient flows, stable stream channels, clean spawning gravels, diverse instream and riparian habitat, a sufficient and diverse food supply, access to spawning and rearing habitat, and barrier-free migration corridors. Each of these factors is essential to the health and survival of individual fish and the population as a whole (CDFG 2002).

Habitat conditions in the Snake River basin differ from those found in other regions inhabited by Chinook salmon and steelhead. For example, Snake River basin Chinook salmon and steelhead migrate up to 900 miles from the ocean (farther than most salmonid populations in the world) and the Snake River flows through terrain that is typically warmer and drier than other ecoregions containing Chinook salmon and steelhead. This warmer climate, combined with highly erodible soils, produces a river system in southeastern Washington that is warmer, more turbid, and higher in alkalinity than most systems in the species' range.

Spring/Summer Chinook Salmon

Chinook salmon in the Columbia and Snake basins are divided into spring, summer, and fall runs based on their migration timing. Spring/summer Chinook salmon generally pass Bonneville Dam from March through May. Summer Chinook salmon begin their freshwater journey a few months later, generally passing Bonneville Dam during June and July. Other than variations in run timing, spring and summer Chinook salmon in the Snake River Basin exhibit similar life history characteristics and will be referred to in this document as "spring/summer Chinook salmon." NMFS also considers these two groups as one ESU; for recovery to occur under the ESA, both forms must meet recovery requirements.

In the Snake River Basin, spring/summer Chinook salmon use medium-sized streams at relatively high elevations. In streams where both spring and summer Chinook salmon co-exist, spring Chinook salmon generally spawn earlier and in the upper portions of available spawning habitat, whereas summer Chinook salmon spawn later and in lower reaches.

In the Snake River Basin, spring/summer Chinook salmon are stream-type Chinook, spending about a year in freshwater before migrating to the ocean. Spring/summer Chinook salmon remain in the ocean most often for two years before maturing sexually and returning to freshwater (Behnke 2002).

Historical abundance of spring/summer Chinook salmon in the Snake River Basin may have exceeded 1.5 million adults during the 19th century (WDFW 2004a; WDFW 2004c; FPC 2004).

Steelhead

Steelhead in the SEWMU are classified as summer steelhead, which enter freshwater in a sexually immature condition and require several months to mature and spawn. Snake River summer steelhead are further subdivided into "A-run" and "B-run" fish. A-run steelhead begin migrating up the Columbia River from June to August, generally passing Bonneville Dam by August 25 and Lower Monumental Dam between June and the following spring (WDFW 2004a, 2004b, 2004c, 2004d).

The majority of steelhead within the Snake River basin exhibit A-run characteristics and are primarily native to the Snake and Salmon rivers. B-run steelhead enter the Columbia River after the A-run and are found in the Clearwater and Salmon basins in Idaho.

The majority of Snake River basin steelhead return to spawn after one year in the ocean. Juveniles emerge from spawning gravels in late May or June and typically rear in or near their natal stream for one to four years before out migrating (Bumgarner et al. 2009). The majority of fish in the Tucannon and Touchet rivers spend two years in freshwater prior to migrating to the ocean.

In contrast to Chinook salmon, which prefer mainstem habitats, steelhead use tributaries and side channels for spawning, and mainstem and tributary habitat for rearing and pre-spawn holding.

"Steelhead" is the name commonly applied to the anadromous form of the species *Oncorhynchus mykiss*. The common names of the non-anadromous form are rainbow trout and redband trout (interior populations). NMFS initially listed the Snake River steelhead DPS as threatened as an "evolutionarily significant unit" (ESU) of salmonids that included both the anadromous and resident forms.

NMFS has concluded that the collective contribution of the resident life history form to persistence of steelhead is unknown, and may not substantially reduce the overall extinction risk of the steelhead DPS (71 FR 834). NMFS revised its species determinations for West Coast steelhead under the ESA, delineating anadromous, steelhead-only "distinct population segments" (DPS). This recovery plan addresses steelhead and not rainbow trout, as is consistent with the 2006 ESA listing decision despite the apparent reproductive exchange between resident and anadromous *O. mykiss.*

The limited data available regarding historic abundance clearly indicate that run sizes were significantly greater prior to the 20th century (WDFW 2004d). For example, historical estimates place Tucannon River adult escapement prior to 1970 at 3 percent (approximately 3,400 adults) of the Snake River basin's total steelhead return (WDFW 2004c).

Bull Trout

Bull trout are categorized as either resident or migratory. Stream-resident bull trout complete their entire life cycle in their natal streams. Migratory bull trout spawn in tributary streams where the juveniles usually spend from one to four years before migrating to either a larger river (fluvial) or lake (adfluvial) where they rear before returning to the headwater tributary stream to spawn (Fraley and Shepard 1989). Migratory forms occur where conditions allow movement from spawning locations to downstream waters that provide greater foraging opportunities and more temperate conditions during winter (Hemmingsen et al. 2002, Faler at al. 2003). They return to their natal streams as a refuge from warm summer temperatures and to spawn. Resident and migratory forms may occur together and either form can produce resident or migratory offspring (Rieman and McIntyre 1993).

Bull trout have more specific habitat requirements than most other salmonids. Bull trout have a year-round reliance on the streambed for incubation, juvenile rearing and spawning making them more susceptible than other salmonids to the effects of sedimentation and channel instability. Bull trout are found in colder streams and require colder water throughout their life history. Research indicates that water temperature influences bull trout distribution more consistently than any other factor (Rieman and McIntyre 1993). Temperatures in excess of 15°C (approximately 60°F) are thought to limit bull trout distribution (Fraley and Shepard 1989; Rieman and McIntyre 1993).

Observations indicate that mainstem reaches and many tributaries Washington portions of the Snake and Grande Ronde rivers and the Umatilla-Walla Walla recovery units—the Tucannon River, Asotin Creek, Walla Walla, Touchet and Grande Ronde watersheds—were, or still are, used by bull trout at various life stages. Their thermal limitations generally restrict bull trout to the upper reaches of a watershed.

Recovery and Restoration Goals and Delisting Criteria

Recovery goals in a locally developed recovery plan may include delisting and other "broad sense" goals. In the SEWMU, the broad sense goals are known as "restoration goals." The delisting criteria are a NMFS determination and may include both technical and policy considerations. Delisting criteria must meet the ESA requirements, while restoration may be defined more broadly and go beyond the requirements for delisting to address, for example, other legislative mandates or social, economic, and ecological values.

The ESA requires that recovery plans, to the maximum extent practicable, incorporate objective, measurable criteria which, when met, would result in a determination in accordance with the provisions of the ESA that the species be removed from the federal List of Endangered and Threatened Wildlife and Plants (50 CFR 17.11 and 17.12). These criteria are of two kinds: the biological viability criteria, which deal with population or demographic parameters, and the "threats" criteria, which relate to the five listing factors below and detailed in Figure 4-1 of the plan. The threats criteria define the conditions under which NMFS can consider the listing factors, or threats, to have been addressed or mitigated. Together these make up the "objective, measurable criteria" required under section 4(f)(1)(B) for the delisting decision. ESA section 4(a)(1) lists factors for re-classification or delisting that are to be addressed in recovery plans:

1. Present or threatened destruction, modification, or curtailment of [the species'] habitat or range

2. Over-utilization for commercial, recreational, scientific or educational purposes

3. Disease or predation

4. Inadequacy of existing regulatory mechanisms

5. Other natural or human-made factors affecting its continued existence

See Chapter 5 of the plan for a discussion of these delisting factors and the specific threats as they apply to the SEWMU.

The delisting criteria are based on the best available scientific information and incorporate the most current understanding of the ESU/DPS and the threats it faces. As this recovery plan is implemented, additional information will become available that can increase certainty about whether the threats have been abated, whether improvements in population and ESU/DPS status have occurred, and whether linkages between threats and changes in salmon status are understood. These criteria will be assessed through an adaptive management program under development for this plan, and NMFS may review the criteria if appropriate during its 5-year reviews of the ESU/DPS.

Once a species is deemed recovered and therefore removed from listed status, section 4(g) of the ESA requires the monitoring of the species for a period of not less than 5 years to ensure that it retains its recovered status.

Biological Viability Criteria

The ICTRT defined the status of a salmonid ESU or DPS expressed in terms of likelihood of persistence or in terms of risk of extinction, within 100 years. The ICTRT defines viability at two levels: less than 5 percent risk of extinction within 100 years (viable) and less than 1 percent risk of extinction within 100 years (highly viable). A third category, “maintained,” represents a less than 25 percent risk. The risk level of the ESU/DPS is built up from the aggregate risk levels of the populations and MPGs. All four VSP parameters must be taken into account to determine the overall risk level.

All the TRTs used the same biological principles for developing their recommendations for ESU/DPS and population viability criteria – criteria that may be used, along with criteria based on mitigation of the factors for decline, in determining whether a species has recovered sufficiently to be downlisted or delisted. These principles are described in a NMFS technical memorandum, *Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units* (McElhany et al. 2000).

The TRT defined viable salmonid populations (VSP) in terms of four parameters: abundance, productivity (growth rate), spatial structure, and diversity. A viable ESU/DPS is naturally self-sustaining, with a high probability of persistence over a 100-year time period. Each TRT made recommendations using the VSP framework, based on data availability, the unique biological characteristics of the ESUs/DPSs and habitats in the domain, and the members’ collective experience and expertise

The following defines the VSP parameters:

Abundance is the number of fish produced by natural processes that have spent their entire life cycle in nature (i.e., natural-origin fish). This is often referred to as gravel-to-gravel survival or fish originating from naturally spawning parents that hatch in a stream’s gravel and survive to spawn naturally years later.

Productivity is a measure of reproductive effectiveness at the population level. Typically it is stated as the number of adult offspring produced per parent (spawner). In its most basic form, it is calculated by dividing the total number of spawners in any year into the number of adult recruits that are subsequently produced by these spawners. Although it is used as an indicator of population health and resilience, it is only appropriate to do so if it has been standardized for two very strong confounding effects: 1) yearly variations in survival rates (e.g., marine conditions), and 2) yearly variations in the density of spawners relative to habitat capacity. Once a means is developed to standardize for these two effects, values obtained for population productivity are indicative of a population’s resilience and likelihood of persistence.

Spatial structure is the range or distribution of wild fish within a population’s habitat range. Any viability evaluation must consider spatial structure within a population (or group of populations) because spatial structure affects extinction risk (McElhany et al. 2000).

Diversity refers to the distribution of traits within and among populations of salmon and steelhead. These traits include anadromy, morphology, fecundity, run timing, spawn timing, juvenile behavior, age at smolting, age at maturity, egg size, developmental rate, ocean distribution patterns, physiology and molecular genetic characteristics. A combination of genetic and environmental factors largely causes phenotypic diversity. Variation or diversity in these and other traits is important to viability because a) it allows fish to take advantage of a wider array of environments; b) it spreads the risk (e.g., different ocean distribution patterns mean not all fish are at risk from local or regional varying ocean conditions); and c) genetic diversity allows fish to adapt to changing environmental conditions. Habitat, harvest, and hatchery factors can all affect diversity. In the case of hatchery programs, gene flow influences patterns of diversity within and among salmon and steelhead populations.

ESU/DPS Viability Criteria

Since major population groups (MPGs) are geographically and genetically cohesive groups of populations, they are critical components of ESU/DPS spatial structure and diversity. Having all MPGs within an ESU/DPS at low risk provides the greatest probability of persistence for the ESU/DPS. The ESU/DPS viability criterion defined by the ICTRT (ICTRT 2007a) is as follows:

> All extant MPGs and any extirpated MPGs critical for proper functioning of the ESU/DPS should be at low risk.

MPG Viability Criteria

MPG viability depends on the number, spatial arrangement, and diversity associated with its component populations.

Major Population Group Viability Criteria
(ICTRT 2007a)

The following five criteria should be met for an MPG to be regarded as at low risk (viable):

1. At least one-half of the populations historically within the MPG (with a minimum of two populations) should meet viability standards.

2. At least one population should be classified as “Highly Viable.”

3. Viable populations within an MPG should include some populations classified (based on historical intrinsic potential) as “Very Large," "Large," or “Intermediate,” generally reflecting the proportions historically present within the MPG. In particular, Very Large and Large populations should be at or above their composite historical fraction within each MPG.

4. All major life history strategies (e.g. spring and summer-run timing) that were present historically within the MPG should be represented in populations meeting viability requirements.

5. Remaining MPG populations should be maintained with sufficient abundance, productivity, spatial structure, and diversity to provide for ecological functions and to preserve options for ESU/DPS recovery.

The presence of viable populations in each of the extant MPGs and some number of highly viable populations throughout the ESUs/DPS would result in sustainable production across a substantial range of environmental conditions. This distribution would preserve a high level of diversity within the ESU/DPS and promote long-term evolutionary potential for adaptation to changing conditions. The presence of multiple, relatively nearby, viable and maintained populations acts as protection against long-term impacts of localized catastrophic loss by serving as a source of re-colonization (ICTRT 2007a).

Population-level Viability Criteria

To be determined to be viable, populations should meet criteria for all four VSP parameters (abundance, productivity, spatial structure, and diversity). The abundance and productivity criteria are related to population size. The ICTRT developed criteria for characterizing the relative size and complexity of Interior Columbia Basin steelhead and Chinook salmon populations based on their analysis of the intrinsic or historical potential habitat available to the population (ICTRT 2005).

The ICTRT categorized historical population sizes as Basic, Intermediate, Large, and Very Large, and set minimum abundance thresholds for viable salmonid populations of each type (Table ES-3).

Of the nine SEWMU populations (including the extirpated Asotin spring/summer Chinook salmon population), three are categorized as Basic and six as Intermediate. No populations are classified as, Large or as Very Large (ICTRT 2007a). Table ES-3 shows the minimum abundance and productivity thresholds for the SEWMU populations to have a 95 percent probability of persistence for the next 100 years.

Abundance and productivity

The ICTRT defined abundance and productivity criteria for SEWMU populations (ICTRT 2005 and 2007) based on analyses of the intrinsic potential of the historically available habitat, the locations and sizes of MaSAs and MiSAs, and, within these areas, the abundance and productivity relationships that would result in a probability of low risk of extinction within 100 years (Table ES-3). The abundance "thresholds" shown in the table represent the number of spawners needed for a population of the given size category to achieve the 5 percent (low) risk level at a given productivity (or, in the case of Tucannon spring/summer Chinook salmon, < 1% risk[1]). Abundance thresholds are 500, 1,000, 1,500, and 2,250 for population sizes of Basic, Intermediate, Large, and Very Large, respectively.

[1] Because the Lower Snake River Chinook salmon MPG consists of the Tucannon and Asotin Creek populations and Asotin Creek is functionally extinct, the ICTRT suggests that for the MPG to be viable, the Tucannon needs to meet high viability criteria.

Table ES-3. Abundance and productivity thresholds (ICTRT 2007) for populations within the Southeast Washington Management Unit (some MPGs have more populations than listed within the table)

Major Population Grouping	SEWMU Population	Population Size	Minimum Abundance Threshold	Productivity Threshold
Lower Snake River spring/summer Chinook	Tucannon River	Intermediate	750	2.10 [a]
	Asotin Cr. (functionally extinct)	Basic	500	1.90
Grande Ronde/Imnaha spring/summer Chinook	Wenaha R.	Intermediate	750	1.76
Umatilla/Walla Walla Rivers steelhead	Walla Walla R.	Intermediate	1000	1.35
	Touchet R.	Intermediate	1000	1.35
Lower Snake River steelhead	Tucannon R.	Intermediate	1000	1.20
	Asotin Cr.	Basic	500	1.20
Grande Ronde steelhead	Lower Grande Ronde	Intermediate	1000	1.14
	Joseph Creek	Basic	500	1.27

[a] Because the Lower Snake River spring/summer Chinook salmon MPG consists of only two populations, and that the Asotin is considered functionally extinct, the ICTRT recommends that the Tucannon spring/summer Chinook salmon population should be at a “Very Low Risk” level of abundance and productivity (< 1%) for the MPG to meet delisting criteria.

Spatial structure and diversity

Spatial structure and diversity criteria are more complex. The ICTRT cautions that there is a good deal of uncertainty in assessing the status of spatial structure and diversity in a population. The ICTRT defined two goals, or biological or ecological objectives, that spatial structure and diversity criteria should achieve: 1) maintain natural rates and levels of spatially mediated processes, and 2) maintain natural patterns of variation.

Bull Trout

Recovery goals and metrics for bull trout are similar, but not the same as for steelhead and Chinook salmon. The USFWS, which has regulatory authority for bull trout, developed a goal and objectives for bull trout recovery throughout its range (USFWS 2002a). The goal for all populations is

… ensure the long-term persistence of self-sustaining, complex interacting groups (or multiple local populations that may have overlapping spawning and rearing areas) of bull trout distributed across the species' native range.

To recover bull trout, the USFWS identified four objectives:

- Maintain current distribution of bull trout within core areas as described in recovery unit chapters and restore distribution where recommended in recovery unit chapters.

- Maintain stable or increasing trend in abundance of bull trout.
- Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
- Conserve genetic diversity and provide opportunity for genetic exchange.

Restoration Goals

The primary purpose of this recovery plan is to present implementable actions that can lead to the de-listing of populations of salmon, steelhead, and bull trout within the SEWMU. This recovery plan adopts the ICTRT minimum abundance thresholds as de-listing goals. However, the recovery board and regional fish managers are clearly interested in more than de-listing. The ultimate goal of the fish restoration effort is to create conditions allowing the establishment of salmonid populations that are both viable, harvestable, and of sufficient abundance to meet other socio-economic goals. Thus, de-listing salmonid populations is the first step on the road to restoring populations within the SEWMU.

The restoration goals summarized in Table ES-4 are aimed at achieving healthy, sustainable and harvestable salmonid populations. The goals are expressed in terms of adult abundance and exceed the values needed for ESA delisting. The restoration goals in Table ES-4 were proposed in tribal recovery plans, the Lower Snake River Compensation Plan (LSRCP), and other documents. At this time the fishery co-managers have not agreed to the restoration goals or the proportion of hatchery and naturally produced fish that would comprise the goals.

Table ES-4 Comparison between de-listing goals and restoration goals for steelhead and spring/summer Chinook salmon populations within the SEWMU. Note that delisting goals are natural-origin only, while restoration goals are hatchery- and natural-origin returning adults. ID = insufficient data..

Sub-basin	**De-listing Goal**		**Current Status (from Appendix B, Table B-22, 2011 SRSR Plan)**		**Restoration Goal**		**Source for Restoration Goals**
	Steelhead	**Chinook**	**Steelhead**	**Chinook**	**Steelhead**	**Chinook**	
Asotin	500	500	587	ID	2,776-3,114	500	LSRCP, NPT goal, etc.; and spring Chinook = NPT/CRITFC goal
Tucannon River	1,000	750	ID	468	1,823-3,400	2,400-3,400	LSRCP goals and NPT goal
Lower Grande Ronde River a	1000		ID		1,855-5,101		NMFS 2002 goal and proportion in Lower Grande Ronde and CRITFC goal
Wenaha River		750		441	NA	1,335	LSRCP goal and proportion in the Wenaha basin
Joseph Creek	500		2,208		2,149-5,909		NMFS Grande Ronde goal and proportion of basin in Joseph Creek
Touchet River	1,000		461		1,563-2,205	?	LSRCP goals and CTUIR goal

Walla Walla River	1,000		860		1,875-3,395	5,500 or 1,110 NOF, and 2,750 HOF	CTUIR goal to mouth of the Walla Walla R is 5,500, but 3,850 in the Walla Walla River, excluding Touchet and Mill Cr.

a The Lower Grande Ronde River population includes the Wenaha River and tributaries, Mud, Courtney, Grossman, Menatchee, Bear, and other lower Grande Ronde tributaries, and Elbow creeks.

Limiting Factors and Threats

Designing effective recovery strategies and actions for the SEWMU populations requires understanding the historical conditions and causes for salmon decline, but most importantly understanding the limiting factors and threats for recovering the SEWMU spring/summer Chinook salmon, steelhead, and bull trout populations. Chapter 5 describes the historical conditions in the SEWMU; the general causes for salmon decline in the SEWMU that primarily occurred prior to listing, noting that many of those causes or factors have been ameliorated since listing; and the current/existing habitat-specific causes and limiting factors for recovery of SEWMU spring/summer Chinook salmon, steelhead, and bull trout. Limiting factors outside the SEWMU, estuary and ocean habitat conditions as well as hydro, hatchery and harvest activities, are included. The five current threats categories as stated in Section 4(a)(1) of the ESA are addressed. Uncertainties, such as global climate change, hatchery effectiveness, and invasive species, are also covered.

This summary focuses on habitat actions that have taken place and the current habitat impacts and limiting factors.

General Causes of SEWMU Salmonid Population Decline

The SEWMU has experienced a variety of impacts to salmonids and salmonid habitat since the arrival of Euro-American settlers in the 19th century. Fur trappers were some of the first Euro-Americans to enter the area. The subsequent decimation of the beaver population in the 1830s and 1840s reduced an important source of large woody debris and pools in streams. The settlers who began arriving in the late 1840s and 1850s were attracted by the agricultural possibilities, and agriculture remains an important land use today. Logging and urbanization have also affected salmonids and their habitat, as have construction and operation of hydroelectric dams on the Snake and Columbia rivers and their tributaries. Harvest, which occurs primarily outside the SEWMU, has also affected the abundance of salmon and steelhead.

General causes of salmonid population declines include irrigation diversion dams (especially during historical times), hydroelectric generation, hatcheries, agriculture, logging, urbanization (including residential and industrial development), recreation, and harvest. Activities associated with these endeavors have removed riparian vegetation, increased stream water temperatures and effects of parasites and diseases, altered and/or dewatered stream courses, introduced pollutants into streams and wetlands, and blocked or impeded fish passage both upstream and downstream. Fish populations have been depleted by over-harvest in the late 19th and early 20th centuries. Hatcheries have introduced fish with different run timing and fish that prey upon or compete with non-hatchery fish. Diseases carried by hatchery fish are also a concern.

Although impacts from all of the factors discussed can be difficult to effectively mitigate, the SRSRB believes that fixing urban-induced problems is the most difficult. This is because of the large number of people that are affected by proposed actions and the costs associated with the actions. The SRSRB will continue to work with and encourage land use planners to develop policies to protect riparian and stream habitat from effects of urban and rural development.

A primary focus of this recovery plan is on actions to restore fish production by improving habitat conditions within the watersheds or subbasins as they are sometimes referred to. The focus, established by the SRSRB, does not mean that the dominant limiting factors are confined to the subbasins within the recovery region. In fact, the NPCC subbasin plans for all of the populations in the SEWMU concluded that 45 percent of the abundance restoration potential for Walla Walla steelhead, 54 percent of the abundance restoration potential for Tucannon steelhead, and 72 percent of the abundance restoration potential for Asotin steelhead are outside the subbasins. In 2005, NPCC completed separate assessments, or subbasin plans, for 58 tributary watersheds and mainstem segments of the U.S. portion of the Columbia River basin. The subbasin plans guide implementation of NPCC's Columbia River Basin Fish and Wildlife Program, which directs more than $140 million per year of Bonneville Power Administration electricity revenues for protection, mitigation and enhancement of fish and wildlife affected by hydropower dams. The subbasin plans can be viewed at Columbia River Basin Fish and Wildlife Program: Subbasin Plans.

Discussion of specific causes of decline in populations for all species due to factors outside the SEWMU watersheds are well covered (and basically up to date) in the FCRPS Biological Opinion (NMFS 2008). Further information on the specific factors related to hydro, harvest, and hatcheries can be found in that document. Information on habitat conditions in the estuary are described Columbia River Estuary ESA Recovery Module for Salmon and Steelhead.

Chapter 5 of this plan presents detailed information on stream habitat conditions limiting salmonid populations in these SEWMU watersheds: Asotin Creek, Tucannon River, Walla Walla River, Grande Ronde River, and Lower Snake. The analyses are based on the results of habitat modeling using the EDT Model (Appendix F) (Lestelle et al. 1996). The EDT analysis looked at the relationships between habitat and fish production for spring/summer Chinook salmon, fall S salmon, and summer steelhead. Impacts to bull trout habitat were derived from the Washington bull trout management plan (WDFW 2000a) and the draft federal bull trout recovery plan (USFWS 2002a). Below are summaries of the habitat factors for each ESU and DPS covered in the plan. They are based on local knowledge and EDT modeling.

Note that some persisting limiting factors are "legacy effects" from past actions and natural events that still affect SEWMU salmonid population viability. Land use actions, such as historic grazing (effects to riparian habitat), previous mining (leaching of pollutants, removal of gravel, etc.), historic forestry practices (increase in sediment load from harvest and road building), previous channelization and diking as flood control measures (loss of stream connectivity to floodplain) are examples of actions taken by humans that have potentially lasting impacts. Natural events, such as flooding and fires, can have impacts that potentially affect salmonid viability for decades. Some important examples of natural events and human responses include the 1930s flood in Walla Walla, which prompted flood control measures that included a flood control dam, artificial lake for diverted flood waters, and a highly modified and channelized waterway for Mill Creek and as a response to the 1964 flood, a straightened, simplified river channel and many miles of levees along the Tucannon River. Many actions and improvements undertaken to date have targeted these original causes for salmonid decline. Also, in many cases as the impacts and factors described below are addressed, continued improvements are anticipated once floodplains and riparian cover matures and once large wood recruits into channels and reestablishes natural function.

Snake River DPS/ESU Asotin Creek Steelhead and Asotin Creek Spring/Summer Chinook Salmon Populations

The Asotin Creek spring/summer salmon and steelhead populations are similar enough that they are described together in this section of the plan. The Asotin Creek populations were analyzed according to the following reach designations: Upper Asotin (Headgate Dam to Forks), Lower George Creek, Lower North Fork Asotin, Charley Creek, and Lower South Fork Asotin. (Spring Chinook salmon, however, were probably never produced in George Creek and Upper SF Asotin, Upper North Fork Asotin and Charley creeks.) For steelhead tributary populations, EDT habitat assessments were completed for Almota, Tenmile and Deadman creeks; and conditions in six other small tributaries (Alkali Flat, Alpowa, Couse, Penawawa, Steptoe, and Wawawai creeks) were assumed to be similar to the three analyzed.

Actions and Improvements

Starting ~~7-15~~almost 20 years ago, habitat restoration project implementers, landowners, and land managers improved grazing practices, converted tilled lands to minimum till agriculture, fenced livestock out of sensitive habitats, constructed sediment retention basins in problem areas, and installed off channel water sources ~~to~~for livestock. They have also planted riparian areas, removed forest roads, altered forest practices, conducted in-stream work to reduce channel width and increase channel length and sinuosity.~~, and piloted irrigation efficiency projects~~. The result has been improvements in habitat diversity and quality, including reduced sediment, improved water quality ~~and~~with lower water temperatures and increased stream length and pool habitat. Salmonid spawning has been documented lower in the watershed due to benefits of a ridge-top-to ridge top restoration principles that have reduced upland sedimentation, protected and restored riparian and instream habitat resulting in more available habitat for adults.

Current Impacts and Limiting Factors

Reduced habitat diversity, lack of key habitat, elevated sediment load, lack of large woody debris, and floodplain function continue to suppress Asotin Creek salmon and steelhead populations. Construction of single-family dwellings and associated activities are encroaching on some floodplain and riparian ~~function~~areas in ~~parts~~the lower five miles of this basin. Past channel straightening, incision, loss of historic riparian forests, and large wood debris are legacy impacts that continue to result in reduced stream channel complexity, confinement, diminished floodplain function, and decreased key habitats. *One* ~~O~~obstruction~~s~~ on Asotin Creek also continues to suppress Asotin juvenile upstream migration ~~and George creek populations~~, while high temperatures remain a limiting factor in ~~some tributaries~~lower George Creek. Fine sediments originating on seep valley slopes remain a concern and have potential for continued impacts on salmon habitat.

Mid-Columbia DPS: Walla Walla River Summer Steelhead

Walla Walla summer steelhead populations in the SEWMU were analyzed according to the following reach designations: the lower Walla Walla mainstem (mouth to Dry Creek), upper Walla Wall and forks, Mill Creek, Walla Walla headwaters (South and North forks), Touchet River mainstem, and the Touchet River mainstem.

Actions and Improvements

Habitat restoration project implementers and local landowners in the Walla Walla River drainage have worked together over the past seven years. They have removed all major passage obstructions in the lower Walla Walla and Touchet mainstems and removed or corrected most obstructions in the Upper Walla Walla mainstem and forks and Touchet River headwaters. Many irrigation diversions have been screened, and in the Touchet River, the result of a barrier free mainstem has been steelhead moving upriver earlier in the fall/winter with increased headwater spawning and rearing habitat compared to the time of listing.

Farmers and ranchers have improved grazing practices, convert tilled lands to minimum till agriculture, fenced livestock out of sensitive habitats, constructed sediment retention basins in problem areas, removed and setback river levees, and installed off channel water sources to livestock. The result has been reduced fine sediment loads and streambed embeddedness. As an interim step to increase stream habitat diversity and critical habitat features, channels have been reconfigured and large wood debris placed in key areas in the Walla Walla basin.

To address high stream temperatures, project implementers and landowners have planted riparian areas, conducted irrigation efficiency projects and aquifer recharge, purchased and leased water rights, and more. In the upper Walla Walla and its forks, such actions have reduced high summer water temperatures extending salmon rearing habitat further downstream and improved fish passage. In the Touchet subbasin, most river reaches are now benefiting from successful riparian reforestation activities.

Current Impacts and Limiting Factors

Reduced habitat diversity, lack of key habitat, elevated sediment load, low flow, channel stability, and stream temperature particularly in lower reaches are suppressing Walla Walla basin steelhead populations. Reduced stream channel complexity and floodplain function caused by past channel straightening, incision, and loss of historic riparian forests and large wood debris have reduced key steelhead habitat. In addition, obstructions continue to limit the steelhead population in Mill Creek. Construction of single-family dwellings is encroaching on floodplain and riparian function in parts of the Walla Walla and Touchet river basins. In the South and North forks of the Walla Walla headwaters, habitat diversity has the most negative impact on the steelhead population, but increased peak flow and decreased base flow also contribute to depressed steelhead productivity.

Snake River DPS/ESU: Tucannon River Steelhead and Spring/Summer Chinook Salmon Populations

Tucannon River steelhead and spring/summer Chinook salmon populations were analyzed according to the following reach designations: Lower Tucannon River (mouth to Pataha) and Pataha Creek; Tucannon River, Pataha confluence to Marengo; Tucannon River: Marengo to Little Tucannon River; Tucannon River: Little Tucannon to Bear Creek ("Mountain Tucannon").

Actions and Improvements

Habitat restoration project implementers, local landowners, and state agencies in the Tucannon River worked together over the past seven years. They have corrected or removed all major obstructions, added or fixed many irrigation diversions screens, improved grazing practices, converted tilled lands to minimum till agriculture, fenced livestock out of sensitive habitats, constructed sediment retention basins in problem areas, and installed off channel water sources to livestock. The result has been reduced fine sediment loads and reduced streambed embeddedness. In some reaches, the reduction of sediment load has been so effective that sediment basins constructed to capture fines routing from upslope agriculture are no longer needed. Elevated stream temperatures have been addressed by planting riparian areas. Stream flows have been improved through irrigation efficiency and trusting of saved water. As a direct result of increased flows, reduce width to depth ratios and maturing riparian trees, salmonid spawning and rearing has been observed farther downstream than at the time of listing.

Current Impacts and Limiting Factors

The major factors limiting the viability of the Tucannon River steelhead and spring/summer Chinook salmon populations are believed to be sediment, large woody debris, anthropogenic confinement, and riparian function and their impacts on habitat diversity and channel stability, key habitat (pools and pool tail-outs), summer water temperature, and flow.

Much of the sedimentation problem in the mainstem Tucannon and Pataha Creek is attributable to agricultural practices exacerbated by a poorly designed road system and extremely unstable and incised stream banks in the Pataha watershed. Impacts by the city of Pomeroy include locating roads and infrastructure in the Pataha Creek floodplain. The lack of key habitats and habitat diversity throughout the Tucannon subbasin is largely attributable to current and historical crop production and grazing practices, historical decimation of beaver populations, elimination of riparian trees by past logging operations, and a series of catastrophic floods. Temperature problems are attributable to riparian damage and to low flows caused by upstream irrigation diversions and hydrological disruptions. The construction of dikes and levees to maximize land use, agriculture, transportation, recreation, and other development have restricted floodplain connectivity and function upstream from the Pataha Creek confluence. Isolating the floodplain has resulted in a poor and narrow riparian zone and lack of shade.

Snake River ESU/DPS: Wenaha Spring/Summer Chinook Salmon and Lower Grande Ronde Steelhead Populations

Described below are habitat conditions that apply to Wenaha spring/summer Chinook salmon and lower Grande Ronde populations in the SEWMU.

Actions and Improvements

The Wenaha watershed benefitted from federal wilderness designation in the 1978 and the termination of cattle grazing in the 1990s.

The lower Grande Ronde River benefited from salmon habitat restoration actions in the drainage that reduced sediment load, removed obstructions, and improved riparian habitat in the tributaries. Farmers, ranchers, and state agencies improved grazing practices, converted tilled lands to minimum till agriculture, fenced livestock out of sensitive habitats, constructed sediment retention basins in problem areas, and installed off channel water sources to livestock.

Current Impacts and Limiting Factors

The Wenaha watershed, except for its lowest reaches, is relatively pristine. Even in the lower reaches, limiting factors are very minor. EDT analysis suggests that key habitat quantity is a very minor limiting factor, affecting overwintering pre-smolts, subyearlings, and smolts.

Limiting factors in the Lower Grande Ronde and its tributaries include lack of habitat diversity, large wood debris caused by past land management and limited riparian, fine sediment, stream temperature, and reduced key habitat quantity.

Snake River DPS: Joseph Creek Steelhead Population

The "Lower Joseph Creek" geographic area, which includes the Washington portion of the drainage (as well as some of the lowermost Oregon reaches), is applicable to this analysis.

Current Impacts and Limiting Factors

An EDT analysis indicates that sedimentation is the dominant limiting factor in the Lower Joseph Creek geographic area. Pathogens, predation, temperature, and a lack of key habitat (pools) play minor roles. Incubation and overwintering are the life stages most affected by sedimentation in these reaches.

Lower Joseph Creek flows through mostly private lands in a relatively confined canyon and partly paralleled by a road. It has a reasonably intact riparian corridor, no logging, some grazing, and isolated ranches. Sedimentation and other impacts affecting this area likely are caused by upstream activities. As a result, habitat improvement actions within lower Joseph Creek are unlikely to improve conditions appreciably.

Recovery Strategies and General Actions

The SRSRB and NMFS overall goal for recovery and restoration, as described in Chapter 4 of the plan, is to have all extant populations at either viable (low risk) or highly viable status, with representation of all the major life history strategies present historically, and with the abundance, productivity, spatial structure, and diversity attributes required for long-term persistence.

The ICTRT's current status assessment for most SEWMU populations is considered at high risk of extinction (Ford et al. 2010). One population, Joseph Creek steelhead, is currently at very low risk or "highly viable" and the Walla Walla steelhead population and possibly the Lower Grande Ronde steelhead populations are considered "maintained." As mentioned in Appendix B, long-term data sets do not exist for most of the steelhead populations. For the Asotin Creek steelhead population,,recent information suggests that abundance may be close to, or exceeding viability criteria, but additional years of monitoring are needed.

As discussed in Chapter 5, the decline of the SEWMU spring/summer salmon and summer steelhead populations is due to widespread historic habitat degradation, impaired mainstem passage, hatchery effects, mainstem fisheries, and predation/ competition/ disease. Actions taken to improve, change, mitigate, and reduce those factors will result in reduced risks and increased survival. Because of the species' complex life cycle, and the many changes that have taken place in their environment, the factors limiting their survival must be addressed in concert, and in an integrated way. Commitment to actions and funding needs to occur at both the local and regional level. Each population and MPG contributes greatly to the wellbeing of the species. The intent for this plan is to build upon, help to coordinate, and add to the ongoing efforts.

NMFS' 2005 and 2006 listing decisions called upon federal, state, and tribal entities to do their best to manage land, hydropower, hatchery, and harvest activities in a manner that would support salmonid recovery. This plan reaffirms those recommendations and adds the contributions of updated science, basinwide programs, and consensus building among stakeholders. While federal, state, and tribal entities can make major contributions to the recovery of SEWMU populations, the actions of individuals on their land, as well as city and county codes and ordinances promoting conservation, are also essential.

The recovery strategies for SEWMU spring/summer Chinook salmon and summer steelhead populations addresses both the basin-wide issues that affect all populations, such as conditions in the migratory corridor, and the subbasin and site-specific issues that are addressed within this plan. This SEWMU plan describes the overall strategy, summarizes the MPG- and population level strategies, and refers to Appendix A for more site-specific, population level actions.

The SRSRB adopted strategic guidelines to drive these SEWMU recovery actions.

1. Emphasis will be placed on projects with long persistence time ("life span") and benefits distributed over the widest possible range of environmental attributes.
2. Recovery/restoration actions must include immediate and long-term measures. Many actions that address the root causes of habitat degradation require a long time to achieve their goals.
3. The management strategy will involve "adaptive management"; that is, it will be a feedback system where changes in information or data detected through monitoring and evaluation will be used to adjust and modify plans and actions.
4. Identification of important areas and proposed actions is based substantially on information contained in the applicable subbasin plans.
5. Actions necessary to accomplish the recovery goals will be considered within the context of the four "Hs" (habitat, harvest, hatcheries, and hydroelectric).
6. Actions implemented within the region will be focused primarily on restoration and protection of habitat; actions pertinent to the other "Hs" will be addressed primarily through other planning processes but the SRSRB may provide recommendations to these processes.
7. The EDT analysis tool, in combination with other analyses, empirical data, and professional opinion will be used to identify and prioritize habitat actions.
8. The final set of proposed actions will be subject to economic, social, and cultural constraints identified by the recovery region.
9. Priority actions are those that the SRSRB hopes to accomplish over the 15-year planning period of this plan.

The SRSRB recovery strategy for the SEWMU spring/summer Chinook salmon and summer steelhead populations is made up of these elements, which complement the SRSRB guidelines.

- Affirm and address the 2005 and 2006 listing decisions recommendations regarding the limiting factors for the ESU/DPS and populations.
- Protect and restore tributary habitat and Columbia River mainstem habitat, through strategies and actions at both the Basin/programmatic level and at the local level as detailed in this plan.
- Address impaired fish passage through strategies and actions in the mainstem Columbia River, as detailed in the 2008 FCRPS Biological Opinion (as summarized in the Hydro Module) and in the tributaries as detailed in this plan.
- Implement hatchery reforms at the population and site-specific level through Hatchery and Genetic Management Plans (HGMPs) as required by the 2008 FCRPS Biological Opinion and as described in Appendix C of the Supplemental Comprehensive Analysis (NMFS 2008a).
- Address ecosystem imbalances in predation, competition, and disease through the strategies and actions in this plan, estuary module, and FCRPS Biop.
- Maintain current low harvest levels through fishery management planning for mainstem fisheries through the *U.S. v. Oregon* 10-year agreement, updated Fisheries Management Evaluation Plans and Tribal Resource Management Plans for tributary fisheries, and Pacific Salmon Treaty and Pacific Fishery Management Council processes.
- Protect and restore the estuary and Columbia River plume as detailed in the Columbia River Estuary module.
- Respond to climate change threats with a strategy based on the principle of preserving biodiversity.
- Implement this plan through effective coordination and governance.
- Research critical uncertainties, monitor and evaluate implementation and effectiveness and adjust course as appropriate through adaptive management.

The SRSRB believes that if this strategy is implemented and the biological response is as expected, the SEWMU spring/summer Chinook salmon and summer steelhead populations are likely to achieve viable status within 25 to 50 years.

Habitat

Actions to protect and improve habitat in the tributaries and the Snake and Columbia mainstems are essential to achieving recovery objectives for the SEWMU populations. Protecting existing high quality and good quality tributary habitat and restoring degraded habitat will specifically benefit SEWMU populations in the spawning and rearing life stages. Improved spawning and rearing means that more fish will reproduce, more juveniles will survive to migrate, and consequently more adults will return, even if the other (outside of SEWMU) factors remain as they are today.

Columbia/Snake River

Relatively little information is available concerning SEWMU populations' use of mainstem Snake and Columbia River habitat upstream of Bonneville Dam, aside from passage through the dams. NMFS believes it is important to assess nearshore habitat and cold water refugia in the mainstem and to explore opportunities for, and potential benefits from, restoration and protection of these areas.

Tributaries

The SRSRB proposed a tributary habitat strategy to address habitat actions in the MaSAs and MiSAs. The approach is to improve these habitat factors: upland habitat, riparian conditions, floodplain functions, instream habitat, water quantity, and water quality. Table 6-2 in the plan shows these habitat factors prioritized and with assigned measurable restoration objectives for each MaSA. The actions proposed to improve stream conditions are presented in Appendix A. Appendix A tables include the habitat factors and actions for each MaSA, MiSA, and population, information on action type, the number of units (acres, miles of stream etc.) affected by the action, annual costs, and the expected costs over the 15-year planning period.

Hydrosystem

Passage for juvenile spring/summer Chinook salmon and summer steelhead migrating to the ocean and adult Chinook salmon and steelhead returning to their natal streams is limited primarily by four federal dams on the lower Snake River mainstem—Lower Granite, Lower Monumental, Ice Harbor and Little Goose —and four federal dams on the Lower Columbia River mainstem—McNary, The Dalles, John Day and Bonneville. All eight dams are part of the Federal Columbia River Power System (FCRPS). NMFS recently issued a new biological opinion on the effects of FCRPS operations on salmonids, including SEWMU spring/summer Chinook salmon and summer steelhead and on the predicted results of current and planned improvements to the system that are intended to improve fish survival (NMFS 2008a).

The plan for current mainstem hydro operations, as summarized in the Hydro Module (NMFS 2008c), and any further improvements for fish survival that may result from the ongoing FCRPS collaborative process, represent the hydropower recovery strategy for all listed salmonids that migrate through the mainstem Snake and Columbia rivers, including the SEWMU salmonid populations.

The Reasonable and Prudent Alternative (RPA) for the FCRPS takes a comprehensive approach to ESA protection that includes hydro, habitat, hatchery, harvest, and predation measures to address the biological needs of salmon and steelhead in every life stage. The RPA is the product of the collaboration between NMFS and the action agencies ordered by the court. It is based on a comprehensive analysis of the salmon life cycle conducted down to the level of the populations that make up the listed species. Section 8.8 and the "Reasonable and Prudent Alternative Table" in the 2008 FCRPS Biological Opinion describe actions that should positively affect SEWMU salmonid populations.

The current plan for operation of the FCRPS through 2018 (NMFS 2008a) contains the following actions intended to address the needs for survival and recovery of ESA-listed salmon and steelhead:

- Continue adult fish passage operations that have resulted in improved survival.
- Improve juvenile fish passage: install removable spillway weirs or similar surface bypass devices at John Day and McNary dams, an extended tailrace spill wall at The Dalles Dam, and various modifications at Bonneville Dam. Passage for steelhead smolts at each of the four Lower Columbia River mainstem projects must reach 96 percent survival.
- Continue and enhance spill for juvenile fish passage.

- Continue reservoir operations and river flows to benefit spring migrating juveniles.
- Develop dry water year operations to better protect migrating juveniles.
- Develop and implement a kelt management plan.

Hatcheries

The hatcheries in the Snake Basin were constructed to mitigate the effects of the hydrosystem by providing fish for harvest for tribal, commercial, and sport fisheries. The NOAA Interior Columbia Technical Recovery Team (ICTRT) noted in their 2011 status review that hatchery programs can help preserve genetic resources, increase spatial distribution, and provide short-term demographic benefit in abundance in low return years. However, they state that artificial propagation also poses risks to natural productivity and diversity. This report is available at http://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/multiple_species/5-yr-sr.pdf

Hatchery practices have evolved as the status of natural populations changed and new plans are now under development, or have been completed for every hatchery program in the Snake River basin.. The SRSRB proposed hatchery strategy is intended to be reflective of current plans and legally binding processes and to assist in meeting recovery objectives. The SRSRB hatchery strategy recognizes that, not only can hatcheries play an important role in recovering fish populations, but they can contribute to providing fish needed to meet tribal, commercial, and sport harvest, as well as recovery and restoration goals. The strategy attempts to balance risks to recovery of listed fish populations with the achievement of harvest objectives. The recovery plan recognizes that management of fish hatcheries is complex and that management decisions are beyond the scope of the Snake River Salmon Recovery Board. The US v Ore management agreement, NOAA-permitted hatchery genetic management plans, BPA-NOAA negotiated reasonable and prudent alternatives under the Federal Columbia River Hydropower System Biological Opinion, and a whole suite of other policy and legal requirements govern the management of hatcheries. The recovery plan provides strategies for hatchery management that support the objectives and priorities in the SEWMU that may be considered by the co-managers

~~Two strategies for hatchery production are proposed: integrated and segregated programs. Integrated programs, which use native broodstock to reduce genetic risk to a specific population, are proposed for most subbasins and populations. The exception is the Walla Walla subbasin summer steelhead program, which is proposed for both integrated and segregated management (to provide harvest opportunities while maintaining genetic integrity). The Wenaha River and Joseph Creek, in the Grande Ronde River subbasin, as well as Asotin Creek are reserved for natural production only, i.e., without direct supplementation of smolts or adults.~~

~~Management of adult returning hatchery-origin fish is complex, and co-managers are not necessarily in agreement on all hatchery management actions listed within this plan. Some studies show that excess hatchery-origin adults spawning in the wild may reduce natural population productivity (e.g., Araki et al. 2008). However, this issue is considered a critical uncertainty, and as such, proper management actions are still in development until additional information is obtained.~~

~~Current management for the SEWMU will be to control the number of hatchery fish allowed to spawn in the wild to the extent possible in certain streams. For example, all hatchery-origin fish~~

~~that are collected in trapping facilities at the Touchet, Tucannon, and Asotin adult traps are removed from the spawning population, while adults from the endemic program are currently released to spawn naturally or collected as brood stock. The overall adult management strategy is designed to reduce potential negative effects of non-native hatchery fish on naturally produced fish populations. Note, however, that the percentage of hatchery-origin fish on the spawning grounds is not directly related to viability criteria.~~

One of the biggest uncertainties concerning hatchery fish is their affect on natural productivity when they spawn naturally in the wild or interbreed with natural-origin fish on the spawning grounds. While most programs in the SEWMU use natural-origin broodstock to varying degrees (and are thus integrated with the natural population, as suggested by HSRG and HRT), uncertainty remains concerning their affect on natural populations. How the hatchery programs are implemented affects harvest strategies within the SEWMU. The SRSRB suggests that as further information is collected and analyzed concerning the affects of hatchery-origin natural spawners, harvest strategies be adapted accordingly.

Specific short- and long-term hatchery strategies and actions for anadromous SEWMU fish species is presented in Appendix D. The proposed hatchery programs for each subbasin are based partly on the HGMPs being developed by the resource agencies and NMFS. Hatchery programs are not proposed for bull trout in the recovery area. In addition, strategies for Snake River fall Chinook salmon will not be captured in this section of the plan.

Predation, Competition, and Disease

Predation, competition, and disease are grouped together as a category of concern because ultimately these factors relate to balance and imbalance in the ecosystem. Improving habitat for salmonids throughout the life cycle is the best strategy for addressing these potential limiting factors (ISAB 2007). Specific measures can also be taken; the following is a summary of ongoing efforts and research.

Extensive research on predation and efforts at predator control, including piscivorous fish, avian predators, and marine mammals have been undertaken in the Columbia Basin for decades and will continue. The FCRPS BiOp and the Estuary Module (73 FR 161, January 2, 2008), both of which are part of this recovery plan, provide extensive evaluations of these issues as threats and limiting factors as well as specific strategies and actions for both monitoring and addressing them.

Competition and subsequent density-dependent mortality can occur at any stage in salmon or steelhead life cycle and may be exacerbated by the introduction and/or cumulative effects of large numbers of hatchery fish released over a relatively short period of time. Consistent with this concern NMFS is planning to better define and describe the scientific uncertainty associated with ecological interactions of hatchery-origin and natural-origin salmonids. See also Appendix C of the 2008 FCRPS Biological Opinion (NMFS 2008a).

Disease in salmonids is caused by multiple factors and probably cannot be directly addressed by recovery actions except in specific instances of known causal factors. It is more likely that nearly all of the recommended recovery actions that improve spawning, rearing, and passage conditions for steelhead and increase the survival, abundance, and productivity of naturally produced fish will result in decreasing incidence of disease.

Harvest

Although the SRSRB has focused their planning efforts on habitat within the SEWMU, it is necessary also to consider harvest strategies, particularly those outside the SEWMU. Existing and proposed harvests management strategies within the SEWMU are described as they relate to habitat restoration at the subbasin level. This information can be found in Appendix E. Additional information on harvest outside of the SEWMU can be found in the Harvest Module.

Harvest management processes that relate to all management units are:

- *U.S. v. Oregon* Columbia River Management Agreement for 2008-2017 governs allocations between treaty Indian and non-treaty fisheries.
- Fisheries Management and Evaluation Plans (FMEPs), submitted by the States of Oregon and Washington and approved by NMFS under the 4(d) rule of the ESA, provide a mechanism for developing, implementing, and adjusting recreational fisheries to achieve management and conservation objectives; evaluation is required every five years.
- Tribal resource management plans (TRMPs) are also submitted by the SEWMU tribal interests and are approved by NMFS under the 4(d) rules of the ESA.

Monitoring and evaluation that will help reduce uncertainties concerning fisheries impacts on SEWMU populations include the following:

- Creel surveys or other methods of quantifying impacts in the more popular fisheries
- In-basin monitoring of escapement from ocean into tributaries and onto the spawning grounds
- Monitoring to verify the applicability of aggregate impact rates of mainstem fisheries on specific populations

Columbia River Plume and Estuary

The estuary is where juvenile salmon and steelhead undergo physiological changes needed to transition to and from saltwater. Because juvenile Chinook salmon and steelhead spend less residence time in the shallow parts of the estuary than other salmonids, the characteristics of the Columbia River plume (the river water flowing out to sea) and the deeper channels of the estuary are more important in determining their survival.

NMFS’ Estuary Module identifies 23 types of management actions that would improve estuary conditions for all salmonids. The following is a selection of these actions most beneficial to SEWMU populations.

- Adjust the timing, magnitude and frequency of flows (especially spring freshets) entering the estuary and plume to provide better transport of sediments and access to habitats in the estuary, plume, and littoral cell.
- Manage pikeminnow, smallmouth bass, walleye, and channel catfish to prevent increases in abundance.

- Identify and implement actions to reduce salmonid predation by pinnipeds.
- Implement projects to redistribute part of the Caspian tern colony currently nesting on East Sand Island.
- Implement projects to reduce double-crested cormorant habitats and encourage dispersal to other locations.
- Implement pesticide and fertilizer best management practices to reduce estuary and upstream sources of toxic contaminants entering the estuary.
- Identify and reduce industrial, commercial, and public sources of pollutants.
- Monitor the estuary for contaminants and/or restore contaminated sites.
- Implement stormwater best management practices in cities and towns.

The module includes an evaluation of the "constraints" on implementation of these actions. Perhaps the most significant action would be to adjust the timing, magnitude and frequency of flows to return to a more natural hydrograph for the estuary; however, this is the least possible of the actions, given the constraints on hydrosystem operations that prevent the return to a natural hydrograph in the estuary. Implementation of this action would be limited by international treaties, the need for flood control, fish management objectives system-wide, and power management (NMFS 2007).

Climate Change

A strategy for addressing the effects of climate change on SEWMU populations needs to be based broadly on the principle of preserving biodiversity. Diversity in terms of both location and biological characteristics gives any species resilience in the face of environmental change. This principle underlies the viability criteria presented in Chapter 4 of this plan, as well as the strategies described in this chapter to address the factors limiting SEWMU population viability, as these are currently understood. NMFS supports the Independent Scientific Advisory Board's (ISAB's) recommendations for mitigating the effects of climate change (ISAB 2007).

The ISAB notes, "As climate and streams warm, tributary habitats will become increasingly important because they usually provide the cool waters for salmonids and other cool-water species in a watershed" (ISAB 2007). It follows that water temperature and stream flow are factors that will remain important throughout salmonid freshwater habitat. All strategies and actions that help to lower water temperature or prevent further increase will help to mitigate climate change. Protecting and/or restoring riparian areas to increase shade, as recommended in Chapter 6, is an important strategy for minimizing water temperature increases. Additional actions include purchasing water rights to leave more water in streams and restoration actions to improve channel complexity and establish side-channel rearing (FCRPS BiOp, NMFS 2008a).

The recovery plan also describes a number of opportunities through the FCRPS BiOp to address problems with warming waters on the mainstem Snake and Columbia rivers.

Coordination/Governance

Coordination of actions and information sharing among fisheries biologists, tribes, local governments, citizen groups, and state and federal agencies based in both Oregon and Washington is a key component of recovery for SEWMU populations. Coordination includes:

- Dealing with shared migration areas consistently
- Developing coherent MPG-level strategies where populations are in two states (Grande Ronde MPGs; Umatilla/Walla Walla steelhead MPG), or the same population is in both states (Walla Walla steelhead population)
- Promoting consistent methods for setting recovery objectives, evaluating strategies, and monitoring progress across populations, MPGs, and the ESU/DPS.

This coordination is currently being implemented through the SRSRB and associated subcommittees and teams. In addition, other processes, like the LSRCP also assist in regional coordination.

Add figure(s) showing implementation coordination with the Mid-C and the other Snake River planning entities?

Summary of Recovery Strategies

The following sections summarize the recovery strategy for spring/summer Chinook salmon and steelhead MPGs. Table ES-5 shows the SEWMU populations within each MPG and the overall MPG risk assessment from the ICTRT's 2011 status assessment (http://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/multiple_species/5-yr-sr.pdf).

Table ES-5. Summary of ICTRT viability risk assessment for each MPG in the SEWMU

MPG	SEWMU Population	ICTRT Risk Status
Lower Snake River spring/summer Chinook	Tucannon River	High risk
	Asotin Creek (functionally extinct)	
Grande Ronde/Imnaha spring/summer Chinook	Wenaha	High risk
Umatilla / Walla Walla Rivers steelhead	Walla Walla R.	Moderate Risk
	Touchet R.	High risk
Lower Snake River steelhead	Tucannon R.	High risk[a]
	Asotin Cr.	
Grande Ronde steelhead	Lower Grande Ronde	Low-moderate risk (?)[b]
	Joseph Cr.	Very Low

[a] For Asotin Creek, abundance appears to meet TRT criteria for moderate to low risk, but information is lacking for productivity.
[b] The RTT disagrees that any risk category can be applied to the Lower Grande Ronde population since there is not enough information.

Only one population in the SEWMU meets the criteria for viable status (Joseph Creek); one (Walla Walla River) is assigned a moderate risk, and one is uncertain and may be either moderate or low risk (Lower Grande Ronde steelhead). One population is extirpated (Asotin Creek spring/summer Chinook salmon).

Although not all populations in an MPG need to meet TRT viability criteria under most viable-MPG scenarios, it is strongly advisable to attempt to improve the status of more than the minimum number of populations to a low risk (viable) situation.

A low risk strategy will thus target more populations than the minimum for viability (ICTRT 2007a). The Snake River RTT agrees with this approach and suggests that meeting the Highly

Viable status for each population within SEWMU would be needed to meet the restoration goals that the region desires. The Snake River RTT viability criteria are thus higher than the ICTRT's MPG-level criteria as applied to the extant populations of the SEWMU ESUs/DPSs. According to the Snake River RTT restoration scenarios, all Snake River populations within each MPG in Washington State need to meet restoration criteria. For a comparison of the Snake River RTT restoration goals and ICTRT recovery goals, see Table ES-4 in this summary and, for more detail, Chapter 4 of this plan.

Lower Snake River Spring/Summer Chinook Salmon MPG

The overall goal set by the SRSRB for recovery and restoration of the Lower Snake spring/summer Chinook salmon MPG is to have both the extant Tucannon population at highly viable status and a reintroduced Asotin Creek population at least viable (low risk), with representation of all the major life history strategies present historically.

Population	ICTRT Risk Level	Desired Status
Tucannon River	High	Very Low Risk
Asotin Creek	Functionally extirpated	Reintroduced and Moderate Risk

Recovery Scenario:
For the Lower Snake River spring/summer Chinook salmon MPG to be considered viable, the Tucannon population will need to achieve highly viable status (Ford et al. 2011~~0~~). MPG viability could be further bolstered if reintroduction of spring/summer Chinook salmon into Asotin Creek succeeds. The ICTRT suggests focusing on achieving highly viable status of the Tucannon for MPG viability and then introduction to Asotin Creek. However, the co-managers are interested in "jump-starting" the Asotin Creek population in the near term to begin reintroduction with appropriate stock of spring/summer Chinook salmon (most likely Tucannon River).

Gap:
The median survival gap (assuming recent ocean and base hydrosystem conditions and 5 percent risk) for the Tucannon River spring/summer Chinook salmon (Asotin Creek is functionally extinct) is 1.23 (meaning that a 123 percent increase in average life-cycle survival is required to achieve 5 percent risk in a 100-year time period). Exceeding the 1% risk curve for the Tucannon spring/summer Chinook salmon would require a 2.48 (248%) improvement in cumulative life cycle survival.

Threats and Limiting Factors:

- Mainstem passage and the survival concerns described in Chapter 4 that apply to all species
- Habitat degradation in tributaries
- Possible effects of hatchery production/straying
- Harvest, depending on abundance

Summary of MPG Recovery Strategy:
The proposed actions for the spring/summer Chinook salmon populations in the Lower Snake River MPG are based on restoring important tributary habitat functions in areas that likely supported historical production. The actions proposed for each population are predicated on

restoring, to the extent possible, the natural conditions that support summer rearing and overwintering in high potential reaches. For the Lower Snake River MPG, reducing embeddedness, increasing recruitment of large woody debris, reducing temperature, and restoring riparian habitats are shared strategies. For several populations, restoring sufficient flow, addressing high summer water temperatures, and other water quality issues are also key components (Table 6-6 in this plan).

Key Actions Proposed (for more information, see the plan's Tables 6-2 and 6-10):

- Protect, improve, and increase freshwater habitat for Chinook salmon production. Improvements to freshwater habitat should be targeted to address specific limiting factors in specific areas as described in Chapter 5 of this plan.
- Conduct research to determine the cause of straying of Tucannon natural- and hatchery-origin fish that continue upstream of Lower Granite Dam instead of into the Tucannon River.
- Reduce straying of Tucannon natural- and hatchery-origin fish upstream of Lower Granite Dam.
- Improve survival in mainstem and estuary through actions detailed in NMFS Estuary Module (NMFS 2007) and FCRPS Biological Opinion (NMFS 2008a).
- Continue hatchery management practices that minimize impacts from hatchery releases on naturally produced fish.
- Coordinate between scientists, planners, and implementers for sequencing of recovery actions and monitoring for adaptive management.

Grande Ronde/Imnaha (Wenaha) Spring/Summer Chinook Salmon MPG

The overall goal set by the SRSRB for recovery and restoration of the Grande Ronde/Imnaha spring/summer Chinook salmon MPG is to have the Wenaha population at viable status, with representation of all the major life history strategies present historically. The remaining populations in this MPG are in Oregon.

Population	ICTRT Risk Level	Desired Status
Wenaha River	High Risk	Low Risk
Lostine/Wallowa Rivers	High Risk	See NE OR Recovery Plan
Minam River	High Risk	See NE OR Recovery Plan
Upper Grande Ronde River	High Risk	See NE OR Recovery Plan
Catherine Creek	High Risk	See NE OR Recovery Plan
Imnaha River	High Risk	See NE OR Recovery Plan

Recovery Scenario:

The Wenaha spring/summer Chinook salmon population is one of three intermediate sized populations within the MPG. The ICTRT (2007b) recommends that within the Grande Ronde basin, the Wenaha or the Minam population (the other intermediate populations) needs to meet viability status, while the Imnaha population (intermediate) is "required" for viability of the MPG.

Gap:
For the Wenaha population, the ICTRT estimated that a gap of 1.38 (138%) improvement in survival would be needed.

Threats and Limiting Factors:

- Mainstem passage and the survival concerns described in Chapter 4 that apply to all species
- Harvest, depending on abundance

Summary of MPG Recovery Strategy:
Because the Wenaha River population is part of the larger Grande Ronde MPG (that is mostly in Oregon), the Wenaha could be one of the two populations, besides the Imnaha population that needs to meet viability criteria.

Key Actions:
The vast majority of the Wenaha River lies entirely within a wilderness area administered by the USFS. The proposed action for this river is to continue protective status.

Lower Snake River Steelhead MPG
The overall goal set by the SRSRB for recovery and restoration of the Lower Snake steelhead MPG is to have the Tucannon population at viable status and Asotin Creek population at very low risk, with representation of all the major life history strategies present historically.

Population	ICTRT Risk Level	Desired Status
Tucannon River	High Risk (??)*	Low Risk
Asotin Creek	Maintained (?)* (High Risk??)*	Very Low Risk

*ICTRT did not have sufficient information to make a solid determination and instead made a rough estimate, which is indicated by question mark(s).

Recovery Scenario:
For the Lower Snake River MPG, the ICTRT suggests that one of the two populations should be highly viable.

Gap:
The ICTRT did not have enough information to determine a gap for either population.

Threats and Limiting Factors:

- Mainstem passage and the survival concerns described in Chapter 4 that apply to all species
- Habitat degradation in tributaries
- Possible effects of hatchery production/straying
- Harvest, depending on abundance

Summary of Recovery Strategies:
The proposed actions for the steelhead populations in the Lower Snake River MPG are based on restoring important tributary habitat functions in areas that likely supported historical production. The actions proposed for each population are predicated on restoring, to the extent possible, the natural conditions that support summer rearing and overwintering in high potential reaches. For

the Lower Snake River MPG, reducing embeddedness, increasing recruitment of large woody debris, reducing temperature, and restoring riparian habitats are common strategies. Restoring sufficient flow, addressing high summer water temperatures, and other water quality issues are also key components (Table 6-7 in the plan).

Key Actions Proposed (for more information, see the plan's Tables 6-2 and 6-10):

- Protect, improve, and increase freshwater habitat for steelhead production. Improvements to freshwater habitat should be targeted to address specific limiting factors in specific areas as described in Chapter 5.
- Conduct research to determine the cause of straying of Tucannon natural- and hatchery-origin fish that continue upstream of Lower Granite Dam instead of into the Tucannon River.
- Reduce straying of Tucannon natural- and hatchery origin fish upstream of Lower Granite Dam.
- Improve survival in mainstem and estuary through actions detailed in NMFS Estuary Module (NMFS 2007) and FCRPS Biological Opinion (NMFS 2008a).
- Continue hatchery management practices that minimize impacts from hatchery releases on naturally produced fish.
- Continue to manage the Asotin Creek population for natural production only.
- Coordinate between scientists, planners, and implementers for sequencing of recovery actions and monitoring for adaptive management.

Grand Ronde Steelhead MPG

The overall goal set by the SRSRB for recovery and restoration of the Grande Ronde steelhead MPG is to have the Lower Grande Ronde population at viable status and Joseph Creek maintained at very low risk, with representation of all the major life history strategies present historically.

Population	ICTRT Risk Level	Desired Status
Lower Grande Ronde	Maintained (?)*	Low Risk
Joseph Creek	Very Low	Very Low Risk
Upper Grande Ronde	Maintained	See NE OR Recovery Plan
Wallowa	High Risk (??)*	See NE OR Recovery Plan

*ICTRT did not have sufficient information to make a solid determination and instead made a rough estimate, which is indicated by question mark(s).

Recovery Scenario:
For the Grande Ronde MPG, one large and one intermediate population must meet or exceed population-level viability criteria, and one population in the MPG must meet highly viable criteria.

Gap:
The ICTRT did not have enough information to determine a gap for the Lower Grande Ronde or Wallowa populations. In addition, there is obviously no gap for Joseph Creek, since that population is considered highly viable.

Threats and Limiting Factors (from the NE OR Recovery Plan)
Aside from the limiting factors and threats that affect all populations (hydro, hatcheries, and harvest related), the habitat limiting factors and threats are identified in the draft Northeast Oregon Snake River Recovery Plan.

Summary of MPG Recovery Strategy:
The proposed actions for the steelhead populations in the Grande Ronde River MPG are based on restoring important tributary habitat functions in areas that likely supported historical production and will primarily be implemented through the Northeast Oregon Snake River Recovery Plan. The actions proposed for each population are predicated on restoring, to the extent possible, the natural conditions that support summer rearing and overwintering in high potential reaches. Since Joseph Creek lies primarily in Oregon, priority actions for the portion of Joseph Creek within Washington are to address imminent threats. Objectives for the Lower Grande Ronde can be found in the draft Northeast Oregon Snake River Recovery Plan.

Key Actions Proposed (for more information, see the plan's Tables 6-2 and 6-10):
- Protect, improve, and increase freshwater habitat for steelhead production. Improvements to freshwater habitat should be targeted to address specific limiting factors in specific areas as described in Chapter 5 of this plan.
- Maintain protection for the Wenaha Basin.
- Improve survival in mainstem and estuary through actions detailed in NMFS Estuary Module (NMFS 2007) and FCRPS Biological Opinion (NMFS 2008a).
- Continue hatchery management practices that minimize impacts from hatchery releases on naturally produced fish.
- Coordinate between scientists, planners, and implementers for sequencing of recovery actions and monitoring for adaptive management.

Umatilla/Walla Walla Steelhead MPG
The overall goal set by the SRSRB for recovery and restoration of the Umatilla/Walla Walla steelhead MPG is to have the Touchet and Walla Walla river populations at viable status, with representation of all the major life history strategies present historically.

Population	ICTRT Risk Level	Desired Status
Umatilla River	Maintained	See mid-Columbia Recovery Plan
Touchet River	High Risk	Low Risk
Walla Walla River	Maintained	Low Risk

Recovery Scenario:
For the Umatilla/Walla Walla MPG to be viable, two populations should meet viability criteria, and one should be highly viable.

Gap:
The median survival gap (assuming recent ocean and base hydrosystem conditions and 5 percent risk) for the Walla Walla mainstem population is 0.34 (meaning that a 34 percent increase in average life-cycle survival is required to achieve 5 percent risk in a 100-year time period). The ICTRT did not have enough information for the Touchet population to determine a gap.

Threats and Limiting Factors

- Mainstem passage and the survival concerns described in Chapter 4 that apply to all species
- Habitat degradation in tributaries
- Possible effects of hatchery production/straying
- Harvest, depending on abundance

Summary of MPG Recovery Strategy:
The proposed actions for the steelhead populations in the Umatilla/Walla Walla steelhead MPG are based on restoring important tributary habitat functions in areas that likely supported historical production. The actions proposed for each population are predicated on restoring, to the extent possible, the natural conditions that support summer rearing and overwintering in high potential reaches. For the Umatilla/Walla Walla MPG, reducing embeddedness, increasing recruitment of large woody debris, reducing temperature, and restoring riparian habitats are common strategies. For several populations, restoring sufficient flow, addressing high summer water temperatures, and other water quality issues are also key components (Table 6-8 in this plan).

Key Actions Proposed (for more information, see the plan's Tables 6-2 and 6-10):
Protect, improve, and increase freshwater habitat for steelhead production. Improvements to freshwater habitat should be targeted to address specific limiting factors in specific (Appendix A tables will include the habitat factors and actions for each MaSA, MiSA, and population, information on action type, the number of units (acres, miles of stream etc.) affected by the action, annual costs, and the expected costs over the 15-year planning period.)

- Protect, improve, and increase freshwater habitat for steelhead production. Improvements to freshwater habitat should be targeted to address specific limiting factors in specific areas as described in Chapter 5 of this plan.
- Improve survival in mainstem and estuary through actions detailed in NMFS Estuary Module (NMFS 2007) and FCRPS Biological Opinion (NMFS 2008a).
- Continue hatchery management practices that minimize impacts from hatchery releases on naturally produced fish.

The plan's Table 6-10, all of the general actions and strategies, are summarized for SEWMU populations. Some of the descriptions of the strategies and actions are not exactly stated as above, but all of the components are illustrated.

Time Required and Cost Estimates

The plan's Appendix A tables include the habitat factors and actions for each MaSA, MiSA, and the population, annual costs, and the expected costs over the plan's 15-year planning period.

The total estimated cost of restoring habitat for the SEWMU populations in the Snake River and Mid-Columbia MPGs is an estimated $207 million over a 10-year period and it is unknown if this investment will improve habitat sufficiently to de-list salmonids or if future costs and time will be requiree (Table ES-6). In addition to the restoration actions (capitol projects) there are non-capitol costs identified in the recovery plan for program operations, monitoring and reporting, outreach and education plus development of regulations.

This estimate includes expenditures by local, tribal, state, and federal governments, private business, and individuals, in implementing both capital projects and non-capital work. The capital and non-capital estimated costs over a 10-year period are in Table ES-6.. Refer to Appendix A in the 2011 Snake River Salmon Recovery Plan for more information on specific costs by watershed, project type, anticipated implementing entity etc.

Table ES-6 Estimated costs by for SEWMU populations in each Snake River MPG

Capital Projects	**Million**
Habitat Restoration	$68
Land and Easement Acquisition	$25
Passage barrier retrofits	$39
Instream flow enhancements	$50
Water quality improvements	$25
Sub-total	**$207**
Non Capital Expenses	
Program operations	$8
Monitoring and assessments	$28
Outreach and education	$2
Development of regulations	$2
Sub-total	**$41**
TOTAL	**$248**

These cost estimates do not include expenses associated with implementing actions within the lower Columbia River, estuary, or Federal Columbia River Power System (FCRPS), first, because of the basin-wide scope and applicability of these actions to all 13 Columbia Basin salmonid species listed as threatened or endangered, and second, because they are considered "baseline actions" that are required through other processes such as section 7 consultations, FERC licensing agreements, and Habitat Conservation Plans.

Implementation Funding

Funding for project implementation is currently available from a variety of sources, but it will be an ongoing challenge. The role of NMFS is to ensure that management unit plan implementers are aware of potential sources of funds and to advocate for the funding and implementation of actions that benefit all populations in the ESUs/DPSs. NMFS will not supersede decisions made by the individual management unit boards but will provide assistance and may promote funding of their projects and programs if requested. Sources of implementation funding include:

- Congressional appropriations to federal agencies and to Pacific Coastal Salmon Recovery

Fund (PCSRF) (through states and tribes)
- Salmon Recovery Funding Board (SRFB) (Washington)
- Oregon Watershed Enhancement Board (OWEB) (Oregon)
- State appropriations (state agencies)
- Northwest Power and Conservation Council Fish and Wildlife Program (states and tribes)
- Federal/state grants
- Non-profit organization programs and grants

Potential Effects of Proposed Recovery Actions

Chapter 7 presents an analysis of the potential effects of actions on the performance of SEWMU salmonid populations. Projected levels of effectiveness were analyzed using the ecosystem diagnosis and treatment (EDT) model performed in 2004 and have not been updated.

Based on EDT analysis, the actions proposed in this recovery plan are expected to substantially increase the abundance, productivity, and diversity of listed species in the recovery area. Until the actions are implemented and their effectiveness determined empirically, actual benefits to fish must be considered a working hypothesis to be tested and monitored over time (See Adaptive Management and RM&E, Appendix C).

As the Chapter 7 discussion states, the conclusions based on EDT modeling have a high degree of uncertainty and, for that reason, are not included in this summary. (The qualifications regarding the EDT analyses and results are included in that chapter.). As more data are collected as part of the monitoring plan described in Appendix C, the conclusions reached in this plan will be updated and refined.

Bull Trout

Determining the effect recovery plan implementation will have on bull trout populations is not currently possible because no existing models are available to forecast the change in bull trout abundance, productivity, or diversity resulting from habitat actions in any of the subbasins. Therefore, the recovery plan focuses on implementing actions that reduce known threats to bull trout. This approach is consistent with the bull trout biological opinion developed by the USFWS for recovery area populations (USFWS 2002a).

USFWS hypothesizes that bull trout will recover to healthy sustainable levels if all known threats to the population are reduced or eliminated. To address the threats, USFWS identified actions that need to be taken in each subbasin of the recovery area that currently support (or historically supported) bull trout. Those actions proposed by the USFWS for Washington waters have been incorporated into this recovery plan. The effect the actions have on bull trout abundance will be determined as part of the monitoring program discussed in Appendix C.

Research, Monitoring and Evaluation and Adaptive Management

An important part of the strategy for achieving recovery is the development of a monitoring plan that will support implementation of the recovery plan and long-term adaptive management in response to changes and trends in the data. Two keys to effective implementation are targeting actions to specific areas and monitoring the results of the actions. Appendix A of this plan discusses specific areas and actions associated with those areas for preservation and restoration, and it is coordinated through the Snake River RTT. The monitoring and research plan is discussed in detail in Appendix C.

In addition to the issue- and area-specific monitoring for adaptive management, research should be directed toward resolving the many uncertainties pertaining to ocean productivity, global climate change, hatchery effectiveness, effects of transportation, invasive species, effects of interacting strategies, and effects of human population growth on SEWMU spring Chinook salmon and steelhead recovery. SRSRB will oversee implementation of the adaptive management plan in a collaborative and coordinated manner. The process will use the current implementation structures and allow for sharing of information and decisions that hold the best opportunities for recovery of SEWMU Chinook salmon and steelhead.

ACRONYMS

BiOp: Biological Opinion

BPA: Bonneville Power Administration

CTUIR: Confederated Tribes of the Umatilla Indian Reservation

DPS: Distinct Population Segments

EDT: Ecosystem Diagnosis and Treatment

ESA: Endangered Species Act

ESU: Evolutionary Significant Unit

FCRPS: Federal Columbia River Power System

FERC: Federal Energy Regulatory Commission

FMEPs: Fisheries Management and Evaluation Plans

GRSO: Governor's Salmon Recovery Office

HGMPs: Hatchery and Genetic Management Plans

HSRG: Hatchery Scientific Review Group

HRT: Hatchery Review Team

ICTRT: Interior Columbia Technical Recovery Team

ISAB: Independent Scientific Advisory Board's

LFH: Lyons Ferry Fish Hatchery

LSRCP: Lower Snake River Compensation Plan

MaSAs: Major Spawning Areas

MiSAs: Minor Spawning Areas

MPGs: Major Population Groups

NMFS: National Marine Fisheries Service

NOAA: National Oceanic and Atmospheric Administration

NPT: Nez Perce Tribe

NRCS: National Resources Conservation Service

NWPCC: Northwest Power and Conservation Council

OWEB: Oregon Watershed Enhancement Board

PCSRF: Pacific Coast Salmon Recovery Fund

RPA: Reasonable and Prudent Alternative

RTT: Regional Technical Team

SEWMU: Southeast Washington Management Unit

SRFB: Salmon Recovery Funding Board

SRSRB: Snake River Salmon Recovery Board

TRMP: Tribal Resource Management Plans

TRT: Technical Recovery Team

USFS: United States Forest Service

USFWS: United States Fish and Wildlife Service

USACE: United States Army Corps of Engineers

VSP: Viable Salmonid Populations

WDOE: Washington Department of Ecology