Executive Summary

The Upper Columbia Salmon Recovery Board (UCSRB) developed this plan for the recovery of Upper Columbia spring Chinook (listed as *endangered* on March 24, 1999), Upper Columbia steelhead (listed as *endangered* on August 18, 1997; reclassified as *threatened* on January 5, 2006; and as a result of a legal challenge, reinstated to *endangered* status on June 13, 2007), and bull trout (the coterminous U.S. population was listed as *threatened* on November 1, 1999).

The mission for the Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan developed by the Upper Columbia Salmon Recovery Board is:

> To restore viable and sustainable populations of salmon, steelhead, and other at-risk species through collaborative, economically sensitive efforts, combined resources, and wise resource management of the Upper Columbia region.

The Board intends to approach salmon recovery efforts in a transparent and evolving process to restore fish populations for ecosystems and people while enhancing the economic viability of the region.

This plan is an outgrowth and culmination of several conservation efforts in the Upper Columbia Basin, including current efforts related to the Endangered Species Act (ESA), state and tribal-sponsored recovery efforts, subbasin planning, and watershed planning.

Use of this Plan

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. Any such regulatory actions deemed necessary as a result of this document must be accompanied by a clear legislative mandate to that end.

The plan may be used to inform state and local agency planning and land use actions, but it may not be deemed to place requirements on such entities. The goal of this 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 this plan, and the plan 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.

This plan is limited to address listed salmonid species. If any threatened or endangered species were introduced into an area where it has been designated as extirpated, this population would be treated as an experimental population under Section 10(j) or other mechanisms under ESA and would not increase ESA liabilities for landowners.

Regional Setting

This recovery plan is intended for implementation within the Upper Columbia River Basin, which includes the Columbia River and its tributaries upstream of the confluence of the Yakima River to the base of Chief Joseph Dam. The Upper Columbia Basin consists of six major "subbasins" (Crab, Wenatchee, Entiat, Lake Chelan, Methow, and Okanogan subbasins), several smaller watersheds, and the mainstem Columbia River. This area captures the distribution of Upper Columbia River spring Chinook, steelhead, and bull trout.

Currently, there are three independent populations of spring Chinook within the Upper Columbia Evolutionarily Significant Unit (Wenatchee, Entiat, and Methow) and five steelhead populations (Wenatchee, Entiat, Methow, Okanogan and Crab Creek populations) within the Upper Columbia steelhead Distinct Population Segment (DPS). Spring Chinook in the U.S. portion of the Okanogan subbasin have been extirpated, while Chinook in Canada have been proposed for endangered listing under the "Species at Risk Act." There are three "core" areas supporting bull trout populations (Wenatchee, Entiat, and Methow subbasins) and two areas designated as "unknown occupancy" (Lake Chelan and Okanogan subbasins) in the Upper Columbia Basin.

This plan emphasizes recovery of three spring Chinook populations (Wenatchee, Entiat, and Methow populations), four steelhead populations (Wenatchee, Entiat, Methow, and Okanogan populations), and recovery of bull trout within the Wenatchee, Entiat, and Methow subbasins.

Plan Development

The process of developing this plan began with identification of priority species—spring Chinook, steelhead, and bull trout—based on ESA listings and their population status (abundance, productivity, spatial structure, and diversity). Empirical information, when available, was used to determine current population status and threats. In cases where empirical information was lacking, derived data (from modeling), preliminary analysis, local knowledge or professional judgment (based on literature review or experience with similar conditions or factors) were used to identify threats. Limiting factors were then identified from the threats (both past and present).

Recovery objectives and criteria were identified by the Interior Columbia Basin Technical Recovery Team (ICBTRT) in collaboration with Upper Columbia technical committees. Categories of recovery actions were then recommended that addressed primary limiting factors within each sector (Harvest, Hatcheries, Hydro, and Habitat). In developing the plan it became clear that recovery objectives and criteria could not be met by implementing actions within only one sector (i.e., Habitat). Recovery of listed species requires implementation of actions within all sectors, including actions implemented outside the Upper Columbia Basin (e.g., within the lower Columbia River, estuary, and ocean).

Implementation of specific recovery actions will be coordinated with local stakeholders and jurisdictions that determine the feasibility of recommend actions, including socio-economic interests, benefits, and costs.

Current Status of Listed Populations

Spring Chinook

Spring Chinook begin returning from the ocean in the early spring, with the run into the Columbia River peaking in mid-May. Spring Chinook enter the Upper Columbia tributaries from April through July. After migration, they hold in freshwater tributaries until spawning occurs in the late summer, peaking in mid to late August. Juvenile spring Chinook spend a year in freshwater before migrating to salt water in the spring of their second year of life. Most Upper Columbia spring Chinook return as adults after two or three years in the ocean. Some precocious males, or jacks, return after one winter at sea. A few other males mature sexually in freshwater without migrating to the sea. The run, however, is dominated by four- and five-year-old fish that

have spent two and three years at sea, respectively. Fecundity ranges from 4,200 to 5,900 eggs, depending on the age and size of the female.

The risk of extinction over a 100-year period for spring Chinook within the Upper Columbia Basin was determined by following the guidance of the ICBTRT (2004, 2005). Risk of extinction was estimated for abundance/productivity and spatial structure/diversity.

Wenatchee Population

When considering the factors that determine diversity and spatial structure, the Wenatchee spring Chinook population is currently considered to be at a high risk of extinction because of the loss of naturally produced Chinook spawning in tributaries downstream from Tumwater Canyon. In addition, the Wenatchee spring Chinook population is currently not viable with respect to abundance and productivity and has a greater than 25% chance of extinction in 100 years. In sum, the Wenatchee spring Chinook population is not currently viable and has a high risk of extinction.

Entiat Population

When considering the factors that determine diversity and spatial structure, the Entiat spring Chinook population is currently considered to be at high risk. The Entiat spring Chinook population is currently not viable with respect to abundance and productivity and has a greater than 25% chance of extinction in 100 years. In sum, the Entiat spring Chinook population is not currently viable and has a high risk of extinction.

Methow Population

When considering the factors that determine diversity and spatial structure, the Methow spring Chinook population is currently considered to be at a high risk of extinction. Based on abundance and productivity, the Methow spring Chinook population is not viable and has a greater than 25% chance of extinction in 100 years. In sum, the Methow spring Chinook population is not currently viable and has a high risk of extinction.

Okanogan Population

Spring Chinook in the Okanogan subbasin are currently extinct. The Colville Tribes are working to reintroduce spring Chinook into the subbasin. This population would be treated as an experimental population under ESA Section 10(j) or other mechanisms under ESA that would not increase ESA liabilities to landowners.

Steelhead

The life-history pattern of steelhead in the Upper Columbia Basin is complex. Adults return to the Columbia River in the late summer and early fall. Unlike spring Chinook, most steelhead do not move upstream quickly to tributary spawning streams. A portion of the returning run overwinters in the mainstem reservoirs, passing over the Upper Columbia River dams in April and May of the following year. Spawning occurs in late spring of the calendar year following entry into the river. Currently, and for the past 20+ years, most steelhead spawning in the wild are hatchery fish. The effectiveness of hatchery fish spawning in the wild compared to naturally produced spawners is unknown at this time and may be a major factor in reducing steelhead productivity.

Juvenile steelhead generally spend one to three years rearing in freshwater before migrating to the ocean, but can spend as many as seven years in freshwater before migrating. Most adult steelhead return to the Upper Columbia after one or two years at sea. Steelhead in the Upper Columbia have a relatively high fecundity, averaging between 5,300 and 6,000 eggs.

Steelhead can residualize (lose the ability to smolt) in tributaries and never migrate to sea, thereby becoming resident rainbow trout. Conversely, progeny of resident rainbow trout can migrate to the sea and thereby become steelhead. Despite the apparent reproductive exchange between resident and anadromous *O. mykiss*, the two life forms remain separated physically, physiologically, ecologically, and behaviorally (70 FR 67130). Given this separation, NMFS (70 FR 67130) proposed that the anadromous steelhead populations are discrete from the resident rainbow trout populations. Therefore, this plan only addresses the recovery of anadromous steelhead. Resident rainbow trout are not included in the recovery of steelhead.

The risk of extinction over a 100-year period for steelhead within the Upper Columbia Basin was determined by following the guidance of the ICBTRT (2004b, 2005a). Risk of extinction was estimated for abundance/productivity and spatial structure/diversity.

Wenatchee Population

When considering the factors that determine diversity and spatial structure, the Wenatchee steelhead population is currently considered to be at a high risk of extinction. Based only on abundance and productivity, the naturally produced Wenatchee steelhead population is not viable and has a greater than 25% chance of extinction in 100 years. In sum, the Wenatchee steelhead population is not currently viable and has a moderate to high risk of extinction.

Entiat Population

When considering the factors that determine diversity and spatial structure, the Entiat steelhead population is currently considered to be at a high risk of extinction. Based only on abundance and productivity, the Entiat steelhead population is not viable and has a greater than 25% chance of extinction in 100 years. In sum, the Entiat steelhead population is not currently viable and has a moderate to high risk of extinction.

Methow Population

When considering the factors that determine diversity and spatial structure, the Methow steelhead population is currently considered to be at a high risk of extinction. Based only on abundance and productivity, the Methow steelhead population is not viable and has a greater than 25% chance of extinction in 100 years. In sum, the Methow steelhead population is not currently viable and has a moderate to high risk of extinction.

Okanogan Population

When considering the factors that determine diversity and spatial structure, the Okanogan steelhead population is currently considered to be at a high risk of extinction. Based on abundance and productivity, the Okanogan steelhead population is not viable and has a greater than 25% chance of extinction in 100 years. In sum, the Okanogan steelhead population is not currently viable and has a high risk of extinction.

Bull Trout

Bull trout in the Upper Columbia Basin exhibit both resident and migratory life-history strategies. Resident bull trout complete their entire life cycle in the tributary stream in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear one to four years before migrating to either a lake (adfluvial form) or river (fluvial form). Migrating bull trout have been observed within spawning tributaries as early as the end of June, while spawning occurs in mid-September to late October/early November. Resident and migratory forms may be found together, and either form may give rise to offspring exhibiting either resident or migratory behavior.

The size and age of bull trout at maturity depends upon life-history strategy. Resident fish tend to be smaller than migratory fish at maturity and produce fewer eggs. Bull trout usually reach sexual maturity in four to seven years and may live longer than 12 years. Bull trout spawn in the fall typically in cold, clean, low-gradient streams with loose, clean gravel. Bull trout at all life stages are associated with complex forms of cover including large woody debris, undercut banks, boulders, and pools.

The U.S. Fish and Wildlife Service has not developed guidance for estimating risk of extinction of Upper Columbia bull trout. Therefore, what follows is a summary of the current status of bull trout without a determination of extinction risk.

Wenatchee Core Area

Abundance and productivity of bull trout in the Wenatchee subbasin is based on redd surveys. However, redd survey procedures have changed over time and different streams have different survey periods. Surveys from 2000-2004 were conducted consistently across all populations and redd counts during this period ranged from 309 to 607 in the core area.

For streams with long-term redd counts, numbers of redds have increased over time (e.g., Chiwawa basin). However, there is a fair amount of variability in all the other populations. Number of redds for Little Wenatchee, Nason Creek, Ingalls Creek, and Chiwaukum Creek are very low. Although both migratory and multiple size classes of resident bull trout are present in upper Icicle Creek, spawning areas are currently unknown. No bull trout redd surveys have been conducted in Icicle Creek.

Bull trout currently occur in the Chiwawa River, White River, Little Wenatchee River, Nason Creek, Chiwaukum Creek, Icicle Creek, Peshastin Creek, Negro Creek, and Ingalls Creek drainages. Adfluvial, fluvial, and resident forms of bull trout exist in the Wenatchee subbasin.

Entiat Core Area

Numbers of bull trout redds in the Entiat subbasin have ranged from 10 to 52 redds in the Mad River and 0 to 46 redds in the Entiat River. A large increase in numbers of redds counted in the Entiat River in 2004 resulted from increasing the survey area and changes in survey effort.

Numbers of bull trout redds in the Entiat subbasin have increased since they were first counted in 1989, suggesting an increasing trend in production.

Bull trout occur in both the Mad and Entiat rivers. It is assumed that most of the bull trout in the Entiat subbasin are fluvial fish, with perhaps a resident form in the upper reaches of the Mad

River drainage. Bull trout have been observed in Tillicum and Stormy creeks. Recent studies suggest that bull trout from this core area use the mainstem Columbia River for overwintering habitat and foraging.

Methow Core Area

Bull trout redd surveys in the Methow subbasin began in the early 1990s. Total numbers of redds within the subbasin have ranged from 4 to 195 redds. However, these are not valid estimates of abundance, because not all bull trout spawning streams were surveyed annually, lengths of surveys reaches have changed within a given stream, and survey methods have changed over time. Based on more recent surveys (2000-2004), when survey methods were more similar, redd counts ranged from 127 to 195.

Numbers of redds counted in the Methow subbasin appear to have increased since the mid-1990s. However, this trend is an artifact of changing survey methods. Looking at recent years (2000-2004), when survey methods were similar, there was a fairly stable number of redds ranging from 147 in 2000 to 148 in 2004. Currently, there is insufficient data to establish a trend for the entire core area. In the Twisp and the Upper Methow areas, redd counts are highly variable, but reveal a decreasing trend since 2000.

Currently bull trout occur within the Twisp River, Chewuch River, Lake Creek, Wolf Creek, Early Winters Creek, Upper Methow River, Lost River, Beaver Creek, Gold Creek and Libby Creek, and Goat Creek drainages. Bull trout exist upstream of the anadromous fish barrier on Early Winters Creek, Wolf Creek, Beaver Creek, and the Lost River. The population structure of the Lost River is unknown, but likely contributes to the genetic diversity of the Methow core population. Resident, fluvial, and adfluvial forms still occur in the Methow subbasin.

Limiting Factors and Threats

Some human activities acting in concert with natural occurrences (e.g., drought, floods, landslides, fires, debris flows, and ocean cycles) have impacted the abundance, productivity, spatial structure, and diversity of Upper Columbia spring Chinook salmon, steelhead, and bull trout populations, resulting in these species being listed under the ESA. Coho salmon and some populations of spring Chinook and bull trout have been lost from the region. Lasting effects from some of these early activities may still act to limit fish production in the Upper Columbia Basin. Threats from some current activities are also present in the Upper Columbia Basin.

Populations of spring Chinook and steelhead within the Upper Columbia River Basin were first affected by the intensive commercial fisheries in the lower Columbia River. These fisheries began in the latter half of the 1800s and continued into the 1900s and nearly eliminated many salmon and steelhead stocks. With time, the construction of dams and diversions, some without passage, blocked salmon and steelhead migrations, isolated or fragmented bull trout populations, and killed upstream and downstream migrating fish. Early hatcheries constructed to mitigate for fish loss at dams and loss of spawning and rearing habitat were operated without a clear understanding of population genetics, where fish were transferred without consideration of their actual origin. Although hatcheries were increasing the abundance of stocks, they were probably also decreasing the diversity and productivity of populations they intended to supplement.

Concurrent with these historic activities, human population growth within the basin was increasing and land uses, in many cases encouraged and supported by governmental policy, were

in some areas impacting salmon and trout spawning and rearing habitat. In addition, non-native species were introduced by both public and private interests throughout the region that directly or indirectly affected salmon and trout. These activities acting in concert with natural disturbances decreased the abundance, productivity, spatial structure, and diversity of Chinook salmon, steelhead, and bull trout in the Upper Columbia Basin.

Presently, harvest has been greatly reduced from historic levels, dams are being changed and operated in ways that increase passage and reservoir survival, hatcheries are in some cases being managed to address spatial structure and diversity issues, and habitat degradation is being reduced by implementation of recovery projects, voluntary efforts of private landowners, irrigators, and local governments, and improved land management practices on public and private lands. Nevertheless, additional actions are needed within all sectors (Harvest, Hatchery, Hydro, and Habitat) in order for listed stocks in the Upper Columbia Basin to recover.

There are a number of threats that may continue to limit the recovery of ESA-listed fish species in the Upper Columbia Basin. These threats can be organized according to the five categories as set forth in Section 4(a)(1) of the ESA and all apply to this recovery plan:

- The present or threatened destruction, modification, or curtailment of its habitat or range.
- Overutilization for commercial, recreational, scientific, or educational purposes.
- Disease or predation.
- Inadequacy of existing regulatory mechanisms.
- Other natural or human-made factors affecting its continued existence.
- Current threats include:
- The following threats were identified in the Federal Register Rules and Regulation at the time the species were listed. Actions identified within this plan address these threats.

The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

- Although land and water management activities have improved, factors such as dams, diversions, roads and railways, some aspects of agriculture (including livestock grazing) residential development, and some historic forest management continue to threaten spring Chinook, steelhead, and bull trout and their habitat in some locations in the Upper Columbia Basin.
- Water diversions without proper passage routes disrupt migrations of listed fish species.
- Unscreened diversions trap or divert juvenile spring Chinook, steelhead, and bull trout resulting in reduced survival.
- Hydroelectric passage mortality reduces abundance of migrant spring Chinook, steelhead, and bull trout.
- Sedimentation from land and water management activities is a cause of habitat degradation in some salmon and trout streams.

- Loss of habitat complexity, off-channel habitat, and large, deep pools due to sedimentation and loss of pool-forming structures such as boulders and large woody debris reduces survival of listed fish species and threatens their habitat in some locations in the Upper Columbia Basin.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

- The effects of incidental mortality on naturally produced spring Chinook, steelhead, and bull trout may increase during recreational fishing for hatchery fish or other species.
- Harvest of bull trout because of misidentification continues under existing fishing regulations.
- Incidental harvest mortality in mixed-stock and commercial fisheries contributes to the loss of naturally produced spring Chinook and steelhead.
- Illegal harvest (poaching) continues to threaten listed fish species.

Disease or Predation

- The presence of non-native species has resulted in increased predator populations that prey on listed fish species and/or compete with listed fish.
- Increased predation by northern pikeminnow affects the survival of downstream migrating spring Chinook, steelhead, and bull trout.
- Predation by pinnipeds (marine mammals) and birds are also a threat to spring Chinook and steelhead.

Inadequacy of Existing Regulatory Mechanisms

- The implementation and enforcement of existing Federal and State laws designed to conserve fishery resources, maintain water quality, and protect aquatic habitat have not been entirely successful in preventing past and ongoing habitat degradation.
- Although the Washington State Growth Management Act and Shoreline Management Act have been significantly changed to improve management, conditions and protection efforts for listed species and compliance monitoring (enforcement) have lagged behind because of a lack of political support and funding.
- The extent and distribution of Federal lands limits the ability of the Northwest Forest Plan and PACFISH/INFISH to achieve its aquatic habitat restoration objectives at watershed and river basin scales.
- The “base” State of Washington Forest Practice Rules do not adequately address large woody debris recruitment, tree retention to maintain stream bank integrity and channel networks within floodplains, and chronic and episodic inputs of coarse and fine sediment that maintain habitat that are properly functioning for all life stages of listed fish species.
- The Federal Clean Water Act has not been completely implemented and therefore has not been completely successful in protecting listed fish species, particularly with respect to non-point sources of pollution.

Other Natural or Human-Made Factors Affecting its Continued Existence

- Natural conditions (e.g., fires, floods, droughts, landslides, etc.) can exacerbate the problems associated with degraded and altered aquatic habitats.
- Drought conditions reduce already limited spawning, rearing, and migration habitat.
- Poor ocean conditions (e.g., less upwelling, warm surface waters, etc.) negatively affect spring Chinook and steelhead production.
- The use of non-locally derived broodstock for hatchery programs may negatively affect genetic integrity.
- Introduction of brook trout threatens bull trout through hybridization, competition, and predation.
- The collection of naturally produced spring Chinook and steelhead for hatchery broodstock may harm small or dwindling natural populations if not done with caution.
- Competition, genetic introgression, and disease transmission resulting from hatchery introductions may reduce the productivity and survival of naturally produced spring Chinook and steelhead.

Recovery Goals

Recovery requires reducing or eliminating threats to the long-term persistence of fish populations, maintaining widely distributed and connected fish populations across diverse habitats of their native ranges, and preserving genetic diversity and life-history characteristics. To be consistent with the vision and goals of this plan, listed populations must meet specific *abundance*, *productivity*, *spatial structure*, and *diversity* objectives and criteria. This plan refers to these parameters as the four "viable salmonid population" (VSP) parameters.

Because listed anadromous fish species and bull trout have different life-history characteristics, this plan recommends different recovery goals for the different species. The specific goal for spring Chinook and steelhead is:

- **To secure long-term persistence of viable populations of naturally produced spring Chinook and steelhead distributed across their native range.**

Recovery of the Upper Columbia spring Chinook ESU will require the recovery of the Wenatchee, Entiat, and Methow populations. Recovery of the Upper Columbia steelhead DPS will require the recovery of the Wenatchee, Entiat, Methow, and Okanogan populations, but not the Crab Creek population. This plan deviates from the most recent recommendation of the ICBTRT (December 2005) that at least two populations within the ESU and DPS must meet abundance/productivity criteria that represent a 1% extinction risk over a 100-year period. This plan requires that all populations within the spring Chinook ESU and the steelhead DPS (save the Crab Creek steelhead population) meet abundance/productivity criteria that represent 5% extinction risk over a 100-year period.

The specific goal for bull trout is:

- **To secure long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed across the native range of the species.**

This plan recognizes the importance of providing valid metrics for tributary productivity. It is the policy of the UCSRB to emphasize juvenile salmonid productivity within each tributary as the primary indicator of habitat restoration success for each basin in the Upper Columbia. This will be accomplished primarily by evaluating "smolts per spawner" and/or "smolts per redd." Although this plan does not identify specific recovery criteria based on these factors, this will allow a consistent approach to evaluate the level of success for restoration and recovery actions in the Upper Columbia and the quality of habitat in tributaries.

Recovery Objectives

Because spring Chinook and steelhead are currently listed as *endangered* under the ESA, this plan identifies two levels of objectives for them. The first identifies objectives related to reclassifying the species as *threatened* and the second relate to recovery (delisting).

Spring Chinook and Steelhead Reclassification Objectives

- Increase the abundance and productivity of naturally produced spring Chinook and steelhead within each population in the Upper Columbia ESU to levels that would lead to reclassification of the ESU and DPS as threatened under the ESA.

- Increase the current distribution of naturally produced spring Chinook and steelhead in the Upper Columbia ESU and DPS and conserve genetic and phenotypic diversity.

Spring Chinook and Steelhead Recovery Objectives

- Increase the abundance of naturally produced spring Chinook and steelhead spawners within each population in the Upper Columbia ESU and DPS to levels considered viable.

- Increase the productivity (spawner:spawner ratios and smolts/redds) of naturally produced spring Chinook and steelhead within each population to levels that result in low risk of extinction.

- Restore the distribution of naturally produced spring Chinook and steelhead to previously occupied areas where practical and allow natural patterns of genetic and phenotypic diversity to be expressed.

Bull trout in the Upper Columbia Basin are currently listed as *threatened* under the ESA. Therefore this plan only identifies recovery objectives. It is important to note that core populations within the Upper Columbia Basin make up only a portion of the total Columbia Basin population. Therefore, even if the core populations within the Upper Columbia meet recovery objectives and criteria, the population may not be de-listed if other core populations throughout the Columbia Basin do not meet their objectives and criteria.

Bull Trout Recovery Objectives

- Increase the abundance of adult bull trout within each core population in the Upper Columbia Basin to levels that are considered self sustaining.

- Maintain stable or increasing trends in abundance of adult bull trout within each core population in the Upper Columbia River Basin.

- Maintain the current distribution of bull trout in all local populations, restore distribution to previously occupied areas where practical, maintain and restore the migratory form and connectivity within and among each core area, conserve genetic diversity, and provide for genetic exchange.

Recovery Criteria

The following criteria developed for recovery of naturally produced spring Chinook, steelhead, and bull trout address quantitative and qualitative measurements of abundance, productivity, spatial structure, and diversity on a population or core population basis.

Spring Chinook Reclassification Criteria

- Abundance and productivity (based on 8-year geometric mean) of naturally produced spring Chinook within the Wenatchee, Entiat, and Methow populations must reach levels that would have less than a 10% risk of extinction over a 100-year period.

- Processes affecting spatial structure must result in at least a ***moderate*** or lower risk assessment for naturally produced spring Chinook within the Wenatchee, Entiat, and Methow populations and all factors considered "high" risk would have been addressed.

- Processes affecting diversity will result in at least a ***moderate*** or lower risk assessment for naturally produced spring Chinook within the Wenatchee, Entiat, and Methow populations and all factors considered "high" risk would have been addressed.

Spring Chinook Recovery Criteria

- Abundance and productivity (based on 12-year geometric mean) of naturally produced spring Chinook within the Wenatchee, Entiat, and Methow populations must reach levels that would have less than a 5% risk of extinction over a 100-year period.

- At a minimum, the Upper Columbia Spring Chinook ESU will have a productivity greater than 1.0 and maintain at least 4,500 naturally produced spawners distributed among the three populations as follows:

Population	Abundance	Productivity (Spawner:Spawner)
Wenatchee	2,000	1.2
Entiat	500	1.4
Methow	2,000	1.2

- Over a 12-year period, naturally produced spring Chinook will use currently occupied spawning areas throughout the ESU according to the following population-specific criteria:

Wenatchee

Naturally produced spring Chinook spawning will occur within four of the five major spawning areas in the Wenatchee subbasin (Chiwawa River, White River, Nason Creek, Little Wenatchee River, or Wenatchee River) and within one minor spawning area downstream from Tumwater Canyon (Chumstick Creek, Peshastin Creek, Icicle Creek, or Mission Creek). The minimum number of naturally produced spring Chinook redds within each major spawning area will be either 5% of the total number of redds within the Wenatchee subbasin or at least 20 redds within each major area, whichever is greater.

Entiat

Naturally produced spring Chinook will spawn within the one major spawning area within the Entiat subbasin.

Methow

Naturally produced spring Chinook spawning will occur within the Twisp, Chewuch, and Upper Methow major spawning areas. The minimum number of naturally produced spring Chinook redds within each major spawning area will be either 5% of the total number of redds within the Methow subbasin or at least 20 redds within each major area, whichever is greater.

- Processes affecting spatial structure will result in a ***moderate*** or lower risk assessment for naturally produced spring Chinook within the Wenatchee, Entiat, and Methow populations and all factors considered "high" risk would have been addressed.
- Processes affecting diversity will result in a ***moderate*** or lower risk assessment for naturally produced spring Chinook within the Wenatchee, Entiat, and Methow populations and all factors considered "high" risk would have been addressed.

Steelhead Reclassification Criteria

- Abundance and productivity (based on 8-year geometric mean) of naturally produced steelhead with in the Wenatchee, Entiat, Methow, and Okanogan populations must reach levels that would have less than a 10% risk of extinction over a 100-year period.
- Processes affecting spatial structure must result in at least a **moderate** or lower risk assessment for naturally produced steelhead within the Wenatchee, Entiat, Methow, and Okanogan populations and all factors considered "high" risk will have been addressed.
- Processes affecting diversity will result in at least a **moderate** or lower risk assessment for naturally produced steelhead within the Wenatchee, Entiat, Methow, and Okanogan populations and all factors considered "high" risk will have been addressed.

Steelhead Recovery Criteria

- Abundance and productivity (based on 12-year geometric mean) of naturally produced steelhead within the Wenatchee, Entiat, Methow, and Okanogan populations must reach levels that would have less than a 5% risk of extinction over a 100-year period.

- At a minimum, the Upper Columbia Steelhead DPS will have a productivity greater than 1.0 and maintain at least 3,000 spawners distributed among the four populations as follows:

Population	Abundance	Productivity (Spawner:Spawner)
Wenatchee	1,000	1.1
Entiat	500	1.2
Methow	1,000	1.1
Okanogan	500[1]	1.2

- Over a 12-year period, naturally produced steelhead will use currently occupied spawning areas throughout the DPS according to the following population-specific criteria:

Wenatchee

Naturally produced steelhead spawning will occur within four of the five major spawning areas in the Wenatchee Subbasin (Chiwawa River, Nason Creek, Icicle Creek, Peshastin Creek, or Chumstick Creek). The minimum number of naturally produced steelhead redds within four of the five major spawning areas will be either 5% of the total number of redds within the Wenatchee population or at least 20 redds within four of the five major areas, whichever is greater.

Entiat

Naturally produced steelhead will spawn within the two major spawning areas within the Entiat subbasin (Middle Entiat and Mad rivers). The minimum number of naturally produced steelhead redds within the two major spawning areas will be either 5% of the total number of redds within the Entiat population or at least 20 redds within major areas, whichever is greater.

Methow

Naturally produced steelhead spawning will occur within three of the four major spawning areas (Twisp, Chewuch, Beaver, or Upper Methow). The minimum number of naturally produced steelhead redds within each major spawning area will be either 5% of the total number of redds within the Methow subbasin or at least 20 redds within each major area, whichever is greater.

Okanogan

Steelhead spawning will occur within the two major spawning areas (Salmon and Omak Creeks) and within at least two of the five minor spawning areas (Ninemile, Whitestone, Bonaparte, Antoine, or Loup Loup). The minimum number of naturally produced steelhead redds within the major spawning areas will be either 5% of the total number of

[1] The Interior Columbia Basin Technical Recovery Team has determined that 500 naturally produced steelhead adults will meet the minimum abundance recovery criteria within the U.S. portion of the Okanogan subbasin. If the Canadian portion of the Okanogan subbasin is included, the minimum abundance recovery criteria would be 1,000 naturally produced steelhead adults.

redds within the Okanogan subbasin or at least 20 redds within each area, whichever is greater.

- Processes affecting spatial structure will result in a ***moderate*** or lower risk assessment for naturally produced steelhead within the Wenatchee, Entiat, Methow, and Okanogan populations and all factors considered "high" risk would have been addressed.

- Processes affecting diversity will result in a ***moderate*** or lower risk assessment for naturally produced steelhead within the Wenatchee, Entiat, Methow, and Okanogan populations and all factors considered "high" risk would have been addressed.

Bull Trout Recovery Criteria

- The abundance of Upper Columbia bull trout will increase and maintain a 12-year geometric mean of 4,144-5,402 spawners, distributed among the three core areas as follows:

Population	Abundance
Wenatchee	1,612-2,257
Entiat	298-417
Methow	1,234-1,728[2]

- The trend in numbers of bull trout redds (an index of numbers of spawners) within each population in the core areas (Wenatchee, Entiat, and Methow) is stable or increasing over a 12-year period.

- Bull trout will use spawning areas throughout the Upper Columbia Basin according to the following population-specific criteria:

Wenatchee

Bull trout spawning will occur within the seven interconnected areas (Chiwawa, White, Little Wenatchee, Nason, Icicle, Chiwaukum, and Peshastin), with 100 or more adults spawning annually within three to five areas.

Entiat

Bull trout spawning will occur within the two interconnected areas (Entiat and Mad), with 100 or more adults spawning annually in both areas.

Methow

Bull trout spawning will occur within the ten interconnected areas (Gold, Twisp, Beaver, Chewuch, Lake Creek, Wolf, Early Winters, Upper Methow, Goat, and Lost), with 100 or more adults spawning annually within three to four areas.

- The migratory form of bull trout and connectivity within and among core areas must be present.

[2] This criterion does not include bull trout in the Lost River drainage.

Strategy for Recovery

This plan recommends recovery actions for all sectors (Harvest, Hatchery, Hydro, and Habitat) that affect populations of spring Chinook, steelhead, and bull trout in the Upper Columbia Basin. Several ongoing processes, including the redevelopment of the biological opinion for the Federal Columbia River Power System (FCRPS) and *U.S. v. Oregon*, are expected to produce new or amended strategies and actions. Some of the recovery actions recommended in this plan were developed in other forums or processes (e.g., Public Utility District Habitat Conservation Plans) and are incorporated with little or no modification. Several have already been implemented to the benefit of one or more of the viable salmonid population parameters (abundance, productivity, spatial structure, and diversity) of populations in the Upper Columbia Basin.

Identified in this plan are **306** recovery actions to be implemented within the Upper Columbia Basin. By sector, there are 87 harvest actions, 50 hatchery actions, 16 hydro project actions, and 153 habitat actions. In addition, there are **188** monitoring and research actions, which, when broken down by sector is 55 harvest actions, 76 hatchery actions, 8 hydro project actions, and 49 habitat actions. One or more actions are associated with each of the following objectives within each sector.

All the recommended recovery objectives and actions identified in this plan may be modified in response to monitoring, research, and adaptive management and as determinations made in other processes such as the FCRPS Biological Opinion, *U.S. v Oregon*, and hatchery reform programs. Any modification, especially those that change the regulatory environment or impose additional costs or restrictions on private property and water rights, shall be submitted for public review and comment by local governments and stakeholders, and approved by the UCSRB before implementation.

Harvest

Harvest objectives for treaty and non-treaty salmon and steelhead fisheries in the Columbia River Basin are set by the applicable state, tribal, and federal agencies. Fishery objectives from McNary Dam to the mouth of the Columbia River (fishing zones 1-6) are established by state, tribal, and federal parties in *U.S. v Oregon*. In developing management plans under *U.S. v Oregon*, the parties recognize the necessity of managing the fisheries to provide spawning escapement to the various tributary production areas, including the Upper Columbia tributaries covered in this plan. At the same time, they seek to provide meaningful treaty and non-treaty fishing opportunities in zones 1-6, targeting the more productive natural and hatchery stocks, and, where possible, allow fish to pass through to provide tributary fishing opportunities.

The following objectives for harvest apply not only to the Upper Columbia Basin, but also include the entire Columbia River. This plan will strengthen the likelihood that all actions and mitigation associated with harvest throughout the Columbia River are consistent with recovery of Upper Columbia spring Chinook, steelhead, and bull trout. These objectives are intended to reduce threats associated with harvest.

Short-Term Objectives

- Use selective harvest techniques to constrain harvest on naturally produced fish at the currently reduced rates in the Upper Columbia Basin.

- Use selective harvest techniques to preserve fishery opportunities in the Upper Columbia Basin that focus on hatchery produced fish that are not needed for recovery.
- Recommend that parties of *U.S. v Oregon* incorporate Upper Columbia viable salmonid population criteria when formulating fishery plans affecting Upper Columbia spring Chinook and steelhead.
- Increase effective enforcement of fishery rules and regulations.
- Appropriate co-managers/fisheries management agencies should work with local stakeholders to develop tributary fisheries management goals and plans.

Long-Term Objectives

- Provide opportunities for increased tributary harvest consistent with recovery.
- Incorporate Upper Columbia viable salmonid population criteria when formulating fishery plans affecting Upper Columbia spring Chinook and steelhead.

Research and Monitoring Objectives

- Research and employ best available technology to reduce incidental mortality of non-target fish in selective fisheries.
- Monitor the effects of incidental take on naturally produced populations in the Upper Columbia Basin.
- Improve estimates of harvested fish and indirect harvest mortalities in freshwater and ocean fisheries.
- Initiate or continue monitoring and research to improve management information, such as the timing of the various run components through the major fisheries.

This plan balances these harvest objectives with the federal government's trust obligations to Native Americans and integrates efforts from the following harvest programs: Pacific Fishery Management Council, the Pacific Salmon Commission, and the Columbia River mainstem and tributary fisheries.

Hatcheries

This plan recognizes that hatchery strategies and actions have been reviewed and considered in several ongoing processes. The following objectives for hatchery programs apply to both federal and state-operated facilities in the Upper Columbia Basin and are intended to be consistent with these ongoing processes. The identified objectives are intended to be consistent with other plans and should reduce the threats associated with hatchery production in the Upper Columbia Basin while meeting other obligations. Actions and mitigation associated with hatcheries throughout the Upper Columbia River Basin should not preclude the recovery of Upper Columbia spring Chinook, steelhead, and bull trout. Additionally, future hatchery facilities will support recovery goals, and minimize and mitigate any impacts (including objectives within other sectors).

Short-Term Objectives

- Continue to use artificial production to maintain critically depressed populations in a manner that is consistent with recovery and avoids extinction.
- Use artificial production to seed unused, accessible habitats.
- Use artificial production to provide for tribal and non-tribal fishery obligations as consistent with recovery criteria.
- Use harvest or other methods to reduce the proportion of hatchery-produced fish in naturally spawning populations.
- To the extent possible use local broodstocks in hatchery programs.
- To the extent possible, integrate federal, state, and tribal-operated hatchery programs that use locally derived stocks.[3]

Long-Term Objectives

- Phase out the use of out-of-basin stock in the federal programs at Leavenworth and Entiat National Fish Hatcheries if continued research indicates that the programs threaten recovery of listed fish and those threats cannot be minimized through operational or other changes.
- Strive to make ongoing hatchery programs consistent with recovery.
- Provide for tribal and non-tribal fishery obligations.
- Use harvest or other methods to reduce the proportion of hatchery produced fish in naturally spawning populations.
- Manage hatcheries to achieve sufficient natural productivity and diversity to de-list populations and to avert re-listing of populations.

Research and Monitoring Objectives

- Employ the best available technology to monitor the effects of hatchery releases on natural populations and production.
- Develop marking programs to assure that hatchery produced fish are identifiable for harvest management, escapement goals, and reproductive success studies.
- Evaluate existing programs and redesign as necessary so that artificial production does not pose a threat to recovery.
- Integrate and coordinate monitoring activities between federal, state, and tribal programs.
- Examine the reproductive success of naturally and hatchery produced spring Chinook and steelhead spawning in the wild.

[3] Because state and federal hatchery programs have different objectives and obligations, the programs cannot be fully integrated. However, they can develop common broodstock protocols and production levels that optimize recovery of naturally produced fish.

- Examine steelhead kelt reconditioning and their reproductive success.
- Continue studies to assess the effects of the coho reintroduction program.
- Examine the interactions (competition and predation) between naturally and hatchery produced steelhead.
- Continue to examine residualism of hatchery produced steelhead.
- Examine the feasibility of reintroducing bull trout (including ESA status of introduced stock) into the Chelan and Okanogan subbasins.
- Examine the feasibility (including ESA status of introduced stock) of reintroducing spring Chinook into the Okanogan subbasin.

This plan recognizes the need to balance hatchery recovery objectives with legal obligations and mandates under Habitat Conservation Plans, the Mitchell Act, federal government and tribal agreements, Hatchery and Genetic Management Plans, *U.S. v. Oregon*, and relicensing agreements.

Hydro Projects

Upper Columbia ESU and DPS migrate through four federally owned projects and three to five projects owned by public utility districts (PUDs). The four federally owned projects include McNary, John Day, The Dalles, and Bonneville dams, power plants, and reservoirs in the lower Columbia River. These projects are part of the FCRPS. Projects owned and operated by public utility districts include Wells (Douglas County PUD), Rocky Reach and Rock Island (Chelan County PUD), and Wanapum and Priest Rapids dams (Grant County PUD). These projects are licensed by the Federal Energy Regulatory Commission.

This plan recognizes that hydro strategies and actions have been reviewed and considered in several ongoing processes, including FCRPS Section 7 consultations (for the lower four federal dams on the Columbia River). The following objectives are intended to be consistent with these processes; however, they apply primarily to the projects owned by the PUDs. These objectives are consistent with the Anadromous Fish Agreement and Habitat Conservation Plans (HCPs), Priest Rapids Salmon and Steelhead Settlement Agreement, and Section 7 Consultations. This plan strengthens the likelihood that all actions and mitigation associated with hydro projects throughout the Columbia River are consistent with recovery of Upper Columbia spring Chinook, steelhead, and bull trout. These objectives are intended to reduce the threats associated with hydroelectric development in the Upper Columbia Basin.

Short-Term Objectives

- Continue the actions identified in the Anadromous Fish Agreement and HCPs that will achieve no net impact for Upper Columbia steelhead and spring Chinook.
- Implement the actions identified in the Settlement Agreement and Section 7 Consultation with Grant PUD that will improve spring Chinook and steelhead survival.

- Implement the actions identified in the U.S. Fish and Wildlife Service biological/conferencing opinion with Douglas and Chelan PUDs that will improve conditions for Upper Columbia bull trout.
- Implement the actions identified in the Lake Chelan Hydroelectric Project relicensing agreement that will provide suitable spawning habitat for steelhead in the tailrace and lower Chelan River (downstream from the natural fish barriers).
- Strive to build hydroelectric dams proposed for construction in the future in the Upper Columbia Basin that have no negative effect on spring Chinook, steelhead, and bull trout viable salmonid population parameters.
- Encourage the implementation of actions for federal hydroelectric projects identified in the remanded Federal Columbia River Power System biological opinion.

Long-Term Objectives

- Provide upstream and downstream passage for juvenile/smolt and adult life stages.
- Implement the actions identified in the Lake Chelan Comprehensive Fishery Management Plan to determine the feasibility and possible reintroduction of bull trout into the basin.
- Achieve no-net-impact on species covered under the Anadromous Fish Agreement, HCPs, and Section 7 Consultations.
- Maintain suitable subadult and adult bull trout rearing and passage conditions in the mainstem Upper Columbia River.
- Maintain suitable spawning habitat for steelhead in the lower Chelan River and tailrace.

Research and Monitoring Objectives

- Determine baseline survival estimates for juvenile spring Chinook, steelhead, and bull trout as they pass hydroelectric projects on the Upper Columbia River.
- Evaluate effects of hydroelectric projects on adult passage of spring Chinook, steelhead, and bull trout.
- Evaluate if passage through hydroelectric projects affect spawning success or fitness of spring Chinook, steelhead, and bull trout.
- Evaluate effectiveness of predator control programs.

Most of these objectives are consistent with the legal mandates of the HCPs, Section 7 Consultations, and relicensing agreements. The primary objective of the HCPs is to achieve no-net-impact. If met, this objective would equate to a net productivity equivalent to the productivity that could be attained if these projects did not exist. The HCPs intend to meet no-net-impact primarily through mainstem survival objectives for juvenile and adult salmonids, and through off-site mitigation with hatchery and tributary habitat improvements. The goal is to achieve combined adult and juvenile survival of 91% per project. The remaining 9% will be compensated through hatchery (7%) and tributary (2%) activities.

Habitat

The following objectives for habitat restoration apply to all streams that currently support or may support (in a restored condition) spring Chinook, steelhead, and bull trout in the Upper Columbia Basin. These objectives are consistent with subbasin plans, watershed plans, the Upper Columbia Biological Strategy, Habitat Conservation Plans, and relicensing agreements, and are intended to reduce threats to the habitat needs of the listed species. Because maintaining existing water rights are important to the economy of landowners within the Upper Columbia Basin, this plan will not ask individuals or organizations to affect their water rights without empirical evidence as to the need for the recovery of listed species. To the extent allowed by law, landowners will be adequately compensated for implementing recovery actions. In addition, any land acquisition proposal in this plan will be based on the concept of no net loss of private property ownership, such as conservation easements, transfer of development rights, and other innovative approaches. This plan will strengthen the likelihood that all actions and mitigation associated with habitat throughout the Columbia River are consistent with recovery of Upper Columbia spring Chinook, steelhead, and bull trout. These objectives will be implemented within natural, social, and economic constraints. Local habitat groups (in cooperation with local landowners) will prioritize and coordinate the implementation of "specific" habitat actions within specific stream areas.

Short-Term Objectives

- Protect[4] existing areas where high ecological integrity and natural ecosystem processes persist.
- Restore connectivity (access) throughout the historic range where feasible and practical for each listed species.
- Where appropriate, establish, restore, and protect stream flows (within the natural hydrologic regime and existing water rights) suitable for spawning, rearing, and migration (based on current research and modeling).
- Protect and restore water quality where feasible and practical within natural constraints.
- Increase habitat diversity in the short term by adding instream structures (e.g., large woody debris, rocks, etc.) where appropriate.[5]
- Protect and restore riparian habitat along spawning and rearing streams and identify long-term opportunities for riparian habitat enhancement.

[4] Protect or protection in this plan refers to ***all*** actions that safeguard required habitat features of listed species. This plan does not recommend land acquisition, unless "no net loss" of the tax base of the county in which the land is being sold is accomplished.

[5] This plan recommends the use of instream structures (such as boulders and LWD) as an immediate, short-term action to increase habitat diversity. These structures can be used while other actions are implemented to restore proper channel and riparian function (i.e., natural watershed processes). The manual addition of instream structures is usually not a long-term recovery action and should not be used in place of riparian or other restoration activities that promote reestablishment of natural watershed processes. However, if recovery of natural watershed processes cannot be achieved, the use of instream structures is a reasonable option.

- Protect and restore floodplain function and reconnection, off-channel habitat, and channel migration processes where appropriate and identify long-term opportunities for enhancing these conditions.
- Restore natural sediment delivery processes by improving road network, restoring natural floodplain connectivity, riparian health, natural bank erosion, and wood recruitment.
- Replace nutrients in tributaries that formerly were provided by salmon returning from the sea.
- Reduce the abundance and distribution of non-native species that compete and interbreed with or prey on listed species in spawning, rearing, and migration areas.

Long-Term Objectives

- Protect areas with high ecological integrity and natural ecosystem processes.
- Maintain connectivity through the range of the listed species where feasible and practical.
- Maintain suitable stream flows (within natural hydrologic regimes and existing water rights) for spawning, rearing, and migration.
- Protect and restore water quality where feasible and practical within natural constraints.
- Protect and restore off-channel and riparian habitat.
- Increase habitat diversity by rebuilding, maintaining, and adding instream structures (e.g., large woody debris, rocks, etc.) where long-term channel form and function efforts are not feasible.
- Reduce sediment recruitment where feasible and practical within natural constraints.
- Reduce the abundance and distribution of non-native species that compete and interbreed with or prey on listed species in spawning, rearing, and migration areas.

Administrative/Institutional Objectives

- Maximize restoration efficiency by concentrating habitat actions in currently productive areas with significant scope for improvement and areas where listed species will benefit.
- Develop incentive and collaborative programs with local stakeholders and land owners to enhance and restore habitat within productive areas.
- Strive to secure compliance with Federal, State, and local regulatory mechanisms designed to conserve fishery resources, maintain water quality, and protect aquatic habitat.
- Counties will continue to consider recovery needs of salmon and trout in comprehensive land-use planning processes.

- Provide information to the public on the importance of "healthy"[6] streams and the potential effects of land and water management activities on the habitat requirements of listed species.
- Until recovery is achieved, improve or streamline the permitting process for conducting research and monitoring on ESA-listed species and for implementing restoration actions.
- Develop, maintain, and provide a comprehensive inventory of habitat projects and their costs and benefits (effectiveness) to the public annually.

Research and Monitoring Objectives

- Monitor the effectiveness of each "class" of habitat action implemented in the Upper Columbia Basin on listed species and community structure.
- Accurately monitor trends in abundance, productivity (including smolts/redd), spatial structure, and diversity at the population and subpopulation scale.
- Assess stream flows (within the natural hydrologic regime and existing water rights) suitable for spawning, rearing, and migration (based on current research and modeling).
- Implement current monitoring protocols and continue to develop standardized monitoring methods.
- Examine relationships between habitat and biological parameters at coarse (landscape) and fine (stream segment) scales.
- Update, revise, and refine watershed and salmonid performance assessment tools (e.g., Ecosystem Diagnosis and Treatment analysis) to adaptively manage the implementation and prioritization strategy.
- Examine the effects of non-native species on listed species.
- Assess abundance and consumption rates of non-native fish that feed on listed species.
- Conduct channel migration studies within each subbasin to identify priority locations for protection and restoration.
- Examine fluvial geomorphic processes within each subbasin to assess how these processes affect habitat creation and loss.
- Inventory and assess fish passage barriers and screens within each subbasin.
- Conduct hydrologic assessments to better understand water balance and surface/groundwater relations within the subbasins (similar to studies conducted in the Methow by the USGS) and relationships to salmonid utilization and survival.

This plan recognizes that at some point the implementation of habitat actions will provide little benefit to the listed species because the habitat has achieved its greatest productivity potential within natural, social, and economic constraints. That is, at some point in the future, habitat

[6] "Healthy" is a relative term and is used in this plan to mean the habitat conditions necessary to sustain the listed species indefinitely.

improvements through protection and restoration will have a limited effect on fish habitat. This plan promotes an end point of habitat improvements that when met will conclude the responsibility of landowner action to improve or protect habitat, regardless of the status of the listed species.

Integration of Actions

The results of preliminary analyses indicate that the implementation of recommended actions in this Plan will move the listed fish species toward recovery. This will occur if actions are implemented within all sectors (Harvest, Hatchery, Hydro, and Habitat). Recovery cannot be achieved by implementing actions within only one sector (e.g., Habitat). Recovery will also require the implementation of actions outside the Upper Columbia Basin (i.e., in the lower Columbia River, estuary, and ocean).

Recovery actions recommended in this plan should significantly improve the abundance and productivity of naturally produced spring Chinook, steelhead, and bull trout in the Upper Columbia Basin. Preliminary analysis suggests that the implementation of recommended recovery actions within all sectors may increase the survival of spring Chinook populations from 99-198%, while steelhead population survivals may increase from 85-226%. There are currently no estimates for bull trout. The amount of survival improvement depends on the specific population and the "intensity" at which recommended actions are implemented.

Implementation of recovery actions within the hatchery and habitat sector should also improve the spatial structure and diversity of the Upper Columbia populations. Implementing actions recommended within the hatchery sector should reduce threats to and improve opportunities for meeting diversity requirements.

Time and Cost Estimates

The ESA section 4(f)(1) requires that the recovery plan include ''estimates of the time required and the cost to carry out those measures needed to achieve the Plan's goal and to achieve intermediate steps toward that goal'' (16 U.S.C. 1533[f][1]). The Upper Columbia Plan contains an extensive list of actions that need to be undertaken to recover spring Chinook and steelhead; however, there are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions as well as long-term and future funding. The Upper Columbia Plan states that if its recommended actions are implemented, recovery of the spring Chinook salmon ESU and the steelhead DPS is likely to occur within 10 to 30 years. The cost estimates cover work projected to occur within the first 10-year period. Before the end of this first implementation period, specific actions and costs will be estimated for subsequent years, to achieve long-term goals and to proceed until a determination is made that listing is no longer necessary.

The estimated cost of restoring habitat for spring Chinook, steelhead, and bull trout in the Upper Columbia Basin is at least $296 million over the first 10-year period. This estimate includes expenditures by local, Tribal, State, and Federal governments and private business and individuals in implementing both capital projects and non-capital work. Although these costs are attributed to spring Chinook, steelhead, and bull trout conservation, other species will also benefit.

There are no estimated costs associated with hatchery programs because these programs are funded to achieve specific program objectives, which may change based on monitoring and evaluation. The cost estimate does not include expenses associated with implementing actions within the lower Columbia River, in the estuary, within the Federal Columbia River Power System, or the cost of implementing measures in the Public Utility District Habitat Conservation Plans and Settlement Agreements. Cost estimates for these items are included in two modules that NMFS developed because of the regional scope and applicability of the actions. These modules are incorporated into the Upper Columbia Plan by reference and are available on the NMFS Web site: www.nwr.noaa.gov/Salmon-Recovery-Planning/ESA-Recovery-Plans/Other-Documents.cfm. The hydropower cost estimates will be updated over time, as the section 7 consultation on the remanded 2004 FCRPS BiOp is completed. The estuary recovery costs could be further refined following public comment on the ESA recovery plan for the three listed lower Columbia ESUs and one listed Lower Columbia steelhead DPS in 2007. There are virtually no estimated costs for recovery actions associated with harvest to report at this time. This is because no actions are currently proposed that go beyond those already being implemented through *U.S. v. Oregon* and other harvest management forums. In the event that additional harvest actions are implemented through these forums, those costs will be added during the implementation phase of this recovery plan. All cost estimates will be refined and updated over time.

The Plan estimates it may cost a total of $10 million to cover agency and organization staffing costs during the first 10 years of plan implementation ($1 million/year), and it is conceivable that this level of effort will need to continue for the Plan's duration. Also, continued actions in the management of habitat, hatcheries, and harvest, including both capital and non-capital costs, will likely warrant additional expenditures beyond the first 10 years. Although it is not practicable to accurately estimate the total cost of recovery, it appears that most of the costs will occur in the first 10 years. Annual costs are expected to be lower for the remaining years, thus the total for the entire period (years 11-30) may possibly range from $150 million to $200 million.

Funding Strategy

It is uncertain exactly how recovery will be funded in the Upper Columbia Basin. Habitat Conservation Plans and binding mitigation agreements help guarantee that some programs (e.g., state-run mitigation hatchery programs, tributary habitat fund, etc.) have secure funding and will continue operating into the future. However, these programs fall short of funding the total needs of this plan. Additional funding from the following sources will be required to implement this recovery plan.

- The Washington Salmon Recovery Funding Board.
- Public Utility District funds.
- The Bonneville Power Administration (BPA) Fish and Wildlife Program.
- The Federal Columbia River Power System Biological Opinion.
- Appropriations from the Washington State Legislature for state agency budgets (WDFW, WDOE, Conservation Districts).
- Pacific Coast Salmon Recovery Fund (NMFS).

- Appropriations from the U.S. Congress for federal agency (USACE, USFWS, USGS, USFS, NRCS, BOR, and BLM).
- Local government mechanisms funded through state legislative appropriations.
- Other nongovernmental organizations such as the National Fish and Wildlife Foundation, Regional Fishery Enhancement Groups, the Bonneville Environmental Foundation, and the Bullitt Foundation.
- Voluntary projects funded through public and private partnerships.

Because of limited resources, recommended actions will be funded according to a prioritization framework that is based on a balance between biological benefit of the action, and the cost and feasibility of implementing the action. Projects that address primary limiting factors, have high biological benefit, are relatively inexpensive, and are feasible to implement will receive highest funding priority.

Implementation and Coordination

The UCSRB is the coordinating body for the plan and it is their responsibility to make sure the plan is implemented in a voluntary manner. An Implementation Team, composed of a Leader, three Lead Entity representatives (one from each County), the Upper Columbia Regional Technical Team, local, State, Federal, and Tribal resource management agencies and others including local stakeholders, will be responsible for implementing the plan, tracking progress, identifying milestones and benchmarks, and sequencing tasks. The Implementation Team will be involved in all issues related to recovery actions, and will work within the framework of the UCSRB, *U.S. v Oregon*, Habitat Conservation Plans for the Public Utility Districts, Biological Opinion and Anadromous Fish Agreement, Section 7 consultations, the Mitchell Act, Hatchery and Genetic Management Plans, and federal trust responsibilities to the tribes. The Implementation Team will work closely with local habitat groups, which will be responsible for identifying specific habitat restoration actions and coordinating activities within their respective subbasins. All proposed recovery actions will be coordinated with local stakeholder input and local stakeholders will be included in the development of any of the planning processes that may affect their interests.

Monitoring and Adaptive Management

The beneficial actions identified in this plan are believed to represent a sound approach based on available information and tools, and they address the range of known threats. However, uncertainty exists for many actions because of insufficient information. This plan does not assume risk-free actions with perfectly predictable results. Therefore, this plan will monitor[7] or assess the outcomes of different recovery actions. The plan is "adaptive" in the sense that it will take this information, combined with cost and benefit estimates, and re-evaluate priorities and reasonable actions. The intent is to use the information as a means of selecting what actions will be sufficient for recovery. This plan is a "living document" that will be updated as new information becomes available. All significant modifications, especially those that change the regulatory environment or impose additional costs or restrictions on private property and water

[7] Monitoring will include implementation, status/trend, and effectiveness monitoring.

rights, will be submitted for public review and comment by local governments and stakeholders, and approved by the UCSRB before implementation.

Assurances

Assurances are needed that good-faith recovery efforts, which are consistent with this recovery plan and are based on the best scientific information available, will reduce the risk that the public would be prosecuted for a take of listed species. In other words, if an entity has corrected problems (threats and limiting factors) that have been identified as detrimental to listed species, there must be a point at which they are no longer responsible for salmonid population problems. Currently, assurances are legally guaranteed only under Section 4, Section 7, and Section 10 of the ESA. The UCSRB encourages the federal agencies to explore additional opportunities for assurances. A legally binding definition of discharge of responsibility for impacts to spring Chinook, steelhead, and bull trout populations would increase voluntary participation in recovery planning and implementation.

Estimated Date of Recovery

The time necessary to achieve reclassification for spring Chinook and steelhead and recovery of spring Chinook, steelhead, and bull trout in the Upper Columbia Basin depends on the status of the fish species, factors affecting their viability, implementation and effectiveness of recovery actions, and responses to recovery actions. A large amount of work within all sectors is needed to recover the species. If the actions recommended in this plan are implemented, recovery of the three listed species should occur within 10 to 30 years.