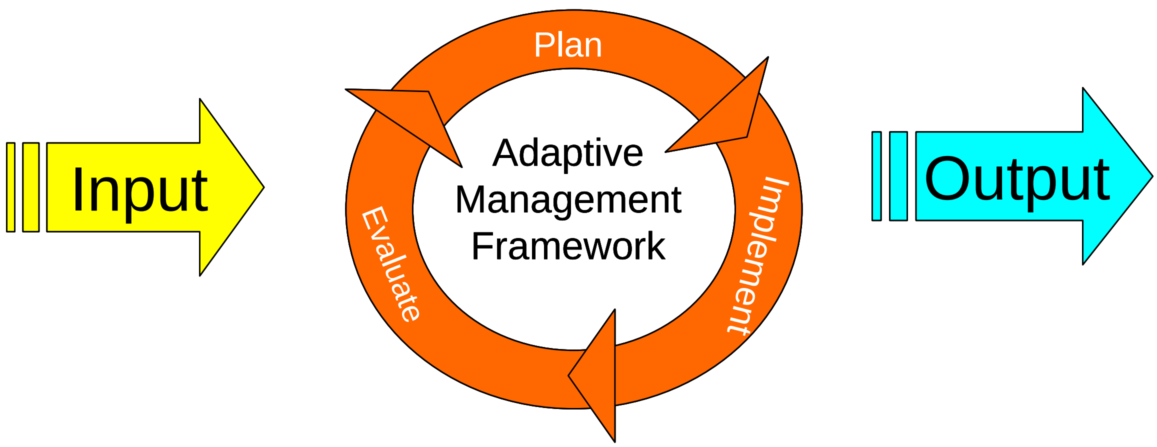
The Fish and Wildlife Agencies and Tribes of

The Columbia Basin Fish and Wildlife Authority

Provide these Recommendations for Amendments to the

NORTHWEST POWER AND CONSERVATION COUNCIL

2000 COLUMBIA BASIN FISH AND WILDLIFE PROGRAM



April 4, 2008

Final

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Columbia Basin Fish and Wildlife Authority Program Amendment Recommendations

Section 1.0. Amendments to the Introduction of the Program

Amendment 1.1. Include the Statutory Basis for the Federal and the region's state fish and wildlife agencies and appropriate Indian Tribes participation in the Program

Include the following language in the Introduction of the Program:

> Under the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act), Congress established the Northwest Power Planning Council (now the Northwest Power and Conservation Council (Council)) and directed the Council to develop "a program to protect, mitigate and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries." The Northwest Power Act envisions a participatory process that depends on the expertise of the fish and wildlife managers. The Northwest Power Act requires the Council to adopt the recommendations of federal, state and Tribal fish and wildlife agencies as part of the Fish and Wildlife Program (Program), unless the Council explains in writing how the recommendations are inconsistent with the Northwest Power Act or less effective than the adopted recommendations.
>
> The Northwest Power Act directs the Council to request recommendations from federal agencies and the region's state fish and wildlife agencies and appropriate Indian Tribes for:
>
> > (A) measures which can be expected to be implemented by the [Bonneville] Administrator … to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, affected by the development and operation of any hydroelectric project on the Columbia River and its tributaries;
> >
> > (B) establishing objectives for the development and operation of such projects on the Columbia River and its tributaries in a manner designed to protect, mitigate, and enhance fish and wildlife; and
> >
> > (C) fish and wildlife management coordination and research and development (including funding) which, among other things, will assist protection, mitigation, and enhancement of anadromous fish at, and between, the region's hydroelectric dams.
>
> The Northwest Power Act directs the Bonneville Power Administration [Bonneville (BPA)] and other federal agencies responsible for operating, or regulating federal or non-federal hydroelectric facilities to consider the Council's Program "at each relevant stage of decision making," and exercise statutory responsibilities, "to the fullest extent practicable" consistent with the Council's Program. Bonneville also is to use the Bonneville Fund "to protect, mitigate, and

enhance fish and wildlife" adversely affected by the production of hydroelectric power on the Columbia River "in a manner consistent with" the Council's Program.

The Council is directed to develop its fish and wildlife program on the basis of recommendations received from the fish and wildlife agencies, appropriate Indian Tribes, the region's water management and power producing agencies and their customers and the public generally. The Council is to include in the Program measures that will:

> (A) complement the existing and future activities of the federal and the region's state fish and wildlife agencies and appropriate Indian Tribes;
>
> (B) be based on, and supported by, the best available scientific knowledge;
>
> (C) utilize, where equally effective alternative means of achieving the same sound biological objective exist, the alternative with the minimum economic cost;
>
> (D) be consistent with the legal rights of appropriate Indian Tribes in the region; and
>
> (E) in the case of anadromous fish:
>
>> (i) provide for improved survival of such fish at hydroelectric facilities located on the Columbia River system; and
>>
>> (ii) provide flows of sufficient quality and quantity between such facilities to improve production, migration, and survival of such fish as necessary to meet sound biological objectives.

The Northwest Power Act directs the Council to resolve inconsistencies between program recommendations by "giving due weight to the recommendations, expertise, and legal rights and responsibilities of the federal and the region's state fish and wildlife agencies and appropriate Indian Tribes." The Council may chose to reject a recommendation of a fish and wildlife agency or Tribe only if the recommendation is inconsistent with the statutory requirements, or is "less effective than the adopted recommendations for the protection, mitigation, and enhancement of fish and wildlife."

Amendment 1.2. Maintain the Geographic Program Structure and Include Anadromous Fish, Resident Fish, and Wildlife Sections at Each Level

Include the following language in the Introduction of the Program:

> This Program will continue to maintain the geographic structure established by the 2000 Program. To complement the existing and future activities of the federal, state and Tribal fish and wildlife managers each, of the geographic sections include separate anadromous fish, resident fish and wildlife sections.

The resident fish program has two important components: resident fish substitution and resident fish mitigation. The resident fish portion of the Program is most appropriately planned, implemented, and evaluated at the basinwide and subbasin scales.

Due to the strictly defined nature of habitat mitigation, and the migratory nature of much of the focal wildlife populations, the wildlife portion of the Program is most appropriately planned, implemented, and evaluated at the basinwide scale.

Amendment 1.3. Combine the Elements of the Existing Program into One Document

Include the following language in the Introduction of the Program:

> Previously the Fish and Wildlife Program consisted of the 2000 Program, the 2003 Mainstem Amendments, and the 57 subbasin plans adopted in 2004-2005. This Program now combines the Mainstem Amendments and updated subbasin plan summaries into one document. Consolidating Program documents will provide for the transparent linkages necessary for the adaptive management framework (discussed in Amendment 1.4). Updated summaries of each subbasin plan are provided in Section 3 and 4, which include updated objectives for each species, based on existing fish and wildlife management plans, including NOAA Fisheries and U.S. Fish and Wildlife Service (USFWS) interim, proposed, and final recovery plans, and other updated fish and wildlife plans. The sub-basin plans will continue to be included as part of the Program in their entirety. Furthermore, where Endangered Species Act (ESA) recovery plans are available, those plans provide more specific detailed updates that will be incorporated into certain sections of subbasin plans where applicable, (see recommended amendment 1.5). Adaptive management will be applied as new information becomes available.

Amendment 1.4. Include an Adaptive Management Architecture as the Framework of the Program

Include the following language in the Introduction of the Program:

> Adaptive management is built on the principle of learning by doing. Natural resource management is not an exact science. Therefore, the premise of this Program is to state hypotheses then implement measures contained herein and monitor, report, and evaluate outcomes to provide a clear sequential structure to decisions required in the continuing evolution and implementation of the Program (Figure 1.4).
>
> The Program will contain or have provisions to develop or track the following essential adaptive management steps:
>
> 1) Updates of the current status of the fish and wildlife resources this plan is intended to protect, mitigate, and enhance;
> 2) Biological objectives and current gaps between Fish and Wildlife Program objectives and status for the fish and wildlife resources of this plan;

3) Limiting factors and threats, quantified in terms of their relationship to the biological objectives with associated assumptions, hypotheses and critical unknowns;
4) Strategies and measures linked to limiting factors and threats with a quantification of expected outcomes toward the filling of the gaps identified in step 2;
5) A Research, Monitoring and Evaluation (RM&E) plan and research priorities that will track status and trends of focal species and their threats and limiting factors, collect the information necessary to test assumptions and hypotheses, address critical uncertainties, and evaluate the implementation of measures;
6) Reporting of accumulated monitoring and research information which will be used to carry out steps 7 and 8;
7) An evaluation process that deliberately contemplates the information from steps 1–6 to verify or adjust assumptions and hypotheses, adjusts biological objectives, and adjusts strategies and measures; and,
8) A process for adjusting the implementation of the Program to align with the changes identified in step 7.

Each of these eight steps is required to support a transparent, accountable, and effective planning, implementation and evaluation process. In this process, measures are the actions, or prescriptions for actions. They implement strategies to address the limiting factors that create the gaps in biological productivity of the focal populations.

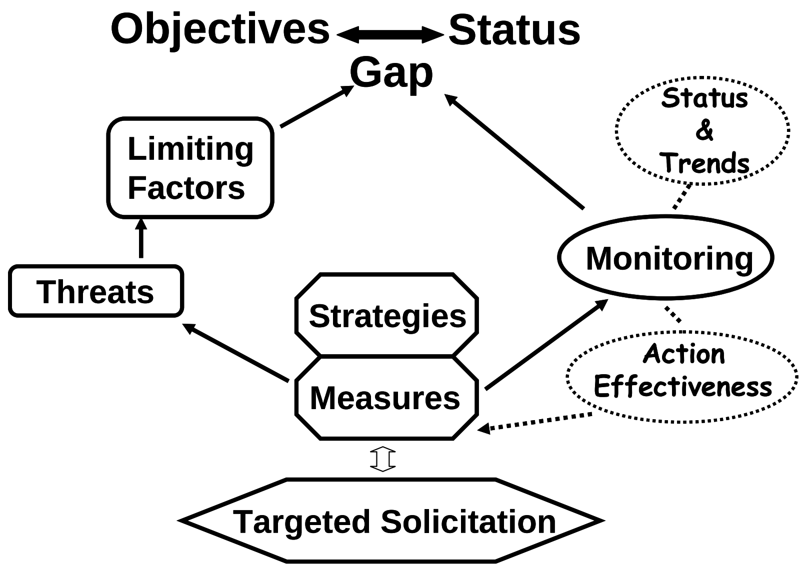

Figure 1.4. Adaptive management architecture to support decision making in the Columbia River Fish and Wildlife Program, arrows indicate quantifiable linkages.

Amendment 1.5. Integrate the Program the with the Plans of the Fish and Wildlife Managers (including Endangered Species Act)

Include the following language in the Introduction of the Program:

> The Northwest Power Act calls on the Council to include in the Program measures that complement the existing and future activities of the federal, state, and Tribal fish and wildlife managers. To this end, the Program incorporates implementation of the ESA into the Fish and Wildlife Program to the extent possible. Specifically, the Program measures identified here were developed based on analyses that synthesized information from updated Subbasin Plans, NOAA Fisheries Recovery Plans, NOAA Fisheries Draft Biological Opinion(s) for the Federal Columbia River Power System (FCRPS), USFWS Biological Opinion(s) for the FCRPS, and other plans of the fish and wildlife agencies and Tribes. The Program contains provisions that require BPA to clearly identify its ESA obligations early in the project selection process, so they can be considered during project review. Furthermore, the project selection process will be coordinated with the ESA recovery implementation forums, for example the State of Washington's salmon recovery boards and Oregon's emerging recovery sounding boards.
>
> This Program incorporates updates to subbasin plans from ESA recovery plans. Program biological objectives will be pursued in a manner that does not prevent, diminish, or slow the attainment of ESA recovery for these species. Furthermore, the ESA recovery plans provide limiting factors, strategies, actions, and implementation plans that are specific to each population. These specific ESA recovery plan components will be considered during the project selection process.

> The Council recognizes that federal agency responsibilities under Section 7 of the ESA represent the measures necessary to ensure their actions do not jeopardize listed species or adversely affect their critical habitat. In addition, those actions should ensure an adequate potential for the eventual recovery of the listed species. However, the Northwest Power Act requires more than just ensuring fish and wildlife resources in the Columbia River do not go extinct as a result of operations of the hydropower system. The Northwest Power Act requires the Fish and Wildlife Program to "protect, mitigate, and enhance" fish and wildlife resources of the Columbia Basin to the extent adversely affected by hydroelectric development. Examples include measures to protect fish and wildlife populations not listed under the ESA.

Amendment 1.6. Integrate the Program the with the Clean Water Act

Include the following language in the Introduction of the Program:

> The Council recognizes that the Columbia River and many of its tributaries are currently listed as water-quality-limited water bodies. Council understands that pollutants adversely affect several beneficial uses of the Columbia River including a healthy functioning ecosystem, fish passage and migration. Council supports the region in meeting its collective Clean Water Act responsibilities and identifies measures that address water quality.

Amendment 1.7. Clearly Establish the Intent of the Program's Scope Consistent with the Northwest Power Act

Include the following language in the Introduction of the Program:

> The Northwest Power Act requires BPA and other federal agencies to act in a manner consistent with the Council's Program. Bonneville and other federal agencies responsible for operating, or regulating federal or non-federal hydroelectric facilities are required to consider the Program "at each relevant stage of decision making," and exercise statutory responsibilities, "to the fullest extent practicable" consistent with the Council's Program.
>
> To that end this Program provides measures, where applicable, that are to be implemented by BPA, the U.S. Army Corp of Engineers (Corps), the Bureau of Reclamation, and the Federal Energy Regulatory Commission (FERC), through its licensing and re-licensing actions.
>
> Additionally, the Council calls for BPA to provide funding to maintain a comprehensive database of restoration activities occurring within each of the Program's subbasins. This will insure coordination and integration between the BPA funded projects and those funded through other sources. The database shall be summarized within the federal and the region's state fish and wildlife agencies and appropriate Indian Tribes Status of the Resource Report.

Amendment 1.8. Clearly Define BPA's Obligations in the Program, Consistent with the Northwest Power Act.

Include the following language in the Introduction of the Program:

> The Northwest Power Act directs the Council to request recommendations "for measures which can be expected to be implemented by the [Bonneville] Administrator." The Northwest Power Act requires the Bonneville Administrator to use the Bonneville Fund "to protect, mitigate, and enhance fish and wildlife" adversely affected by the production of hydroelectric power on the Columbia River "in a manner consistent with" the Council's Program. Therefore, the Program identifies specific measures to be implemented with BPA funding, consistent with the Subbasin Management Plans described in the 2000 Program. These Measures are scientifically tied to biological objectives, with expected outcomes at the appropriate scale, and are set within the context of other known activities occurring within the subbasins or the broader Columbia River Basin.

Section 2.0. Amendments to the Basinwide Provisions

Amendment 2.0.1 Add Language to the Objectives for Biological Performance

Add the following language to this paragraph in the Objectives for Biological Performance – "*The Council recognizes that significant losses of anadromous fish, resident fish, and wildlife and their habitats have occurred as a result of the development and operation of the hydrosystem. To be consistent with the Power Act, these losses establish the underlying basis for population objectives for the program as a whole. Collectively, specific biological objectives should represent what is considered to be mitigation for losses under the program.*"

> Construction and operation of the FCRPS is a major threat for many species of fish and wildlife in the Columbia River Basin, and the adverse impacts of the hydroelectric system are a major limiting factor. Achieving the biological objectives expressed in the Program may or may not represent the sole responsibility of the FCRPS. However, the FCRPS mitigation responsibility is large enough that for several species, progress towards meeting the overarching biological objectives identified in the Program are indicators of whether implementation of the Program is adequate to meet mitigation responsibilities.

Amendment 2.0.2 Reorganize the Strategies Section of the Program

Maintain the language in the current Strategies section of the Program, but reorganize the information into Overarching Strategies and Measures, Anadromous Fish Strategies and Measures, Resident Fish Strategies and Measures, and Wildlife Strategies and Measures.

Amendment 2.0.3 Include a Research, Monitoring and Evaluation Plan in the Overarching Strategies Section

Include the following language in the Overarching Strategies section of the Program:

> The RM&E plan provides the foundation for the Program's adaptive management framework [as presented previously in Amendment 1.4 of these recommendations]. The adaptive management framework supports management decisions to implement mitigation and enhancement measures by evaluating their effectiveness, and iteratively adjusting those decisions to meet management objectives.
>
> The federal and state fish and wildlife agencies and Tribes are the legally recognized managers of the fish and wildlife resources based on federal and state statutes, treaties and court actions. These agencies and Tribes maintain expertise and authority to manage fish and wildlife resources and, with relevant recovery planning efforts and habitat management entities, are key partners in the design, implementation and analysis of regional monitoring programs. The success of mitigation and recovery efforts under the Program will be assessed through regional monitoring and evaluation.

The RM&E plan is built upon the following principles:

- The RM&E plan is designed to be consistent with Section 4(h)(6) of the Northwest Power Act in that it "complements the existing and future activities of the federal and the region's state fish and wildlife agencies and appropriate Indian Tribes", is "based on, and supported by, the best available scientific knowledge", "utilize(s), where equally effective alternative means of achieving the same sound biological objective exist, the alternate with the minimum economic cost", and is consistent with the legal rights of appropriate Indian Tribes in the region."
- The RM&E plan is designed to complement and enhance the existing and future programs of the fish and wildlife management agencies and Tribes including ESA-based recovery plans.
- The RM&E plan integrates existing and planned status and trend, hatchery, harvest, hydro system and habitat monitoring into a framework that addresses local and regional needs.
- The RM&E plan is designed to provide the foundation for implementation of the adaptive management framework (previously described in Amendment 1.4 of these program recommendations).
- The RM&E plan will collect data to assess Program objectives and performance standards (e.g. Smolt-to-Adult returns, viability criteria, catch per effort, and habitat condition).
- The RM&E plan will be designed such that the accuracy and precision of the data are within acceptable risks associated with making decisions in a timely manner at the desired scale.
- The RM&E plan integrates life history stages and data are collected for multiple species in an efficient manner.
- The RM&E plan articulates the data management and reporting needs to support adaptive management.

Amendment 2.0.3.1 Status of the Resource Report

Include the following language in the Overarching Strategies section of the Program:

Bonneville will fund the production of an annual *Status of the Resource Report* to report progress towards Biological Objectives and implementation of the Fish and Wildlife Program, consistent with requirements of other regional reports such as the Council's Fish and Wildlife Expenditures Report to the Governors and the Washington *State of Salmon in Watersheds Report.*

Amendment 2.0.3.2 Cooperative data compilation, development, distribution and reporting

Include the following language in the Overarching Strategies section of the Program:

Bonneville will fund the fish and wildlife managers in cooperation with other appropriate entities to provide access to data from collection through to reporting.

Specific activities include:

- Provide information management services to assist the agencies and Tribes to make their data available to support regional reporting for the Program,
- Coordinate with the Status of the Resource Project to provide access support to agency and tribal fish and wildlife data,
- Maintain and update databases of fish and aquatic data (e.g., fish distribution, adult abundance, GIS streams layer, hatchery releases, hatchery returns, dams and fish passage facilities, hatchery facilities, harvest, Council Protected Areas, smolt density model data, Subbasin Planning data, independent data sets, genetics, etc.),
- Maintain the appropriate web sites to allow access to regionally consistent short and long-term time series data in both tabular and GIS formats,
- Support data inventory and other regional requirement for RM&E as necessary,
- Support development of advanced data management systems within data creating agencies to improve data flow to the Status of the Resource Project and other regional scale data outlets,
- Coordinate basinwide monitoring and data programs through interagency forums,
- Maintain depositories of region-wide fish and wildlife reports and publications, linked to StreamNet data where appropriate, and
- Continue to use PISCES to track project implementation information.

Amendment 2.0.4 Add Coordination Measures as a Strategy in the Overarching Section

Include the following language in the Overarching Strategies section of the Program:

The Program requires the active participation by individual agencies and Tribes in its planning, implementation, and evaluation to ensure goals and objectives, and other program measures, are effectively integrated with the management programs of each fish and wildlife agency and Tribe and that the policy and technical basis for regional decision making is consistent with those programs. As coordinating entities, it is the responsibility of agencies and Tribes to ensure their policy and technical representatives dedicate time and effort as necessary to ensure the Fish and Wildlife Program is integrated with other management programs and is designed, implemented, and evaluated so that anticipated benefits accrue to fish and wildlife. Bonneville will fund the fish and wildlife agencies and Tribes' coordination efforts to ensure appropriate and meaningful participation in Program decision making. The fish and wildlife agencies and Tribes will define their coordination needs, which may or may not include membership organizations, and provide recommendations to Council and BPA.

Bonneville will fund data management and reporting that will support the monitoring and evaluation requirements for the Program. A significant amount of the information necessary to report and evaluate Program and project performance is collected outside of Program funding. Nevertheless, BPA funding is required for the activities necessary to make that information easily accessible and available in a regionally consistent format for decision makers to successfully implement the Program.

Amendment 2.0.5 Add Language Discussing the Impacts of Climate Change and Human Population Growth in the Overarching Strategies Section

Include the following language in the Overarching Strategies section of the Program:

The Program includes planning measures to address the potential impacts of global climate change and population growth on fish and wildlife resources in the Columbia River Basin.

Amendment 2.0.6 Add Language Supporting State Aquatic Nuisance Species Plans

Include the following language in the Appendix A: Glossary of the Program:

Nonnative aquatic species may be released or "introduced" into an aquatic environment intentionally or unintentionally. Most often, such species are unable to adapt to their new environments and do not form self-sustaining populations. However, if such a species is able to adapt, become established, and thrive, it has the potential to threaten the diversity or abundance of native species and aquatic habitats and may even affect economic resources and human health. Such species are considered aquatic nuisance species (ANS).

A definition for the term aquatic nuisance species is a "nonnative aquatic plant or animal species that threatens the diversity or abundance of native species, the ecological stability of infested waters, or commercial, agricultural, or recreational activities dependent on such waters." Since few natural controls exist in their new habitat, ANS may spread rapidly, damaging recreational opportunities, lowering property values, clogging waterways, impacting irrigation and power generation, destroying native plant and animal habitat, and sometimes destroying or endangering native species.

Include the following language in the Overarching Strategies section of the Program:

Aquatic nuisance species can threaten the diversity and abundance of native species and aquatic habitat. They can also significantly threaten infrastructure such as hydroelectric facilities. Currently the greatest known ANS threat to the region is the zebra\quagga mussel (*Dreissena* sp). This invasive mussel has caused significant economic and ecological impacts in the Great Lakes region and eastern United States. It has now arrived in the lower Colorado River drainage and connected waterways in Arizona and California. Economic costs to manage this species are in the hundreds of millions dollars annually. Ecosystem impacts included a decline in food chain productivity for fish, loss of recreational beaches, and degradation of drinking water quality. Potential impacts to the Columbia Basin projects include significant increases in maintenance costs at existing dams to maintain turbine cooling water systems, cleaning fish passage systems to prevent cuts and abrasions to salmon and steelhead, along with loss of basic productivity.

The states of Washington, Oregon, Idaho, and Montana have all developed Aquatic Nuisance Species Management Plans, which have been accepted by the national Aquatic Nuisance Species Task Force. These complementary plans identify potential threats from ANS, preventative and early detection measures, invasion pathways, and control actions if ANS are found in the basin. Pacific States Marine Fisheries Commission (PSMFC), in collaboration with federal, state, Tribal and private sector organizations is coordinating various efforts to prevent and control ANS in the Pacific region. Additional effort and funding is needed to comprehensively address ANS issues specific to the Columbia River Basin.

Amendment 2.0.7 Fully Integrate the Columbia Basin Water Transactions Program into the Program

Include the following language in the Overarching Strategies section of the Program:

Bonneville will fund the continuation of the Columbia Basin Water Transactions Program (CBWTP) to pursue acquisition of water rights in subbasins where water quantity has been identified as a primary limiting factor to meet the biological objectives within the subbasin plans. The CBWTP will continue to support the full range of temporary and permanent transaction tools for instream flow restoration. The CBWTP will coordinate with the fish and wildlife managers and other project sponsors to integrate instream water transactions with efforts to address other ecological factors that are limiting fish habitat and to develop cost-effective water quantity reporting standards. Finally, the CBWTP will seek closer integration of land and water acquisition activities and move towards an integrated land and water acquisition program.

Amendment 2.0.8 Add Provisions to Support Fish and Wildlife Strongholds

Include the following language in the Overarching Strategies section of the Program:

The Council will make fish and wildlife strongholds a focus in the Program. A stronghold refers to a watershed, multiple watersheds, or other defined spatial units (tributaries or focal action areas) where populations are strong, diverse, and includes areas that provide critical life-cycle requirements of aquatic species. Stronghold habitat has a high intrinsic potential to support a particular species, or suite of species, and is expected to afford a measure of productivity resilience under predicted scenarios of climate change. Focus strongholds must be consistent with the population objectives and measures identified in subbasin plans.

Amendment 2.0.9 Add Provisions to Reduce Sea Lion Predation

Include the following language in the Overarching Strategies section of the Program:

The vulnerability of fish to California and Steller sea lion predation is significantly exacerbated by Bonneville Dam as it restricts fish passage and favors these predators.

Bonneville and the Corps shall provide funding to support the following measures:

- Support land and water based harassment efforts by NOAA Fisheries, ODFW, WDFW and the Tribes to keep sea lions away from the area immediately downstream of Bonneville Dam;
- Provide and improve Sea Lion Exclusion Devices (SLEDs) to protect fishway entry at Bonneville Dam;
- Support development, testing, and implementation of non-lethal deterrence alternatives;
- Provide assistance and support to the states for the removal of animals as authorized under Section 120 of the Marine Mammal Protection Act;
- Document foraging activities of individually identifiable pinnipeds in the Columbia River below Bonneville Dam;
- Provide assistance and support to states for the removal of animals as authorized under section 120 of the MMPA;
- Estimate overall sea lion abundance immediately below Bonneville Dam; and,
- Monitor the spatial and temporal distribution of sea lion predation attempts and estimate predation rates.

Section 2.1. Anadromous Fish

Amendment 2.1.1 Current Biological Condition

Include the following language in the Anadromous Strategies section of the Program:

> The Columbia River Basin includes six provinces in which anadromous salmonids are extant. These anadromous salmonid species include spring Chinook salmon, spring/summer Chinook salmon, summer/fall Chinook salmon, fall Chinook salmon, summer steelhead, winter steelhead, coho salmon, chum salmon, and sockeye salmon (Table 2.1). Pacific lamprey are also present in these provinces. Subbasin plans included biological objectives for many, but not all, anadromous populations.

Table 2.1. Recent aggregate adult returns in each province.

This table is incomplete at this time and should be revised to include estimates of natural, hatchery, harvest, and broodstock components during the development of the 2008 Program amendments and be clear about the relationship of this table to the objective of achieving 5 million salmon and steelhead above Bonneville Dam.

Province - Species	Number of Subbasins with Data	Recent Aggregate Adult Returns
Lower Columbia		
Spring Chinook	6 of 8	36,617-110,999
Fall Chinook	7 of 8	28,351-88,531
Summer steelhead	3 of 8	1,072-2,335
Winter steelhead	8 of 8	4,047-9,997
Coho	1 of 8	--
Chum	1 of 8	3,032-10,932
Columbia Gorge		
Spring Chinook	2 of 6	968-1,285
Fall Chinook	5 of 6	8,081-32,572
Summer steelhead	3 of 6	1,472-2,599
Winter steelhead	2 of 6	732-2,627
Coho	0 of 6	--
Chum	0 of 6	--
Columbia Plateau		
Spring Chinook	3 of 6	8,589-12,832
Fall Chinook	4 of 6	16,037-24,266
Summer steelhead	5 of 6	9,864
Coho	1 of 6	3,820-8,319
Sockeye	0 of 6	--
Columbia Cascade		
Spring Chinook	3 of 4	242-14,794
Summer/fall Chinook	1 of 4	2,209-4,630
Summer steelhead	4 of 4	391-3,973
Coho	2 of 4	--
Sockeye	1 of 4	10,586-78,053
Blue Mountain		
Spring/summer Chinook	3 of 4	1,436-1,486
Fall Chinook	2 of 4	7,000
Summer steelhead	1 of 4	814
Mountain Snake		
Spring/summer Chinook	1 of 2	11,802
Fall Chinook	1 of 2	1,273
Summer steelhead	0 of 2	--
Coho	1 of 2	512
Sockeye	1 of 2	3-27
Pacific lamprey by dam		
Bonneville	--	19,313-117,029
McNary	--	2,456-13,325
Ice Harbor	--	277-1,702
Lower Granite	--	34-282

Amendment 2.1.2 Biological Objectives

Maintain the current basinwide biological objectives expressed in the 2000 Program with two modifications shown here in bold (to represent a 10 year implementation plan for these recommendations):

> "Halt declining trends in salmon and steelhead populations above Bonneville Dam by **2018** (~~2005~~). ~~Obtain the information necessary to begin~~ Begin restoring the characteristics of healthy lamprey populations.
>
> Restore the widest possible set of healthy naturally reproducing populations of salmon and steelhead in each relevant province by 2018 (~~2012~~). Healthy populations are defined as having an 80 percent probability of maintaining themselves for 200 years at a level that can support harvest rates of at least 30 percent, so long as ESA recovery objectives can be met and there is no contribution to further ESA listings.
>
> Increase total adult salmon and steelhead runs, in a manger consistent with achieving recovery of ESA listed populations and prevents additional listings of listed species, above Bonneville Dam by 2025 to an average of 5 million annually in a manner that supports tribal and non-tribal harvest. Within 100 years achieve population characteristics that, while fluctuating due to natural variability, represent on average full mitigation for losses of anadromous fish caused by development and operation of hydroelectric facilities in the Columbia Basin."

Continue to recognize productivity objectives for salmon and steelhead:

> "As an interim objective, contribute to achieving smolt-to-adult survival rates (SARs) in the 2-6 percent range (minimum 2 percent; average 4 percent) for listed Snake River and upper Columbia salmon and steelhead."

In addition, the Program should continue to recognize the mitigation responsibility for areas where anadromous fish have been extirpated:

> "Part of the anadromous fish losses has occurred in the blocked areas. A corresponding part of the mitigation for these losses must occur in those areas. The Program has a "Resident Fish Substitution Policy" for areas where anadromous fish have been extirpated. Given the large anadromous fish losses in the blocked areas, these actions have not mitigated these losses. The following objectives address anadromous fish losses and mitigation requirements in all blocked areas:
>
> Restore native resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where original habitat conditions exist and where habitats can be feasibly restored.
>
> Take action to reintroduce anadromous fish into blocked areas, where feasible.
>
> Administer and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery-reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near historic abundance (includes intensive fisheries within closed or isolated systems)."

Amendment 2.1.3 Limiting Factors

Add a section to the Program that summarizes the factors limiting naturally produced salmon and steelhead across all of “the Hs”.

Include the following summary of factors limiting production of anadromous fish:

> The relative effect on anadromous species of the Columbia River hydrosystem varies among provinces and subbasins. The hydrosystem affects focal populations to varying degrees in large part because the number of dams passed during migration ranges from zero to nine. In general, as fish pass more dams it becomes harder to mitigate for the effects of those dams. Also, the relative condition of habitat varies greatly among subbasins, with habitat in some areas being in near-pristine condition, whereas other areas have been severely degraded by current and past land use. The relative effect of harvest and artificial production varies by province and focal population, as well.
>
> Include Table 2.1.3 which provides a summary of hydrosystem limiting factors and threats.

Table 2.1.3. Summary of hydrosystem-related limiting factors and threats:

Limiting Factor	Threat	Mechanism
Juvenile salmonids Direct mortality	 Hydrosystem operations Hydrosystem construction/operation	 Turbine mortality Predation Modification of rearing/migration habitat
Increased travel time	Hydrosystem construction/operation Low velocity	Velocity modification Bypass operations Impoundments Irrigation withdrawals
Delayed mortality	Transportation	
Latent mortality	Hydrosystem construction/operation	
Water quality	Hydrosystem operations	Warm water discharge Cold water discharge Dissolved gas
Adult salmonids		
Passage survival	Hydrosystem operations Transportation as juveniles	
Water quality	Hydrosystem operations	Thermal barriers

Amendment 2.1.4 Strategies and Measures

Include the following language in the Anadromous Strategies section of the Program:

Strategies and measures necessary to make progress towards biological objectives vary among subbasins. Strategies and measures to address subbasin habitat effects are detailed for each subbasin in Section 3. Because strategies and measures to address mainstem passage effects vary little among provinces and subbasins, they are summarized here. Potential responses by salmonid populations to the suite of hydrosystem measures summarized here are given for each subbasin in Section 3.

Strategies and measures relate directly to the limiting factors and threats specified in Section 2.1.3. Earlier arrival time at Bonneville Dam is a key factor in survival rates. Surface bypass has been shown to be effective in low flow periods. Spill especially increases survival because migrating fish avoid turbine and bypass passage.

Table 2.1.4. Hydrosystem-related strategies and measures.

Strategy	General Measure	Limiting Factors
2.1.4.1: Manage the hydrosystem to increase juvenile survival, juvenile passage, and smolt to adult returns	**2.1.4.1a** Provide velocities to enhance migration conditions **2.1.4.1b** Provide spill **2.1.4.1c** Provide and evaluate surface bypass **2.1.4.1d** Reduce turbine passage and improve bypass survival **2.1.4.1e** Manage risk associated with transportation **2.1.4.1f** Reduce delayed and latent mortality of juveniles	• Increased travel time • Direct mortality • Delayed mortality; Latent mortality

Amendment 2.1.4.1 Consider Results from Hatchery Review Processes

Add the following language to the Anadromous Strategies section of the Program:

> Optimization of hatchery practices is an integral component of an All-H (Hydro, Harvest, Hatchery, and Habitat) management strategy to address recovery, restoration, and mitigation for anadromous salmonids in the Columbia River Basin. Results from Columbia River Basin hatchery review processes (e.g., USFWS National Fish Hatchery review, Hatchery Scientific Review Group, etc.) may be used to evaluate hatchery and harvest performance and improvement options. Incorporation of appropriate recommendations from these review processes will supplement existing and ongoing analyses of hydrosystem and habitat performance options.

Amendment 2.1.4.2 Add Language Supporting Water Quality Measures

Include the following language to the Anadromous Strategies section of the Program:

> The Columbia River and many of its tributaries are currently listed as water quality limited water bodies. Pollutants affect several beneficial uses including a healthy functioning ecosystem, fish passage and migration. The Program identifies measures to address the effects of hydropower system development and

operation on the natural seasonal thermal patterns of the Columbia and Snake Rivers. The development of large reservoirs increased the cross sectional area of the river and reduced water velocity, increasing the solar heating and increasing water temperatures. The natural seasonal thermal pattern has shifted and may continue to shift because of hydropower system operations. The shift may alter the timing of salmonid spawning and the emergence and out-migration of juveniles. Changes in the natural seasonal thermal pattern may also have additional adverse impacts to juvenile fish such as reducing the available food supply and increasing habitat for predaceous native and non-native fish species.

- The Program includes measures that improve cold water refugia and improve thermal conditions to meet federal and state Water Quality Temperature criteria.
- The Council calls on BPA and other federal agencies responsible for managing, operating, and regulating Columbia River hydroelectric facilities to develop water quality plans for total dissolved gas and temperature in the mainstem Columbia and Snake Rivers which includes a comprehensive update of both total dissolved gas and temperature with dam specific structural and operational objectives and implementation strategies to benefit juvenile and adult fish.
- The Council directs the federal operators and regulators to work with state, Tribal, and federal water quality agencies to meet the Total Maximum Daily Load (TMDL) implementation and Total Dissolved Gas (TDG) waiver requirements and to implement the recommendations of the state, Tribal, and federal fishery managers.
- The Council supports Columbia River monitoring to better understand toxics and the relationship between fish abundance and return rates in watersheds with high levels of contaminants and to better understand how those contaminants are taken up by juvenile salmon and their effects on out migration.
- Also, source identification in the watersheds would help to better understand the toxic loadings of contaminants of concern to the mainstem Columbia Basin.

Amendment 2.1.5 Monitoring

Add the following Conceptual Framework for Anadromous Fish to the Program:

The RM&E plan for anadromous fish is based in part on the RM&E measures in the FCRPS Biological Opinion and the adaptive management framework shown in Figure 1.4 and informs and supports steps 2, 3, 4, 7, 8 and 9 of the Conceptual Framework (Figure 2.1.5.1). The Monitoring Framework for the Program is organized into three Levels (Figure 2.1.5.2). Level 1 tracks population status and trends across the overall life-cycle of focal species. Level 2 provides for action effectiveness monitoring that tracks effectiveness of overall hydro system actions. Level 3 provides focus at key life stages (and associated limiting factors) effected by individual Hs (Hydro, Harvest, Hatchery, and Habitat). The Evaluation Context uses and builds on existing monitoring projects to adaptively evaluate and coordinate these programs. It will provide periodic reports and updates to the Council, federal, state and Tribal fish managers to update information on population metrics and indicators that inform progress toward achieving biological objectives. Practically speaking, all populations cannot be intensively monitored to provide high resolution information. Collaborative teams formed under the Evaluation Context will work to determine a mix of cost effective intensively monitored and index monitoring to adequately report status of fish populations compared to the biological objectives.

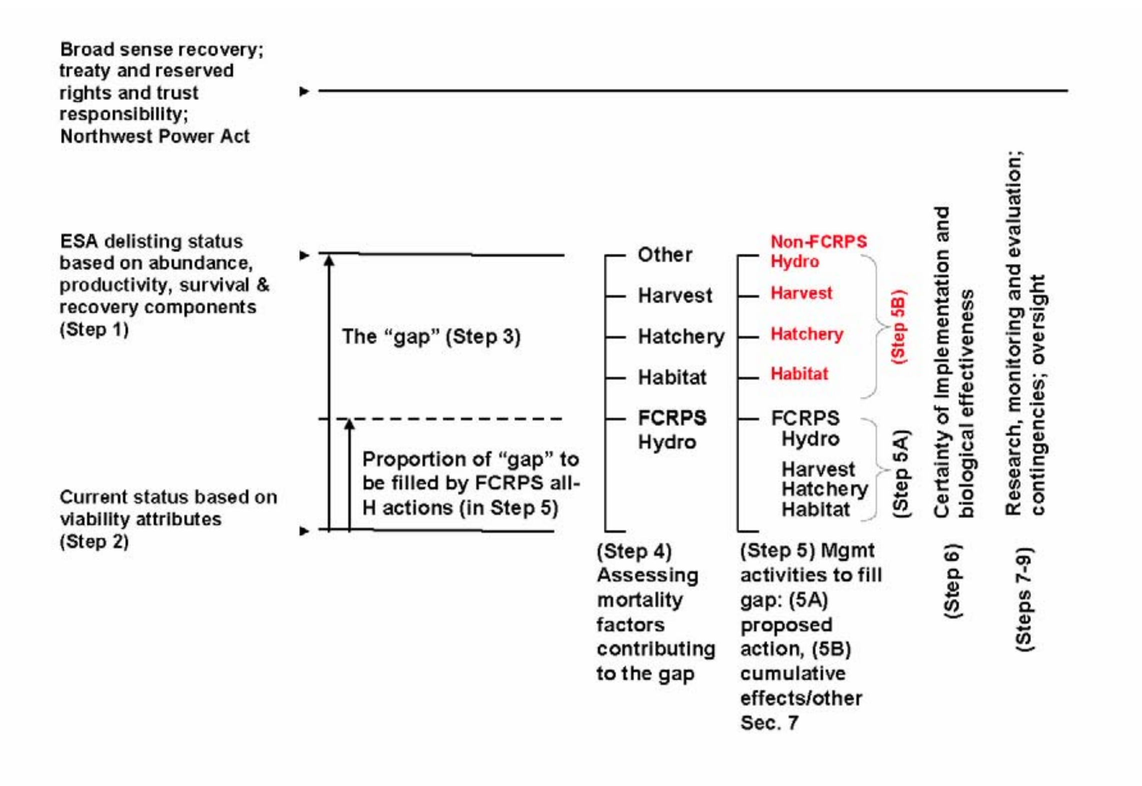

Figure 2.1.5.1. Conceptual Framework for Anadromous Fish.

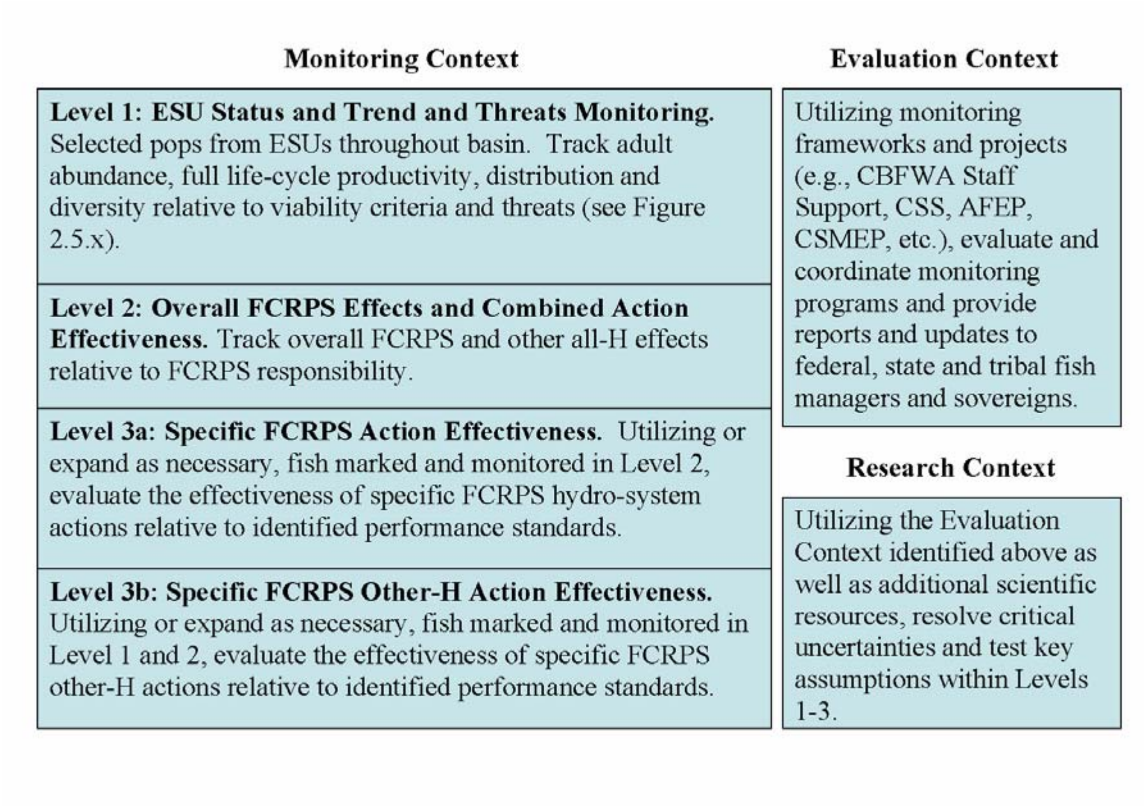

Figure 2.1.5.2. Monitoring Framework

Monitoring to track status and trend and action effectiveness is integrated throughout levels 1-3. This integration requires tracking survival at discrete life stages between spawning and the return of progeny to spawn for monitoring effectiveness of fish restoration management actions, as well as the effects of environmental stressors in tributaries, the mainstem Snake and Columbia Rivers, the estuary, and the ocean.

Monitoring of populations or population aggregates must (1) be spatially representative of the range and distribution of the various Columbia Basin populations, (2) be representative of both life-cycle experience differences and similarities (e.g., populations being directly compared share similar experiences within the estuary and ocean), and (3) be statistically valid with adequate sample sizes to detect differences among populations, across spatial distributions, and across temporal scales relative to varying human-induced and natural environmental stressors (Figure 2.1.5.3).

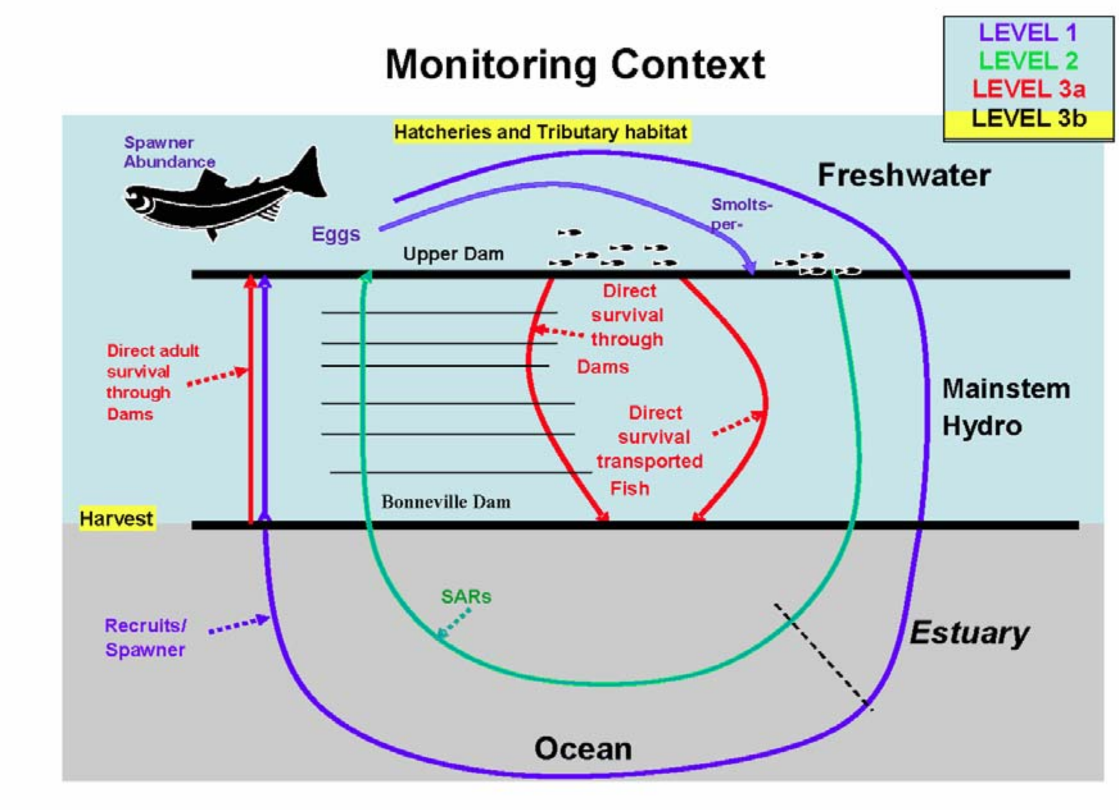

Figure 2.1.5.3. The monitoring context as it applies to anadromous fish population

The Program monitoring framework is consistent with NOAA Fisheries decision framework and monitoring guidance for ESA-listed salmon and steelhead (NOAA Fisheries 2007).

The evaluation context is based upon collaboration among the fish and wildlife agencies and Tribes. To maximize efficiency, use of resources and application of developed products, the evaluation component of the RM&E plan should use existing, forums and structures wherever possible. The guiding principles for the evaluation component of RM&E are:

- Base RM&E on measuring progress towards quantifiable biological objectives.
- Collaboration among the fish and wildlife agencies, Tribes, and others in the evaluation of the responses of listed salmon and steelhead and other focal species to management actions and in resolution of critical uncertainties about those responses.
- Maximize the use of existing entities and processes, as well as products and expertise. Maintain long-term continuity and consistency of established migration data time series such as survival, timing, travel time, passage distribution and smolt-to-adult return. Integrate RM&E programs

basin-wide to maximize efficiency and multiple application to management questions.

- Emphasize increased efficiency and productivity of presently established RM&E programs and optimize the data collected for all species.
- Recognize and maintain the active management and decision making role of state, federal, Tribal and local resource managers in all levels of RM&E: Level 1- ESU status and trend monitoring, Level 2-Overall FCRPS Action Effectiveness, Level 3a- specific FCRPS Action Effectiveness, and Level 3b- Specific hatchery, harvest, and habitat ("Other-H") action effectiveness.

A number of existing projects carry out functions and details of Level 1, 2 and 3 monitoring and evaluation in the Columbia River Basin. These include projects such as the Collaborative Systemwide Monitoring and Evaluation Project (CSMEP) number 200303600, Comparative Survival Study project 199602000, Smolt Monitoring Program project 198712700, and the Fish Passage Center project 199403300, funded by the BPA under the Fish and Wildlife Program, and projects by the Corps under the Anadromous Fish Evaluation Program (AFEP) of the Columbia River Fish Mitigation Project, as well as by project funded by various federal, state, local and Tribal agencies. To maximize funding efficiencies, ensure collaboration and improve transparency, the Council calls on the fish and wildlife managers, in collaboration with others, to develop and implement a regional monitoring and evaluation program that integrates ongoing monitoring and evaluation projects.

Amendment 2.1.5.1 Monitoring Measures

Add the following language to the Program to describe the monitoring measures for anadromous fish:

Level 1 monitoring tracks adult abundance, full life-cycle productivity, distribution, and diversity relative to Viable Salmonid Population (VSP) criteria as well as threats. The abundance and origin of spawners and their adult progeny, along with productivity, are the most important of the VSP metrics used to determine viability. Productivity is a derived metric based on abundance of adults. Recruitment requires knowing the origin of spawning fish (hatchery or wild) and their age at return. Because the estimate of productivity depends on knowing spawner abundance, the data quality of productivity can be no better than that of abundance. Tracking the status of the habitat and other subjects associated with threats and ESA limiting factors is an important aspect of Level 1 monitoring.

Level 2 monitoring tracks direct and delayed impacts of the FCRPS on fish survival relative to identified performance standards. This monitoring is long-term and concentrates on ESU and DPS stock aggregates to address potential impacts resulting from juvenile and adult migration experience through the FCRPS. This monitoring utilizes, or expands as necessary, fish marked and monitored in Level 1 to evaluate the overall effectiveness of FCRPS actions. For anadromous salmon and steelhead, effectiveness can be gauged relative to performance standards that quantify the magnitude of the actions' effects on narrowing the survival gaps between current and desired status based on abundance/productivity, survival and recovery components (Figure 2.1.5.1).

Level 3 monitoring evaluates the effectiveness of specific actions intended to improve survival. Level 3a focuses on hydrosystem actions and Level 3b address hatchery, harvest, and habitat ("Other-H") actions. Level 3a monitoring includes actions intended to alter/improve passage routing, reduce passage delay and travel time, and increase survival of fish migrating through the FCRPS. This monitoring utilizes, or expands as necessary, fish marked and monitored in Levels 1 and 2. Level 3b monitoring utilizes, or expands as necessary, fish monitored in Levels 1, 2 and 3a to evaluate the effectiveness of other-H actions. For salmonids, effectiveness is gauged relative to performance standards that provide a clear and defensible linkage to reducing the survival gaps between current and desired status based on abundance/productivity, survival and recovery components (Figure 2.5.1).

The evaluation context for RM&E includes components of federal, state, and Tribal collaboration and coordination of monitoring and evaluation efforts with other entities. This includes projects that evaluate and coordinate monitoring programs, and provide reports and updates to the region. In addition, this includes a process to optimize the efficiencies by integrating study design and implementation components across the monitoring levels. The research context addresses key assumptions and uncertainties within levels 1-3 that research projects should address. The following are the RM&E measures that should be incorporated into the Program. For each of the measures, the primary associated monitoring level is identified.

Amendment 2.1.5.2 Collaborative Systemwide Monitoring and Evaluation

Include the following language in the Program:

Fund the fish and wildlife managers to work with others to:

- Coordinate, assemble, evaluate and report on fish status and trend monitoring metrics including abundance, productivity, spatial structure and diversity (VSP) (Level 1).
    1. Develop standardized descriptions of the primary indicators used to assess VSP parameters in collaboration with fish and wildlife agencies and Tribes
    2. Characterize the metrics and methodologies used to estimate the primary indicators of VSP parameters
    3. Inventory the available primary indicators used to estimate VSP parameters and identify populations without coverage.

4. Assess the metrics and methodologies used to estimate the primary indicators characterizing the adequacy of the information and identify the deficiencies
5. Evaluate and recommend the alternative integration and mix of monitoring activities that promote consistency so the data are comparable among all subbasins, and to optimize cost effective monitoring across all levels.
6. Annually report the VSP indicators through the *Status of the Resource Report*. Report on the findings and recommendations from the inventory, and the assessment of adequacies and deficiencies of the metrics and methodologies

- Develop monitoring designs (informed by the findings and recommendations in 6, above), and estimate their accuracy, precision and cost to describe population status and trends that inform biological objectives. Ensure that the estimated metrics represent appropriate spatial, temporal, and population scales (Level 1).
- Periodically estimate population status and trends of fish species (e.g. every five years) (Level 1).
- Work with land and water resource management agencies to assemble and report habitat metrics at appropriate biological scales in the *Status of the Resource Report*. These may include watershed condition, miles of accessible stream, 303D listings Clean Water Act standards (examples: temperature, turbidity, contaminants). Coordinate with other regional reports such as EPA's *State of the River* Report, Washington *State of Salmon in Watersheds Report* (Level 1)
- Periodically assess the monitoring associated with management decisions and recommend improved designs integrated across the monitoring levels (Evaluation Context).
- Develop and maintain run-reconstructions (systematic organization of all mortality sources by origin (hatchery or wild) and age in lifecycle framework data sets) for each appropriate biological scale. Continue maintenance of TRT data sets and include populations and focal species that are not protected under ESA (Evaluation Context).
- Work with the Ad Hoc Supplementation Work Group (AHSWG) to implement the recommended Stray Ratio and Relative Reproductive Success designs as outlined in the Collaborative Systemwide Monitoring and Evaluation Project (CSMEP) Snake Basin Pilot reports (Marmorek et al. 2007a and b) and largely incorporated and expanded upon in the AHSWG report (Galbreath

et al. 2008 draft), and in future habitat effectiveness monitoring. Annually oversee implementation of the regional monitoring program and reporting (Level 3b). Work jointly with the U.S. vs. Oregon Technical Advisory Committee and technical committees under the Pacific Salmon Commission to develop an improved modeling interface between Columbia River and ocean fisheries Level 3 b).

- Review the results of Intensively Monitored Watersheds (IMW) and other habitat restoration programs. Facilitate the integration between the intensively monitored watersheds and other monitoring programs. Provide a forum so results from habitat restoration programs and research can be incorporated into future restoration programs (Level 3b).

Amendment 2.1.5.3 Level 2 PIT Tag Needs

Include the following language in the Program:

> PIT tagging to support Level 2 monitoring of salmon and steelhead will occur in three general release areas: the Snake River and its tributaries, the Columbia River and tributaries upriver from Priest Rapids Dam, and the Columbia River and its tributaries downstream from Priest Rapids Dam. Table 2.1.5.3.1 provides initial estimates of tagging levels that would enable monitoring of status and trends and estimates of overall FCRPS effects. These estimates build on and include ongoing and existing programs. Specific PIT tag release numbers may be modified under the adaptive management framework.

Table 2.1.5.3.1 Level 2 Monitoring: Current and necessary additional hatchery and wild smolt annual PIT tagging targets by general release area (SR=Snake River; UCR=Columbia River upstream from Priest Rapids Dam; LCR=Columbia River downstream from Priest Rapids Dam).

	SR	UCR	LCR	Sum
CURRENT				
Annual hatchery PIT-tag releases	**SR**	**UCR**	**LCR**	**Sum**
yearling spring/summer Chinook salmon	198,000	15,000	59,000	272,000
subyearling summer Chinook salmon	0	0	6,000	6,000
summer steelhead	0	0	0	0
subyearling fall Chinook salmon	328,000	3,000	0	331,000
Sum of hatchery PIT-tag releases	**526,000**	**18,000**	**65,000**	**609,000**
Annual PIT-tagging targets for wild fish				0
yearling spring/summer Chinook salmon	135,000	7,000	21,000	163,000
subyearling summer Chinook salmon	0	0	0	0
summer steelhead	50,000	5,000	8,000	63,000
subyearling fall Chinook salmon	0	0	0	0
Sum of wild fish PIT-tag releases	**185,000**	**12,000**	**29,000**	**226,000**
Sum of annual hatchery and wild fish PIT-tag releases	**711,000**	**30,000**	**94,000**	**835,000**
NECESSARY ADDITIONAL				
Annual hatchery PIT-tag releases	**SR**	**UCR**	**LCR**	**Sum**
yearling spring/summer Chinook salmon	63,000	50,000	30,000	143,000
subyearling summer Chinook salmon	0	0	0	0
summer steelhead	141,000	25,000	30,000	196,000
subyearling fall Chinook salmon	42,000	25,000	50,000	117,000
juvenile sockeye salmon	50,000	0	0	50,000
Sum of hatchery PIT-tag releases	**296,000**	**100,000**	**110,000**	**506,000**
Annual PIT-tagging targets for wild fish				
yearling spring/summer Chinook salmon	45,000	33,000	4,000	82,000
subyearling summer Chinook salmon	0	0	0	0
summer steelhead	20,000	5,000	12,000	37,000
subyearling fall Chinook salmon	0	0	40,000	40,000
Sum of wild fish PIT-tag releases	**65,000**	**38,000**	**56,000**	**159,000**
Sum of annual hatchery and wild fish PIT-tag releases	**361,000**	**138,000**	**166,000**	**665,000**
SUM OF CURRENT AND NECESSARY ADDITIONAL				
Annual hatchery PIT-tag releases	**SR**	**UCR**	**LCR**	**Sum**
yearling spring/summer Chinook salmon	261,000	65,000	89,000	89,000
subyearling summer Chinook salmon	0	0	6,000	6,000
summer steelhead	141,000	25,000	30,000	196,000
subyearling fall Chinook salmon	370,000	28,000	50,000	448,000
juvenile sockeye salmon	50,000	0	0	50,000
Sum of hatchery PIT-tag releases	**822,000**	**118,000**	**175,000**	**789,000**
Annual PIT-tagging targets for wild fish				
yearling spring/summer Chinook salmon	180,000	40,000	25,000	245,000
subyearling summer Chinook salmon	0	0	0	0
summer steelhead	70,000	10,000	20,000	100,000
subyearling fall Chinook salmon	0	0	40,000	40,000
Sum of wild fish PIT-tag releases	**250,000**	**50,000**	**85,000**	**385,000**
Sum of annual hatchery and wild fish PIT-tag releases	**1,072.00**	**168,000**	**260,000**	**1,500,000**

Amendment 2.1.5.4 Fish Passage Center

Include the following language in the Program:

Retain the existing Fish Passage Center language (2003 Mainstem Amendment, pages 27-28) in the Program with the following exceptions:

- Remove the reference to dual management/supervisory authority over the fish passage manager.
- Remove the reference to CBFWA providing a liaison position between the public and the Center.
- Remove the last paragraph that makes reference to a technical advisory committee.
- Add the following language to the Program: Bonneville will fund a position within the Fish Passage Center whose expertise can support storage reservoir operations analyses and identify in-season resident fish impacts of the FCRPS.
- Replace the language describing the Fish Passage Center Oversight Board (FPCOB) with the following to clarify it's role:

"*The Council has established an oversight board for the Center, with representation from NOAA Fisheries, state fish and wildlife agencies, tribes, the Council, and others to provide policy guidance for the Center. ~~And to ensure that the Center carries out its functions in a way that assures regional accountability and compatibility with the regional data management system.~~ The oversight board ~~'s responsibilities~~ will ~~include conducting~~ conduct ~~an~~ the annual review of the performance of the Center and ~~developing~~ develop a goal-oriented plan for ~~next year's~~ the Center's operation <u>to ensure that the Center carries out its functions in a way that assures regional accountability and compatibility with the regional data management system.</u> The Center shall prepare an annual report to the oversight board and the Council, summarizing its activities and accomplishments. There will be no other oversight board or board of directors for the Center.*"

Amendment 2.1.5.5 Salmon and Steelhead Life Cycle Monitoring

Include the following language in the Program:

Bonneville will fund elements of the life cycle monitoring field sampling, marking and real time data necessary to report on migration characteristics, smolt survival, travel time, passage distribution, migration characteristics, and other monitoring data required by regional fish and hydrosystem managers. This information forms the basis for short and long term hydrosystem fish passage management and mitigation decisions. Provide a long-term, consistent, continuous data base on lifecycle parameters of productivity such as smolt to adult returns and migration characteristics including, the movement of smolts out of major drainages and past the series of dams on the Snake and Columbia rivers. Assess smolt to adult return, survival, life cycle parameters and migration characteristics relative to environmental characteristics, hydrosystem operations and migration conditions.

Fund fishery managers to provide post season analysis to the region on indices of migration abundance and migration timing, smolt to adult return via passage route, and migration characteristics related to environmental factors and hydrosystem operations for fish migration. Migration characteristics will be collected for marked hatchery and wild fish. Other characteristics of fish condition such as de-scaling, and gas bubble trauma measures, will be collected to provide an indicator of health of the run. These data are used for in-season operational decisions relative to flow and spill management, particularly during periods when spill is being provided to improve smolt passage at dams (Level 3a) and will provide a consistent long term data base to support future fish passage discussions.

- The federal, state, and Tribal fish management agencies will review the design and implementation of the life cycle monitoring program annually (Evaluation Context)
- The life cycle monitoring data will be made available to the region on the Fish Passage Center Website and updated daily to facilitate hydro system fish passage management. The Fish Passage Center will report migration characteristics and life cycle parameters to the region in their annual report.

Amendment 2.1.5.6 Columbia River PIT Tag Information System

Include the following language in the Program:

The Columbia River PIT Tag Information System (PTAGIS) is a data collection, distribution, and coordination project. PTAGIS manages and maintains all of the PIT tag data collected since 1986 for anadromous salmon and steelhead in the Columbia River Basin.

The goal of this project is to operate and maintain the Columbia River Basin-wide database for PIT Tagged fish and to operate and maintain the established interrogation systems. The data collected by this system is accessible to all entities. The measurable goal for the system is to collect 100% valid data and provide that data in “near-real” time with downtime of any system component of not more than one percent as measured during the period of peak out-migration.

The PTAGIS project gets guidance from The Columbia Basin PIT Tag Steering Committee. The PTAGIS project will carry out the following tasks (Evaluation Context):

- Management of a long term Columbia River Basin-wide database system accessible to all entities;

- Maintenance and documentation of fish tagging and interrogation software;
- Operation and maintenance of equipment at the remote sites;
- Provision of technical support for the software and hardware;
- Provision of training to users; and
- Purchase and distribution of PIT tags and associated equipment.

Amendment 2.1.5.7 Regional Mark Processing Center (RMPC) (Evaluation Context)

Include the following language in the Program:

Fund the Regional Mark Processing Center (RMPC) to maintain the BPA funded hatchery portion of the coded wire tag database, known as the Regional Mark Information System (RMIS), and to implement and coordinate coded wire tag recovery programs for Columbia River Basin origin fish with the basin's fish and wildlife agencies and Tribes. Coded wire tags are a tool used by the basin's fish managers to identify salmon stocks, determine age composition and specific location of origin. The information provided by the use of coded wire tags is crucial to measure success of mitigation programs and fish population recovery plans. Specific activities related to the BPA funded hatchery portion of the RMPC and RMIS include:

- Provide a regional database and information management services used by the agencies and Tribes to support regional reporting of coded wire tagged releases and recoveries.
- Maintain, update and improve the RMIS database, especially as needs change and new methods are developed.
- Cooperate with other regional data reporting projects to support data access for all entities within the region.
- Maintain the RMPC web site to provide public access to the coded wire tag information and provide standardized reports for the regional fish managers.
- Coordinate standardization of data formats so that collected coded wire tag data can be seamlessly entered into the RMIS database.
- Provide custom queries and reports to scientists and managers as needed.
- Coordinate the maintenance of a coded wire tag recovery laboratory for extracting, and reading and recording tags retrieved from salmon and steelhead.
- Coordinate with regional fisheries agencies and Tribes to implement sampling programs for tribal, sport and commercial fisheries, and at spawning grounds, hatcheries, fishways, and other sampling locations.
- Support data inventory for the CSMEP project as needed.

- Participate in regional data coordination programs such as StreamNet, PNAMP and NED.

These services are to be used to monitor salmon and steelhead survival, stock composition, and abundance in ocean and Columbia Basin freshwater fisheries and escapement to spawning grounds and to hatcheries.

Amendment 2.1.5.8 Anadromous Fish Evaluation Program (AFEP) (Level 3a)

Include the following language in the Program:

The Corps will continue improvements in collaboration with the fish and wildlife agencies and Tribes to achieve objectives within the Fish and Wildlife Program.

Amendment 2.1.5.9 Harvest Specific Monitoring Measures (Level 3b)

Include the following language in the Program:

Consistent with the scope of this Program, improve estimates of stock composition in fisheries:

- Fund deployment of PIT-tag detectors for fisheries sampling. Expand deployment of PIT-tag detectors in terminal areas.
- Support the application of coded wire tags in representative groups of hatchery releases and appropriate naturally produced fish and the necessary sampling programs for recovering coded wire tags in sport, commercial and tribal fisheries.
- Develop a regional Genetic Stock Identification (GSI) program with an emphasis on species for which broad-scale PIT tagging and/or coded wire tagging is not a viable option. The program shall include systematic establishment and maintenance of a regional fish stock DNA baseline, and systematic non-lethal tissue sampling of catch and encountered fish in the fisheries. This will require a central, standardized database that is closely coordinated with the genetics laboratories processing the tissue samples. In addition to baseline data, the database will contain the results of the samples for access by the fisheries managers and the public.
- Determine the run timing and entry patterns of adult salmon returns of major population groups.

Support increased monitoring of encounter rates to better characterize harvest impacts in fisheries that release by-catch.

Amendment 2.1.5.10 Hatchery Specific Monitoring Measures (Level 3b)

Include the following language in the Program:

Council supported hatchery monitoring programs as required under ESA consultation (HGMP monitoring programs) should be fully funded as a required cost for operating the facilities.

Implementation and compliance monitoring and reporting should be required for all Program funded hatcheries**.** Hatchery program implementation monitoring is simply the reporting of the number and characteristics of hatchery fish released, which already occurs in ongoing hatchery programs, albeit in a manner which is not fully standardized. This information should be described relative to the production goals and marking schemes within *U.S. v. Oregon* agreements. Standardized performance measures associated with implementation monitoring should include hatchery production abundance, size at emigration (release), and condition of juveniles at emigration (release). A description of identifying marks applied (type of mark, unique code, and marking rate, including estimated marking efficiency/retention) is also included as implementation monitoring. Implementation monitoring performance measures are used to validate categorization of hatchery programs based on spawner composition (broodstock and natural spawners), rearing strategy, and release strategy. Of primary interest is the evaluation and reporting of:

- Confirmation of hatchery type (segregated harvest augmentation, integrated supplementation, or conservation),
- Status of Hatchery Genetic Management Plan (HGMP) or similar master plan,
- target and realized annual hatchery-natural composition of broodstock,
- target and realized annual hatchery-natural composition of natural spawners,
- target and realized annual Proportion of Natural Influence (PNI)
- target and realized annual rearing density,
- target and life stage at release,
- total release by life stage;
- target and realized size at release (length and weight);
- target and annual acclimation period,
- target and annual and release location, and
- duration of program (number of years operated).

The information above should be posted to the appropriate web sites (e.g., PSFMC and the Fish Passage Center), and described in annual reports. Implementation monitoring should be required on <u>all</u> artificial production programs releasing Chinook salmon, Coho salmon, Sockeye salmon, and steelhead in the Columbia River Basin.

Support the two-pronged approach to regional supplementation effectiveness monitoring: 1) through exploitation of standardized monitoring practices to provide comparable data for regional analyses of population trends in abundance and productivity, and 2) through coordinated analysis of relative reproductive success studies of a subset of hatchery supplementation programs, consistent with recommendations of CSMEP (Marmorek et al. 2007a and b) and of the Ad Hoc Supplementation Work Group (Galbreath et al. 2008 draft).

Amendment 2.1.5.11 Habitat Specific Monitoring Measures (Level 3b)

Include the following language in the Program:

Council should provide a web-based system for habitat project implementation reporting integrated with other funding sources. BPA should be directed to fund CBFWA to annually report implementation of fish and wildlife restoration projects through the Status of the Resource consistent with requirements for the Council's Fish and Wildlife Expenditures Report to the Governors and with the needs of other regional reports such as the Washington *State of Salmon in Watersheds Report.*

A basic level of effectiveness monitoring and reporting should be required for all projects to determine if stated project habitat objectives have been achieved.

Intensively Monitored Watersheds – The Council, working with the fish and wildlife managers, NOAA Fisheries, Independent Scientific Advisory Board (ISAB), Salmon Recovery Funding Board (SRFB) and Oregon Watershed Enhancement Board (OWEB) should facilitate development of a process to identify a network of intensively monitored watersheds. Process should be established within one year of adoption of this program and a recommended network of IMWs within 2 years of Program adoption. All IMWs should have specific study objectives, regular reporting requirements and an estimated timeframe for completion.

Amendment 2.1.5.12 Critical Uncertainties

Include the following language in the Program:

The Research context of the RM&E plan relies on the guiding principles established in the Evaluation context, which are based upon collaboration of federal, state, Tribal and local resource managers. Emphasis will be on maximizing application of present RM&E methods and data to new and innovative analysis, and developing new research approaches and projects only where it proves necessary. The research context must be structured to inform critical management questions, information gaps, and key assumptions and working hypotheses, and it must take into consideration the life histories of each species. Thus, the research approach will be to complement, rather than precede, the implementation of actions. Some examples of identified research needs are:

- The feasibility of using genetic parental analysis of hatchery fish to determine its effectiveness as a monitoring tool compared to other marking techniques
- Use of genetic stock identification of adult steelhead and Chinook salmon at Lower Granite Dam (and/or any other facility) can be assessed in the research context as it might be applied and developed for Level 1 monitoring.

- Describe Elastomer tag (VIE) retention and detection rates by age class for Snake River fall Chinook salmon
- Support increased monitoring of encounter rates to better characterize harvest impacts in fisheries that release by catch.
- Hatchery critical uncertainties include:
    - The effects of stray hatchery (harvest augmentation or supplementation) origin adults on the productivity of non-target natural populations.
    - The effects of supplementation hatchery origin adults on the long term productivity of target natural populations.
    - The effects of hatchery programs on hatchery/wild fish competition in terms of habitat use and nutrition/growth.
    - The effects of hatchery programs on mortality rates of natural populations due to predation by hatchery origin fish.

Amendment 2.1.6 Identify Specific Reporting Requirements for the Program

Include the following language in the Basinwide Provisions for Anadromous Fish:

Bonneville will fund adequate monitoring to fill data gaps, to answer the following questions in an annual report to Council and the region -

- What rivers and reaches are currently accessible by anadromous salmon?
- How many salmon and steelhead populations occur above Bonneville Dam? How many of those populations demonstrate an increasing trend in abundance?
- How many naturally producing populations of salmon and steelhead occur within each relevant province? How many of those populations are healthy as defined by the Program?
- How many salmon and steelhead pass Bonneville Dam annually? How are they allocated across the Basin (harvest, hydrosystem and natural mortality, hatchery brood stock, and subbasin escapement)?
- What is the current knowledge about the characteristics of healthy lamprey populations?

Amendment 2.1.7 Evaluation

Include the following language in the Basinwide Provisions for Anadromous Fish:

A programmatic evaluation of the anadromous fish basinwide strategies will occur preceding Program amendments, to determine whether anadromous fish measures are moving the Program towards its biological objectives for performance.

Amendment 2.1.8 Adjustment in Program Direction

Include the following language in the Basinwide Provisions for Anadromous Fish:

The project solicitation process identified in Implementation Provisions of this Program (Amendment 5.2) will rely on conclusions from the evaluation of the anadromous fish to set project selection priorities. Monitoring, evaluation and reporting efforts will be used to help develop measures and amendments.

Section 2.2. Resident Fish

Amendment 2.2 Include in Appendix A: Glossary, the following information for the definition of Resident Fish

Include in Appendix A: Glossary, the following information for the definition of Resident Fish:

> Resident fish are freshwater fish that live and migrate within the rivers, streams, and lakes of the Columbia River Basin, but do not travel to the ocean. For the purpose of this program, anadromous white sturgeon, bull trout, and coastal cutthroat trout shall be classified as resident fish. Resident fish exist throughout the basin and are particularly important in areas where anadromous fish runs are blocked by natural or manmade obstructions. This section of the program addresses mitigation for resident fish losses caused by hydropower development and operations, and substitutions of resident fish to compensate for losses of anadromous fish and harvest opportunities in areas blocked by hydropower projects.
>
> The development and operation of the FCRPS has contributed to the reduction in diversity, abundance, and habitat of most resident fish species. As with anadromous fish, which have been extirpated from several areas of the basin, reservoir operations may interfere with flows needed for resident fish spawning, incubation, emergence, rearing, and migration. In addition, hydropower operations impair the reservoir environment for spawning, incubation, and rearing of some reservoir-inhabiting resident fish species. Hydropower development and operations have especially impacted bull trout, which are federally listed as threatened throughout the Columbia River Basin, the Oregon Chub which is federally listed as Endangered, as well as the Kootenai River and Upper Columbia white sturgeon populations which are listed as endangered in the United States and Canada, respectively. Other native resident fish species impacted by the hydrosystem include, but are not limited to, kokanee, redband trout, westslope cutthroat trout, burbot and mountain whitefish.

Amendment 2.2.1 Report the Current Biological Condition for Resident Fish Populations

Include the following language in the Program:

> The Council will work with the agencies and Tribes to develop a summary of the current status of resident fish populations in the Columbia River Basin. This information will be presented annually in the Status of the Resource Report.

Amendment 2.2.2 Maintain the Current Basinwide Objectives for Biological Performance in the Program

In addition to the current Basinwide Objectives for biological performance for Resident Fish Losses, the fish and wildlife agencies and Tribes recommend that the following performance objective be added at the basinwide level:

- Monitoring and evaluation strategies will be implemented to determine success and measure progress towards achieving biological objectives.

Include in the Program the following goal statement for resident fish measures:

> The Program goal for resident fish will emphasize the long-term stability of native fish in native habitats where possible, but also recognize that where impacts have severely changed the native ecosystem, the Program actions shall manage for, and utilize those species best suited for surviving in the altered ecosystem. Resident fisheries will be enhanced to allow for consumptive subsistence, commercial spiritual/cultural, and recreational fisheries for the region's Indian Tribes, as well as consumptive and non-consumptive recreational fisheries for sport anglers. A number of resident fish populations throughout the basin are depressed to an extent that they require immediate attention. To be effective, the Program will focus on funding resident fish measures that provide on-the-ground benefits, and use an adaptive management approach that employs monitoring and evaluation measures to monitor success.

The Program will continue to recognize the mitigation responsibility for areas where anadromous fish have been extirpated, and recognize that this portion of the Anadromous Fish Program is implemented through the Resident Fish Program:

> "Part of the anadromous fish losses has occurred in the blocked areas. A corresponding part of the mitigation for these losses must occur in those areas. The program has a "Resident Fish Substitution Policy" for areas in which anadromous fish have been extirpated. Given the large anadromous fish losses in the blocked areas, resident fish substitution actions have not fully mitigated for these losses. The following objectives address anadromous fish losses and mitigation requirements in all blocked areas:
>
> Restore native resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where original habitat conditions exist and where habitats can be feasibly restored.
>
> Take action to reintroduce anadromous fish into blocked areas, where feasible.
>
> Administer and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery-reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near historic abundance (includes intensive fisheries within closed or isolated systems)."

Amendment 2.2.3 Outline the Current Limiting Factors Affecting Resident Fish Populations

Include the following language in the Program:

> The Council will work with the fish and wildlife agencies and Tribes to develop a summary of the current limiting factors for achieving resident fish population objectives (including Resident Fish Substitution) in the Columbia River Basin. This information will be presented annually in the Status of the Resource Report.

Table 2.2.3 provides a summary of hydrosystem-related limiting factors and threats for resident fish.

Table 2.2.3 Summary of hydrosystem-related limiting factors and threats for resident fish.

Limiting Factor	General Threat	Specific Threat
Water quantity	Hydrosystem operations	Flow fluctuations Short-term flow reductions
Water quality	Hydrosystem operations	Warm water discharge Cold water discharge Dissolved gas
Habitat quality/quantity	Hydrosystem operations	Reservoir elevations River stages
Community shifts	Hydrosystem operations Species introductions	Enhanced competition and predation from native and non-native fish
Obstructions	Hydrosystem construction/operations	Dams; physical barriers

Amendment 2.2.4 Provide Priorities and Principles for Resident Fish Strategies and Measures

Include in the Program the following statement of priorities for resident fish measures:

The Program will accord highest priority to rebuilding to sustainable levels, weak, but recoverable, native resident fish populations affected by the hydropower system and resident fish substitution measures in areas that previously had salmon and steelhead, but where anadromous fish are now blocked by hydropower development. Because in-kind mitigation cannot occur for anadromous fish losses, projects satisfying the substitution priority shall be clearly distinguished from other projects. The Program will also accord priority to resident fish measures that meet the following criteria (not in rank order):

- Provide benefits to wildlife and/or anadromous fish.
- Protect and enhance the health of resident fish populations and associated habitat.
- Address recovery and/or BiOp measures for ESA-listed resident fish.
- Construction and inundation habitat losses are most effectively mitigated thought the perpetual protection (easement or

acquisition) of habitat in an amount at least equivalent to that which was lost.

- Protect and enhance other native stocks that may be at risk due to the construction and operation of the FCRPS.
- Substitution measures in areas that previously had anadromous fish, but where such fish are now blocked by hydropower facilities.

Include in the Program the following statement on resident fish mitigation principles:

> Hydropower development and operations have resulted in losses in abundance and diversity of resident fish. Measures to address the impacts, to resident fish and associated habitat, caused by hydropower development and operations shall be defined as resident fish mitigation. To promote comprehensive and cooperative watershed management, ecosystem diversity, productivity and stability as integral components of fish management strategies in the Columbia River Basin, and to conserve the natural genetic diversity within native resident fish species, subspecies, and unique stocks, the following resident fish mitigation principles will be applied:
>
> - Protect, mitigate, and enhance resident fish and associated habitat to the extent that they were or are affected by hydropower development and operation.
> - Protect, mitigate, and enhance resident fish and associated habitat in hydropower system storage projects to the fullest extent from negative effects associated with water releases.
> - In areas above, within, and below storage projects, protect, mitigate, and enhance resident fish and associated habitat that are affected by altered annual flow regimes, daily load following, temperature modifications, and nutrient trapping.
> - Construction and inundation habitat losses are most effectively mitigated through the perpetual protection (easement or acquisition) of at least equivalent habitat that was lost.
> - Land protection, operations, and maintenance activities are funded at current market rates.
> - Land restoration funding shall be provided to restore degraded habitat.
> - Long-term management funding (consisting of operations and maintenance and enhancements) shall be included in capital investments in the form of perpetual habitat protection activities to ensure habitat values are maintained.

- Managers also need the capacity to secure mitigation properties opportunistically and timely as they are operating in a highly competitive real estate market. This capacity can be increased via settlement agreements between fish and wildlife managers and BPA.

Include the following Measures in the Basinwide Provisions of the Resident Fish Section of the Program:

Amendment 2.2.4A Develop Resident Fish Loss Assessment Methodology and Continue to Fund Existing Projects in the Interim:

Bonneville will fund the fish and wildlife agencies and Tribes to develop and implement a Columbia River Basin Resident Fish Loss Assessment Methodology that will be applied by each agency and/or Tribe in their specific geographical area. This methodology may be customized to fit specific circumstances within a given subbasin. Include recommendations, to be completed by 2010, for assessing, in a consistent manner, resident fish and habitat losses due to: 1) development and 2) operation of hydropower facilities throughout the Columbia River Basin, notwithstanding existing resident fish projects. Implementation of existing and new resident fish mitigation and substitution measures and strategies will not be delayed pending the completion of loss assessments.

Amendment 2.2.4B Complete Resident Fish Loss Assessments:

Upon completion of the best scientifically based most feasible methodology, the fishery managers will complete assessments of resident fish losses related to construction and operation of each hydropower facility throughout the Columbia River Basin and submit to Council for inclusion into the Program, notwithstanding existing projects.

Include the following Table of Measures in the Basinwide Provisions of the Resident Fish Section of the Program:

Amendment 2.2.4C-N Table of Measures for Resident Fish:

Table 2.2.4C-N Hydrosystem-related strategies and measures for resident fish.

Strategy	Measure
Restore natural hydrograph to provide appropriate flow during critical periods.	C. Reduce flow fluctuations D. Minimize short-term flow reductions E. Reduce drawdown and improve reservoir refill F. Provide appropriate flows for white sturgeon, bull trout and burbot G. Implement VARQ
Improve degraded water quality	H. Restore channel maintenance flows I. Minimize effects of dissolved gas J. Implement measures to restore normative hydrograph

Strategy	Measure
Restore floodplain connectivity and function.	K. Reconnect floodplains to channels. L. Reconnect side channels and off-channel habitats to stream channels
Restore channel structure and complexity.	M. Restore natural channel form where feasible N. Stabilize streambanks

Amendment 2.2.5 Include a Statement Regarding Monitoring of Resident Fish Populations

Include the following language in the Basinwide Provisions for Resident Fish:

> The Program relies on the monitoring efforts of the fish and wildlife agencies and Tribes for a majority of the information related to resident fish. Bonneville will fund monitoring efforts at the project scale where necessary to fill in information gaps necessary for supporting Program decision making. The monitoring for resident fish will be facilitated for the Program through collaboration and the coordination of the fish and wildlife agencies and Tribes.
>
> Amendment 2.2.5.1 Collaborative Systemwide Monitoring and Evaluation

Fund the fish and wildlife managers to work with others to:

- Coordinate, assemble, evaluate and report on fish status and trend monitoring metrics including abundance, productivity, spatial structure and diversity.
    - Develop standardized descriptions of the primary indicators used to assess VSP parameters in collaboration with fish and wildlife agencies and Tribes.
    - Characterize the metrics and methodologies used to estimate the primary indicators of VSP parameters.
    - Inventory the available primary indicators used to estimate VSP parameters and identify populations without coverage.
    - Assess the metrics and methodologies used to estimate the primary indicators characterizing the adequacy of the information and identify the deficiencies.
    - Evaluate and recommend the alternative integration and mix of monitoring activities that promote consistency so the data are comparable among all subbasins, and to optimize cost effective monitoring across all levels.
    - Annually report the VSP indicators through the *Status of the Resource Report*. Report on the findings and recommendations from the inventory, and the assessment of adequacies and deficiencies of the metrics and methodologies.

- Develop monitoring designs (informed by the findings and recommendations in 6. above), and estimate their accuracy, precision and cost to describe population status and trends that inform biological objectives. Ensure that the estimated metrics represent appropriate spatial, temporal, and population scales.
- Periodically estimate population status and trends of fish species (e.g. every 5 years).
- Work with land and water resource management agencies to assemble and report habitat metrics at appropriate biological scales in the *Status of the Resource Report*. These may include watershed condition, miles of accessible stream, 303D listings Clean Water Act standards (examples: temperature, turbidity, contaminants). Coordinate with other regional reports such as EPA's *State of the River* Report, Washington *State of Salmon in Watersheds Report.*
- Periodically assess the monitoring associated with management decisions and recommend improved designs.
- Develop and maintain run-reconstructions (systematic organization of all mortality sources by origin (hatchery or wild) and age in lifecycle framework data sets) for each appropriate biological scale.
- Review the results of Intensively Monitored Watersheds and other habitat restoration programs. Facilitate the integration between the intensively monitored watersheds and other monitoring programs. Provide a forum so results from habitat restoration programs and research can be incorporated into future restoration programs.

Amendment 2.2.6 Identify Specific Reporting Requirements for the Program

Include the following language in the Basinwide Provisions for Resident Fish:

Bonneville will fund adequate monitoring to fill data gaps, to answer the following questions in an annual report to Council and the region -

- How many native resident fish species (subspecies, stocks and populations) occur in areas affected by the FCRPS? How many of those populations demonstrate abundance similar to historic conditions?
- What actions have been taken to reintroduce anadromous fish into blocked areas?
- When loss assessments have been completed, what is the FCRPS mitigation responsibility for resident fish?
- What rivers and reaches currently have low ecological connectivity between aquatic areas, riparian zones, floodplains and uplands?

- Which rivers and reaches currently have poor water quality (temperature, toxics, etc.)?
- Which rivers and reaches have insufficient water quantity to support all life stages of resident and anadromous fish?
- Are hatchery projects meeting their production goals in terms of adult fish?
- Is the Program meeting its harvest objectives for resident fish populations?
- What actions are being taken to provide opportunities for consumptive and non-consumptive resident fisheries?

Amendment 2.2.7 Identify How Evaluation of the Resident Fish Section of the Program Will Occur

Include the following language in the Basinwide Provisions for Resident Fish:

> A programmatic evaluation of the Resident Fish Section of the Program will occur preceding Program amendments, to determine whether resident fish measures are moving the Program towards its biological objectives for performance.

Amendment 2.2.8 Explain How Adjustment in Program Direction Will Occur Over Time

Include the following language in the Basinwide Provisions for Resident Fish:

> The project solicitation process identified in Implementation Provisions of this Program (Amendment 5.2) will rely on conclusions from the evaluation of the Resident Fish Section of the Program to set project selection priorities. Monitoring, evaluation and reporting efforts will be used to help develop measures and amendments.

Section 2.3. Wildlife

Amendment 2.3.1 Include the Current Ledger for Wildlife

Include the Construction and Inundation Losses Ledger, Table 2.3.1, in the Program:

> The Program calls for BPA and the Fish and Wildlife Managers to complete mitigation agreements that, in combination with existing projects, equals 200 percent of the habitat units identified in the loss assessments (NWPCC 2000 Fish and Wildlife Program: Table 11-4). The doubling of the losses is done in part to address the significant annualized impacts that have accrued since construction.
>
> Table 2.3.1 reflects the current status of BPA's obligation for construction and inundation losses.

Table 2.3.1 replaces Table 11-4 in the Council's 2000 Fish and Wildlife Program and identifies BPA's mitigation obligation for the losses due to hydropower construction at federal dams in the Columbia River Basin.

Table 2.3.1: Amended Losses Due to Hydropower Construction	
Species by Hydropower Facility	**Total Habitat Units**
Albeni Falls	
• Mallard Duck	**-11,970**
• Canada Goose	**-9,398**
• Redhead Duck	**-6,758**
• Breeding Bald Eagle	**-9,016**
• Wintering Bald Eagle	**-8,730**
• Black-Capped Chickadee	**-4,572**
• White-tailed Deer	**-3,360**
• Muskrat	**-3,512**
Lower Snake Projects	
• Downy Woodpecker	**-729.8**
• Song Sparrow	**-575.2**
• Yellow Warbler	**-1,854**
• California Quail	**-41,016**
• Ring-necked Pheasant	**-5,293.6**
• Canada Goose	**-4,079.6**
Anderson Ranch	
• Mallard	**-2,096**
• Mink	**-3,464**
• Yellow Warbler	**-722**
• Black Capped Chickadee	**-1,780**
• Ruffed Grouse	**-1,838**
• Blue Grouse	**-3,960**
• Mule Deer	**-5,378**
• Peregrine Falcon	**-1,222 acres***
* Acres of riparian habitat lost. Does not require purchase of any lands.	
Black Canyon	
• Mallard	**-540**
• Mink	**-1,304**
• Canada Goose	**-428**
• Ring-necked Pheasant	**-520**
• Sharp-tailed Grouse	**-1,064**

Table 2.3.1: Amended Losses Due to Hydropower Construction	
Species by Hydropower Facility	**Total Habitat Units**
• Mule Deer	**-484**
Deadwood	
• Mule Deer	**-4,160**
• Mink	**-1,974**
• Spruce Grouse	**-2,822**
• Yellow Warbler	**-618**
Palisades	
• Bald Eagle	**-11,882 Breeding**
	-37,130 Wintering
• Yellow Warbler	**-1,436 scrub-shrub**
• Black Capped Chickadee	**-2,716 forested**
• Elk/Mule Deer	**-4,908**
• Waterfowl and Aquatic Furbearers	**-11,406**
• Ruffed Grouse	**-4,662**
• Peregrine Falcon*	**-3,354 acres forested wetlands**
* Acres of riparian habitat lost. Does not require purchase of any lands.	**-1,664 acres scrub-shrub wetland**
Willamette Basin Projects	
• Black-tailed Deer	**-34,508**
• Roosevelt Elk	**-30,590**
• Black Bear	**-9,628**
• Cougar	**-7,706**
• Beaver	**-8,954**
• River Otter	**-4,816**
• Mink	**-4,836**
• Red Fox	**-5,180**
• Ruffed Grouse	**-22,290**
• California Quail	**-5,972**
• Ring-necked Pheasant	**-3,972**
• Band-tailed Pigeon	**-6,974**
• Western Gray Squirrel	**-2,708**
• Harlequin Duck	**-1,102**
• Wood Duck	**-3,894**
• Spotted Owl	**-11,422**
• Pileated Woodpecker	**-17,380**
• American Dipper	**-1,908**
• Yellow Warbler	**-4,710**
Grand Coulee	
• Sage Grouse	**-5,492**
• Sharp-tailed Grouse	**-65,446**
• Ruffed Grouse	**-33,004**
• Mourning Dove	**-18,632**
• Mule Deer	**-54,266**
• White-tailed Deer	**-42,724**
• Riparian Forest	**-3,264**
• Riparian Shrub	**-54**
• Canada Goose Nest Sites	**-148**
McNary	
• Mallard (nesting)	**-13,918**
• Western Meadowlark	**-6,938**
• Canada Goose	**-6,968**
• Spotted Sandpiper	**-2,726**

Table 2.3.1: Amended Losses Due to Hydropower Construction	
Species by Hydropower Facility	**Total Habitat Units**
• Yellow Warbler	**-658**
• Downy Woodpecker	**-754**
• Mink	**-2,500**
• California Quail	**-12,628**
John Day	
• Great Blue Heron	**-6,372**
• Canada Goose	**-16,020**
• Spotted Sandpiper	**-6,372**
• Yellow Warbler	**-2,170**
• Black-capped Chickadee	**-1,738**
• Western Meadowlark	**-10,118**
• California Quail	**-12,648**
• Mallard	**-14,798**
• Mink	**-2,874**
The Dalles	
• Great Blue Heron	**-854**
• Canada Goose	**-878**
• Spotted Sandpiper	**-1,068**
• Yellow Warbler	**-340**
• Black-capped Chickadee	**-366**
• Western Meadowlark	**-494**
• Mink	**-660**
Bonneville	
• Great Blue Heron	**-8,600**
• Canada Goose	**-4,886**
• Spotted Sandpiper	**-5,534**
• Yellow Warbler	**-326**
• Black-capped Chickadee	**-2,044**
• Mink	**-3,244**
Minidoka	
• Yellow Warbler	**-684**
• River Otter	**-5,986**
• Mule Deer	**-6,826**
• Sage Grouse	**-7,510**
Chief Joseph	
• Sharp-tailed Grouse	**-4,580**
• Mule Deer	**-3,984**
• Spotted Sandpiper	**-2,510**
• Sage Grouse	**-2,358**
• Mink	**-1,840**
• Bobcat	**-802**
• Lewis' Woodpecker	**-572**
• Ring-necked Pheasant	**-478**
• Canada Goose	**-426**
• Yellow Warbler	**-116**
Note: Credits (against this losses ledger) assume BPA's current crediting policy of full credit for existing values on properties permanently protected by Bonneville and/or as stated in project MOA's with managers.	

Include the operational and other wildlife losses in the Program:

The operational losses, while recognized, have not yet been quantified and will be formally added to the current status of losses following completion of loss assessments.

Amendment 2.3.2 Update the Current Basinwide Objectives for Biological Performance for Wildlife

Include the following language in the Basinwide Objectives for Biological Performance for Wildlife:

The overall biological objective for the wildlife program is to mitigate for all wildlife losses due to the FCRPS by protecting and enhancing the ecological function of wildlife habitat consistent with the subbasin plans and state conservation strategies and tribal management plans. The wildlife mitigation program should continue to mitigate for construction and inundation losses as expressed in habitat units displayed in Table 2.3.1.

Amendment 2.3.3 Include the Current Limiting Factors Affecting Wildlife

Include the following language to describe limiting factors based on FCRPS impacts:

Construction and inundation impacts of the hydropower system:
In previous Council programs, the wildlife habitat losses associated with construction and inundation impacts have received considerable attention. These impacts to wildlife were assessed using the Habitat Evaluation Procedure (HEP) to determine the habitat lost, expressed as habitat units (HUs), and published in loss assessments. The loss assessments were adopted in previous Council programs (i.e., Council's 2000 Fish and Wildlife Program: Table 11-4) to create a ledger and serve as a starting point for wildlife mitigation measures.

HEP does not adequately reflect management priorities or characterize ecological conditions. The 2008 Program supports investigation of alternative habitat assessment methodologies to HEP. These alternatives represent a paradigm shift away from HEP to ecologically based assessment methods that better represent ecological functions and conditions.

Operational losses:
The ecological impacts to wildlife populations due to the loss of fish and the losses caused by the operations of the hydro system have not been assessed. The fish and wildlife resources of the Columbia Basin have been deprived of marine-derived nutrients associated with the return of adult anadromous fish. The implications of this impact, while not yet clearly defined or quantified in terms of wildlife, must be mitigated and the 2008 Program increases this emphasis.

Given the vision of this program, the strong scientific case for a more comprehensive, ecosystem-based approach, and the shift to implementation of this program through provincial and subbasin plans, wildlife mitigation projects should complement fish mitigation projects to the extent practical. Lands protected as part of fish mitigation may be credited to offset wildlife operational losses if the lands protect priority focal wildlife habitats.

Funding:

The rapid increase in human population, and associated land values in the Northwest necessitates the expeditious acquisition of habitats to minimize cost to BPA ratepayers. During the period from FY2002-2006, BPA expenditures on all wildlife projects totaled approximately $12.5 million annually (Status of the Resources website). At these funding levels, the amount of habitat required to fulfill the loss ledger cannot be obtained (Figure 2.3.1). With further delays, implementation costs will likely increase and the extent and quality of available habitat will be diminished. Managers also need the capacity to secure mitigation properties opportunistically and timely as they are operating in a highly competitive real estate market. This capacity can be increased via settlement agreements between fish and wildlife managers and BPA.

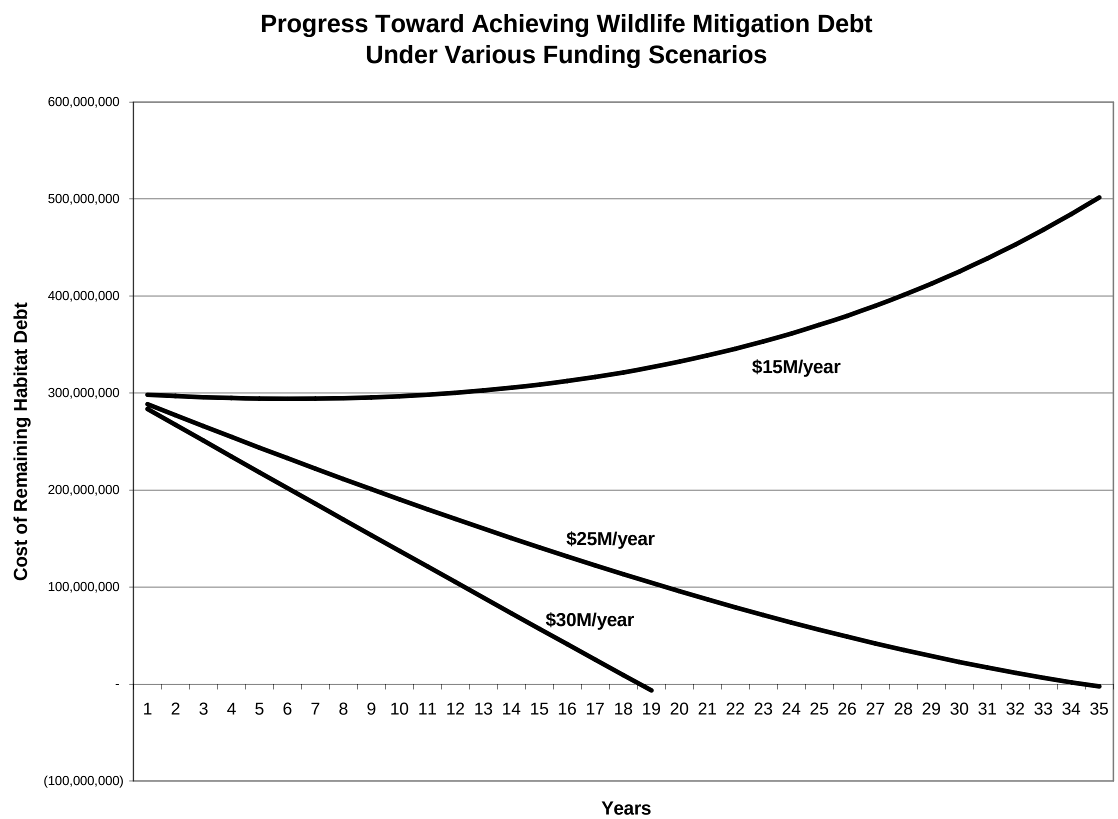

Figure 2.3.1 Progress Toward Achieving Wildlife Mitigation Debt (CBFWA May 1, 1998 http://www.cbfwa.org/FWProgram/Reports/FY1997/10YearBudget.doc).

Amendment 2.3.4 Provide Priorities and Principles for Wildlife Strategies and Measures

Include in the Program the following statement of priorities for wildlife measures:

Primary Strategies:

The FCRPS has impacted wildlife populations through the loss of habitat due to the hydropower facility construction and subsequent inundation of land. These losses were quantified using the HEP and expressed as habitat units. In addition there are un-quantified wildlife habitat losses due to the annual operation of the hydropower system. During the implementation of the 2000 Fish and Wildlife program subbasin plans were completed. The plans identified focal species and/or focal habitats as priorities for conservation and restoration. Further broad guidance for wildlife management is also contained in recently completed state conservation strategies.

The hypothesis/assumptions of the wildlife program strategy is that protection of acreage and restoration of ecological functioning habitat will support and restore native wildlife populations to meet mitigation obligations of the FCRPS. To evaluate this hypothesis/assumption, an adequate amount of land must be protected (represented by the identified construction and inundation losses and future loss assessments). A monitoring program needs to be in place to collect and analyze the biological information necessary to determine the habitat functionality which in turn allows the evaluation of the response in focal species abundance and use.

The Program should build on the eight scientific principles identified in the 2000 Program to introduce a new paradigm that emphasizes management for ecological function supported by the subbasin plans. In general, the subbasin plans identified focal habitats which, along with federal, state, and Tribal wildlife management plans, serve as the collective foundation for project sponsors to develop wildlife project management plans. These wildlife project management plans will establish specific ecological objectives for the protected focal habitats. The ecological objectives will be the basis for determining management needs, building a monitoring and evaluation framework, and determining and tracking enhancement credits.

The Program should include Wildlife measures to:

1) quantify operational losses; 2) assure funding adequate to manage protected habitats to meet habitat and ecological objectives as expressed in project specific management plans which are linked to subbasin plan priorities; 3) establish a Wildlife Crediting Forum to develop and oversee crediting procedures for the Council and incorporate wildlife mitigation credits into the Fish and Wildlife Program to track progress towards mitigating for the lost habitat; and 4) assure an adequate funded Research, Monitoring and Evaluation (RM&E) program for wildlife to support adaptive management by monitoring ecological function on protected lands as described in the project management plans to ensure wildlife program investments are consistent with the plans of the wildlife managers.

Amendment 2.3.4A Fund Operational Loss Assessments:

Hydropower operational impact assessments are needed to determine the extent and directions of ecological alterations and to institute a standard, rigorous, transferable, and regionally accepted assessment methodology to describe and quantify ecological losses attributable to the FCRPS.

The 2000 Program initially defined operational loss as "the direct wildlife losses caused by the day-to-day fluctuations in flows and reservoir levels resulting from the operation of the hydrosystem". This definition does not adequately describe the full extent of the ecological impacts due to the operation of the hydroelectric system. Assessment of operational losses must incorporate concepts of river ecology, accepted scientific and ecological principles, along with appropriate indices of biological or ecological integrity.

Bonneville will fund the Agencies and Tribes to complete operational loss assessments using methods that provide a systematic approach to characterize active physical and biological processes in watersheds and describes spatial distributions, histories and linkages among important ecosystem components. A framework for assessing operational losses shall be in place by the end of 2009 with loss assessments initiated in 2010.

Ecosystem management should maintain or recover the biological integrity of the system (Figure 2.3.2). Determining the extent to which ecological systems are experiencing anthropogenic disturbance and change in structure and function is critical for long-term conservation or restoration of biotic diversity in the face of changing and compromised landscapes and land use. To determine parameters needed to address ecological integrity, the Council, wildlife managers, and BPA will adopt a framework that can: (1) identify and isolate operational impacts from other basin changes, (2) assess operations-based influences on downstream physical processes, (3) link physical, biological, and ecological processes (4) account for natural floodplain dynamics, and (5) be used in a predictive capacity.

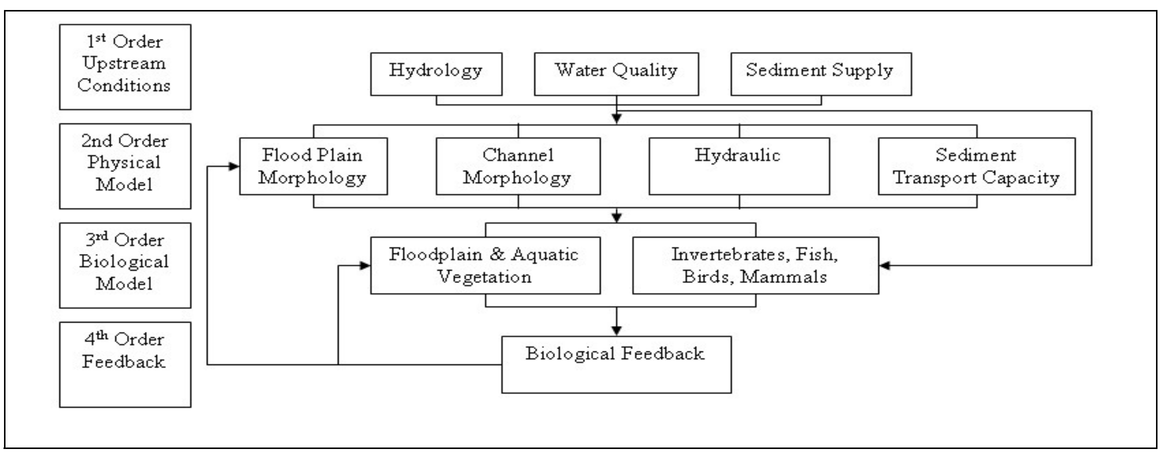

Figure 2.3.2. Order of Impacts (From Jorde et.al. 2005)

Bonneville will fund assessments of ecological impacts to wildlife from the reduction or loss of anadromous fish as part of the operational loss assessment. The assessments need to evaluate an array of core ecological parameters (e.g., biological/biotic and physical/abiotic) with the understanding that habitats, communities, and processes are ecologically linked (Figure 2.3.3). The results of these assessments will be the basis for quantification of operational impacts and subsequent mitigation obligation. Existing and future habitat actions implemented to benefit anadromous fish may be suitable mitigation for some of these impacts.

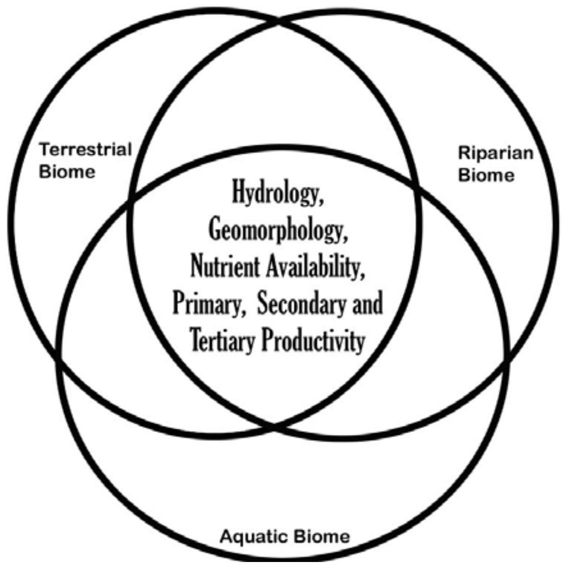

Figure 2.3.3. Integration of watershed/basin environmental parameters and ecological functions (e.g., aquatic, riparian, and terrestrial biomes) as part of an operational assessment framework (created by Kootenai Tribe of Idaho – Fish and Wildlife Department 2007).

Amendment 2.3.4B Long-term funding agreements:

Long-term funding agreements are necessary to provide the certainty required to optimize wildlife benefits and cost efficiencies. They must also retain flexibility to address changing needs on the landscape and address known and unforeseen external threats (e.g. invasive species, wildfires, etc). Agreements for ongoing and future projects must include provisions for adequate management funding to sustain the ecological functions and the minimum credited habitat values for the life of the project. Funding of these long-term agreements must occur prior to formally assigning mitigation credit to the ledger.

Consistent with the 2000 Program, the project sponsor and BPA will propose for Council consideration and recommendation a long-term funding agreement(s) adequate to sustain minimum credited value and maintain ecological functions for the life of the hydroelectric project impact.

Bonneville will enter into long-term funding agreements for existing and future mitigation projects that:

- Assure continuity of funding for the life of the hydroelectric project impact.
- Assure sufficient funding levels to implement the habitat management strategies and monitoring and evaluation needs identified in project area management plans.
- Provide flexibility to respond to uncertainties and unforeseen events.
- Provide adjustment for annual inflation.

Amendment 2.3.4C Fund existing projects at levels adequate to implement management plans:

Table 2.3.2 lists the existing wildlife program. Funding needs to continue to maintain the base level of habitat and credits accomplished to date. Bonneville will fund existing wildlife projects at levels determined to be consistent with the project management plans. Funding must be sufficient for habitat maintenance and enhancement, and appropriate monitoring as agreed upon in the management plans. Where management plans are not in place BPA will provide interim funding to manage the wildlife projects and complete the management plans.

Table 2.3.2 Ongoing Wildlife Habitat Projects Currently Funded by BPA.

Proposal #	Proposal Title	Organization
199206100	Albeni Falls Wildlife Mitigation	Albeni Falls Interagency Work Group
200002700	Acquisition Of Malheur River Wildlife Mitigation Project	Burns Paiute Tribe
200000900	Logan Valley Wildlife Mitigation Site	Burns Paiute Tribe
200103300	Hangman Restoration Project	Coeur d'Alene Tribe
199204800	Colville Confederated Tribes Wildlife Mitigation Project	Colville Confederated Tribes
200702700	Colville Confederated Tribes Acquisition Project	Colville Confederated Tribes
199009200	Wanaket Wildlife Area	Confederated Tribes of the Umatilla Indian Reservation
199506001	Iskuulpa Watershed Project	Confederated Tribes of the Umatilla Indian Reservation
200002600	Rainwater Wildlife Area Operations and Maintenance	Confederated Tribes of the Umatilla Indian Reservation
199802200	Pine Creek Conservation Area: Wildlife Habitat and Watershed Management on 33,557-acres to benefit grassland, shrub-steppe, riparian, and aquatic species.	Confederated Tribes of Warm Springs Reservation of Oregon
199505700	Southern Idaho Wildlife Mitigation	Idaho Department of Fish & Game
199505701	Southern Idaho Wildlife Mitigation	Idaho Department of Fish & Game

Proposal #	Proposal Title	Organization
199205900	Amazon Basin/Eugene Wetlands -	The Nature Conservancy
199608000	Northeast Oregon Wildlife Project (NPT) Precious Lands	Nez Perce Tribe
199206800	Willamette Basin Mitigation	Oregon Department of Fish & Wildlife
200002100	Securing Wildlife Mitigation Sites - Oregon Ladd Marsh WMA and Grande Ronde Subbasin Wetlands	Oregon Department of Fish & Wildlife
199107800	Burlington Bottoms Wildlife Mitigation Project	Oregon Department of Fish & Wildlife
199505703	Southern Idaho Wildlife Mitigation	Shoshone Paiute Tribes
199505702	Southern Idaho Wildlife Mitigation	Shoshone-Bannock Tribes
199106200	Spokane Tribe Wildlife Mitigation	Spokane Tribe
199800300	Spokane Tribe Wildlife Mitigation Operations & Maintenance	Spokane Tribe
200001600	Tualatin River NWR Additions	Tualatin River NWR
200600400	Wenas Wildlife Area O&M	Washington Department of Fish and Wildlife
199609401	Scotch Creek Wildlife Area	Washington Department of Fish and Wildlife
200301200	Shillapoo Wildlife Area	Washington Department of Fish and Wildlife
200201400	Sunnyside Wildlife Mitigation	Washington Department of Fish and Wildlife
199404400	Enhance, protect and maintain shrub-steppe habitat on the Sagebrush Flat Wildlife Area (SFWA)	Washington Department of Fish and Wildlife
199106100	Swanson Lake Wildlife Mitigation Project (Swanson Lakes Wildlife Area)	Washington Department of Fish and Wildlife
200600300	Desert Wildlife Area O&M (Wetland Enhancement)	Washington Department of Fish and Wildlife
200600500	Asotin Creek Wildlife Area O&M (Schlee Acquisitions)	Washington Department of Fish and Wildlife
200102700	Western Pond Turtle Recovery – Columbia River Gorge	Washington Department of Fish and Wildlife
199206200	Yakama Nation - Riparian/Wetlands Restoration	Yakama Nation

Amendment 2.3.4D Establish a Wildlife Crediting Forum for maintaining the crediting ledger:

Bonneville, the Council, and the fish and wildlife managers will establish a BPA funded forum to develop a regional protocol for establishment and maintenance of a crediting ledger documenting progress towards achieving mitigation obligations. This crediting ledger will be formally included in the Program. The forum will track crediting of construction, inundation and operational mitigation actions and will address disputes, inconsistencies, and other issues related to application of credit against wildlife losses. This forum is to be in place by no later than one year after the adoption of the revised Program

The development of the above-mentioned procedures and protocols must not be considered a prerequisite to continuing wildlife mitigation efforts. New and on-going wildlife mitigation projects will continue during the development and review of crediting protocols.

Habitat enhancement credits will be provided to BPA when habitat management activities funded by BPA lead to a net increase in habitat value when compared to the baseline habitat inventory. This determination will be made through periodic monitoring of the project site. Bonneville shall be credited for habitat enhancement efforts at a ratio of one habitat unit credited for every habitat unit gained.

Funding for mitigation projects may be secured to supplement the ratepayer monies provided by BPA. These funds may be used to expand the project area, enhance or restore habitat or to support operations and maintenance of the project. The extent to which these funds may result in improvements in habitat suitability relative to ratepayer funding is difficult to quantify, complicating crediting against the mitigation debt. Therefore, Bonneville, the Council, and the fish and wildlife managers shall work through the crediting forum to develop an appropriate crediting methodology to avoid in-lieu funding from non-hydro mitigation sources and to assure BPA receives mitigation credit proportional to the ratepayer contribution.

For a project to be credited against construction and inundation losses it must be consistent with the Fish and Wildlife Program. Criteria shall include:

- Project areas must be permanently protected and dedicated to wildlife benefits through covenants, easements, fee title acquisitions or other appropriate agreements for the life of the hydroelectric project,
- Projects must benefit priority wildlife habitat, species, or populations as defined by federal, state, Tribal wildlife management plans or subbasin plans.
- A project area management plan must be completed.
- A long-term funding agreement adequate to support implementation of the management plan has been adopted.

If settlement agreements are reached between affected managers and BPA for a specific hydro project or projects, then the regional crediting protocol may not apply. Such settlement agreements are the preferred strategy to complete BPA's wildlife mitigation responsibilities for the construction and inundation impacts.

Amendment 2.3.4E Fund Adequate M&E:

Bonneville will fund research, monitoring and evaluation of wildlife mitigation projects adequately to assure tracking of crediting, to evaluate trends in ecological functions of managed ecosystems, and provide managers the ability to assess the effectiveness of their strategies by evaluating species and habitat responses that contributes to broader monitoring efforts. Bonneville will continue funding HEP surveys on acquired land in support of the Wildlife Crediting Forum to track mitigation implementation progress against Table 2.3.1.

Amendment 2.3.5 Include a Statement Regarding Monitoring of Wildlife

Amend the Program to include the following language in the Basinwide Provisions for Wildlife:

> The purpose of monitoring and evaluation is to determine the condition of existing ecological functions, develop project objectives, and implement adaptive management. Data generated by monitoring and evaluation are used to affirm, adjust, and improve site specific management actions as well as programmatic strategies based on scientific principles.
>
> The program has used HEP to evaluate and credit properties and easements acquired with mitigation funding. HEP is also used to evaluate and credit enhancements on these projects. The Council's Program will support the transition from HEP to a new ecologically-based paradigm where assessments of ecological functions are used to guide management decisions.
>
> The level of RM&E will be based on the ecological objectives described in site specific management and subbasin plans. RM&E funding must be sufficient to allow project sponsors to track trends in ecological functions, to provide data to assess the effectiveness of management actions, and to effectively implement principles of adaptive management. Fundamental to the RM&E program is the establishment and measure of reference sites to address changing conditions (unforeseen events) or longer term objectives.
>
> Where appropriate, project level RM&E will complement and be consistent with larger scale efforts including but not limited to State Conservation Strategies through use of compatible protocols and data sharing. Data summaries from each project should link to region-wide databases. Compatible protocols (across the Basin) should be developed and used to determine baseline wildlife and habitat conditions.

Amendment 2.3.6 Identify and Support Specific Reporting Requirements for the Program

Amend the Program to include the following language in the Basinwide Provisions for Wildlife:

> Bonneville will fund adequate monitoring, data management, and reporting to answer the following questions in an annual report to Council and the region -
>
> - How many habitat units have been mitigated for FCRPS construction and inundation caused losses of wildlife?
> - How many of those habitat units are secured through long term funding?
> - How are wildlife species and habitats responding to FCRPS mitigation actions?
> - What is the FCRPS mitigation responsibility for wildlife operational losses?

Bonneville will fund the following activities in support of the Program:

- Operate and maintain the regional Interactive Habitat and Biodiversity Information System (IBIS),
- Update and refine wildlife basin, eco-province, and subbasin habitat maps,
- Develop wildlife and habitat GIS tools and services, and
- Develop and implement new Habitat Assessment protocols to evaluate mitigation impact and sites.

Amendment 2.3.7 Identify How Evaluation of the Wildlife Section of the Program Will Occur

Amend the Program to include the following language in the Basinwide Provisions for Wildlife:

> A programmatic evaluation of the Wildlife Section of the Program will occur preceding Program amendments, to determine whether wildlife measures are moving the Program towards its biological objectives for performance.

Amendment 2.3.8 Explain How Adjustment in Program Direction Will Occur Over Time

Amend the Program to include the following language in the Basinwide Provisions for Wildlife:

> The project solicitation process identified in the Implementation Provisions (Amendment 5.2) of this Program will rely on conclusions from the evaluation of the Wildlife Section (Amendment 2.3.7) of the Program to set project selection priorities.

Section 3.0. Amendments to the Ecological Province, Subbasin, and Focal Species Provisions for Anadromous Fish

This section includes, for most provinces, a subbasin by subbasin summary of objectives, current status, limiting factors and threats, and recommended strategies and measures for anadromous fish in the Columbia River Basin. Objectives are those defined in subbasin plans and/or recovery plans where available. Although some information on productivity is available, objectives are often limited to adult returns to the subbasin, and are usually for naturally-produced fish only. These adult-return objectives are not directly comparable to basin-wide objectives, because they do not generally incorporate returns of hatchery fish, broodstock needs, mainstem harvest, or unexplained losses between Bonneville Dam and subbasin of origin. Current returns are given as a range or average of returns over the most recent 5 years for which data are available. Limiting factors and threats are summarized from those provided in more detail in subbasin plans and recovery plans. Strategies and measures are designed to provide a general framework that supports more specific actions to address threats.

Section 3.1 Columbia River Estuary Province and Ocean

Section 3.1.1 Biological Objectives and Status

The Columbia River estuary is where juvenile and adult salmonids undergo vast physiological changes needed to transition to and from saltwater. Pacific lampreys also undergo metamorphoses when leaving freshwater and becoming adults. In addition, a properly functioning estuary provides growth opportunities and refugia from predators. Every downstream-migrating anadromous fish must use the habitats of the estuary to complete its life cycle. These fish were historically successful because they exploited a wide array of the habitat niches available to them. They did this by employing a variety of strategies that allowed them to use many diverse habitats across a wide geographic space.

In 2006, about 168 million juvenile salmonids entered the Columbia River estuary. Only about 1 percent of the juveniles entering the estuary will return as adults and 99 percent are lost as a result of all the limiting factors (human and natural) in the estuary, plume, nearshore, and ocean. Understanding the extent to which the estuary and plume contribute to these losses, and to losses of lamprey, is essential to the ultimate recovery of populations throughout the basin.

Restoration and recovery of anadromous fish in the Columbia River may not be possible without properly functioning estuary, plume, and nearshore ecosystems. It is difficult to characterize specific objectives for the estuary and plume because overall mortality in the estuary and specific mortality rates related to specific threats are not easily understood. For planning purposes only, the estuary recovery plan module released by NOAA Fisheries Service selects 20 percent as a target for improvement in the survival rate of wild juvenile salmonids in the estuary and plume. Twenty percent represents a hypothetical level of improvement that might be realized through the implementation of the strategies and actions summarized in Section 3.1.3. No estuary target has been developed for lamprey.

Section 3.1.2. Limiting Factors and Threats

The estuary and plume are considerably degraded, and the estuary tidal prism is about 20 percent smaller than it was historically. This reduction in estuary size is due mostly to dike and filling practices used to convert the floodplain to agricultural, industrial, commercial, and residential uses. Instream flows entering the estuary also have changed dramatically, with a decrease in spring freshets or floods, and the annual timing, magnitude, and duration of flows no longer resemble those that historically occurred in the Columbia River. Changes to flow volume and timing are attributed to flow regulation by the hydrosystem, water withdrawal for irrigation and water supplies, and climate fluctuations.

Flow alterations and dike and filling practices affect anadromous fish in several ways. Historically, vegetated wetlands within the floodplain supplied the estuary with its base-level food source of macrodetritus. The near elimination of over-bank events and the separation of the river from its floodplain have altered the food web by reducing macrodetrital inputs. At the same time, phytoplankton detrital sources from upstream reservoirs now dominate the base of the food chain. The substitution of food sources likely has profound effects on the estuary ecosystem. In addition, access to and use of floodplain habitats by ocean-type salmonids have been severely compromised through alterations in the presence and availability of these critical habitats.

The timing, magnitude, and duration of flows also have important ramifications to in-channel habitat availability and connectivity. Sand transport along the river bottom is highly correlated to flow. With reductions in the magnitude and duration of flows, erosion and accretion processes no longer function as they have for thousands of years. This may have far-reaching consequences to the estuary, plume, and nearshore lands north and south of the river's mouth. At the same time, upstream dams have prevented sediments from entering the estuary, while dredging activities have exported sand and gravel out of the estuary. The full impact of these changes is unknown; however, sediment transport is a primary habitat-shaping force that determines the type, location, and availability of habitats distributed in the estuary and plume. Decreases in sediments also improve water clarity and increase the effectiveness of predators that consume anadromous fish.

Elevated temperatures of water entering the estuary are also a threat to anadromous fish. Degradation of tributary riparian habitat caused by forest, residential, commercial, and industrial practices, as well as reservoir heating, is responsible for increased temperatures.

Water quality in the estuary and plume has been degraded by human practices from within the estuary and also from upstream sources. An important indicator of water quality degradation found in the estuary is the presence of toxic contaminants. These contaminants include water-soluble agricultural pesticides and fertilizers such as simazine, atrazine, and diazinon. Industrial contaminants include polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs). Concentrations of these substances, and others, are found throughout the estuary, sometimes near cities and other times in bays and shallows where low water velocities allow suspended contaminants to settle. Anadromous fish are affected by contaminants through short-term exposure to lethal substances or through longer exposures to chemicals that accumulate over time and magnify through the food chain.

Increased predation is another threat to anadromous fish in the estuary. New islands formed through the disposal of dredged materials attracted Caspian terns away from their traditional habitats, which may be being degraded. Reduced sediment in the river increased terns' efficiency in capturing steelhead juveniles migrating to saltwater at the same time that the birds need additional food for their broods. The result is a predator/prey shift in the estuary that has increased mortality for steelhead juveniles. Double-crested cormorants also prey on juvenile salmonids, in similar numbers as terns.

Section 3.1.3. Strategies and Measures

Strategy 3.1.3.1 Operate the hydrosystem to more closely approximate the shape of the natural hydrograph and to enhance flows and water quality to improve juvenile and adult fish survival.

Measures:

3.1.3.1a Establish minimum instream flows for the estuary that will help prevent further degradation.

3.1.3.1b Operate the hydrosystem to reduce the effects of reservoir surface heating.

3.1.3.1c Adjust the timing, magnitude, and frequency of flows entering the estuary and plume to provide better transport of coarse sediments and access to habitats in the estuary and plume.

3.1.3.1d Protect intact riparian areas in the estuary and restore riparian areas that are degraded.

Strategy 3.1.3.2 Restore floodplain connectivity and function.

Measures:

3.1.3.2a Breach or lower dikes and levees to improve access to off-channel habitats.

3.1.3.2b Remove pilings and pile dikes with low economic value.

3.1.3.2c Protect remaining high-quality off-channel habitat from degradation.

Strategy 3.1.3.3 Restore channel structure and complexity.

Measures:

3.1.3.3a Reduce the export of sand and gravels via dredge operations by using dredged materials beneficially.

3.1.33b Reduce entrainment and habitat effects resulting from main and side-channel dredge activities in the estuary.

Strategy 3.1.3.4 **Restore degraded water quality.**

Measures:

3.1.3.4a Implement pesticide and fertilizer best management practices to reduce estuary and upstream sources of toxic contaminants.

3.1.3.4b Identify and reduce industrial, commercial, and public sources of pollutants.

Strategy 3.1.3.5 **Address food web-related threats.**

Measures:

3.1.3.5a Manage northern pikeminnow and other piscivorous fish to reduce predation.

3.1.3.5b Identify and implement actions to reduce predation by pinnipeds.

3.1.3.5c Implement projects to reduce Caspian tern and double-crested cormorant predation.

Strategy 3.1.3.6 **Mitigate for reduced productivity resulting from inundated spawning habitat and impeded or blocked passage**

Measures:

3.1.3.6a Implement a mix of artificial propagation measures, habitat restoration actions, improved mainstem passage and survival in an integrated approach to improve anadromous fish returns to the Columbia River Estuary subbasin and to achieve objectives.

3.1.3.6b Implement select area fisheries to mitigate for lost mainstem fishing opportunities

Strategy 3.1.3.7 **Monitor status and trends of focal species and populations.**

Measures:

3.1.3.7a Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness

Section 3.2. Lower Columbia Province

Biological Objectives and Status

The Lower Columbia Province includes eight subbasins with populations of anadromous salmonids. These anadromous species include spring Chinook salmon, fall Chinook salmon, summer steelhead, winter steelhead, coho salmon, and chum salmon (Table 3.2). Subbasin plans included biological objectives for most of these species. Recent adult escapement has reached subbasin plan objectives more often than in any other province.

Table 3.2. Adult escapement objectives and recent adult escapement for anadromous salmonids in the Lower Columbia Province. Adult-return objectives are not directly comparable to basin-wide objectives, because they do not generally incorporate returns of hatchery fish, broodstock needs, or mainstem harvest.

Subbasin, species	No. of Populations	Adult Returns	
		Objective	Recent (5 years)
Grays			
Fall Chinook	1	1,400	78-726
Winter steelhead	1	600	396-1,200
Coho	1	600	--
Chum	1	6,000	3,032-10,932
Elochoman			
Fall Chinook	1	1,400	317-7,531
Winter steelhead	1	400	232-544
Coho	1	600	--
Chum	1	1,100	--
Cowlitz			
Spring Chinook	4	8,150	419-1,937
Fall Chinook	4	6,900	6,918-25,073
Winter steelhead	7	4,150	1,392-3,341
Coho	7	3,150	--
Chum	2	600	--
Kalama			
Spring Chinook	1	1,400	352-5,564
Fall Chinook	1	1,300	6,612-24,710
Summer steelhead	1	700	361-817
Winter steelhead	1	650	1,495-2,500
Coho	1	300	--
Chum	1	150	--
Lewis			
Spring Chinook	1	2,200	393-7,530
Fall Chinook	2	14,500	11,826-20,087
Summer steelhead	2	275	425-910
Winter steelhead	2	900	246-1,298
Coho	2	1,200	--
Chum	1	1,100	--

Subbasin, species	No. of Populations	Adult Returns	
		Objective	Recent (5 years)
Willamette			
Spring Chinook	7	100,000	35,453-95,968
Fall Chinook	1	--	--
Winter steelhead	5	--	5,963-16,656
Coho	1	--	--
Chum	1	--	--
Sandy			
Spring Chinook	1	--	2,452-5,285
Fall Chinook	2	--	622-1,315
Winter steelhead	1	--	632-1,529
Coho	1	--	289-1,178
Washougal			
Fall Chinook	1	5,800	2,600-10,404
Summer steelhead	1	700	607-608
Winter steelhead	1	400	286-1,114
Coho	1	300	--
Chum	1	5,200	--

Limiting Factors and Threats

There is no direct passage effect of the Columbia River hydrosystem on anadromous salmonids in the Lower Columbia River Province; however, changes to flow volume and timing in the estuary are attributed to flow regulation by the hydrosystem. Populations are affected to varying degrees by degraded habitat within subbasins. Access to habitat is limited or blocked in many subbasins by obstructions ranging from culverts to impassable dams in the Willamette River subbasin. Habitat quality and quantity have been reduced in each subbasin by land use practices such as timber harvest, agriculture, grazing, and diking. Land use practices have also resulted in reduced water quality in most subbasins. Finally, water quantity is affected in some subbasin by withdrawals.

Strategies and Measures

Many strategies and measures to address subbasin habitat effects are common to most or all subbasins. The first strategy in all subbasins is to protect and conserve natural ecological processes. Restoring passage and connectivity to habitats blocked or impaired by artificial barriers is another strategy common to many subbasins. More specific measures may vary among subbasins. Strategies to address reduced habitat, water quantity, and water quality include restoring floodplain connectivity and function, restoring channel structure and complexity, restoring riparian condition and recruitment of large woody debris, restoring the natural hydrograph to provide sufficient flow during critical periods, and improving degraded water quality.

Section 3.2.1 Grays River Subbasin

Section 3.2.1.1 Biological Objectives and Status

Fall Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Grays River	--	1,400	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Grays River	1,400	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Grays River	78-726	--	Low+

Steelhead

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Grays River	--	600	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Grays River	396-1,200	--	Not ESA listed

Coho Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Grays River	--	600	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Grays River	600	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Grays River	--	--	Low

Chum Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Grays River	--	6,000	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Grays River	4,300	--	High+

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Grays River	3,032-10,932	--	Low+

Section 3.2.1.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		Fall Chinook	Steelhead	Coho	Chum
Subbasin habitat effects		1.4	1.0	2.8	--
• Physical habitat quality/quantity	• Grazing • Roads • Diking • Timber harvest				
• Water quantity	• Withdrawals				
• Water quality	• Roads • Agriculture				

Section 3.2.1.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.2.1.3.1: Protect and conserve natural ecological processes	**3.2.1.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.2.1.3.2: Restore floodplain connectivity and function.	**3.2.1.3.2a:** Reconnect floodplains to channels. **3.2.1.3.2b:** Reconnect side channels and off-channel habitats to stream channels. **3.2.1.3.2c:** Remove dikes and levies.	Immediate to long term	5 to 15 years
3.2.1.3.3: Restore channel structure and complexity.	**3.2.1.3.3a:** Restore natural channel form. **3.2.1.3.3b:** Increase role and abundance of wood and large organic debris in streambeds. **3.2.1.3.3c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.2.1.3.4: Restore riparian condition and LWD recruitment	**3.2.1.3.4a:** Restore natural riparian vegetative communities. **3.2.1.3.4b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.2.1.3.5: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.2.1.3.5a:** Implement agricultural water conservation measures. **3.2.1.3.5b:** Improve irrigation conveyance and efficiency. **3.2.1.3.5c:** Obtain water rights and convert to instream water rights.	Immediate to long term	Immediate to long term
3.2.1.3.6: Improve degraded water quality	**3.2.1.3.6a:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
Monitoring and Evaluation:			
3.2.1.3.7: Monitor status and trends of focal species	**3.2.1.3.7a:** Establish or use preexisting index sites to gather baseline, trend, and	--	--

and populations	comparative data.		
3.2.1.3.8: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.2.1.3.8a:** Develop methods to monitor biological response to habitat improvement. **3.2.1.3.8b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.2.2 Elochoman River Subbasin

Section 3.2.2.1 Biological Objectives and Status

Fall Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Elochoman River	--	1,400	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Elochoman River	1,400	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Elochoman River	317-7,531	--	Low+

Steelhead

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Elochoman River	--	400	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Elochoman River	232-544	--	Not ESA listed

Coho Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Elochoman River	--	600	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Elochoman River	600	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Elochoman River	--	--	Low

Chum Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Elochoman River	--	1,100	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Elochoman River	1,100	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Elochoman River	--	--	Low

Section 3.2.2.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		Fall Chinook	Steelhead	Coho	Chum
Subbasin habitat effects		1.0	1.1	1.3	--
• Physical habitat quality/quantity	• Grazing • Roads				

	• Diking				
• Water quality	• Roads • Grazing				

Section 3.2.2.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.2.2.3.1: Protect and conserve natural ecological processes	**3.2.2.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.2.2.3.2: Restore floodplain connectivity and function.	**3.2.2.3.2a:** Reconnect floodplains to channels. **3.2.2.3.2b:** Reconnect side channels and off-channel habitats to stream channels. **3.2.2.3.2c:** Remove dikes and levies.	Immediate to long term	5 to 15 years
3.2.2.3.3: Restore channel structure and complexity.	**3.2.2.3.3a:** Restore natural channel form. **3.2.2.3.3b:** Increase role and abundance of wood and large organic debris in streambeds. **3.2.2.3.3c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.2.2.3.4: Restore riparian condition and LWD recruitmen**t**	**3.2.2.3.4a:** Restore natural riparian vegetative communities. **3.2.2.3.4b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.2.2.3.5: Improve degraded water quality	**3.2.2.3.5a:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
Monitoring and Evaluation:			
3.2.2.3.6: Monitor status and trends of focal species and populations	**3.2.2.3.6a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.2.2.3.7: Monitor and evaluate effectiveness of	**3.2.2.3.7a:** Develop methods to monitor biological response to habitat	--	--

actions taken to implement measures.	improvement. **3.2.2.3.7b:** Monitor effectiveness of hatchery and natural production measures.		

Section 3.2.3 Cowlitz River Subbasin

Section 3.2.3.1 Biological Objectives and Status

Spring Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Upper Cowlitz River	--	5,400	--	--
Cispus River	--	1,800	--	--
Tilton River	-	150	--	--
Toutle River	--	800	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Upper Cowlitz River	2,800	--	High+
Cispus River	1,400	--	High+
Tilton River	1,400	--	Very low
Toutle River	1,400	--	Medium

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Upper Cowlitz River	419-1,937 (entire subbasin)	--	Low
Cispus River		--	Low
Tilton River		--	Very low
Toutle River		--	Very low

Fall Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Lower Cowlitz River	--	2,300	--	--
Upper Cowlitz River	--	--	--	--
Toutle River	--	1,000	--	--

Coweeman River	--	3,600	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Lower Cowlitz River	3,900	--	Medium
Upper Cowlitz River	1,400	--	Very low
Toutle River	1,400	--	Low
Coweeman River	3,000	--	High+

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Lower Cowlitz River	6,918-25,073 (entire subbasin)	--	Low+
Upper Cowlitz River		--	Very low
Toutle		--	Low
Coweeman		--	Medium

Steelhead

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Lower Cowlitz River	--	300	--	--
Coweeman River	--	800	--	--
South Fork Toutle River	--	1,600	--	--
North Fork Toutle River	--	700	--	--
Upper Cowlitz River	---	300	---	--
Cispus River	--	300	--	--
Tilton River	--	150	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Lower Cowlitz River	600	--	Medium
Coweeman River	800	--	High
South Fork Toutle River	1,400	--	High+
North Fork Toutle River	700	--	High
Upper Cowlitz River	600	--	Medium
Cispus River	600	--	Medium
Tilton River	600	--	Low

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Lower Cowlitz River	1,392-3,341 (entire subbasin)	--	Low
Coweeman River		--	Low+
South Fork Toutle River		--	Medium
North Fork Toutle River		--	Low
Upper Cowlitz River		--	Low
Cispus River		--	Low
Tilton River		--	Very low

Coho Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Lower Cowlitz River	--	600	--	--
Coweeman	--	600	--	--
South Fork Toutle River	--	600	--	--
North Fork Toutle River	--	600	--	--
Upper Cowlitz River	--	300	--	--
Cispus River	--	300	--	--
Tilton River	--	150	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Lower Cowlitz River	600	--	High
Coweeman	600	--	High
South Fork Toutle River	600	--	High
North Fork Toutle River	600	--	High
Upper Cowlitz River	600	--	Medium
Cispus River	600	--	Medium
Tilton River	600	--	Low

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Lower Cowlitz River	--	--	Low
Coweeman	--	--	Low
South Fork Toutle River	--	--	Low
North Fork Toutle River	--	--	Low
Upper Cowlitz River	--	--	Very low

Cispus River	--	--	Very low
Tilton River	--	--	Very low

Chum Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Cowlitz River	--	600	--	--
Coweeman River	--	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Cowlitz River	1,100	--	Medium
Coweeman River	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Cowlitz River	--	--	Very low
Coweeman River	--	--	--

Section 3.2.3.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		Spring Chinook	Fall Chinook	Steelhead	Coho
Subbasin habitat effects		1.0	1.4	1.1	1.1
• Physical habitat quality/quantity	• Grazing • Roads • Diking				
• Water quality	• Roads • Agriculture • Grazing				

Section 3.2.3.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.2.3.3.1: Protect and conserve	**3.2.3.3.1a:** Continue existing protections, and	5 to 15 years	Immediate to 15 years

natural ecological processes	increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.		
3.2.3.3.2: Restore floodplain connectivity and function.	**3.2.3.3.2a:** Reconnect floodplains to channels. **3.2.3.3.2b:** Reconnect side channels and off-channel habitats to stream channels. **3.2.3.3.2c:** Remove dikes and levies.	Immediate to long term	5 to 15 years
3.2.3.3.3: Restore channel structure and complexity.	**3.2.3.3.3a:** Restore natural channel form. **3.2.3.3.3b:** Increase role and abundance of wood and large organic debris in streambeds. **3.2.3.3.3c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.2.3.3.4: Restore riparian condition and LWD recruitment	**3.2.3.3.4a:** Restore natural riparian vegetative communities. **3.2.3.3.4b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.2.3.3.5: Improve degraded water quality	**3.2.3.3.5a:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
Monitoring and Evaluation:			
3.2.3.3.6: Monitor status and trends of focal species and populations	**3.2.3.3.6a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.2.3.3.7: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.2.3.3.7a:** Develop methods to monitor biological response to habitat improvement. **3.2.3.3.7b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.2.4 Kalama River Subbasin

Section 3.2.4.1 Biological Objectives and Status

Spring Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Kalama River	--	1,400	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Kalama River	1,400	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Kalama River	352-5,564	--	Very low

Fall Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Kalama River	--	1,300	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Kalama River	1,300	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Kalama River	6,612-24,710	--	Low+

Steelhead

Interim objectives from subbasin plan:

Population	Adult returns

	Total	Natural spawners	Harvest	Broodstock
Kalama River summer	--	700	--	--
Kalama River winter	--	650	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Kalama River summer	700	--	High
Kalama River winter	600	--	High+

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Kalama River summer	361-817	--	Low+
Kalama River winter	1,495-2,500	--	Medium+

Coho Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Kalama River	--	300	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Kalama River	600	--	Medium

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Kalama River	--	--	Low

Chum Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Kalama River	--	150	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Kalama River	1,100	--	Low

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Kalama River	--	--	Very low

Section 3.2.4.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)				
		Spring Chinook	Fall Chinook	Summer Sthd	Winter Sthd	Coho
Subbasin habitat effects		1.0	1.0	1.2	1.0	1.4
• Physical habitat quality/quantity	• Grazing • Roads • Diking					
• Water quantity	• Agriculture • Roads					
• Water quality	• Roads • Agriculture					

Section 3.2.4.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.2.4.3.1: Protect and conserve natural ecological processes	**3.2.4.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.2.4.3.2: Restore floodplain connectivity and function.	**3.2.4.3.2a:** Reconnect floodplains to channels. **3.2.4.3.2b:** Reconnect side channels and off-channel habitats to stream channels. **3.2.4.3.2c:** Remove dikes and levies.	Immediate to long term	5 to 15 years
3.2.4.3.3: Restore channel structure and	**3.2.4.3.3a:** Restore natural channel form. **3.2.4.3.3b:**	Immediate to long term	Immediate to 15 years

complexity.	Increase role and abundance of wood and large organic debris in streambeds. **3.2.4.3.3c:** Stabilize streambanks with passive restoration techniques.		
3.2.4.3.4: Restore riparian condition and LWD recruitment	**3.2.4.3.4a:** Restore natural riparian vegetative communities. **3.2.4.3.4b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.2.4.3.5: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.2.4.3.5a:** Implement agricultural water conservation measures. **3.2.4.3.5b:** Improve irrigation conveyance and efficiency. **3.2.4.3.5c:** Obtain water rights and convert to instream water rights. **3.2.4.3.5d:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Immediate to long term	Immediate to long term
3.2.4.3.6: Improve degraded water quality	**3.2.4.3.6a:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
Monitoring and Evaluation:			
3.2.4.3.7: Monitor status and trends of focal species and populations	**3.2.4.3.7a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.2.4.3.8: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.2.4.3.8a:** Develop methods to monitor biological response to habitat improvement. **3.2.4.3.8b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.2.5 Lewis River Subbasin

Section 3.2.5.1 Biological Objectives and Status

Spring Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Lewis River	--	2,200	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Lewis River	2,200	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Lewis River	393-7,530	--	Very lowk

Fall Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
East Fork Lewis River	--	2,900	--	--
North Fork Lewis River	--	11,600	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
East Fork Lewis River	1,900	--	High+
North Fork Lewis River	6,500	--	High+

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
East Fork Lewis River	11,826-20,087 (entire subbasin)	--	Medium
North Fork Lewis River		--	Medium+

Steelhead

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
East Fork Lewis River summer	--	200	--	--
North Fork Lewis River summer	--	75	--	--
East Fork Lewis River winter	--	300	--	--
North Fork Lewis River winter	--	600	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
East Fork Lewis River summer	200	--	High
North Fork Lewis River summer	600	--	Very low
East Fork Lewis River winter	600	--	High
North Fork Lewis River winter	600	--	Medium

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
East Fork Lewis River summer	425-910 (All summer steelhead)	--	Low+
North Fork Lewis River summer		--	Very low
East Fork Lewis River winter	246-1,298 (All winter steelhead)	--	Low+
North Fork Lewis River winter		--	Low

Coho Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
East Fork Lewis River	--	600	--	--
North Fork Lewis River	--	600	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
East Fork Lewis River	600	--	High
North Fork Lewis River	600	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
East Fork Lewis River	--	--	Low
North Fork Lewis River	--	--	Low

Chum Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Lewis River	--	1,100	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Lewis River	1,100	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Lewis River	--	--	Very low

Section 3.2.5.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)				
		Spring Chinook	Fall Chinook	Summer Sthd	Winter Sthd	Coho
Subbasin habitat effects		1.0	1.0	2.4	1.1	1.3
• Physical habitat quality/quantity	• Grazing • Roads • Diking					
• Water quantity	• Agriculture • Diking					
• Water quality	• Roads • Agriculture • Hydropower operations					
• Obstructions	• Culverts • Merwin Dam					

Section 3.2.5.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.2.5.3.1: Protect and conserve natural ecological processes	**3.2.5.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.2.5.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.2.5.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan.	Immediate to 50 years	Immediate
3.2.5.3.3: Restore floodplain connectivity and function.	**3.2.5.3.3a:** Reconnect floodplains to channels. **3.2.5.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.2.5.3.3c:** Remove dikes and levies.	Immediate to long term	5 to 15 years
3.2.5.3.4: Restore channel structure and complexity.	**3.2.5.3.4a:** Restore natural channel form. **3.2.5.3.4b:** Increase role and abundance of wood and large organic debris in streambeds. **3.2.5.3.4c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.2.5.3.5: Restore riparian condition and LWD recruitmen**t**	**3.2.5.3.5a:** Restore natural riparian vegetative communities. **3.2.5.3.5b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.2.5.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.2.5.3.6a:** Operate the tributary hydrosystem to provide appropriate flows for spawning and rearing. **3.2.5.3.6b:** Implement agricultural water conservation measures. **3.2.5.3.6c:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Immediate to long term	Immediate to long term

3.2.5.3.7: Improve degraded water quality	**3.2.5.3.7a:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
Monitoring and Evaluation:			
3.2.5.3.8: Monitor status and trends of focal species and populations	**3.2.5.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.2.5.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.2.5.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.2.5.3.9b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.2.6 Willamette River Subbasin

Section 3.2.6.1 Biological Objectives and Status

Spring Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Clackamas River	100,000 (past Willamette Falls)	--	--	--
Molalla River		--	--	--
South Santiam River		--	--	--
North Santiam River		--	--	--
Calapooia River		--	--	--
McKenzie River		--	--	--
Middle Fork Willamette River		--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Clackamas River	--	--	High
Molalla River	--	--	--
South Santiam River	--	--	--
North Santiam River	--	--	--
Calapooia River	--	--	--
McKenzie River	--	--	--
Middle Fork Willamette River	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Clackamas River	35,453-95,968 (past Willamette Falls)	--	High
Molalla River		--	--
South Santiam River		--	--
North Santiam River		--	--
Calapooia River		--	--
McKenzie River		--	--
Middle Fork Willamette River		--	--

Fall Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Clackamas River	--	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Clackamas River	--	--	Medium

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Clackamas River	--	--	Very low

Steelhead

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Clackamas River	--	--	--	--
Molalla River	--	--	--	--
South Santiam River	--	--	--	--
North Santiam River	--	--	--	--
Calapooia River	--	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Clackamas River	--	--	High
Molalla River	--	--	--
South Santiam River	--	--	--
North Santiam River	--	--	--
Calapooia River	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Clackamas River	5,963-16,656 (past Willamette Falls)	9.27	High
Molalla River		5.34	--
South Santiam River		6.96	--
North Santiam River		7.00	--
Calapooia River		4.33	--

Coho Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Clackamas River	--	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Clackamas River	--	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Clackamas River	--	--	High

Chum Salmon

No information available.

Section 3.2.6.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		Spring Chinook	Fall Chinook	Steelhead	Coho
Subbasin habitat effects		--	--	--	1.1
• Physical habitat quality/quantity	• Grazing • Agriculture • Urban development				
• Water quality	• Roads • Agriculture				
• Water quantity	• Willamette hydrosystem • Withdrawals				
• Obstructions	• Culverts • Willamette hydrosystem				

Section 3.2.6.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.2.6.3.1: Protect and conserve natural ecological processes	**3.2.6.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.2.6.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.2.6.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3.2.6.3.2b:** Provide adequate screening at all irrigation diversions. **3.2.6.3.2c:** Reintroduce native salmon species in areas where they have been extirpated by human activities.	Immediate to 50 years	Immediate
3.2.6.3.3: Restore floodplain connectivity and function.	**3.2.6.3.3a:** Reconnect floodplains to channels. **3.2.6.3.3b:** Reconnect side channels and off-channel habitats to stream	Immediate to long term	5 to 15 years

	channels.		
3.2.6.3.4: Restore channel structure and complexity.	**3.2.6.3.4a:** Restore natural channel form. **3.2.6.3.4b:** Increase role and abundance of wood and large organic debris in streambeds. **3.2.6.3.4c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.2.6.3.5: Restore riparian condition and LWD recruitmen**t**	**3.2.6.3.5a:** Restore natural riparian vegetative communities. **3.2.6.3.5b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.2.6.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.2.6.3.6a:** Operate the tributary hydrosystem to provide appropriate flows for spawning and rearing. **3.2.6.3.6b:** Implement agricultural water conservation measures. **3.2.6.3.6c:** Improve irrigation conveyance and efficiency. **3.2.6.3.6d:** Obtain water rights and convert to instream water rights. Protect and rehabilitate springs.	Immediate to long term	Immediate to long term
3.2.6.3.7: Improve degraded water quality	**3.2.6.3.7a:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
3.2.6.3.8: Mitigate for impeded and blocked passage within the subbasin	**3.2.6.3.8a:** Implement artificial propagation measures to mitigate for lost habitat access and habitat productivity.	--	--
Hatchery Effects:			
3.2.6.3.9: Increase hatchery effectiveness for restoration and mitigation	**3.2.6.3.9a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.	--	--
Monitoring and Evaluation:			
3.2.6.310: Monitor status and trends of focal species and populations	**3.2.6.3.10a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data. **3.2.6.3.10b:** Gather and analyze harvest data	--	--

	to aid in run reconstruction to evaluate status and action effectiveness.		
3.2.6.3.11: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.2.6.3.11a:** Develop methods to monitor biological response to habitat improvement. **3.2.6.3.11b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.2.7 Sandy River Subbasin

Section 3.2.7.1 Biological Objectives and Status

Spring Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Sandy River	--	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Sandy River	--	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Sandy River	2,452-5,285	4.80	Medium

Fall Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Sandy River early	--	--	--	--
Sandy River late	--	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Sandy River early	--	--	Medium
Sandy River late	--	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Sandy River early	2,452-5,285 (entire subbasin)	5.26	Very low
Sandy River late		5.00	high

Steelhead

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Sandy River	--	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Sandy River	--	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Sandy River	632-1,159	2.00	Very low

Coho Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Sandy River	--	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Sandy River	--	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Sandy River	289-1,178	--	Low

Section 3.2.7.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		Spring Chinook	Fall Chinook	Steelhead	Coho
Subbasin habitat effects		1.0	1.0	1.0	1.4
• Physical habitat quality/quantity	• Grazing • Roads • Land development				
• Water quantity	• Agriculture • Withdrawals				
• Water quality	• Roads • Agriculture				
• Obstructions	• Culverts • Bull Run Dam				

Section 3.2.7.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.2.7.3.1: Protect and conserve natural ecological processes	**3.2.7.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.2.7.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.2.7.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3.2.7.3.2b:** Provide adequate screening at all irrigation diversions.	Immediate to 50 years	Immediate
3.2.7.3.3: Restore floodplain connectivity and function.	**3.2.7.3.3a:** Reconnect floodplains to channels. **3.2.7.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.2.7.3.3c:**	Immediate to long term	5 to 15 years

	Restore wet meadows.		
3.2.7.3.4: Restore channel structure and complexity.	**3.2.7.3.4a:** Restore natural channel form. **3.2.7.3.4b:** Increase role and abundance of wood and large organic debris in streambeds. **3.2.7.3.4c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.2.7.3.5: Restore riparian condition and LWD recruitmen**t**	**3.2.7.3.5a:** Restore natural riparian vegetative communities. **3.2.7.3.5b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.2.7.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.2.7.3.6a:** Implement agricultural water conservation measures. **3.2.7.3.6b:** Improve irrigation conveyance and efficiency. **3.2.7.3.6c:** Obtain water rights and convert to instream water rights. **3.2.7.3.6d:** Protect and rehabilitate springs.	Immediate to long term	Immediate to long term
3.2.7.3.7: Improve degraded water quality	**3.2.7.3.7a:** Upgrade or remove problem forest roads. **3.2.7.3.7b:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
3.2.7.3.8: Mitigate for impeded and blocked passage within the subbasin	**3.2.7.3.8a:** Implement artificial propagation measures to mitigate for lost habitat access and habitat productivity.		
Hatchery Effects:			
3.2.7.3.9: Increase hatchery effectiveness for restoration and mitigation	**3.2.7.3.9a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.		
Monitoring and Evaluation:			
3.2.7.3.10: Monitor status and trends of focal species and populations	**3.2.7.3.10a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data. **3.2.7.3.10b:** Gather and analyze harvest data	--	--

	to aid in run reconstruction to evaluate status and action effectiveness.		
3.2.7.3.11: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.2.7.3.11a:** Develop methods to monitor biological response to habitat improvement. **3.2.7.3.11b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.2.8 Washougal River Subbasin

Section 3.2.8.1 Biological Objectives and Status

Fall Chinook Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Washougal River	--	5,800	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Washougal River	5,800	--	High

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Washougal River	2,600-10,404	--	Low+

Steelhead

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Washougal River summer	--	700	--	--
Washougal River winter	--	400	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Washougal River summer	500	--	High+
Washougal River winter	600	--	Medium

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Washougal River summer	607-608	--	Low+
Washougal River winter	286-1,114	--	Low+

Coho Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Washougal River	--	300	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Washougal River	600	--	Medium

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Washougal River	--	--	Low

Chum Salmon

Interim objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Washougal River	--	5,200	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population viability status
Washougal River	1,100	--	High+

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population viability status
Washougal River	--	--	Low

Section 3.2.8.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)		
		Fall Chinook	Steelhead	Coho
Subbasin habitat effects		1.0	1.2	1.5
• Physical habitat quality/quantity	• Grazing • Roads • Land development			
• Water quantity	• Withdrawals			
• Water quality	• Roads • Agriculture			

Section 3.2.8.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.2.8.3.1: Protect and conserve natural ecological processes	**3.2.8.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.2.8.3.2: Restore floodplain connectivity and function.	**3.2.8.3.2a:** Reconnect floodplains to channels. **3.2.8.3.2b:** Reconnect side channels and off-channel habitats to stream channels. **3.2.8.3.2c:** Restore wet meadows.	Immediate to long term	5 to 15 years
3.2.8.3.3: Restore channel structure and complexity.	**3.2.8.3.3a:** Restore natural channel form. **3.2.8.3.3b:** Increase role and abundance of wood and large organic debris in streambeds. **3.2.8.3.3c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years

3.2.8.3.4: Restore riparian condition and LWD recruitment	**3.2.8.3.4a:** Restore natural riparian vegetative communities. **3.2.8.3.4b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.2.8.3.5: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.2.8.3.5a:** Implement agricultural water conservation measures. **3.2.8.3.5b:** Improve irrigation conveyance and efficiency. **3.2.8.3.5c:** Obtain water rights and convert to instream water rights. Protect and rehabilitate springs.	Immediate to long term	Immediate to long term
3.2.8.3.6: Improve degraded water quality	**3.2.8.3.6a:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
Monitoring and Evaluation:			
3.2.8.3.7: Monitor status and trends of focal species and populations	**3.2.8.3.7a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.2.8.3.8: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.2.8.3.8a:** Develop methods to monitor biological response to habitat improvement. **3.2.8.3.8b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.3. Columbia Gorge Province

Biological Objectives and Status

The Columbia Gorge Province includes six subbasins with populations of anadromous salmonids. These anadromous species include spring Chinook salmon, fall Chinook salmon, summer steelhead, winter steelhead, coho salmon, and chum salmon (Table 3.3). Subbasin plans included biological objectives for relatively few of these species. Recent adult escapement has been lower than subbasin plan objectives for most.

Table 3.3. Adult escapement objectives and recent adult escapement for anadromous salmonids in the Columbia Gorge Province. Adult-return objectives are not directly comparable to basin-wide objectives, because they do not generally incorporate returns of hatchery fish, broodstock needs, mainstem harvest, or unexplained losses between Bonneville Dam and subbasin of origin..

Subbasin, focal species	No. of Populations	Adult Returns	
		Objective	Recent (5 years)
Wind			
Fall Chinook	1	--	235-1,499
Summer steelhead	1	--	542-930
Winter steelhead	1	--	--
Coho	1	--	--
Chum	1	--	--
Little White Salmon			
Fall Chinook	1	--	2,653-7,758
Chum	1	--	--
White Salmon			
Spring Chinook	1	570	--
Fall Chinook	1	982	755-11,480
Summer steelhead	1	301	--
Coho	1	470	--
Hood			
Spring Chinook	1	200	70-143
Fall Chinook	1	--	8-70
Summer steelhead	1	600	205-708
Winter steelhead	1	1,100	344-705
Klickitat			
Spring Chinook	1	--	898-1,142
Fall Chinook	1	--	4,430-11,765
Summer steelhead	1	--	725-961
Coho	1	--	--
Fifteenmile			
Winter steelhead	1	--	388-1,922

Limiting Factors and Threats

The relative effect on anadromous salmonids of the Columbia River hydrosystem and subbasin habitat varies among subbasins. The hydrosystem effect is generally less severe than for other provinces because only Bonneville Dam must be passed during migration. All populations are affected to some degree by degraded habitat within subbasins. Access to habitat is limited or blocked in all subbasins by obstructions ranging from culverts to Hemlock Dam in the Wind River Subbasin and Condit Dam in the White Salmon River Subbasin. Habitat quality and quantity have been reduced in each subbasin by land use practices such as timber harvest, agriculture and grazing. Land use practices have also resulted in reduced water quality in most subbasins. Finally, water quantity is affected in some subbasin by withdrawals.

Strategies and Measures

Strategies and measures to address mainstem passage effects are summarized in Section 2. Many strategies and measures to address subbasin habitat effects are common to most or all subbasins. The first strategy in all subbasins is to protect and conserve natural ecological processes. Restoring passage and connectivity to habitats blocked or impaired by artificial barriers is another strategy common to many subbasins. More specific measures may vary among subbasins. Strategies to address reduced habitat, water quantity, and water quality include restoring floodplain connectivity and function, restoring channel structure and complexity, restoring riparian condition and recruitment of large woody debris, restoring the natural hydrograph to provide sufficient flow during critical periods, and improving degraded water quality.

Section 3.3.1 Wind River Subbasin

Section 3.3.1.1 Biological Objectives and Status

Fall Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Wind River	--	0-400	--	--

Minimum de-listing criteria from draft recovery plan:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Wind River	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Wind River	235-1,499	4.54	--

Steelhead

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Wind River summer	--	1,200-1,900	--	--
Wind River winter	--	100	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Wind River summer	--	--	Viable
Wind River winter	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Wind River summer	542-930	4.80	--
Wind River winter	--	3.40	--

Coho Salmon and Chum Salmon

No information available.

Section 3.3.1.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)	
		Fall Chinook	Steelhead
Mainstem passage effects		Unknown	1.2-1.3
• Obstructions	• Mainstem hydro		
Subbasin habitat effects		Unknown	1.5
• Physical habitat quality/quantity	• Grazing • Roads • Land development		
• Water quantity	• Agriculture • Withdrawals		
• Water quality	• Roads • Agriculture		
• Obstructions	• Culverts; Hemlock Dam		

Section 3.3.1.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.3.1.3.1: Protect and conserve natural ecological processes	**3.3.1.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.3.1.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.3.1.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3.3.1.3.2b:** Provide adequate screening at all irrigation diversions. **3.3.1.3.2c:** Restore passage at Hemlock Dam.	Immediate to 50 years	Immediate
3.3.1.3.3: Restore floodplain connectivity and function.	**3.3.1.3.3a:** Reconnect floodplains to channels. **3.3.1.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.3.1.3.3c:** Restore wet meadows.	Immediate to long term	5 to 15 years

3.3.1.3.4: Restore channel structure and complexity.	**3.3.1.3.4a:** Restore natural channel form. **3.3.1.3.4b:** Increase role and abundance of wood and large organic debris in streambeds. **3.3.1.3.4c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.3.1.3.5: Restore riparian condition and LWD recruitment	**3.3.1.3.5a:** Restore natural riparian vegetative communities. **3.3.1.3.5b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.3.1.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.3.1.3.6a:** Implement agricultural water conservation measures. **3.3.1.3.6b:** Improve irrigation conveyance and efficiency. **3.3.1.3.6c:** Obtain water rights and convert to instream water rights. **3.3.1.3.6d:** Protect and rehabilitate springs.	Immediate to long term	Immediate to long term
3.3.1.3.7: Improve degraded water quality	**3.3.1.3.7a:** Upgrade or remove problem forest roads. **3.3.1.3.7b:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
Mainstem Passage Effects: See Section 2			
Monitoring and Evaluation:			
3.3.1.3.8: Monitor status and trends of focal species and populations	**3.3.1.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.3.1.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.3.1.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.3.1.3.9b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.3.2 Little White Salmon River Subbasin

Section 3.3.2.1 Biological Objectives and Status

Fall Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Little White Salmon River	--	--	--	--

Minimum de-listing criteria from draft recovery plan:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Little White Salmon River	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Little White Salmon River	2,653-7,758	--	--

Chum Salmon

No information available.

Section 3.3.2.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)
		Fall Chinook
Mainstem passage effects		Unknown
• Obstructions	• Mainstem hydro	
Subbasin habitat effects		Unknown
• Physical habitat quality/quantity	• Timber harvest • Roads	
• Water quantity	• Diversions • Roads	
• Water quality	• Roads • Past grazing	
• Obstructions	• Diversions	

Section 3.3.2.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.3.2.3.1: Protect and conserve natural ecological processes	**3.3.2.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.3.2.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.3.2.3.2a:** Provide adequate screening at all irrigation diversions.	Immediate to 50 years	Immediate
3.3.2.3.3: Restore floodplain connectivity and function.	**3.3.2.3.3a:** Reconnect floodplains to channels. **3.3.2.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.3.2.3.3c:** Restore wet meadows.	Immediate to long term	5 to 15 years
3.3.2.3.4: Restore channel structure and complexity.	**3.3.2.3.4a:** Restore natural channel form. **3.3.2.3.4b:** Increase role and abundance of wood and large organic debris in streambeds. **3.3.2.3.4c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.3.2.3.5: Restore riparian condition and LWD recruitmen**t**	**3.3.2.3.5a:** Restore natural riparian vegetative communities. **3.3.2.3.5b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.3.2.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.3.2.3.6a:** Implement agricultural water conservation measures. **3.3.2.3.6b:** Improve irrigation conveyance and efficiency. **3.3.2.3.6c:** Obtain water rights and convert to instream water rights.	Immediate to long term	Immediate to long term
3.3.2.3.7: Improve degraded water quality	**3.3.2.3.7a:** Upgrade or remove problem forest roads. **3.3.2.3.7b:**	Long term	Immediate to 15 years

	Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.		
Mainstem Passage Effects: See Section 2			
Monitoring and Evaluation:			
3.3.2.3.8: Monitor status and trends of focal species and populations	**3.3.2.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.3.2.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.3.2.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.3.2.3.9b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.3.3 White Salmon River Subbasin

Section 3.3.3.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns		Spawner to spawner ratio
	Total	Natural spawners	
White Salmon River	570	--	3.1

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
White Salmon River	--	--	--

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
White Salmon River	--	--	Extirpated

Fall Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns		Spawner to spawner ratio
	Total	Natural spawners	
White Salmon River	792	--	3.7

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
White Salmon River	--	--	--

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
White Salmon River	755-11,480	--	--

Steelhead

Objectives from subbasin plan:

Population	Adult returns		Spawner to spawner ratio
	Total	Natural spawners	
White Salmon River	301	--	3.3

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
White Salmon River	--	--	Viable

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
White Salmon River	--	--	Extirpated

Coho Salmon

No information available.

Section 3.3.3.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)		
		Spring Chinook	Fall Chinook	Steelhead
Mainstem passage effects		Unknown	Unknown	1.1-1.2
• Obstructions	• Mainstem hydro			
Subbasin habitat effects		Unknown	Unknown	1.0
• Physical habitat quality/quantity	• Grazing • Roads • Land development			
• Water quantity	• Withdrawals • Agriculture			
• Water quality	• Agriculture • Roads			
• Obstructions	• Condit Dam			

Section 3.3.3.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.3.3.3.1: Protect and conserve natural ecological processes	**3.3.3.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.3.3.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.3.3.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3.3.3.3.2b:** Provide adequate screening at all irrigation diversions. **3.3.3.3.2c:** Restore passage at Condit Dam.	Immediate to 50 years	Immediate
3.3.3.3.3: Restore floodplain connectivity and function.	**3.3.3.3.3a:** Reconnect floodplains to channels. **3.3.3.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.3.3.3.3c:** Restore wet meadows.	Immediate to long term	5 to 15 years

3.3.3.3.4: Restore channel structure and complexity.	**3.3.3.3.4a:** Restore natural channel form. **3.3.3.3.b:** Increase role and abundance of wood and large organic debris in streambeds. **3.3.3.3.4c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.3.3.3.5: Restore riparian condition and LWD recruitmen**t**	**3.3.3.3.5a:** Restore natural riparian vegetative communities. **3.3.3.3.5b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.3.3.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.3.3.3.6a:** Implement agricultural water conservation measures. **3.3.3.3.6b:** Improve irrigation conveyance and efficiency. **3.3.3.3.6c:** Obtain water rights and convert to instream water rights. **3.3.3.3.6d:** Protect and rehabilitate springs.	Immediate to long term	Immediate to long term
3.3.3.3.7: Improve degraded water quality	**3.3.3.3.7a:** Upgrade or remove problem forest roads. **3.3.3.3.7b:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
Mainstem Passage Effects: See Section 2			
Monitoring and Evaluation:			
3.3.3.3.8: Monitor status and trends of focal species and populations	**3.3.3.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.3.3.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.3.3.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.3.3.3.9b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.3.4 Hood River Subbasin

Section 3.3.4.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Hood River	--	200	2,000	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Hood River	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Hood River	70-143 natural	--	Very high risk

Fall Chinook Salmon

Biological Objectives:

	Subbasin Plan	Draft Recovery Plan		
Population	Adult returns	Minimum abundance threshold	Spawner to spawner ratio	Population status
Hood River	--	--	--	Very high risk

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Hood River	8-70 natural	1.47	Very high risk

Steelhead

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Hood River summer	--	600	--	--
Hood River winter	--	1,100	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Hood River summer	--	--	--
Hood Riverwinter	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Hood River summer	205-708	2.00	Very high risk
Hood River winter	344-705	1.11	Medium risk

Section 3.3.4.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)		
		Spring Chinook	Fall Chinook	Steelhead
Mainstem passage effects		1.4	Unknown	1.4-1.6
• Obstructions	• Mainstem hydro			
Subbasin habitat effects		Unknown	Unknown	2.7
• Physical habitat quality/quantity	• Grazing • Roads • Land development			
• Water quality	• Roads • Agriculture			
• Obstructions	• Powerdale Dam • Diversions			

Section 3.3.4.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.3.4.3.1: Protect and conserve natural ecological processes	**3.3.4.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.3.4.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.3.4.3.2a:** Improve passage at Powerdale Dam. **3.3.4.3.2b:** Provide adequate screening at all irrigation diversions.	Immediate to 50 years	Immediate

3.3.4.3.3: Restore floodplain connectivity and function.	**3.3.4.3.3a:** Reconnect floodplains to channels. **3.3.4.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.3.4.3.3c:** Restore wet meadows.	Immediate to long term	5 to 15 years
3.3.4.3.4: Restore channel structure and complexity.	**3.3.4.3.4a:** Restore natural channel form. **3.3.4.3.4b:** Increase role and abundance of wood and large organic debris in streambeds. **3.3.4.3.4c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.3.4.3.5: Restore riparian condition and LWD recruitmen**t**	**3.3.4.3.5a:** Restore natural riparian vegetative communities. **3.3.4.3.5b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.3.4.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.3.4.3.6a:** Implement agricultural water conservation measures. **3.3.4.3.6b:** Improve irrigation conveyance and efficiency. **3.3.4.3.6c:** Obtain water rights and convert to instream water rights.	Immediate to long term	Immediate to long term
3.3.4.3.7: Improve degraded water quality	**3.3.4.3.7a:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years
3.3.4.3.8: Mitigate for impeded and blocked passage	**3.3.4.3.8a:** Implement artificial propagation measures to mitigate for lost habitat access and habitat productivity.	--	--
Mainstem Passage Effects: See Section 2			
Hatchery Effects:			
3.3.4.3.9: Increase hatchery effectiveness for restoration and mitigation	**3.3.4.3.9a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.	--	--
Monitoring and Evaluation:			
3.3.4.3.10: Monitor status and trends of focal species	**3.3.4.3.10a:** Establish or use preexisting index sites to gather baseline, trend, and	--	--

and populations	comparative data.		
3.3.4.3.11: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.3.4.3.11a:** Develop methods to monitor biological response to habitat improvement. **3.3.4.3.11b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.3.5 Klickitat River Subbasin

Section 3.3.5.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Klickitat River	--	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Klickitat River	898-1,142 natural	--	Not ESA listed

Fall Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Klickitat River	--	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Klickitat River	4,430-11,765 natural	--	Not ESA listed

Steelhead

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Klickitat River	--	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Klickitat River	1,000	1.35	Viable

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Klickitat River	725-961 natural	3.23	Moderate risk

Coho Salmon

No information available.

Section 3.3.5.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)		
		Spring Chinook	Fall Chinook	Steelhead
Mainstem passage effects		1.2-1.3	Unknown	1.2-1.4
• Obstructions	• Mainstem hydro			
Subbasin habitat effects		13	Unknown	1.5
• Physical habitat quality/quantity	• Grazing • Roads • Land development			
• Water quantity	• Past logging • Roads			
• Water quality	• Roads • Past grazing			
• Obstructions	• Culverts • Castile Falls fishway			

Section 3.3.5.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.3.5.3.1: Protect and conserve natural ecological processes	**3.3.5.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.3.5.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.3.5.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3.3.5.3.2b:** Provide adequate screening at all irrigation diversions. **3.3.5.3.2c:** Monitor effectiveness of passage improvements at Castile Falls. **3.3.5.3.2d:** Continue restoration in Snyder Creek Mill reach.	Immediate to 50 years	Immediate
3.3.5.3.3: Restore floodplain connectivity and function.	**3.3.5.3.3a:** Reconnect floodplains to channels. **3.3.5.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.3.5.3.3c:** Restore wet meadows.	Immediate to long term	5 to 15 years
3.3.5.3.4: Restore channel structure and complexity.	**3.3.5.3.4a:** Restore natural channel form. **3.3.5.3.4b:** Increase role and abundance of wood and large organic debris in streambeds. **3.3.5.3.4c:** Stabilize streambanks with passive restoration techniques. **3.3.5.3.4d:** Increase instream habitat through manual placement of structures.	Immediate to long term	Immediate to 15 years
3.3.5.3.5: Restore riparian condition and LWD recruitmen**t**	**3.3.5.3.5a:** Restore natural riparian vegetative communities. **3.3.5.3.5b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.3.5.3.6: Restore natural	**3.3.5.3.6a:** Implement agricultural water	Immediate to long term	Immediate to long term

hydrograph to provide sufficient flow during critical periods.	conservation measures. **3.3.5.3.6b:** Improve irrigation conveyance and efficiency. **3.3.5.3.6c:** Obtain water rights and convert to instream water rights. **3.3.5.3.6d:** Protect and rehabilitate springs.		
3.3.5.3.7: Improve degraded water quality	**3.3.5.3.7a:** Upgrade or remove problem forest roads. **3.3.5.3.7b:** Construct water and sediment control basins. **3.3.5.3.7c:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations. **3.3.5.3.7d:** Implement short-term fertilization of streams with carcasses or carcass analogs	Long term	Immediate to 15 years
Mainstem Passage Effects: See Section 2			
Monitoring and Evaluation:			
3.3.5.3.8: Monitor status and trends of focal species and populations	**3.3.5.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.		
3.3.5.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.3.5.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.3.5.3.9b:** Monitor effectiveness of hatchery and natural production measures.		

Section 3.3.6 Fifteenmile Creek Subbasin

Section 3.3.6.1 Biological Objectives and Status

Steelhead

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Fifteenmile Creek	--	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Fifteenmile Creek	500	1.56	Viable

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Fifteenmile Creek	388-1,922	1.82	Viable

Section 3.3.6.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)
		Steelhead
Mainstem passage effects		1.2-1.4
• Obstructions	• Mainstem hydro	
Subbasin habitat effects		2.1
• Physical habitat quality/quantity	• Grazing • Roads • Agriculture	
• Water quantity	• Withdrawals • Roads	
• Water quality	• Agriculture • Grazing	
• Obstructions	• Culverts	

Section 3.3.6.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.3.6.3.1: Protect and conserve natural ecological processes	**3.3.6.3.1:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.3.6.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.3.6.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3.3.6.3.2b:** Provide adequate screening at all	Immediate to 50 years	Immediate

	irrigation diversions.		
3.3.6.3.3: Restore floodplain connectivity and function.	**3.3.6.3.3a:** Reconnect floodplains to channels. **3.3.6.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.3.6.3.3c:** Restore wet meadows.	Immediate to long term	5 to 15 years
3.3.6.3.4: Restore channel structure and complexity.	**3.3.6.3.4a:** Restore natural channel form. **3.3.6.3.4b:** Increase role and abundance of wood and large organic debris in streambeds. **3.3.6.3.4c:** Stabilize streambanks with passive restoration techniques.	Immediate to long term	Immediate to 15 years
3.3.6.3.5: Restore riparian condition and LWD recruitmen**t**	**3.3.6.3.5a:** Restore natural riparian vegetative communities. **3.3.6.3.5b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.3.6.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.3.6.3.6a:** Implement agricultural water conservation measures. **3.3.6.3.6b:** Improve irrigation conveyance and efficiency. **3.3.6.3.6c:** Obtain water rights and convert to instream water rights. Protect and rehabilitate springs.	Immediate to long term	Immediate to long term
3.3.6.3.7: Improve degraded water quality	**3.3.6.3.7a:** Restore natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Long term	Immediate to 15 years

Mainstem Passage Effects: See Section 2			
Monitoring and Evaluation:			
3.3.6.3.8: Monitor status and trends of focal species and populations	**3.3.6.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data. **3.6.6.3.8b:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	--	--
3.3.6.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.3.6.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.3.6.3.9b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.4. Columbia Plateau Province

Biological Objectives and Status

The Columbia Plateau Province includes seven subbasins in which anadromous salmonids are considered extant. One subbasin, Crab Creek, is not included here. Anadromous salmonids include spring Chinook salmon, summer/fall Chinook salmon, fall Chinook salmon, summer steelhead, coho salmon, and sockeye salmon (Table 3.4). Subbasin plans included biological objectives for many of these species. Recent adult escapement has been lower than subbasin plan objectives for most.

Table 3.4. Adult escapement objectives and recent escapement for anadromous salmonids in the Columbia Plateau Province. Adult-return objectives are not directly comparable to basin-wide objectives, because they do not generally incorporate returns of hatchery fish, broodstock needs, mainstem harvest, or unexplained losses between Bonneville Dam and subbasin of origin.

Subbasin, species	No. of Populations	Adult Escapement	
		Objective	Recent (5 years)
Deschutes			
Spring Chinook	1	2,600-2,800	--
Fall Chinook	1	13,000-16,000	11,789-13,500
Summer steelhead	2	6,900-8,400	2,055
Sockeye	--	--	--
John Day			
Spring Chinook	3	12,000	--
Summer steelhead	5	29,400	5,079
Umatilla			
Spring Chinook	1	8,000[a]	2,528-5,885[a]
Fall Chinook	1	12,000[a]	2,181-4,127[a]
Summer steelhead	1	5,500[a]	1,977-5,663[a]
Coho	1	6,000[a]	5,115-9,715[a]
Walla Walla			
Spring Chinook	1	5,500[a,b]	123-283[a]
Summer steelhead	2	3,438-5,600[a,c]	960
Yakima			
Spring Chinook	3	3,300-4,400 (short term)[d]	6,050
Fall Chinook	2	--	1,920-6,090[a]
Summer steelhead	4	4,500 (short term)[c]	1,258
Sockeye	--	--	--
Tucannon			
Spring Chinook	1	2,400-3,400 (2,000 natural)[e]	11-897
Fall Chinook	1	2,000 (1,000 natural)[e]	147-549
Summer steelhead	1	1,823-3,400[c]	--

[a] Includes hatchery fish.
[b] ODFW and CTUIR objective.
[c] From draft recovery plan.
[d] Yakama Indian Nation project proposal 199506325
[e] Nez Perce Tribe objective.

Limiting Factors and Threats

The relative effect on anadromous salmonids of the Columbia River hydrosystem and subbasin habitat varies among subbasins. The hydrosystem affects focal populations to varying degrees because the number of dams passed during migration ranges from two (Deschutes) to six (Tucannon). All populations are affected to some degree by degraded habitat within subbasins. Access to habitat is limited or blocked in all subbasins by obstructions ranging from culverts to small diversion dams to large hydropower complexes such as Pelton-Round Butte in the Deschutes River Subbasin. Habitat quality and quantity have been reduced in each subbasin by land use practices such as agriculture and grazing. Land use practices have also resulted in reduced water quality in most subbasins. Finally, water quantity is affected in each subbasin by withdrawals.

Strategies and Measures

Strategies and measures to address mainstem passage effects are summarized in Section 2. Many strategies and measures to address subbasin habitat effects are common to most or all subbasins. The first strategy in all subbasins is to protect and conserve natural ecological processes. Restoring passage and connectivity to habitats blocked or impaired by artificial barriers is another strategy common to all subbasins. More specific measures may vary among subbasins. Strategies to address reduced habitat, water quantity, and water quality include restoring floodplain connectivity and function, restoring channel structure and complexity, restoring riparian condition and recruitment of large woody debris, restoring the natural hydrograph to provide sufficient flow during critical periods, and improving degraded water quality.

Section 3.4.1 Deschutes River Subbasin

Section 3.4.1.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns		Spawner to spawner ratio
	Total	Natural spawners	
Deschutes River	--	2,600-2,800 (2,200-2,300 above Warm Springs NFH; 400-500 in Shitike Creek)	7.0

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Deschutes River	94-420 redds–Warm Springs; 21-109 redds–Shitike Creek	--	Not ESA listed

Fall Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns		Spawner to spawner ratio
	Total	Natural spawners	
Deschutes River	--	13,000–16,000	7.1

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Deschutes River	11,789-13,500 natural	--	Not ESA listed

Steelhead

Objectives from subbasin plan:

Population	Adult returns		Spawner to spawner ratio
	Total	Natural spawners	
Eastside tributaries	--	2,400-2,900	2.3
Westside tributaries	--	4,500-5,500	6.0

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Eastside tributaries	1,000	1.35	Viable
Westside tributaries	1,500	1.26	Viable

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Eastside tributaries	1,599 natural	1.89	Low risk
Westside tributaries	456 natural	1.05	High risk

Sockeye Salmon

No information available. Anadromous sockeye salmon have been extirpated.

Section 3.4.1.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)		
		Spring Chinook	Fall Chinook	Steelhead
Mainstem passage effects		1.7-2.1	Unknown	1.2-1.6
• Obstructions	• Mainstem hydro			
Subbasin habitat effects		1.5	Unknown	2.7
• Physical habitat quality/quantity	• Grazing • Timber harvest • Agriculture			
• Water quantity	• Withdrawals			
• Water quality	• Withdrawals			
• Obstructions	• Pelton-Round Butte complex			

Section 3.4.1.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.4.1.3.1: Protect and conserve natural ecological processes	**3.4.1.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	5 to 15 years	Immediate to 15 years
3.4.1.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.4.1.3.2a:** Restore passage at Pelton-Round Butte Complex. **3.4.1.3.2b:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3.4.1.3.2c:** Provide adequate screening at all irrigation diversions. **3.4.1.3.2d:** Reintroduce native salmon species in areas where they have been extirpated by human activities.	Immediate to 50 years	Immediate
3.4.1.3.3: Restore floodplain connectivity and function.	**3.4.1.3.3a:** Reconnect floodplains to channels. **3.4.1.3.3b:** Reconnect side channels and off-channel habitats to stream	Immediate to long term	5 to 15 years

	channels. **3.4.1.3.3c:** Promote the creation and maintenance of beaver dams.		
3.4.1.3.4: Restore channel structure and complexity.	**3.4.1.3.4a:** Restore natural channel form. **3.4.1.3.4b:** Increase role and abundance of wood and large organic debris in streambeds. **3.4.1.3.4c:** Stabilize streambanks with passive restoration techniques (Eastside tributaries). **3.4.1.3.4d:** Increase instream habitat in Westside tributaries through manual placement of structures.	Immediate to long term	Immediate to 15 years
3.4.1.3.5: Restore riparian condition and LWD recruitmen**t**	**3.4.1.3.5a:** Restore natural riparian vegetative communities. **3.4.1.3.5b:** Develop grazing strategies that promote riparian recovery. **3.4.1.3.5c:** Eradicate invasive plant species from riparian areas where opportunities exist. **3.4.1.3.5d:** Install and maintain fencing to exclude livestock.	Long term	5 to 15 years
3.4.1.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.4.1.3.6a:** Implement agricultural water conservation measures. **3.4.1.3.6b:** Improve irrigation conveyance and efficiency. Obtain water rights and convert to instream water rights.	Immediate to long term	Immediate to long term
3.4.1.3.7: Improve degraded water quality	**3.4.1.3.7a:** Manage irrigation return flow to reduce stream temperatures. Reduce chemical pollution inputs from agricultural lands throughout the subbasin.	Long term	Immediate to 15 years
3.4.1..3.8: Mitigate for impeded and blocked passage	**3.4.1.3.8a:** Implement artificial propagation measures to mitigate for lost habitat access and habitat productivity.	--	--
Mainstem Passage Effects: See Section 2			
Hatchery Effects:			
3.4.1.3.9: Increase hatchery effectiveness for	**3.4.1.3.9a:** Explore and implement innovative hatchery actions to	--	--

restoration and mitigation	achieve both restoration and mitigation objectives.		
Monitoring and Evaluation:			
3.4.1.3.10: Monitor status and trends of focal species and populations	**3.4.1.3.10a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data. **3.4.1.3.10b:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	--	--
3.4.1.3.11: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.4.1.3.11a:** Develop methods to monitor biological response to habitat improvement. **3.4.1.3.11b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.4.2 John Day River Subbasin

Section 3.4.2.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Return to mouth	Natural spawners	Harvest	Broodstock
Entire subbasin	12,000	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Middle Fork	114-310 redds	--	Not ESA listed
North Fork	211-711 redds	--	Not ESA listed
Upper Mainstem	177-480 redds	--	Not ESA listed

Steelhead

Objectives from subbasin plan:

Population	Adult returns			
	Return to mouth	Natural spawners	Harvest	Broodstock
Entire subbasin	29,400	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Lower Mainstem	2,250	1.19	Viable
Middle Fork	1,000	1.35	Viable
North Fork	1,500	1.26	Highly viable
South Fork	500	1.56	Moderate risk
Upper Mainstem	1,000	1.35	Viable

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Lower Mainstem	1,800 natural	2.99	Moderate risk
Middle Fork	756 natural	2.45	Moderate risk
North Fork	1,740 natural	2.41	Very low risk
South Fork	259 natural	2.06	Moderate risk
Upper Mainstem	524 natural	2.14	Moderate risk

Section 3.4.2.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)	
		Spring Chinook	Steelhead
Mainstem passage effects		1.6-1.9	1.6-2.2
• Obstructions	• Mainstem hydro		
Subbasin habitat effects		4.6	2.3
• Physical habitat quality/quantity	• Agriculture • Grazing • Roads • Diking		
• Water quantity	• Withdrawals • Agriculture		
• Water quality	• Agriculture • Grazing • Timber harvest		
• Obstructions	• Push up dams		

Section 3.4.2.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.4.2.3.1: Protect and conserve natural ecological	**3.4.2.3.1a:** Continue existing protections, and increase protection of high quality	5 to 15 years	Immediate to 15 years

processes	habitats through acquisition, conservation easements, and cooperative agreements.		
3.4.2.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.4.2.3.2a:** Remove or minimize use of push up dams per priorities described in the draft recovery plan. **3.4.2.3.2b:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3.4.2.3.2c:** Construct ladder over existing permanent dams in Beech Creek. **3.4.2.3.2d:** Provide adequate screening at all irrigation diversions.	Immediate to 50 years	Immediate
3.4.2.3.3: Restore floodplain connectivity and function.	**3.4.2.3.3a:** Reconnect floodplains to channels. **3.4.2.3.3b:** Restore wet meadows. **3.4.2.3.3c:** Reconnect side channels and off-channel habitats to stream channels. **3.4.2.3.3d:** Promote the creation and maintenance of beaver dams.	Immediate to long term	5 to 15 years
3.4.2.3.4: Restore channel structure and complexity.	**3.4.2.3.4a:** Restore natural channel form. **3.4.2.3.4b:** Place stable wood and other large organic debris in streambeds. **3.4.2.3.4c:** Stabilize and protect stream banks.	Immediate to long term	Immediate to 15 years
3.4.2.3.5: Restore riparian condition and LWD recruitmen**t**	**3.4.2.3.5a:** Restore natural riparian vegetative communities. . **3.4.2.3.5b:** Develop grazing strategies that promote riparian recovery.	Long term	5 to 15 years
3.4.2.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.4.2.3.6a:** Implement agricultural water conservation measures. **3.4.2.3.6b:** Improve irrigation conveyance and efficiency. **3.4.2.3.6c:** Obtain water rights and convert to instream water rights.	Immediate to long term	Immediate to long term
3.4.2.3.7: Improve degraded water quality	**3.4.2.3.7a:** Increase riparian shading. **3.4.2.3.7b:**	Long term	Immediate to 15 years

	Address contamination from mine-related discharge **3.4.2.3.7c:** Reduce chemical pollution and nutrient inputs		
Mainstem Passage Effects: See Section 2.			
Monitoring and Evaluation:			
3.4.2.3.10: Monitor status and trends of focal species and populations	**3.4.2.3.10a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data. **3.4.2.3.10b:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	--	--
3.4.2.3.11: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.4.2.3.11a:** Develop methods to monitor biological response to habitat improvement. **3.4.2.3.11b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.4.3 Umatilla River Subbasin

Section 3.4.3.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Umatilla River	8,000	2,000	--	--

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Umatilla River	2,528-5,885 (natural plus hatchery)	--	Not ESA listed

Fall Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Umatilla River	12,000	6,000	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Umatilla River	2,181-4,127 (natural plus hatchery)	--	Not ESA listed

Steelhead

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Umatilla River	5,500	4,000	--	--

Minimum de-listing criteria from draft recovery plan:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Umatilla River	1,500	1.26	Viable

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Umatilla River	2,268 natural	1.50	Moderate risk

Coho Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Umatilla River	6,000	1,568	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Umatilla River	5,115-9,715 (natural plus hatchery)	--	Not ESA listed

Section 3.4.3.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		Spring Chinook	Fall Chinook	Steelhead	Coho
Mainstem passage effects		1.4-1.6	1.3-1.4	1.6-2.3	Unknown
• Obstructions	• Mainstem hydro				
Subbasin habitat effects		1.1	1.3	1.9	1.0
• Physical habitat quality/quantity	• Agriculture • Wood removal				
• Water quantity	• Withdrawals				
• Water quality	• Agriculture • Withdrawals				
• Obstructions	• Storage reservoirs • Culverts • Diversions				

Section 3.4.3.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3..4.3.3.1: Protect and conserve natural ecological processes	**3..4.3.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.4.3.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3..4.3.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3..4.3.3.2b:** Construct ladders over existing concrete or earth-fill dams per priorities described in the draft recovery plan.	5 to 20 years	Immediate

	3..4.3.3.2c: Provide adequate screening at all irrigation diversions. **3.4.3.3.2d:** Reintroduce native salmon species in areas where they have been extirpated by human activities.		
3..4.3.3.3: Restore floodplain connectivity and function.	**3..4.3.3.3a:** Reconnect floodplains to channels. **3.4.3.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.4.3.3.3c:** Remove dikes and levies.	Immediate to 10 years	Immediate to long term
3.4.3.3.4: Restore channel structure and complexity.	**3.4.3.3.4a:** Restore natural channel form. **3.4.3.3.4b:** Place stable wood and other large organic debris in streambeds. **3.4.3.3.4c:** Stabilize and protect stream banks. **3.4.3.3.4d:** Construct rock and log weirs to create pool habitats or elevate incised channels.	Immediate to 25 years	Immediate to long term
3.4.3.3.5: Restore riparian condition and LWD recruitmen**t**	**3.4.3.3.5a:** Restore natural riparian vegetative communities. **3.4.3.3.5b:** Develop grazing strategies that promote riparian recovery. **3.4.3.3.5c:** Develop riparian buffers and setbacks. **3.4.3.3.5d:** Install riparian exclosure fencing. **3.4.3.3.5e:** Close, remove, and restore riparian road prisms.	25 years to long term	Immediate to long term
3.4.3.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.4.3.3.6a:** Implement Umatilla Basin Project Phases I-III. **3.4.3.3.6b:** Obtain additional instream water rights. **3.4.3.3.6c:** Implement agricultural water conservation measures.	Immediate to long term	Immediate
3.4.3.3.7: Improve degraded water quality	**3.4.3.3.7a:** Address point sources of water pollution in the Umatilla River and Birch Creek.	Immediate	Immediate

3.4.3..3.8: Mitigate for impeded and blocked passage	**3.4.3.3.8a:** Implement artificial propagation measures to mitigate for lost habitat access and habitat productivity.	--	--
Mainstem Passage Effects: See Section 2.			
Hatchery Effects:			
3.4.3.3.9: Increase hatchery effectiveness for restoration and mitigation	**3.4.3.3.9a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.	--	--
Monitoring and Evaluation:			
3.4.3.3.10: Monitor status and trends of focal species and populations	**3.4.3.3.10a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data. **3.4.3.3.10b:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	-	--
3.4.3.3.11: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.4.3.3.11a:** Develop methods to monitor biological response to habitat improvement. **3.4.3.3.11b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.4.4 Walla Walla River Subbasin

Section 3.4.4.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Entire subbasin (ODFW and CTUIR only)	5,500	3,000	2,000	--

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Entire subbasin	123-283	--	Not ESA listed

Steelhead

Objectives from draft recovery plan or Technical Recovery Team:

Population	Adult returns		Spawner to spawner ratio	Population status
	Minimum abundance threshold	Restoration goal		
Walla Walla River	1,000	1,875-3,395	1.35	Viable
Touchet River	1,000	1,563-2,205	1.35	Viable

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Walla Walla River	650 natural	1.34	Moderate risk
Touchet River	310 natural	1.21	--

Section 3.4.4.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)	
		Spring Chinook	Steelhead
Mainstem passage effects		1.5-1.6	2.3-3.8
• Obstructions	• Mainstem hydro		
Subbasin habitat effects		1.1	2.6
• Physical habitat quality/quantity	• Agriculture • Roads • Land development		
• Water quantity	• Withdrawals • Agriculture		
• Water quality	• Agriculture • Roads • Withdrawals		
• Obstructions	• Culverts • Diversions		

Section 3.4.4.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.4.4.3.1: Protect and conserve natural ecological processes	**3.4.4.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition,	Immediate to long term	Immediate to long term

	conservation easements, and cooperative agreements.		
3.4.4.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.4.4.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3.4.4.3.2b:** Construct ladders over existing concrete or earth-fill dams per priorities described in the draft recovery plan. **3.4.4.3.2c:** Provide adequate screening at all irrigation diversions. **3.4.3.3.2d:** Reintroduce native salmon species in areas where they have been extirpated by human activities.	Immediate to 5 years	Immediate
3.4.4.3.3: Restore floodplain connectivity and function.	**3.4.4.3.3a:** Reconnect floodplains to channels. **3.4.4.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.4.4.3.3c:** Remove dikes and levies. **3.4.4.3.3d:** Promote the creation and maintenance of beaver dams.	Immediate to long term	Immediate to long term
3.4.4.3.4: Restore channel structure and complexity.	**3.4.4.3.4a:** Restore natural channel form. **3.4.4.3.4b:** Place stable wood and other large organic debris in streambeds. **3.4.4.3.4c:** Stabilize and protect stream banks. **3.4.4.3.4d:** Construct rock and log weirs to create pool habitats or elevate incised channels.	Immediate to 25 years	Immediate to long term
3.4.4.3.5: Restore riparian condition and LWD recruitmen**t**	**3.4.4.3.5a:** Restore natural riparian vegetative communities. **3.4.4.3.5b:** Develop grazing strategies that promote riparian recovery. **3.4.4.3.5c:** Develop riparian buffers and setbacks. **3.4.4.3.5d:** Install riparian exclosure fencing. **3.4.4.3.5e:**	25 years to long term	Immediate to long term

	Close, remove, and restore riparian road prisms.		
3.4.4.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.4.4.3.6a:** Investigate feasibility of water storage or exchange to improve instream flows. **3.4.4.3.6b:** Obtain additional instream water rights. **3.4.4.3.6c:** Improve irrigation conveyance and efficiency. . **3.4.4.3.6d:** Enhance hyporheic flows and spring inputs.	Immediate to long term	Immediate
3.4.4.3.7: Improve degraded water quality	**3.4.4.3.7a:** Address point sources of water pollution in the Walla Walla River and Pine Creek.	Immediate to 25 years	Immediate to 25 years
3.4.4..3.8: Mitigate for impeded and blocked passage	**3.4.4.3.8a:** Implement artificial propagation measures to mitigate for lost habitat access and habitat productivity.		
Mainstem Passage Effects: See Section 2.			
Hatchery Effects:			
3.4.4.3.9: Increase hatchery effectiveness for restoration and mitigation	**3.4.4.3.9a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.		
Monitoring and Evaluation:			
3.4.4.3.10: Monitor status and trends of focal species and populations	**3.4.4.3.10a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data. **3.4.4.3.10b:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	-	--
3.4.4.3.11: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.4.4.3.11a:** Develop methods to monitor biological response to habitat improvement. **3.4.4.3.11b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.4.5 Yakima River Subbasin

Section 3.4.5.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from Yakama Indian Nation:

Population	Adult natural returns		
	Near term	Mid term	Long term
Entire subbasin	3,300-4,400	15,400-19,500	69,500-84,400

Current status:

Population	Recent average adult returns	Spawner to spawner ratio	Population status
American River	6,050 natural (entire subbasin)	3.89	Not ESA listed
Naches River		2.61	Not ESA listed
Upper Yakima River		3.28	Not ESA listed

Fall Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Yakima River	--	--	--	--
Marion Drain	--	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Yakima River	1,920-6,090 (total counts)	3.29	Not ESA listed
Marion Drain		2.08	Not ESA listed

Steelhead

Objectives from draft recovery plan:

	Adult returns			Spawner to spawner ratio	Population status
Population	De-listing	Short term	Long term		
Naches River	1,500	1,500	2,000	≥1.3	Viable
Satus Creek	1,000	1,000	1,500	≥1.65	Viable
Toppenish Creek	250	500	5,400	≥1.2	Maintained
Upper Yakima River	500	1,500	7,700	≥1.2	Maintained

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Naches River	472	1.12	Moderate risk
Satus Creek	379	1.40	Moderate risk
Toppenish Creek	322	1.60	Moderate risk
Upper Yakima River	85	1.09	High risk

Sockeye

No information available. Anadromous sockeye salmon have been extirpated.

Section 3.4.5.2 Limiting Factors and Threats

Primary Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)		
		Spring Chinook	Fall Chinook	Steelhead
Mainstem passage effects		2.0-2.2	1.9-2.6	2.2-3.4
• Obstructions	• Mainstem hydro			
Subbasin habitat effects		2.5	1.4	4.0
• Physical habitat quality/quantity	• Roads • Grazing • Floodplain development			
• Water quantity	• Withdrawals • Flow regulations			
• Obstructions	• Culverts • Diversions			

Section 3.4.5.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.4.5.3.1: Protect and conserve natural ecological processes	**3.4.5.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.4.5.3.2: Restore passage and connectivity to habitats blocked or	**3.4.5.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft	5 to 20 years	Immediate to long term

impaired by artificial barriers.	recovery plan. **3.4.5.3.2b:** Improve juvenile passage and survival through mainstem Yakima River diversion dams. **3.4.5.3.2c:** Provide adequate screening at all irrigation diversions. **3.4.5.3.2d:** Provide upstream and downstream passage at USBR irrigation storage dams (Cle Elum & Bumping).		
3.4.5.3.3: Restore floodplain connectivity and function.	**3.4.5.3.3a:** Reconnect floodplains to channels. **3.4.5.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.4.5.3.3c:** Remove dikes and levies. **3.4.5.3.3d:** Promote the creation and maintenance of beaver dams.	Immediate to 10 years	Immediate to long term
3.4.5.3.4: Restore channel structure and complexity.	**3.4.5.3.4a:** Restore natural channel form. **3.4.5.3.4b:** Place stable wood and other large organic debris in streambeds. **3.4.5.3.4c:** Stabilize and protect stream banks.	Immediate to 25 years	Immediate to long term
3.4.5.3.5: Restore riparian condition and LWD recruitmen**t**	**3.4.5.3.5a:** Restore natural riparian vegetative communities. **3.4.5.3.5b:** Develop grazing strategies that promote riparian recovery. **3.4.5.3.5c:** Develop riparian buffers and setbacks. **3.4.5.3.5d:** Install riparian exclosure fencing. **3.4.5.3.5e:** Close, remove, and restore riparian road prisms..	25 years to long term	Immediate to long term
3.4.5.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.4.5.3.6a:** Adjust flow regulation and reservoir operations. **3.4.5.3.6b:** Obtain additional instream water rights. **3.4.5.3.6c:** Improve irrigation conveyance and efficiency.	Immediate to long term	Immediate

	3.4.5.3.6d: Enhance hyporheic flows and spring inputs.		
3.4.5.3.7: Improve degraded water quality	**3.4.5.3.7a:** Increase riparian shading. **3.4.5.3.7b:** Reduce chemical pollution and nutrient inputs.	Immediate	Immediate
Mainstem Passage Effects: See Section 2.			
Monitoring and Evaluation:			
3.4.5.3.8: Monitor status and trends of focal species and populations	**3.4.5.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	-	--
3.4.5.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.4.5.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.4.5.3.9b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.4.6 Tucannon River Subbasin

Section 3.4.6.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from subbasin plan and draft recovery plan:

	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Subbasin plan(Nez Perce Tribe only)	2,400-3,400	2,000	1,200	160
Draft recovery plan	2,400-3,400	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Tucannon River	750	1.60	Highly viable

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Tucannon River	11-897	1.28	High risk

Fall Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Entire subbasin (Nez Perce Tribe only)	2,000	1,000	1,000	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Tucannon River	147–549	--	--

Steelhead

Objectives from subbasin plan and draft recovery plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Subbasin plan				
Nez Perce Tribe	2,200-3,400	1,500	700-1,900	--
Washington Department of Fish and Wildlife	--	600	--	--
Draft recovery plan	1,823-3,400	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Tucannon River	1,000	1.20	Highly viable

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Tucannon River	--	--	High risk

Section 3.4.6.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)		
		Spring Chinook	Fall Chinook	Steelhead
Mainstem passage effects		3.0-5.7	Unknown	2.0-4.5
• Obstructions	• Mainstem hydro			
Subbasin habitat effects		1.5	Unknown	1.0
• Physical habitat quality/quantity	• Agriculture • Grazing			
• Water quantity	• Withdrawals • Agriculture			
• Water quality	• Agriculture • Roads • Diking • Land development • Withdrawals • Recreation			
• Obstructions	• Culverts • Diversions			

Section 3.4.6.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.4.6.3.1: Protect and conserve natural ecological processes	**3.4.6.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.4.6.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.4.6.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the draft recovery plan. **3.4.6.3.2b:** Provide adequate screening at all irrigation diversions.	Immediate to 5 years	Immediate
3.4.6.3.3: Restore floodplain connectivity and function.	**3.4.6.3.3a:** Reconnect floodplains to channels. **3.4.6.3.3b:** Reconnect side channels and off-channel habitats to stream	Immediate to long term	Immediate to long term

	channels. **3.4.6.3.3c:** Promote the creation and maintenance of beaver dams.		
3.4.6.3.4: Restore channel structure and complexity.	**3.4.6.3.4a:** Restore natural channel form. **3.4.6.3.4b:** Place stable wood and other large organic debris in streambeds. **3.4.6.3.4c:** Stabilize and protect stream banks.	Immediate to 25 years	Immediate to long term
3.4.6.3.5: Restore riparian condition and LWD recruitment	**3.4.6.3.5a:** Restore natural riparian vegetative communities. **3.4.6.3.5b:** Develop grazing strategies that promote riparian recovery. **3.4.6.3.5c:** Develop riparian buffers and setbacks. **3.4.6.3.5d:** Install riparian exclosure fencing.	25 years to long term	Immediate to long term
3.4.6.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.4.6.3.6a:** Obtain additional instream water rights. **3.4.6.3.6b:** Improve irrigation conveyance and efficiency. .	Immediate to long term	Immediate
3.4.6.3.7: Improve degraded water quality	**3.4.6.3.7a:** Increase riparian shading.	Immediate to 25 years	Immediate to 25 years
Mainstem Passage Effects: See Section 2.			
Monitoring and Evaluation:			
3.4.6.3.8: Monitor status and trends of focal species and populations	**3.4.6.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.4.6.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.4.6.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.4.3.3.9b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.5 Columbia Cascade Province

Biological Objectives and Status

The Columbia Cascade Province includes four subbasins in which anadromous salmonids are considered extant. Anadromous salmonids include spring Chinook salmon, summer or summer/fall Chinook salmon, summer steelhead, coho salmon, and sockeye salmon (Table 3.5). Subbasin plans included biological objectives for some of these species. Recent adult escapement has been lower than subbasin plan objectives for most.

Table 3.5. Adult escapement objectives and recent escapement for anadromous salmonids in the Columbia Cascade Province. Adult-return objectives are not directly comparable to basin-wide objectives, because they do not generally incorporate returns of hatchery fish, broodstock needs, mainstem harvest, or unexplained losses between Bonneville Dam and subbasin of origin..

Subbasin,	No. of	Adult Returns	
species	Populations	Objective	Recent (5year)
Wenatchee			
Spring Chinook	1	5,500[a]	119-4,446[b]
Summer/fall Chinook	1	13,500[a]	--
Summer steelhead	1	2,500[a]	273-2,864
Coho	1	1,500[c]	343-4,068[a]
Sockeye	1	23,000[a]	--
Entiat			
Spring Chinook	1	500[a]	44-444[b]
Summer/fall Chinook	1	--	--
Summer steelhead	1	500[a]	35-366
Coho	1	--	--
Methow			
Spring Chinook	1	2,000	79-9,904[b]
Summer/fal l Chinook	1	2,000	2,209-4,630[b]
Summer steelhead	1	2,500	66-587
Coho	1	1,500[c]	140-571[b]
Okanogan			
Spring Chinook	1	300[b]	--
Summer/fall Chinook	1	3,500[d]	--
Summer steelhead	1	600[a]	17-156
Sockeye	1	58,730[d]	10,586-78,053[d]

[a] WDFW objective.
[b] Includes hatchery fish.
[c] Yakama Nation Master Plan for coho restoration in mid-Columbia tributaries.
[d] Past Wells Dam.

Limiting Factors and Threats

The effect of the Columbia River hydrosystem on anadromous salmonids is severe relative to the effect of subbasin habitat. The effect of the hydrosystem, although severe, affects populations to varying degrees because the number of dams passed during migration ranges from seven (Wenatchee) to nine (Okanogan). All populations are affected to some degree by degraded habitat within subbasins. Access to habitat is limited or blocked in all subbasins by obstructions such as culverts, diversions, and check dams. Habitat quality and quantity have been reduced in each subbasin by land use practices such as agriculture, diking, residential development, and also by roads. Land use practices have also resulted in reduced water quality in most subbasins. Finally, water quantity is affected in each subbasin by withdrawals and land use.

Strategies and Measures

Strategies and measures to address mainstem passage effects are summarized in Section 2. Many strategies and measures to address subbasin habitat effects are common to most or all subbasins. The first strategy in all subbasins is to protect and conserve natural ecological processes. Restoring passage and connectivity to habitats blocked or impaired by artificial barriers is another strategy common to all subbasins. More specific measures may vary among subbasins. Strategies to address reduced habitat, water quantity, and water quality include restoring floodplain connectivity and function, restoring channel structure and complexity, restoring riparian condition and recruitment of large woody debris, restoring the natural hydrograph to provide sufficient flow during critical periods, and improving degraded water quality.

Section 3.5.1 Wenatchee River Subbasin

Section 3.5.1.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from Washington Department of Fish and Wildlife:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Wenatchee River	5,500	4,100	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Wenatchee River	2,000	1.20	Viable

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Wenatchee River	119-4,446 (natural plus hatchery)	2.09-4.59	High risk

Summer Chinook Salmon

Objectives from Washington Department of Fish and Wildlife:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Wenatchee River	13,500	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Wenatchee River	2,857-5,419 redds	--	Not ESA listed

Steelhead

Objectives from Washington Department of Fish and Wildlife:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Wenatchee River	2,500	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Wenatchee River	1,000	1.10	Viable

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Wenatchee River	273-2,864 natural	0.56-4.73	Moderate risk

Coho Salmon

Objectives from Yakama Nation master plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Wenatchee River	--	1,500	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Wenatchee River	343-4,068 hatchery; 0-55 natural	--	Not ESA listed

Sockeye Salmon

No information available.

Section 3.5.1.2 Primary Limiting Factors and Threats

Primary Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		Spring Chinook	Summer Chinook	Steelhead	Coho
Mainstem passage effects		2.4-2.9	1.9-2.1	3.4-3.6	Unknown
• Obstructions	• Mainstem hydro				
Subbasin habitat effects		1.3	1.2	1.1	Unknown
• Physical habitat quality/quantity	• Roads • Agriculture • Diking				
• Water quantity	• Withdrawals				
• Water quality	• Agriculture • Residential development				
• Obstructions	• Culverts • Check dams				
• Hatchery effects		--	--	--	--
• Hatchery practices	• Out-of-subbasin stocks				

Section 3.5.1.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.5.1.3.1: Protect and conserve natural ecological processes	**3.5.1.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.5.1.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.5.1.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the recovery plan. **3.5.1.3.2b:** Provide adequate screening at all irrigation diversions.	5 to 20 years	Immediate
3.5.1.3.3: Restore floodplain connectivity and function.	**3.5.1.3.3a:** Reconnect floodplains to channels. **3.5.1.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.5.1.3.3c:** Remove dikes and levies.	Immediate to 10 years	Immediate to long term
3.5.1.3.4: Restore riparian condition and LWD recruitment	**3.5.1.3.4a:** Restore natural riparian vegetative communities.	25 years to long term	Immediate to long term
3.5.1.3.5: Improve degraded water quality	**3.5.1.3.5a:** Reduce sediment recruitment by improving road maintenance. **3.5.1.3.5b:** Reduce high water temperatures by restoring natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Immediate	Intermediate
Mainstem Passage Effects: See Section 2			
Hatchery Effects:			
3.5.1.3.6: Improve hatchery practices	**3.5.1.3.6a:** Reduce or eliminate presence of out of subbasin stock on spawning grounds	--	--
Monitoring and Evaluation:			
3.5.1.3.7: Monitor status and trends of focal species and populations	**3.5.1.3.7a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--

3.5.1.3.8: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.5.1.3.8a:** Develop methods to monitor biological response to habitat improvement. **3.5.1.3.8b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.5.2 Entiat River Subbasin

Section 3.5.2.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from Washington Department of Fish and Wildlife:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Entiat River	--	500	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Entiat River	500	1.40	Viable

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Entiat River	44-444 (natural plus hatchery)	0.25-4.72	High risk

Summer-Fall Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Entiat River	--	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Entiat River	153-309 redds	--	Not ESA listed

Steelhead

Objectives from Washington Department of Fish and Wildlife:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Entiat River	--	500	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Entiat River	500	1.20	Viable

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Entiat River	35-366 natural	0.56-4.73	Moderate risk

Coho Salmon

No information available.

Section 3.5.2.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)		
		Spring Chinook	Summer-Fall Chinook	Steelhead
Mainstem passage effects		2.8-4.0	1.3-3.2	1.4-1.6
• Obstructions	• Mainstem hydro			
Subbasin habitat effects		1.3	1.0	1.0
• Physical habitat quality/quantity	• Roads • Agriculture • Diking			
• Water quantity	• Agriculture • Residential development			
• Obstructions	• Culverts			
Hatchery Effects		--	--	--
• Hatchery practices	• Out-of-subbasin stocks			

Section 3.5.2.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.5.2.3.1: Protect and conserve natural ecological processes	**3.5.2.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.5.2.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.5.2.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the recovery plan. **3.5.2.3.2b:** Provide adequate screening at all irrigation diversions.	5 to 20 years	Immediate
3.5.2.3.3: Restore floodplain connectivity and function.	**3.5.2.3.3a:** Reconnect floodplains to channels. **3.5.2.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.5.2.3.3c:** Remove dikes and levies.	Immediate to 10 years	Immediate to long term
3.5.2.3.4: Restore riparian condition and LWD recruitment	**3.5.2.3.4a:** Restore natural riparian vegetative communities.	25 years to long term	Immediate to long term
3.5.2.3.5: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.5.2.3.5a:** Obtain additional instream water rights. **3.5.2.3.5b:** Improve irrigation conveyance and efficiency. **3.5.2.3.5c:** Enhance hyporheic flows and spring inputs.	Immediate to long term	Immediate
Mainstem Passage Effects: See Section 2			
Hatchery Effects:			
3.5.2.3.6: Improve hatchery practices	**3.5.2.3.6a:** Reduce or eliminate presence of out of subbasin stock on spawning grounds	--	--
Monitoring and Evaluation:			
3.5.2.3.7: Monitor status and trends of focal species and populations	**3.5.2.3.7a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--

3.5.2.3.8: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.5.2.3.8a:** Develop methods to monitor biological response to habitat improvement. **3.5.2.3.8b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.5.3 Methow River Subbasin

Section 3.5.3.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Methow River	--	2,000	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Methow River	2,000	1.20	Viable

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Methow River	79-9,904 (natural plus hatchery)	1.41-3.80	High risk

Summer Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Methow River		2,000	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Methow River	2,209-4,630 (natural plus hatchery)	--	Not ESA listed

Steelhead

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Methow River	--	2,500	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Methow River	1,000	1.10	Viable

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Methow River	65-587 natural	0.14-2.67	Moderate risk

Coho Salmon

Objectives from Yakama Nation master plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Methow River	--	1,500	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Methow River	140-571 hatchery	--	Not ESA listed

Section 3.5.3.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		Spring Chinook	Summer Chinook	Steelhead	Coho
Mainstem passage effects		3.6-4.5	2.7-3.4	5.6-6.4	Unknown
• Obstructions	• Mainstem hydro				
Subbasin habitat effects		1.4	1.1	1.1	Unknown
• Physical habitat quality/quantity	• Roads • Agriculture • Diking • Residential development				
• Water quantity	• Agriculture • Residential development				
• Water quality	• Agriculture • Roads				
• Obstructions	• Diversions • Culverts				
Hatchery Effects		--	--	--	--
• Hatchery practices	• Out-of-subbasin stocks				

Section 3.5.3.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.5.3.3.1: Protect and conserve natural ecological processes	**3.5.3.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.5.3.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.5.3.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the recovery plan. **3.5.3.3.2b:** Provide adequate screening at all irrigation diversions.	5 to 20 years	Immediate
3.5.3.3.3: Restore floodplain connectivity and function.	**3.5.3.3.3a:** Reconnect floodplains to channels. **3.5.3.3.3b:**	Immediate to 10 years	Immediate to long term

	Reconnect side channels and off-channel habitats to stream channels. **3.5.3.3.3c:** Remove dikes and levies.		
3.5.3.3.4: Restore riparian condition and LWD recruitment	**3.5.3.3.4a:** Restore natural riparian vegetative communities.	25 years to long term	Immediate to long term
3.5.3.3.5: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.5.3.3.5a:** Obtain additional instream water rights. **3.5.3.3.5b:** Improve irrigation conveyance and efficiency. **3.5.3.3.5c:** Enhance hyporheic flows and spring inputs.	Immediate to long term	Immediate
3.5.3.3.6: Improve degraded water quality	**3.5.3.3.6a:** Reduce sediment recruitment by improving road maintenance. **3.5.3.3.6b:** Reduce high water temperatures by restoring natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Immediate	Intermediate
Mainstem Passage Effects: See Section 2			
Hatchery Effects:			
3.5.3.3.7: Improve hatchery practices	**3.5.3.3.7a:** Reduce or eliminate presence of out of subbasin stock on spawning grounds	--	--
Monitoring and Evaluation:			
3.5.3.3.8: Monitor status and trends of focal species and populations	**3.5.3.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.5.3.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.5.3.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.5.3.3.9b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.5.4 Okanogan River Subbasin

Section 3.5.4.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Okanogan River	300	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Okanogan River	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Okanogan River	Unknown	--	Extirpated

Summer Chinook Salmon

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Okanogan River	3,500 past Wells Dam	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Okanogan River	3,420-13,857 redds	--	Not ESA listed

Steelhead

Objectives from Washington Department of Fish and Wildlife:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Okanogan River	--	600	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Okanogan River	500	1.2	Viable

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Okanogan River	17-156 natural	0.14-2.67	High risk

Sockeye Salmon

No information available.

Section 3.5.4.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)		
		Spring Chinook	Summer Chinook	Steelhead
Mainstem passage effects		3.6-9.3	3.8-4.3	4.2-4.3
• Obstructions	• Mainstem hydro			
Subbasin habitat effects		1.2	1.1	1.1
• Physical habitat quality/quantity	• Roads • Agriculture • Diking • Residential development			
• Water quantity	• Agriculture • Residential development			
• Water quality	• Agriculture • Roads			
• Obstructions	• Diversions • Culverts			

Section 3.5.4.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.5.4.3.1: Protect and conserve natural ecological processes	**3.5.4.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term

3.5.4.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.5.4.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the recovery plan. **3.5.4.3.2b:** Provide adequate screening at all irrigation diversions.	5 to 20 years	Immediate
3.5.4.3.3: Restore floodplain connectivity and function.	**3.5.4.3.3a:** Reconnect floodplains to channels. **3.5.4.3.3b:** Reconnect side channels and off-channel habitats to stream channels. **3.5.4.3.3c:** Remove dikes and levies.	Immediate to 10 years	Immediate to long term
3.5.4.3.4: Restore riparian condition and LWD recruitment	**3.5.4.3.4a:** Restore natural riparian vegetative communities.	25 years to long term	Immediate to long term
3.5.4.3.5: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.5.4.3.5a:** Obtain additional instream water rights. **3.5.4.3.5b:** Improve irrigation conveyance and efficiency. **3.5.4.3.5c:** Enhance hyporheic flows and spring inputs.	Immediate to long term	Immediate
3.5.4.3.6: Improve degraded water quality	**3.5.4.3.6a:** Reduce sediment recruitment by improving road maintenance. **3.5.4.3.6b:** Reduce high water temperatures by restoring natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Immediate	Intermediate
Mainstem Passage Effects: See Section 2			
Monitoring and Evaluation:			
3.5.4.3.7: Monitor status and trends of focal species and populations	**3.5.4.3.7a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.5.4.3.8: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.5.4.3.8a:** Develop methods to monitor biological response to habitat improvement. **3.5.4.3.8b:** Monitor effectiveness of hatchery and natural production measures.	--	--

Section 3.6 Blue Mountain Province

Biological Objectives and Status

The Blue Mountain Province includes four subbasins in which anadromous salmonids are considered extant. Anadromous salmonids include spring or spring/summer Chinook salmon, fall Chinook salmon, and steelhead (Table 3.6). Subbasin plans included biological objectives for most of these species. Recent adult escapement has been lower than subbasin plan objectives for all.

Table 3.6. Adult escapement objectives and recent escapement for anadromous fish in the Blue Mountain Province. Adult-return objectives are not directly comparable to basin-wide objectives, because they do not generally incorporate returns of hatchery fish, broodstock needs, mainstem harvest, or unexplained losses between Bonneville Dam and subbasin of origin..

Subbasin, species	No. of Populations	Adult Returns	
		Objective	Recent (5 year)
Asotin			
Spring Chinook	1	500	<50
Summer steelhead	1	2,776-3,114[a,b]	814
Grande Ronde			
Spring Chinook	6	5,000-16,000[b,c]	1,136
Fall Chinook	1	10,000[b,c]	500
Summer steelhead	4	5,000-27,500[b,c]	--
Coho	1	3,500[b,c]	0
Sockeye	1	2,500[b,c]	0
Imnaha			
Spring/summer Chinook	1	5,740[b]	380
Fall Chinook	1	3,000	--
Summer steelhead	1	4,315[b]	--
Snake Hells Canyon			
Spring Chinook	--	25,000	--
Fall Chinook	--	26,800	6,500
Summer steelhead	--	62,200	--
Pacific lamprey	--	10,000-20,000	<100

[a] From draft recovery plan
[b] Includes hatchery fish
[c] Nez Perce Tribe objective

Limiting Factors and Threats

The effect of the Columbia River hydrosystem on anadromous species is severe relative to the effect of subbasin habitat, because fish from all focal populations must pass eight dams during migration. All populations are affected to some degree by degraded habitat within subbasins. Habitat quality and quantity have been reduced in each subbasin by land use practices such as agriculture, grazing, diking, residential development, and roads. Effects from past practices such as splash dams also continue to affect some populations. Land use practices have also resulted in reduced water quality in most subbasins. Finally, water quantity is affected in each subbasin by withdrawals and land use.

Strategies and Measures

Strategies and measures to address mainstem passage effects are summarized in Section 2. Many strategies and measures to address subbasin habitat effects are common to most or all subbasins. The first strategy in all subbasins is to protect and conserve natural ecological processes. Specific measures may vary among subbasins. Strategies to address reduced habitat, water quantity, and water quality include restoring floodplain connectivity and function, restoring channel structure and complexity, restoring riparian condition and recruitment of large woody debris, restoring the natural hydrograph to provide sufficient flow during critical periods, and improving degraded water quality.

Section 3.6.1 Asotin Creek Subbasin

Section 3.6.1.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives and existing status from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective	500	250	100	40
Existing	<50	<50	Undefined	0

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Asotin Creek	500	1.90	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Asotin Creek	<50	--	Functionally Extirpated

Steelhead

Objectives and existing conditions from subbasin plan and draft recovery plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Subbasin plan objective	160-2,000	1,500	500	0
Subbasin plan existing	651	651	Undefined	0
Draft recovery plan	2,776-3,114	--	--	--

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Asotin Creek	1,000	1.40	--

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Asotin Creek	814	--	Moderate risk

Section 3.6.1.2 Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)	
		Spring Chinook	Steelhead
Mainstem passage effects		Unknown	5.1-12.0
• Obstructions	• Mainstem hydro		
Subbasin habitat effects		Unknown	1.2
• Physical habitat quality/quantity	• Agriculture • Grazing • Diking • Roads • Residential development		
• Water quantity	• Residential development • Agriculture		
• Water quality	• Agriculture • Grazing • Roads • Land development		

Section 3.6.1.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.6.1.3.1: Protect and conserve natural ecological processes	**3.6.1.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.6.1.3.2: Restore floodplain connectivity and function.	**3.6.1.3.2a:** Reconnect floodplains to channels. **3.6.1.3.2b:** Reconnect side channels and off-channel habitats to stream channels. **3.6.1.3.2c:** Remove dikes and levies.	Immediate to 10 years	Immediate to long term
3.6.1.3.3: Restore riparian condition and LWD recruitmen**t**	**3.6.1.3.3a:** Restore natural riparian vegetative communities. **3.6.1.3.3b:** Install and maintain riparian fencing.	25 years to long term	Immediate to long term
3.6.1.3.4: Restore floodplain connectivity and function.	**3.6.1.3.4a:** Reconnect floodplains to channels. **3.6.1.3.4b:** Reconnect side channels and off-channel habitats to stream channels. **3.6.1.3.4c:** Remove dikes and levies.	Immediate to long term	Immediate to long term
3.6.1.3.5: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.6.1.3.5a:** Install water control structures in fields, draws, ditches, etc.	Immediate to long term	Immediate
3.6.1.3.6: Improve degraded water quality	**3.6.1.3.6a:** Reduce sediment recruitment by improving road and ditch maintenance. **3.6.1.3.6b:** Relocate roads where feasible.	Immediate to 25 years	Intermediate to 25 years
Mainstem Passage Effects: See Section 2			
3.6.1.3.7: Mitigate for impeded and blocked passage	**3.6.1.3.7a:** Implement a mix of artificial propagation measures, habitat restoration actions, improved mainstem passage and survival in an integrated approach to	**--**	**--**

	improve anadromous fish returns to the Asotin Subbasin and to achieve objectives.		
Hatchery Effects:			
3.6.1.3.8: Increase hatchery effectiveness for restoration and mitigation	**3.6.1.3.8a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.	--	--
Monitoring and Evaluation:			
3.6.1.3.9: Monitor status and trends of focal species and populations	**3.6.1.3.9a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.6.1.3.10: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.6.1.3.10a:** Develop methods to monitor biological response to habitat improvement. **3.6.1.3.10b:** Monitor effectiveness of hatchery and natural production measures. **3.6.1.3.10c:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	--	--

Section 3.6.2 Grande Ronde River Subbasin

Section 3.6.2.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective (Nez Perce Tribe)	5,000-16,000	5,000-12,400	500-4,000	720
Existing	250-3,000	250-3,000	0	720

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Wenaha River	750	1.60	--
Lostine River	1,000	1.45	--
Catherine Creek	750	1.45	--
Lookingglass Creek	500	--	--
Minam River	750	1.60	--
Upper Grande Ronde River	1,000	1.45	--

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status[a,b]
Wenaha River	376	0.74	High risk
Lostine River	276	0.78	High risk
Catherine Creek	107	0.89	High risk
Lookingglass Creek	--	--	Functionally extirpated
Minam River	337	1.02	High risk
Upper Grande Ronde River	38	0.42	High risk

Fall Chinook Salmon

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective (Nez Perce Tribe)	10,000	7,500	2,500	0
Existing	500	500	0	0

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Entire subbasin	500	--	--

Steelhead

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective (Nez Perce Tribe)	5,000-27,500	5,000-18,500	1,000-9,050	0
Existing	1,100-8,500	1,100-8,500	0	0

Objectives from draft recovery plan:

Population	Adult returns		Spawner to spawner ratio	Population status
	Minimum threshold	Restoration goal		
Joseph Creek	1,000	2,149-5,909	1.20	--
Lower Grande Ronde River	1,000	1,855-5,101	1.20	--
Upper Grande Ronde River	1,500	--	1.13	--
Wallowa River	1,000	--	1.20	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Joseph Creek	2,132	2.62	Very low risk
Lower Grande Ronde River	--	--	--
Upper Grande Ronde River	1,226	2.29	Moderate risk
Wallowa River	--	1.21	Moderate risk

Coho Salmon

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective (Nez Perce Tribe)	3,500	1,000	300	2,200
Existing	0	0	0	0

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Entire subbasin	--	--	Extirpated

Sockeye Salmon

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective (Nez Perce Tribe)	2,500	Undetermined	Undetermined	Undetermined
Existing	0	0	0	0

Current status:

Population	Average recent adult returns	Spawner to spawner ratio	Population status
Entire subbasin	--	--	Extirpated

Section 3.6.2.2 Primary Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)	
		Spring Chinook	Steelhead
Mainstem passage effects		2.0-2.7	3.0-6.8
• Obstructions	• Mainstem hydro		
Subbasin habitat effects		1.0	1.4
• Physical habitat quality/quantity	• Agriculture • Grazing • Diking • Roads • Historic splash dams		
• Water quantity	• Withdrawals		
• Water quality	• Agriculture • Grazing • Withdrawals		
• Obstructions	• Wallowa Lake Dam • Culverts • Diversions		

Section 3.6.2.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.6.2.3.1: Protect and conserve natural ecological processes	**3.6.2.3.1:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.6.2.3.2: Restore channel structure and complexity.	**3.6.2.3.2a:** Restore natural channel form. **3.6.2.3.2b:** Place stable wood and other large organic debris in streambeds. **3.6.2.3.2c:** Stabilize and protect stream banks.	Immediate to 25 years	Immediate to long term
3.6.2.3.3: Restore riparian condition and LWD recruitment	**3.6.2.3.3a:** Restore natural riparian vegetative communities. **3.6.2.3.3b:** Develop grazing strategies that promote riparian recovery. **3.6.2.3.3c:** Develop riparian buffers and setbacks. **3.6.2.3.3d:** Install riparian exclosure fencing.	Immediate to long term	Immediate to long term
3.6.2.3.4: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.6.2.3.4a:** Obtain additional instream water rights. **3.6.2.3.4b:** Improve irrigation conveyance and efficiency. **3.6.2.3.4c:** Enhance hyporheic flows and spring inputs.	Immediate to long term	Immediate
3.6.2.3.5: Improve degraded water quality	**3.6.2.3.5a:** Increase riparian shading. **3.6.2.3.5b:** Reduce sediment recruitment by restoring natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Immediate to 25 years	Immediate to 25 years
Mainstem Passage Effects: See Section 2.			
3.6.1.3.6: Mitigate for impeded and blocked passage	**3.6.1.3.6a:** Implement a mix of artificial propagation measures, habitat restoration actions, improved mainstem passage and survival in		

	an integrated approach to improve anadromous fish returns to the Grande Ronde subbasin and to achieve objectives.		
Hatchery Effects:			
3.6.2.3.7: Increase hatchery effectiveness for restoration and mitigation.	**3.6.2.3.7a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.	--	--
Monitoring and Evaluation:			
3.6.2.3.8: Monitor status and trends of focal species and populations	**3.6.2.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.6.2.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.6.2.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.6.2.3.9b:** Monitor effectiveness of hatchery and natural production measures. **3.6.1.3.9c:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	--	--

Section 3.6.3 Imnaha River Subbasin

Section 3.6.3.1 Biological Objectives and Status

Spring/summer Chinook Salmon

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective	5,740	3,800	700	320
Existing	4,206	2,789	212	1,503

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Imnaha River (includes Big Sheep Creek)	1,000 (includes 250 for Big Sheep Creek)	1.80	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Imnaha River	380	0.79	High risk

Fall Chinook Salmon

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective	3,000	3,000	Undefined	Undefined
Existing	155-179	155	0	0

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Imnaha River (Lower Snake River)	--	--	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Imnaha River	--	--	--

Steelhead

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective	4,315	2,100	2,000	195
Existing	>1,904	>1,540	148-449	1,537

Minimum de-listing criteria from draft recovery plan or Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Imnaha River	1,000	1.20	--

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Imnaha River	--	1.51	Moderate risk

Section 3.6.3.2 Primary Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)		
		Spring Chinook	Fall Chinook	Steelhead
Mainstem passage effects		2.0-2.4	Unknown	2.4-5.1
• Obstructions	• Mainstem hydro			
Subbasin habitat effects		1.0	Unknown	1.1
• Physical habitat quality/quantity	• Agriculture • Grazing • Roads			
• Water quantity	• Withdrawals			
• Water quality	• Agriculture • Grazing			

Section 3.6.3.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.6.3.3.1: Protect and conserve natural ecological processes	**3.6.3.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.6.3.3.2: Restore channel structure and complexity.	**3.6.3.3.2a:** Restore natural channel form. **3.6.3.3.2b:** Place stable wood and other large organic debris in streambeds. **3.6.3.3.2c:** Stabilize and protect stream banks.	Immediate to 25 years	Immediate to long term
3.6.3.3.3: Restore riparian condition and LWD recruitment	**3.6.3.3.3a:** Restore natural riparian vegetative communities. **3.6.3.3.3b:** Develop grazing strategies that promote riparian recovery. **3.6.3.3.3c:** Develop riparian buffers and setbacks. **3.6.3.3.3d:** Install riparian exclosure fencing.	25 years to long term	Immediate to long term
3.6.3.3.4: Restore natural hydrograph to provide sufficient flow during	**3.6.3.3.4a:** Obtain additional instream water rights. **3.6.3.3.4b:**	Immediate to long term	Immediate

critical periods.	Improve irrigation conveyance and efficiency. **3.6.3.3.4c:** Enhance hyporheic flows and spring inputs.		
3.6.3.3.5: Improve degraded water quality	**3.6.3.3.5a:** Increase riparian shading.	Immediate to 25 years	Immediate to 25 years
Mainstem Passage Effects: See Section 2.			
3.6.3.3.6: Mitigate for impeded and blocked passage	**3.6.3.3.6a:** Implement a mix of artificial propagation measures, habitat restoration actions, improved mainstem passage and survival in an integrated approach to improve anadromous fish returns to the Imnaha Subbasin and to achieve objectives.		
Hatchery Effects:			
3.6.3.3.7: Increase hatchery effectiveness for restoration and mitigation.	**3.6.3.3.7a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.	--	--
Monitoring and Evaluation:			
3.6.3.3.8: Monitor status and trends of focal species and populations	**3.6.3.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data. **3.6.3.3.8b:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness	--	--
3.6.3.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.6.3.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.6.3.3.9b:** Monitor effectiveness of hatchery and natural production measures. **3.6.3.3.9c:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	--	--

Section 3.6.4 Snake Hells Canyon Subbasin

Section 3.6.4.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives and existing conditions from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Objective	Undefined	25,000	Undefined	10,000
Existing	Unknown	3,886	Unknown	--

Fall Chinook Salmon

Objectives and existing conditions from subbasin plan and draft management plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Objective from subbasin plan	>26,800	6,500	Undefined	4,100
Existing from subbasin plan	1,396	557	Unknown	1,300
Draft management plan			--	--
De-listing	--	3,000	--	--
Short term	22,984	7,500	--	--
Long term	39,110	14,360	--	--

Steelhead

Objectives and existing conditions from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Objective	62,200	Undefined	Undefined	Undefined
Existing	Unknown	Unknown	Unknown	--

Pacific Lamprey

Objectives and existing conditions from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Objective	10,000-20,000	Undefined	Undefined	Undefined
Existing	Unknown	Unknown	0	0

Section 3.6.4.2 Primary Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		Spring Chinook	Fall Chinook	Steelhead	Pacific Lamprey
Mainstem passage effects		Unknown	Unknown	Unknown	Unknown
• Obstructions	• Mainstem hydro				
Subbasin habitat effects		Unknown	Unknown	Unknown	Unknown
• Physical habitat quality/quantity	• Agriculture • Grazing • Roads				
• Water quantity	• Withdrawals				
• Water quality	• Agriculture • Grazing				

Section 3.6.4.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.6.4.3.1: Protect and conserve natural ecological processes	**3.6.4.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.6.4.3.2: Restore channel structure and complexity.	**3.6.4.3.2a:** Restore natural channel form. **3.6.4.3.2b:** Place stable wood and other large organic debris in streambeds. **3.6.4.3.2c:** Stabilize and protect stream banks.	Immediate to 25 years	Immediate to long term
3.6.4.3.3: Restore riparian condition and LWD	**3.6.4.3.3a:** Restore natural riparian vegetative communities.	25 years to long term	Immediate to long term

recruitment	**3.6.4.3.3b:** Develop grazing strategies that promote riparian recovery. **3.6.4.3.3c:** Develop riparian buffers and setbacks. **3.6.4.3.3d:** Install riparian exclosure fencing.		
3.6.4.3.4: Restore normative hydrograph to provide sufficient flow during critical periods.	**3.6.4.3.4a:** Obtain additional instream water rights. **3.6.4.3.4b:** Improve irrigation conveyance and efficiency. **3.6.4.3.4c:** Enhance hyporheic flows and spring inputs.	Immediate to long term	Immediate
3.6.4.3.5: Improve degraded water quality	**3.6.4.3.5a:** Increase riparian shading.	Immediate to 25 years	Immediate to 25 years
Mainstem Passage Effects: See Section 2.			
3.6.4.3.6: Mitigate for impeded and blocked passage	**3.6.4.3.6a:** Implement a mix of artificial propagation measures, habitat restoration actions, improved mainstem passage and survival in an integrated approach to improve anadromous fish returns to the Snake Hells Canyon Subbasin and to achieve objectives.		
Hatchery Effects:			
3.6.4.3.7: Increase hatchery effectiveness for restoration and mitigation	**3.6.4.3.7a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.	--	--
Monitoring and Evaluation:			
3.6.4.3.8: Monitor status and trends of focal species and populations	**3.6.4.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data. **3.6.4.3.8b:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness	--	--

3.6.4.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.6.4.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.6.4.3.9b:** Monitor effectiveness of hatchery and natural production measures. **3.6.4.3.9c:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	--	--

Section 3.7 Mountain Snake Province

Biological Objectives and Status

Both subbasins in the Mountain Snake Province include populations of anadromous fish. These anadromous species include spring or spring/summer Chinook salmon, fall Chinook salmon, summer steelhead, coho salmon, sockeye salmon and Pacific lamprey (Table 3.7). Subbasin plans included biological objectives for all of these species. Recent adult escapement has been lower than subbasin plan objectives for all.

Table 3.7. Adult escapement objectives and recent escapement for anadromous fish in the Mountain Snake Province. Adult-return objectives are not directly comparable to basin-wide objectives, because they do not generally incorporate returns of hatchery fish, broodstock needs, mainstem harvest, or unexplained losses between Bonneville Dam and subbasin of origin..

Subbasin, species	No. of Populations	Adult Returns	
		Objective	Recent (5 years)
Clearwater			
Spring Chinook	7	60,000[a]	11,802
Fall Chinook	1	50,000[a,b]	1,273
Summer steelhead	6	47,900–101,000[a]	Unknown
Coho	1	14,000[a,b]	512[c]
Pacific lamprey	--	10,000-20,000	<100
Salmon			
Spring/summer Chinook	22	179,200-254,000	--
Fall Chinook	1	5,000	--
Summer steelhead	12	145,000-192,900	--
Sockeye	1	8,000-44,500	3-27

[a] Includes hatchery fish
[b] Nez Perce Tribe objective.
[c] Past Lower Granite Dam.

Limiting Factors and Threats

The effect of the Columbia River hydrosystem on anadromous species is generally severe relative to the effect of subbasin habitat, because fish from all populations must pass eight dams during migration. Populations are affected to varying degrees by degraded habitat within subbasins. Access to habitat is limited or blocked by obstructions ranging from culverts to Dworshak Dam in the Clearwater River Subbasin. Habitat is in near-pristine condition in some areas of the Middle Fork Salmon River, but habitat quality and quantity have been reduced in other areas by current and past land use practices and roads. Past activities such as mining still affect water quality in some areas. Current land use practices have also resulted in reduced water quality in some areas. Finally, water quantity is affected in some areas of the Salmon River subbasin by withdrawals.

Strategies and Measures

Strategies and measures to address mainstem passage effects are summarized in Section 2. Many strategies and measures to address subbasin habitat effects are common to most or all subbasins. The first strategy in all subbasins is to protect and conserve natural ecological processes. Restoring passage and connectivity to habitats blocked or impaired by artificial barriers is another strategy common to all subbasins. More specific measures may vary among subbasins. Strategies to address reduced habitat, water quantity, and water quality include restoring floodplain connectivity and function, restoring channel structure and complexity, restoring riparian condition and recruitment of large woody debris, restoring the natural hydrograph to provide sufficient flow during critical periods, and improving degraded water quality.

Section 3.7.1 Clearwater River Subbasin

Section 3.7.1.1 Biological Objectives and Status

Spring Chinook Salmon

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective	60,000	10,000	45,000	5,000
Existing	11,802	1,832	5,170	4,800

Current status:

Total number of redds in annual index sites from 2000 through 2005 ranged from under 100 to slightly under 800.

Fall Chinook Salmon

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective (Nez Perce Tribe)	50,000	10,000	35,000	5,000
Existing	2,319	1,019	0	1,300

Minimum de-listing criteria from Interior Columbia River Technical Recovery Team:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Total Snake River	3,000	--	--

Current status:

Total number of redds in annual index sites from 2001 through 2006 ranged from 257 to 628. Natural spawner ten year average = 1,273.

Steelhead

Objectives from subbasin plan:

Population	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
A run; entire subbasin	5,900-10,000	4,900	1,000	--
B run; entire subbasin	42,000-91,000	12,000	5,000	25,000-74,000

Minimum de-listing criteria from draft recovery plan:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Lower Mainstem Clearwater River	1,500	1.13	Viable
North Fork Clearwater River	2,250	1.10	--
Lolo Creek	500	1.40	Viable
Lochsa River	1,500	1.13	Viable
Selway River	1,500	1.13	--
South Fork Clearwater River	1,000	1.20	Viable

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Lower Mainstem Clearwater River	--	--	Moderate risk
North Fork Clearwater River	--	--	Blocked
Lolo Creek	--	--	High risk
Lochsa River	--	--	High risk
Selway River	--	--	High risk
South Fork Clearwater River	--	--	High risk

Coho Salmon

bjectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective (Nez Perce Tribe)	14,000	Undefined	Undefined	1,650
Existing	512 (at Lower Granite Dam)	52	0	339

Current status:

Unknown

Pacific Lamprey

Objectives and existing conditions from subbasin plan:

	Adult returns			
	Total	Natural spawners	Harvest	Broodstock
Objective	10,000-20,000	10,000	35,000	5,000
Existing (Based on Counts at Lower Granite Dam)	<100	<100	0	107-178 (Translocated)

Section 3.7.1.2 Primary Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		Spring Chinook	Fall Chinook	Steelhead	Coho
Mainstem passage effects		2.5-4.3	Unknown	2.2-4.5	Unknown
• Obstructions	• Mainstem hydro				
Subbasin habitat effects		1.4	Unknown	1.2	Unknown
• Physical habitat quality/quantity	• Past timber harvest • Past dredge mining • Agriculture • Roads				
• Water quality	• Roads • Agriculture • Past mining				
• Obstructions	• Culverts • Dworshak Dam				

Section 3.7.1.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.7.1.3.1: Protect and conserve natural ecological processes	**3.7.1.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative agreements.	Immediate to long term	Immediate to long term
3.7.1.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.7.1.3.2a**: Remove or replace culverts and other passage barriers in the Lochsa River watershed per priorities described in the recovery plan.	5 to 20 years	Immediate
3.7.1.3.3: Restore floodplain connectivity and function.	**3.7.1.3.3a**: Reduce road-related impacts through relocation, reconstruction, or decommissioning, and return road surfaces, cuts, and fills to productivity. **3.7.1.3.3b**: Restore channel integrity.	Immediate to 10 years	Immediate to long term
3.7.1.3.4: Restore riparian condition and LWD recruitmen**t**	**3.7.1.3.4a:** Establish riparian vegetation to provide cover, stabilize streambanks, reduce stream temperatures, and provide LWD.	25 years to long term	Immediate to long term
3.7.1.3.5: Improve degraded water quality	**3.7.1.3.5a:** Reduce sediment recruitment by modifying roads and trails. **3.7.1.3.5b:** Establish riparian vegetation to provide cover, stabilize streambanks, and reduce stream temperatures. **3.7.1.3.5c:** Reduce high water temperatures by restoring natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Immediate	Intermediate
Mainstem Passage Effects: See Section 2			
3.7.1.3.6: Mitigate for impeded and blocked passage	**3.7.1.3.6a:** Implement a mix of artificial propagation measures, habitat restoration actions, improved mainstem passage and survival in an integrated approach to		

	improve anadromous fish returns to the Clearwater River and to achieve objectives. **3.7.1.3.6b:** Continue implementation of existing Resident Fish Substitution actions to partially mitigate for the blocked area behind Dworshak Dam. **3.7.1.3.6c:** Explore and implement additional Resident Fish Substitution actions towards mitigation for the Dworshak blocked area.		
Hatchery Effects:			
3.7.1.3.7: Increase hatchery effectiveness for restoration and mitigation.	**3.7.1.3.7a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.	--	--
Monitoring and Evaluation:			
3.7.1.3.8: Monitor status and trends of focal species and populations	**3.7.1.3.8a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data. **3.7.1.3.8b:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	--	--
3.7.1.3.9: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.7.1.3.9a:** Develop methods to monitor biological response to habitat improvement. **3.7.1.3.9b:** Monitor effectiveness of hatchery and natural production measures. **3.7.1.3.9c:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	--	--

Section 3.7.2 Salmon River Subbasin

Section 3.7.2.1 Biological Objectives and Status

Spring-Summer Chinook Salmon

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective	179,200-254,000	36,400	206,000	6,160
Existing	--	3,886	6,639	4,937

Minimum de-listing criteria from draft recovery plan:

Major population group, Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
South Fork Salmon River			
Little Salmon River	500	1.90	--
South Fork Salmon River	1,000	1.45	Viable
Secesh River	750	2.10	Viable
East Fork South Fork Salmon River	1,000	1.45	Viable
Middle Fork Salmon River			
Chamberlain Creek	500	1.90	Viable
Lower Middle Fork Salmon River	750	1.60	--
Big Creek	1,000	1.45	Viable
Camas Creek	500	1.90	--
Loon Creek	500	1.90	Viable
Upper Middle Fork Salmon River	750	1.60	--
Sulphur Creek	500	1.90	--
Bear Valley Creek	750	1.60	Viable
Marsh Creek	500	1.90	Viable
Upper Salmon River			
North Fork Salmon River	500	1.90	--
Lemhi River	2,000	1.20	Viable
Lower Mainstem Salmon River	2,000	1.20	--
Pahsimeroi River	1,000	1.45	Viable
East Fork Salmon River	1,000	1.45	--
Yankee Fork Salmon River	500	1.90	--
Valley Creek	500	1.90	--
Upper Mainstem Salmon River	1,000	1.45	Viable
Panther Creek	750	1.60	--

Current status:

Major population group, population	Average recent adult returns	Spawner to spawner ratio	Population status
South Fork Salmon River			
Little Salmon River	--	--	High risk
South Fork Salmon River	601	1.20	High risk
Secesh River	403	1.21	High risk
East Fork South Fork Salmon River	105	0.97	High risk
Middle Fork Salmon River			
Chamberlain Creek	223	2.45	High risk
Lower Middle Fork Salmon River	--	--	High risk
Big Creek	90	1.22	High risk
Camas Creek	28	0.83	High risk
Loon Creek	51	1.06	High risk
Upper Middle Fork Salmon River	--	--	High risk
Sulphur Creek	21	1.05	High risk
Bear Valley Creek	182	1.46	High risk
Marsh Creek	42	1.01	High risk
Upper Salmon River			
North Fork Salmon River	--	--	High risk
Lemhi River	79	1.07	High risk
Lower Mainstem Salmon River	103	1.22	High risk
Pahsimeroi River	127	0.54	High risk
East Fork Salmon River	148	1.07	High risk
Yankee Fork Salmon River	13	0.68	High risk
Valley Creek	34	1.07	High risk
Upper Mainstem Salmon River	246	1.51	High risk
Panther Creek	--	--	Extirpated

Fall Chinook Salmon

Objectives and existing conditions from subbasin plan:

Population	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective	5,000	2,100-2,500	Undefined	Undefined
Existing	49	49	0	0

Current status:

No information available.

Steelhead

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective	145,000-192,900	21,600	126,000	1,740
Existing	Unknown	Unknown	22,601	2,658

Minimum de-listing criteria from draft recovery plan:

Population	Minimum abundance threshold	Spawner to spawner ratio	Population status
Little Salmon River	1,000	1.20	--
South Fork Salmon River	1,000	1.20	Viable
Secesh River	500	1.40	Viable
Chamberlain Creek	1,000	1.20	Viable
Lower Middle Fork Salmon River	1,500	1.13	--
Upper Middle Fork Salmon River	1,500	1.13	Viable
Panther Creek	1,000	1.20	--
North Fork Salmon River	500	1.40	--
Lemhi River	1,000	1.20	--
Pahsimeroi River	1,000	1.20	--
East Fork Salmon River	1,000	1.20	--
Upper Mainstem Salmon River	1,000	1.20	Viable

Current status:

All populations are rated at “high risk” for abundance and productivity. No information on recent returns or spawner to spawner ratios is available.

Sockeye Salmon

Objectives and existing conditions from subbasin plan:

	Adult returns (entire subbasin)			
	Total	Natural spawners	Harvest	Broodstock
Objective	8,000-44,500	2,000	2,000	--
Existing	Unknown	28	0	28

Current status:

Population	Recent adult returns	Spawner to spawner ratio	Population status
Entire subbasin	3-27	--	Endangered

Section 3.7.2.2 Primary Limiting Factors and Threats

Limiting Factors	Specific Threats	Potential population response if addressed (abundance increase relative to current – see Appendix)			
		South Fork Chinook	Middle Fork Chinook	Upper Salmon Chinook	Steelhead
Mainstem passage effects		2.4-4.4	2.5-4.6	5.1-11.4	2.4-5.2
• Obstructions	• Mainstem hydrosystem				
Subbasin habitat effects		1.6	1.0	6.7	1.4
• Physical habitat quality/quantity	• Roads • Timber harvest • Grazing • Past mining • Reduced marine-derived nutrient loading				
• Water quantity	• Withdrawals				
• Water quality	• Roads • Past mining • Past grazing • Past timber harvest				
• Obstructions	• Culverts • Roads • Dredge tailings • Diversions				

Section 3.7.2.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.7.2.3.1: Protect and conserve natural ecological processes	**3.7.2.3.1a:** Continue existing protections, and increase protection of high quality habitats through acquisition, conservation easements, and cooperative	Immediate to long term	Immediate to long term

	agreements.		
3.7.2.3.2: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.7.2.3.2a:** Remove or replace culverts and other passage barriers per priorities described in the recovery plan. **3.7.2.3.2b:** Reintroduce native salmon species in areas where they have been extirpated by human activities.	5 to 20 years	Immediate
3.7.2.3.3: Restore floodplain connectivity and function.	**3.7.2.3.3a:** Reduce road-related impacts through relocation, reconstruction, or decommissioning, and return road surfaces, cuts, and fills to productivity. **3.7.2.3.3b:** Reconnect side channels and off-channel habitats to stream channels .**3.7.2.3.3c:** Reconnect tributaries and ponds to river.	Immediate to 10 years	Immediate to long term
3.7.2.3.4: Restore riparian condition and LWD recruitmen**t**	**3.7.2.3.4a:** Establish riparian vegetation to provide cover, stabilize streambanks, reduce stream temperatures, and provide LWD. **3.7.2.3.4b:** Reduce road densities.	25 years to long term	Immediate to long term
3.7.2.3.5: Improve degraded water quality	**3.7.2.3.5a:** Reduce road densities. **3.7.2.3.5b:** Reduce sediment recruitment by modifying roads and trails. **3.7.2.3.5c:** Rehabilitate abandoned mine sites. **3.7.2.3.5d:** Reduce sediment and metals recruitment by rehabilitating abandoned mine sites in the Big Creek, Bear Valley Creek, and Yankee Fork watersheds. **3.7.2.3.5e:** Reduce high water temperatures by restoring natural functions and processes through measures identified to address physical habitat quality/quantity limitations. **3.7.2.3.5f:** Increase stream/lake productivity to near historic levels to increase	Immediate	Intermediate

	growth and survival of juvenile salmonids.		
3.7.2.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.7.2.3.6a:** Identify opportunities to restore streamflows in the Camas Creek and Yankee Fork watersheds. **3.7.2.3.6b:** Improve irrigation efficiencies. **3.7.2.3.6c:** Sequence diversion operations. **3.7.2.3.6d:** Reconnect mainstem tributaries.	Immediate to long term	Immediate
Mainstem Passage Effects: See Section 2			
3.7.2.3.7: Mitigate for impeded and blocked passage	**3.7.2.3.7a:** Implement a mix of artificial propagation measures, habitat restoration actions, improved mainstem passage and survival in an integrated approach to improve anadromous fish returns to the Salmon River subbasin and to achieve objectives.		
Hatchery Effects:			
3.7.2.3.8: Increase hatchery effectiveness for restoration and mitigation	**3.7.2.3.8a:** Explore and implement innovative hatchery actions to achieve both restoration and mitigation objectives.		
Monitoring and Evaluation:			
3.7.2.3.9: Monitor status and trends of focal species and populations	**3.7.2.3.9a:** Establish or use preexisting index sites to gather baseline, trend, and comparative data.	--	--
3.7.2.3.10: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.7.2.3.10a:** Develop methods to monitor biological response to habitat improvement. **3.7.2.3.10b:** Monitor effectiveness of hatchery and natural production measures. **3.6.1.3.10c:** Gather and analyze harvest data to aid in run reconstruction to evaluate status and action effectiveness.	--	--

Section 3.8 Middle Snake Province

Section 3.8.1 Malheur River Subbasin

Section 3.8.1.1 Biological Objectives and Status

Anadromous fish were extirpated from the Malheur River subbasin by completion of the Hells Canyon Complex. Poor survival through the federal hydropower system contributed significantly to the decline of Malheur river anadromous salmonids. Objectives for anadromous salmonids in the Malheur River subbasin include (1) restoration of the spring Chinook salmon population to 25% of its historic abundance and (2) the restoration and protection of the habitat needed to sustain anadromous and resident fish populations.

Section 3.8.1.2 Limiting Factors and Threats

The primary factors limiting spring Chinook salmon in the Malheur River subbasin are (1) obstructions (habitat access), (2) physical habitat quality/quantity, (3) water quality, and (4) water quantity. The primary threats are mainstem hydrosystem dams (federal and Hells Canyon), land use (grazing, timer harvest, roads agriculture, and land development), and irrigation.

Section 3.8.1.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Subbasin Habitat Effects:			
3.8.1.3.1: Restore passage and connectivity to habitats blocked or impaired by artificial barriers.	**3.8.1.3.1a:** Reintroduce native salmon species in areas where they have been extirpated by human activities.	5 to 20 years	Immediate
3.8.1.3.2: Restore floodplain connectivity and function.	**3.8.1.3.2a:** Reduce road-related impacts through relocation, reconstruction, or decommissioning, and return road surfaces, cuts, and fills to productivity. **3.8.1.3.2b:** Reconnect side channels and off-channel habitats to stream channels **3.8.1.3.2c:** Reconnect tributaries and ponds to river.	Immediate to 10 years	Immediate to long term
3.8.1.3.3: Restore channel structure and	**3.8.1.3.3a:** Restore natural channel form. **3.8.1.3.3b:**	Immediate to long term	Immediate to 15 years

complexity.	Increase role and abundance of wood and large organic debris in streambeds. **3.8.1.3.3c:** Stabilize streambanks with passive restoration techniques.		
3.8.1.3.4: Restore riparian condition and LWD recruitmen**t**	**3.8.1.3.4a:** Establish riparian vegetation to provide cover, stabilize streambanks, reduce stream temperatures, and provide LWD. **3.8.1.3.4b:** Reduce road densities.	25 years to long term	Immediate to long term
3.8.1.3.5: Improve degraded water quality	**3.8.1.3.5a:** Reduce high water temperatures by restoring natural functions and processes through measures identified to address physical habitat quality/quantity limitations.	Immediate	Intermediate
3.8.1.3.6: Restore natural hydrograph to provide sufficient flow during critical periods.	**3.8.1.3.6a:** Improve irrigation efficiencies. **3.8.1.3.6b:** Sequence diversion operations. **3.8.1.3.6c:** Reconnect mainstem tributaries.	Immediate to long term	Immediate
Mainstem Passage Effects: See Section 2			
3.8.1.3.7: Mitigate for impeded and blocked passage	**3.8.1.3.7a:** Implement a mix of artificial propagation measures, habitat restoration actions, improved mainstem passage and survival in an integrated approach to restore anadromous fish returns to the Malheur River subbasin and to achieve objectives.		
Monitoring and Evaluation:			
3.8.1.3.8: Monitor and evaluate effectiveness of actions taken to implement measures.	**3.8.1.3.8a:** Conduct feasibility studies to asses and plan the reintroduction of anadromous fish to the Malheur River subbasin.	--	--

Section 3.9 Pacific Lamprey

Section 3.9.1 Biological Objectives and Status

Abundance indices of anadromous lamprey are exhibiting severe downward trends in the Columbia River Basin, which underscores the urgent need for action-oriented improvements to passage and restoration of lamprey in the basin. A long-term objective of developing self sustaining and harvestable populations throughout the historical range requires this downward trend to halt and be reversed. Nine strategies and numerous measures have therefore been developed to address limiting factors and threats to production and sustainability of lamprey in the Columbia River Basin.

Objectives

- Attain self sustaining and harvestable populations throughout the historical range still accessible to lamprey passage.
- Restore lamprey passage and habitat in tributaries that historically supported spawning lamprey populations.
- Mitigate for lost lamprey production in areas where restoration of habitat or passage is not feasible.

Mainstem and tributary passage improvements and restoration of anadromous lamprey have been identified as high priorities in reversing the severe downward trends in abundance, and recent efforts to improve passage of adults have been encouraging; therefore, passage and restoration are addressed in the first two strategies. Refinement of these management-oriented strategies is informed and guided by expanding our understanding of the status, diversity, production, biology, and population dynamics of anadromous lamprey. Based upon the critical need for passage improvements and restoration of anadromous lamprey in the basin and on our present state of knowledge, the nine strategies should be viewed in an adaptive management context, whereby passage improvements and restoration actions are informed by continual advances in knowledge of the various aspects of anadromous lamprey status and biology.

Our limited knowledge of the current status of Pacific lamprey across its historical range poses difficulties in identifying solid abundance targets. Although inaccuracies of adult migrant counts at dams exist, available indices indicate severely declining numbers and precarious status. This is especially true for the interior Columbia River Basin, such as the Snake River Basin in Idaho. Similarly, information on adult Pacific lamprey passage efficiencies past dams indicates that proportions successfully passing through the hydrosystem are low and that passage success is poorer for smaller lamprey. Based on 2000-2002 radio telemetry research, passage efficiencies at Bonneville, The Dalles, and John Day dams averaged 47%, 74%, and 53%, respectively. Although passage rates vary among years, patterns indicate that passage rates at some dams (i.e. Bonneville and John Day) is lower than at others (The Dalles). Almost nothing is known on downstream migration survival for juvenile lamprey, although some areas of loss, such as impingement on screens are known, and can be addressed.

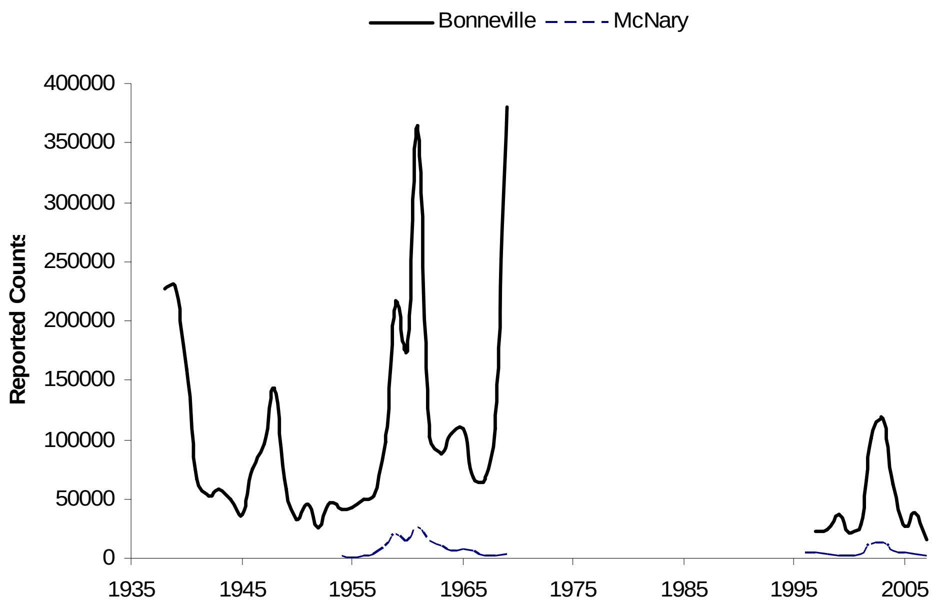

Figure 3.9.1. Annual counts of adult lamprey at Bonneville (start 1938) and McNary (start 1954) dams to present. No counts were made during 1970's and 1980's.

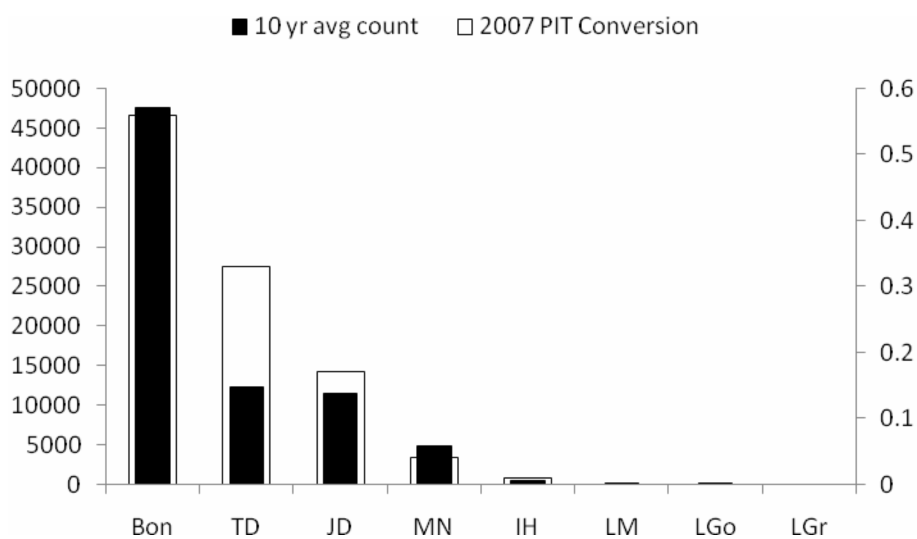

Figure 3.9.2. Comparison of ten year average counts (1998-2007) of adult lamprey at Columbia and Snake River dams (solid bars) and conversion of PIT-tagged adult lamprey through Ice Harbor Dam for fish released downstream of Bonneville Dam in 2007 (Chris Peery University of Idaho, personal. communication). Bon = Bonneville, TD = The Dalles, JD = John Day, MN = McNary, IH = Ice Harbor, LM = Lower Monumental, LGo – Little Goose, and LGr = Lower Granite.

Development of a Columbia River Basin lamprey conservation plan was identified in the U. S. Fish and Wildlife Services' (USFWS) Pacific Lamprey Conservation Initiative in 2007. This collaborative effort will facilitate and identify actions that address threats, restore habitat, increase our knowledge of lampreys, and improve distribution and abundance of lampreys within the Columbia Basin. The Columbia River Basin lamprey conservation plan will be part of a larger effort by the USFWS to restore Pacific lampreys throughout their range. While this plan is being developed and adopted, substantive actions based on current knowledge must be implemented to address the immediate threat to Pacific lamprey across vast portions of its remaining historical range within the Columbia Basin.

Knowledge of lamprey status in the Columbia River Basin is limited primarily to counts of adults and juveniles at dams, traps, or other counting structures. In most cases, these facilities were designed for counting salmonids; therefore, counts of lamprey are incomplete. Little is known about additional information critical to evaluating status (e.g., numbers of spawners; survival rate of juveniles, etc.), although juvenile lamprey presence/absence, density and size distribution data have been collected recently in selected tributaries to contribute to the knowledge base regarding their status.

Section 3.9.2 Limiting Factors and Threats

In the Columbia River Basin, lampreys may migrate hundreds of kilometers through both mainstem and tributary habitats. Consequently, they encounter a variety of obstacles to passage that could negatively affect their populations. Large mainstem and tributary hydropower dams delay and obstruct adult and juvenile passage. Smaller obstacles in tributaries, such as diversion dams and culverts, may also obstruct adult and juvenile lamprey.

Predation may be a limiting factor related to mainstem passage. Juvenile lamprey have been observed in the stomach contents of smallmouth bass and northern pikeminnow from the tailraces of lower Columbia River dams.

Degradation of habitat within subbasins also limits lamprey. Physical habitat quality and quantity has diminished, which may especially limit juvenile rearing. Changes in water quantity exacerbated by irrigation withdrawals, roads, and agriculture practices during critical periods affect lamprey passage and survival. Finally, degradation of water quality (sedimentation and high temperatures) from various land use practices also limits lamprey production.

A final important limiting factor is our lack of knowledge of lamprey population delineation, biology and ecology, and population dynamics. Increased knowledge of lamprey biology and ecology will enhance our ability to evaluate the relative effectiveness of priority management actions. Population dynamics can assist in predicting the effects of various conservation actions.

Section 3.9.3 Strategies and Measures

Key to implementing the following proposed measures will be the development of a collaborative lamprey conservation strategy (Strategy 3.9.3.4) that identifies critical uncertainties related to lamprey status, biology, and conservation. The plan will help guide priorities of measures to implement in addition to the immediate actions taken to improve passage and restore habitat.

Strategy 3.9.3.1 **Improve adult and juvenile Pacific lamprey passage survival and reduce delays in migration.**

Measures:

3.9.3.1a Develop and implement aids to passage at known and suspected lamprey passage obstacles.

3.9.3.1b Identify additional specific structures or operations that delay, obstruct, or kill migrating lamprey.

3.9.3.1c Monitor lamprey passage to evaluate passage improvement actions and to identify additional passage problem areas.

3.9.3.1d Assess passage efficiency, direct mortality, and/or other metrics that relate to migratory success.

Strategy 3.9.3.2: **Continue restoring freshwater spawning and rearing habitat for anadromous lampreys**

Measures:

3.9.3.2a Develop, implement, and evaluate lamprey-specific restoration projects (restoring natural processes in the absence of information on limiting factors).

3.9.3.2b Identify ongoing habitat restoration and safety-net activities and evaluate their effects on lamprey.

Strategy 3.9.3.3: **Reintroduce and restore lamprey production to suitable habitats where they no longer occur, and monitor results.**

3.9.3.3a Develop, implement, and monitor restoration actions.

Strategy 3.9.3.4: **Develop a collaborative lamprey conservation, restoration, and management plan.**

Measures:

3.9.3.4a Improve our understanding and documentation of critical uncertainties by updating the Columbia River Basin Lamprey Technical Workgroup Critical Uncertainties document as part of a Columbia Basin lamprey conservation plan.

3.9.3.4b Support development of a Columbia Basin lamprey management plan. The plan should include: (1) abundance targets measured at mainstem dams and tributaries, and (2) adult and juvenile passage efficiency targets and performance standards for mainstem dams.

3.9.3.4c Identify research and analyses that address critical uncertainties regarding lamprey habitat, status, distribution, and genetic structure.

3.9.3.4d Develop and maintain a regional Pacific lamprey data base for housing and accessing historic, current and new literature on distribution, life history, ecology, status, restoration, and cultural values.

Strategy 3.9.3.5: Better understand lamprey status

Measures:

3.9.3.5a Compile and evaluate current and historical information on Pacific lamprey distribution, abundance and status within the Columbia Basin.

3.9.3.5b Develop methods to differentiate among species at all life stages (field-based).

3.9.3.5c Develop standardized sampling protocols and conduct systematic basin-wide surveys to assess adult and juvenile abundance and distribution.

3.9.3.5d Define, improve, and continue historic distribution and abundance indices (e.g., dam counts, tribal harvest records, smolt trap collections, etc).

3.9.3.5e Coordinate information exchange with existing and future projects not targeting lamprey specifically.

Strategy 3.9.3.6: Determine anadromous lamprey population structure

Measures:

3.9.3.6a Supplement existing libraries of genetic markers for lamprey (e.g., microsatellites, single nucleotide polymorphisms).

3.9.3.6b Collect and maintain lamprey tissue samples from the Columbia River Basin and neighboring basins.

3.9.3.6c Investigate and determine population characteristics.

Strategy 3.9.3.7: Determine anadromous lamprey limiting factors

Measures:

3.9.3.7a Document habitat preferences and habitat availability for all life stages of anadromous lamprey.

3.9.3.7b Evaluate the physiological and behavioral responses of lamprey to a variety of environmental stressors.

3.9.3.7c Assess trophic relationships.

3.9.3.7d Assess the potential magnitude and effect of predation on lamprey productivity.

Strategy 3.9.3.8: Describe anadromous lamprey biology and ecology

Measures:

3.9.3.8a Describe the ecological function of anadromous lamprey.

3.9.3.8b Describe the biology of anadromous lamprey.
3.9.3.8c Develop methodology for gender identification in the field and laboratory.
3.9.3.8d Develop aging techniques.
3.9.3.8e Assess life history characteristics of freshwater and ocean-phase anadromous lamprey.

Strategy 3.9.3.9: Describe anadromous lamprey population dynamics

Measures:
3.9.3.9a Estimate demographic rate parameters capable of changing the size of populations such as birth, death, immigration, and emigration rates.

Section 4.0. Recommended Amendment to Subbasin and Focal Species Provisions for Resident Fish

Section 4.1 Lower Columbia Province

Section 4.1.1 Columbia Lower and Estuary Subbasin

A. White Sturgeon

Section 4.1.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Abundance (36-72 inches)		Number of local populations	Number of adults	Total number of adults
Lower Columbia/ Columbia River Estuary	>400,000		NA	NA	NA
	Annual Harvest				
	50,000		NA	NA	NA
	Productivity				
	>1 recruit per spawner		NA	NA	NA

Status:

Population	Abundance	Annual Harvest	Productivity
Lower Columbia/ Columbia River Estuary	121,500 (2006)	33,783 (2006 combined recreational and commercial harvest)	NA

Section 4.1.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Loss of habitat and population connectivity	Dams	River fragmentation by Bonneville Dam limits the ability of white sturgeon to redistribute, to seek out the best

		spawning and rearing areas, and to access and follow seasonal food resources.
Pollutants and contaminants	Current land use practices	Industrial discharges and dumping; agriculture and residential applications
Predation	Marine mammals; native and non-native fishes	Steller and California sea lion predation on adult and sub-adult sturgeon; potential sturgeon larvae and egg predation by suckers, walleye, catfish, black bass, etc.
Spawning and recruitment variability	Dams; flows	Current Bonneville Dam operations alter spawning and rearing flows (spring and winter flows)
Fisheries and harvest	Over-harvest	Illegal harvest of legal and over-sized white sturgeon for meat and caviar; potential handling stress from catch and release in over-size fishery
Water temperature	Dams	Bonneville Dam operations can artificially increase river water temperatures to detrimental levels
Flow and flow variation	Dams	Alteration of historic hydrograph as water is stored for power generation and irrigation by the FCRPS
Sediments	Dams; dredging	Bonneville Dam operations and dredging for cargo ships and other commercial uses may result in deposition of fine sediments in preferred spawning habitats.
Habitat quality/quantity	Current land and river use practices	Roads; agriculture; forestry; residential development; Bonneville Dam
Non-native species	Introduced aquatic species	A potential decrease in prey quality (lipid content, energy, etc) and/or competition for food resources with juvenile white sturgeon
Incidental hydrosystem mortality	Dams	Dewatering of Bonneville Dam turbines can result in mortality of stranded white sturgeon

Section 4.1.1A.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Loss of habitat and population connectivity			
• Restore upstream and downstream movement of white sturgeon in the lower Columbia River	• A. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • B. Manage marine mammals to reduce predation of white sturgeon downstream of Bonneville Dam • C. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • D. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Pollutants and contaminants			
• Ensure water quality and contaminant loads in river substrates meet existing guidelines and regulations	• E. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • F. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Predation			
• Conduct non-lethal hazing actions on the Columbia River to deter Steller and California sea lions from feeding on white sturgeon.	• G. Manage marine mammals to reduce predation of white sturgeon downstream of Bonneville Dam • H. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • I. Conduct research that addresses critical white	Immediate	1 – 5 years

	sturgeon uncertainties		
• Investigate the need and potential measures for minimizing egg and larval white sturgeon piscivory	• J. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • K. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • L. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Spawning and recruitment variability			
• Obtain consistent annual spawning and recruitment of white sturgeon in the lower Columbia River	• M. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • N. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • O. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • P. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Fisheries and harvest			
• Set harvest guidelines to ensure adequate escapement of harvestable-size fish to broodstock	• Q. In consultation with the appropriate management agencies fund intensive sustainable white sturgeon fishery management • R. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • S. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years

Water temperature			
• Create habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• T. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • U. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • V. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Flow and flow variation			
• Obtain consistent annual spawning and recruitment of white sturgeon in the lower Columbia River	• W. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • X. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • Y. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Sediments			
• Achieve habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• Z. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • AA. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • BB. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
• Investigate scope and impact of direct white sturgeon mortality due to dredging activities	• CC. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • DD. Conduct dredging operations to minimize operation related mortality on white sturgeon in the free-flowing river below Bonneville Dam • EE. Monitor and evaluate, a)	Immediate	1 – 5 years

	mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • FF. Conduct research that addresses critical white sturgeon uncertainties		
Non-native species			
• Characterize white sturgeon interactions with introduced species.	• GG. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • HH. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Incidental hydrosystem mortality			
• Operate the hydrosystem to reduce mortality on white sturgeon	• II. Block access to turbine draft tubes during turbine dewatering and other maintenance operations to minimize white sturgeon entrainment and mortality • JJ. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • KK. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years

B. Green Sturgeon

Section 4.1.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Lower Columbia/ Columbia River Estuary	None		NA	NA	NA

	Subbasin/Management Plans		Recovery Plan		
	Annual Harvest				
	Commercial and sport harvest banned		NA	NA	NA

Status:

Population	Abundance	Annual Harvest	Productivity
Lower Columbia/ Columbia River Estuary	Unknown	Closed	Unknown

Section 4.1.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Harvest	Fishing mortality	Incidental catch in white sturgeon fisheries and non-retention fisheries
Non-native species	Introduced aquatic species	A potential decrease in prey quality (lipid content, energy, etc) and/or competition for food resources with juvenile white sturgeon
Predation	Marine mammals	Pinnipeds
Habitat diversity and productivity	Current land use practices	Dikes and filling activities; loss of wetland habitats and productivity
Contaminants	Current land use	Industrial discharges and dumping; agriculture and residential applications

Section 4.1.1B.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Harvest			
• Quantify green sturgeon abundances in the lower Columbia River to better inform management decisions	• A. Develop and conduct studies to quantify green sturgeon abundances and associated spatio-temporal variability • B. Monitor harvest levels and the effectiveness of current fishery regulations	Immediate	1 – 5 years

Non-native species			
• Evaluate green sturgeon interactions with non-native species and remove potentially detrimental non-native prey	• C. Study the impacts of diet shifts on the transfer of energy and materials from prey to green sturgeon • D. Potentially remove detrimental non-native prey	Immediate	6 – 10 years
Predation			
• Evaluate significance of pinniped predation on green sturgeon.	• E. Manage marine mammals to reduce predation of green sturgeon.	Immediate	1 – 5 years
Habitat diversity and productivity			
• Characterize diets of green sturgeon and consider limiting dike construction and filling activities	• F. Asses the importance of macro-detritus and wetland associated macro-benthos in the diets of green sturgeon • G. Regulate diking and filling activities that may limit green sturgeon access to wetland derived production	Immediate	1 – 5 years
Contaminants			
• Ensure water quality and contaminant loads in river substrates meet appropriate guidelines and regulations	• H. Conduct research that quantifies and addresses the affects of specific contaminants and water quality requirements on green sturgeon	Immediate	1 – 5 years

Section 4.1.2 Kalama Subbasin

A. Kalama Coastal Cutthroat Trout

Section 4.1.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population			Number of local populations	Number of adults	Total number of adults
Kalama	None		NA	NA	NA

Status:

Population	Adult Abundance
Kalama	Unknown

Section 4.1.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Forestry practices, roads, and residential development
Competition/predation	Non-native species	Rainbow trout
Population traits	Population information	Lack population density, distribution and genetic information

Section 4.1.2A.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Create population database	• Implement biological surveys to evaluate population density and composition • Identify migration patterns through telemetry studies • Implement mark-recapture studies to estimate population size	Immediate	5-10 years

B. Lewis Coastal Cutthroat Trout

Section 4.1.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population			Number of local populations	Number of adults	Total number of adults
Lewis	None		NA	NA	NA

Status:

Population	Adult Abundance
Lewis	Unknown

Section 4.1.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Forestry practices, roads, and residential development
Competition/predation	Non-native species	Rainbow trout
Population traits	Population information	Lack population density, distribution and genetic information

Section 4.1.2B.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Create population database	• A. Implement biological surveys to evaluate population density and composition • B. Identify migration patterns through telemetry studies • C. Implement mark-recapture studies to estimate population size	Immediate	5-10 years

Section .4.1.3 Washougal Subbasin

A. Washougal Coastal Cutthroat Trout

Section 4.1.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population			Number of local populations	Number of adults	Total number of adults
Washougal	None		NA	NA	NA

Status:

Population	Adult Abundance
Washougal	Unknown

Section 4.1.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Forestry practices, roads, and residential development
Competition/predation	Non-native species	Rainbow trout
Population traits	Population information	Lack population density, distribution and genetic information

Section 4.1.3A.3 Strategies and Measures for Washougal Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Create population database	• A. Implement biological surveys to evaluate population density and composition • B. Identify migration patterns through telemetry studies • C. Implement mark-recapture studies to estimate population size	Immediate	5-10 years

Section 4.1.4 Willamette Subbasin

A. Willamette Bull Trout

Section 4.1.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Upper Willamette	--			--	

	Subbasin/Management Plans		Draft Recovery Plan		
	Number of local populations				
	4		4		
	Total number of adults				
	600-1,000				600-1,000

Status:

Population	Number of local populations	Number of adults/population	Total number of adults
Upper Willamette		--	174 (2007)

Section 4.1.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Inundation by hydro-development, road building, forestry, and urban encroachment
Habitat access	Dams	Lack of passage at Willamette River dams
Population traits	Dams	Lack of passage facilities at Willamette River dams isolates populations and prevents gene flow
Competition	Non-native species	Brook trout competition
Nutrients	Dams	Lack of Chinook salmon in habitat above Willamette River dams due to lack of passage facilities

Section 4.1.4A.3 Strategies and Measures for Willamette Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Improve habitat to sustain populations of bull trout in at least four tributaries of the Willamette River	• Protect, restore, and enhance bull trout habitat, and implement projects to restore instream structure and complexity by adding large woody debris, side	Immediately	1-5 years

(McKenzie, Middle Fork Willamette, Clackamas, North Santiam rivers)	channels and spawning gravels		
Habitat Access			
• Restore connectivity in migratory corridor	• Correct manmade barriers that impede bull trout access to suitable habitat by developing upstream and downstream passage at dams that block access to former and present bull trout populations	Immediately	1-5years
• Reestablish bull trout in unoccupied historical habitats in the Willamette Basin	• Assess the feasibility of reestablishing bull trout in former habitat by compiling existing data on potential bull trout spawning and rearing habitat and gathering new data where there are gaps in the information • Determine potential sources of bull trout in the Willamette Basin including all known populations (Anderson Creek, Roaring River, Sweetwater Creek and the McKenzie above Trail Bridge Reservoir) • If determined feasible and advisable, relocate bull trout for a minimum of seven years (one bull trout generation)	Immediately	1-5years
Population Traits			
• Develop a genetic management plan for bull trout in the Upper Willamette River core area providing for multiple, genetically healthy populations	• Collect tissue samples from bull trout for genetic characterization, characterize the genetic structure among local populations by determining frequencies of alleles • Draft a genetic management plan that specifies the rate and directions of artificial gene flow necessary to minimize the risk of inbreeding depression and genetic drift while maintaining population structure • Implement the genetic management plan until intact migratory corridors among all local populations in the Willamette Recovery Unit provide opportunities for natural	Immediately	1-5years

	gene flow		
Competition			
• Eliminate or significantly reduce brook trout populations in habitats that contain bull trout populations	• Determine brook trout distribution • Develop/implement test methods of reducing brook trout in bull trout watersheds	Immediately	1-5years
Nutrients			
• Production of juvenile salmon in waters with bull trout	• Re-establish populations of Chinook salmon in bull trout habitats above dams in the Willamette Basin		

B. Willamette Coastal Cutthroat Trout

Section 4.1.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Willamette	None		NA	NA	NA

Status:

Population	Adult Abundance
Willamette	Above critical levels for the past five years

Section 4.1.4B.2 Primary Limiting Factors and Threats:

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Forestry practices, road construction, agriculture, and urbanization

Section 4.1.4B.3 Strategies and Measures for Willamette Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protect and	• A. Protect /restore: 1)	Immediate	1-5 years

conserve natural ecological processes that support the viability of populations	riparian condition and large woody debris, 2) floodplain connectivity and function, 3) stream channel structure and complexity via collaborative efforts with landowners, watershed councils, municipalities, and other public and private entities • B. Develop financial incentive and educational programs to increase participation • C. Employ regulatory mechanisms as necessary		

C. Willamette Oregon Chub

Section 4.1.4C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Number of adults/population		Number of local populations	Number of adults	Total number of adults
Willamette	≥ 500		20	≥500	10,000
	Number of Populations				
	20				

Status:

Population	Number of local populations
Willamette	15 stable populations (2007)

Section 4.1.4C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Operation of Willamette River dams for flood control, agriculture, and urbanization
Competition/predation	Non-native species	Smallmouth bass, largemouth bass, bluegill, bullheads, mosquitofish, etc)

Section 4.1.4C.3 Strategies and Measures for Willamette Oregon Chub

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Modify flood control operations and reduce channelization	• A. Reconnect floodplain habitats, remove revetments, restore wetland habitats, restrict development in floodplains, provide stream and wetland buffers in agricultural lands	Immediate	1-5 years
Competition/Predation			
• Restrict movement of non-native fishes and remove non-native fishes when feasible	• B. Limit stocking of non-native fishes to secure areas where there is no emigration and/or movement during flooding • C. Remove non-native fishes where they threatened nearby Oregon chub populations • D. Restore off-channel and side channel habitats	Immediate	1-5 years

Section 4.2 Columbia Gorge Province

Section 4.2.1 Big White Salmon Subbasin

A. Big White Salmon Rainbow Trout

Section 4.2.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Big White Salmon	None		NA	NA	NA

Status:

Population	Adult Abundance
Big White Salmon	Unknown

Section 4.2.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/predation	Fish species	Reintroduction of anadromous fish above Condit Dam
Population traits	Population information	Lack population density, distribution and genetic information

Section 4.2.1A.3 Strategies and Measures for Big White Salmon Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Create population database	• A. Implement biological surveys to evaluate population density and composition • B. Identify migration patterns through telemetry studies • C. Implement mark-recapture studies to estimate population size	Immediate	

B. Columbia Gorge White Sturgeon

Section 4.2.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Consumptive Harvest		Number of local populations	Number of adults	Total number of adults
Bonneville	5 kg/ha		NA	NA	NA
	Target Exploitation				
	21% fish 42-60" (sport) 25% fish 45-60" (commercial)		NA	NA	NA

Status:

Population	Consumptive Harvest	Sport Exploitation 42-60"	Commercial Exploitation 45-60"	Annual Recruitment	Broodstock Abundance
Bonneville	1074 (2004-07 average)	NA	NA	Consistent, moderate (1999-2007)	243 (2006)

Section 4.2.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Loss of habitat and population connectivity	Dams	River fragmentation by the FCRPS limits the ability of white sturgeon to redistribute, to seek out the best spawning and rearing areas, and to access and follow seasonal food resources.
Pollutants and contaminants	Current land use practices	Industrial discharges and dumping; agriculture and residential applications
Spawning and recruitment variability	Dams; flows	Current operations of the FCRPS alter spawning and rearing flows (spring and winter flows)
Fisheries and harvest	Over-harvest	Illegal harvest of legal and over-sized white sturgeon for meat and caviar; potential handling stress from catch and release over-size fishery

Limiting Factor	General Threat	Specific Threats
Piscine Predation	Native and non-native fishes	Potential sturgeon larvae and egg predation by suckers, walleye, catfish, black bass, etc.
Water temperature	Dams	FCRPS operations can artificially increase river water temperatures to detrimental levels
Flow and flow variation	Dams	Alteration of historic hydrograph as water is stored for power generation and irrigation by the FCRPS
Sediments	Dams	Operation of the FCRPS may result in deposition of fine sediments in preferred spawning habitats
Loss of prey base	Dams	Abundance and migrations of historically important prey species have been negatively impacted by the FCRPS.
Non-native species	Introduced aquatic species	A potential decrease in prey quality (lipid content, energy, etc) and/or competition for food resources with juvenile white sturgeon

Section 4.2.1B.3 Strategies and Measures for Columbia Gorge White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Loss of habitat and population connectivity			
• Restore upstream and downstream movement of white sturgeon impounded in Columbia River reservoirs	• A. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. • B. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • C. Identify and quantify regional white sturgeon hatchery augmentation	Immediate	1 – 5 years

	needs and immediately implement Master Plan processes • D. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • E. Conduct research that addresses critical white sturgeon uncertainties		
Pollutants and contaminants			
• Ensure water quality and contaminant loads in river substrates meet existing guidelines and regulations	• F. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. • G. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • H. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Spawning and recruitment variability			
• Obtain consistent annual spawning and recruitment of white sturgeon in Bonneville Reservoir	• I. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • J. In consultation with the appropriate state agencies and tribes, fund intensive sustainable white sturgeon fishery management • K. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. • L. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day	Immediate	1 – 5 years

	and The Dalles reservoirs • M. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • N. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • O. Conduct research that addresses critical white sturgeon uncertainties		
Fisheries and harvest			
• Set harvest guidelines to ensure adequate escapement of harvestable-size fish to broodstock	• P. In consultation with the appropriate state agencies and tribes, fund intensive sustainable white sturgeon fishery management • Q. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. • R. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • S. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • T. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • U. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years

Piscine Predation			
• Investigate the need and potential measures for minimizing egg and juvenile white sturgeon predation by native and introduced resident fishes.	• V. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • W. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. • X. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • Y. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • Z. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • AA. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Water Temperature			
• Create habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• BB. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • CC. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. • DD. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day	Immediate	1 – 5 years

	and The Dalles reservoirs • EE. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • FF. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • GG. Conduct research that addresses critical white sturgeon uncertainties		
Flow and flow variation			
• Obtain consistent annual spawning and recruitment of white sturgeon in Bonneville Reservoir	• HH. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • II. In consultation with the appropriate state agencies and tribes, fund intensive sustainable white sturgeon fishery management • JJ. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. • KK. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • LL. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • MM. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population	Immediate	1 – 5 years

	responses to environmental conditions • NN. Conduct research that addresses critical white sturgeon uncertainties		
Sediments			
• Achieve habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• OO. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • PP. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. • QQ. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • RR. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • SS. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • TT. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Loss of prey base			
• Increase habitat connectivity	• UU. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • VV. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan.	Immediate	1 – 5 years

	• WW. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • XX. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • YY. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • ZZ. Conduct research that addresses critical white sturgeon uncertainties		
Non-native species			
• Characterize white sturgeon interactions with introduced species.	• AAA. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. • BBB. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • CCC. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years

Section 4.2.2 Small Oregon Gorge Tributaries

A. Rainbow Trout

Section 4.2.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Distribution		Number of local populations	Number of adults	Total number

					of adults
Tributaries	At least 50% of historic habitat		NA	NA	NA
	Adult Abundance				
	Naturally produced spawners > 25% of average abundance over most recent 30 year period		NA	NA	NA
	In years when total spawner abundance is less than average abundance over 30 years, ensure rate of population increase is at least 1.2 adult offspring per parent		NA	NA	NA

Status:

Population	Distribution	Adult Abundance
Tributaries	Unknown	Unknown

Section 4.2.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Highway and railroad corridor development, and inundation due to Bonneville Dam
Habitat access	Current land use	Highway and railroad corridor development

Section 4.2.2A.3 Strategies and Measures for Small Oregon Tributary Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protect and restore existing instream and riparian habitat (reduce reservoir inundation)	• A. Implement habitat restoration and protection measures described in the Lower Columbia River Recovery Plan	Immediate	1-5 years

Habitat Access			
• Restore unimpeded access that has been blocked by anthropogenic factors	• B. Implement habitat restoration and protection measures described in the Lower Columbia River Recovery Plan	Immediate	1-5 yeasr

B. Fifteenmile Coastal Cutthroat Trout

Section 4.2.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Distribution		Number of local populations	Number of adults	Total number of adults
Fifteenmile	At least 50% of historic habitat		NA	NA	NA
	Adult Abundance				
	Naturally produced spawners > 25% of average abundance over most recent 30 year period		NA	NA	NA
	In years when total spawner abundance is less than average abundance over 30 years, ensure rate of population increase is at least 1.2 adult offspring per parent		NA	NA	NA

Status:

Population	Adult Abundance
Fifteenmile	Unknown

Section 4.2.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture, forestry, road building

Water quality	Current land use	Agriculture, forestry, road building
Water quantity	Current land use	Agriculture, forestry, road building

Section 4.2.2B.3 Strategies and Measures for Fifteenmile Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protect and restore aquatic and riparian habitats	• A. Encourage land owners and managers to utilize best management practices that both protect and restore aquatic habitat • B. Implement conservation strategies developed in Mid-Columbia Steelhead Recovery Plan and other planning documents	Immediate	1-5 years
Water Quality			
• Reduce stream temperatures	• C. Encourage land owners and managers to utilize best management practices that do not increase temperatures, and cause point source pollution issues • D. Implement conservation strategies developed in Mid-Columbia Steelhead Recovery Plan	Immediate	1-5 years
Water Quantity			
• Restore natural hydrograph	• E. Implement water conservation and efficiency programs that reduce stream water withdrawals, and upland conservation measures designed to effect runoff • F. Implement of water conservation strategies developed in Mid-Columbia Steelhead Recovery Plan and other planning documents	Immediate	1-5 years

C. Fifteenmile Rainbow Trout

Section 4.2.2C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Distribution		Number of local populations	Number of adults	Total number of adults
Fifteenmile	At least 50% of historic habitat		NA	NA	NA
	Abundance				
	Naturally produced spawners > 25% of average abundance over most recent 30 year period		NA	NA	NA
	In years when total spawner abundance is less than average abundance over 30 years, ensure rate of population increase is at least 1.2 adult offspring per parent		NA	NA	NA

Status:

Population	Adult Abundance
Fifteenmile	Unknown

Section 4.2.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture, forestry, road building
Water quality	Current land use	Agriculture, forestry, road building
Water quantity	Current land use	Agriculture, forestry, road building

Section 4.2.2C.3 Strategies and Measures for Fifteenmile Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protect and restore aquatic and riparian habitats	• A. Encourage land owners and managers to utilize best management practices that both protect and restore aquatic habitat • B. Implement conservation strategies developed in Mid-Columbia Steelhead Recovery Plan and other planning documents	Immediate	1-5 years
Water Quality			
• Reduce stream temperatures	• C. Encourage land owners and managers to utilize best management practices that do not increase temperatures, and cause point source pollution issues • D. Implement conservation strategies developed in Mid-Columbia Steelhead Recovery Plan	Immediate	1-5 years
Water Quantity			
• Restore natural hydrograph	• E. Implement water conservation and efficiency programs that reduce stream water withdrawals, and upland conservation measures designed to effect runoff • F. Implement of water conservation strategies	Immediate	1-5 years

	developed in Mid-Columbia Steelhead Recovery Plan and other planning documents		

Section 4.2.3 Hood Subbasin

A. Hood Bull Trout

Section 4.2.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Hood River	--			--	
	Number of local populations				
	3 or more		3 or more		
	Total number of adults				
	500				500

Status:

Population	Number of local populations	Number of adults/population	Total number of adults
Hood River			93 upstream of Laurance Lake (2007)

Section 4.2.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quality	Current land use	Increased temperatures and sedimentation due to agricultural, domestic, and hydroelectric uses
Water quantity	Current land use	Agricultural, domestic, and hydroelectric diversions reduce streamflow
Habitat access	Current land use	Road, water diversion structures, and other artificial impediments limit access into historic habitat
Habitat quality/quantity	Current and historic land use	Agriculture, forestry, and domestic

Section 4.2.3A.3 Strategies and Measures for Hood River Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water Quality			
• Restore natural hydrograph	• A. Implement water conservations measures described in the Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents to reduce water diversion	Immediate	1-5 years
Water Quantity			
• Restore natural hydrograph	• B. Implement water conservations measures described in the Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents to reduce water diversion	Immediate	1-5 years
Habitat Access			
• Restore access to all historic habitats	• C. Implement measures described in the Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents	Immediate	1-5 years
Habitat Quality/Quantity			
• Protect and restore instream and riparian habitat	• D. Implement measures described in Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents	Immediate	1-5 years

B. Hood Coastal Cutthroat Trout

Section 4.2.3B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Distribution		Number of local populations	Number of adults	Total number of adults
Hood	At least 50% of historic habitat		NA	NA	NA
	Abundance				
	Naturally produced spawners > 25% of average abundance over most recent 30 year period		NA	NA	NA
	In years when total spawner abundance is less than average abundance over 30 years, ensure rate of population increase is at least 1.2 adult offspring per parent		NA	NA	NA

Status:

Population	Adult Abundance
Hood	Unknown

Section 4.2.3B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quality	Current land use	Increased temperatures and sedimentation, resulting from domestic, hydroelectric, and agricultural water usage
Water quantity	Current land use	Agricultural, domestic, and hydroelectric diversions reduce streamflow
Habitat access	Current land use	Road, water diversion structures, and other artificial impediments limit access to historic habitat

Habitat quality/quantity	Current and historic land use	Agriculture, forestry and domestic practices

Section 4.2.3B.3 Strategies and Measures for Hood Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water Quality			
• Restore natural hydrograph	• A. Implement water conservations measures described in the Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents to reduce water diversion	Immediate	1-5 years
Water Quantity			
• Restore natural hydrograph	• B. Implement water conservations measures described in Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents to reduce water diversion	Immediate	1-5 years
Habitat Access			
• Restore access to all historic habitats	• C. Implement measures described in Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents	Immediate	
Habitat Quality/Quantity			
• Protect and restore instream and riparian habitat	• D. Implement measures described in Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents	Immediate	1-5 years

Section 4.2.4 Klickitat Subbasin

A. Klickitat Bull Trout

Section 4.2.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Klickitat River	Unknown			Unknown	
	Number of local populations				
	4		4		
	Total number of adults				
	Unknown				Unknown

Status:

Population	Number of local populations	Number of adults/population	Total number of adults
Klickitat	Unknown	Unknown	Unknown

Section 4.2.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat and water quality and quantity	Climate change	
Population traits	Population information	Lack population density, distribution and genetic information

Section 4.2.4A.3 Strategies and Measures for Klickitat Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Create population database	• A. Implement biological surveys to evaluate population density and composition • B. Identify migration patterns through telemetry studies • C. Implement mark-recapture studies to estimate population size	Immediate	5-10 years

Section 4.3 Columbia Plateau Province

Section 4.3.1 Columbia Lower Middle Subbasin

A. Columbia Lower Middle White Sturgeon

Section 4.3.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Consumptive Harvest		Number of local populations	Number of adults	Total number of adults
The Dalles, John Day, and McNary/Hanford Reach	5 kg/ha		NA	NA	NA
	Target Harvest Exploitation				
	21% fish 42-60” (sport) 25% fish 45-60” (commercial)		NA	NA	NA
	Annual Recruitment (Productivity)				
			NA	NA	NA
	Broodstock Abundance				
			NA	NA	NA

Status:

Population	Consumptive Harvest	Sport Exploitation 42-60”	Commercial Exploitation 45-60”	Annual Recruitment	Broodstock Abundance
The Dalles Reservoir					
John Day Reservoir					
McNary Reservoir / Hanford	429 (1988-2005 average) trend is for	N/A	N/A	Sporadic and low (1999-	1,300 (1995)

Population	Consumptive Harvest	Sport Exploitation 42-60”	Commercial Exploitation 45-60”	Annual Recruitment	Broodstock Abundance
Reach	declining sport harvest			2007)	

Section 4.3.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Dams	Because white sturgeon generally do not use fish ladders, Columbia River dams connectivity, habitat access, and access to prey
Contaminants	Current land use	Significant levels of dioxins/furans, DDT, and metals have been identified in lower Columbia River fish and sediment samples. White sturgeon may uptake contaminants through direct contact or bioaccumulation through the food chain.
Hydro-operations	Flows	
Harvest	Over-harvest	Commercial, sport, and illegal harvest
Competition/ Predation	Native and non-native species	There is some evidence from predation studies that white sturgeon eggs and age-0 white sturgeon are vulnerable to fish predators, including larger sturgeon, found in the reservoirs. Hundreds of species introductions, both intentional and unintentional, have occurred in the Columbia River mainstem Effects on white sturgeon may be a decrease in prey quality (lipid content, energy, etc) associated with replacement of native/historic forage with invasive prey. Although non-native Asiatic clams (*Corbicula fluminea*) and American shad (*Alosa sapidissima*) now make up a considerable part of the white sturgeon diet in The Dalles and John Day reservoirs; relatively little is known about the food value of these

		species compared to native prey items. Also, some introduced species, such as shad and other game fish, may compete for food sources with juvenile white sturgeon.
Population traits	Dams	Columbia River dams have led to the creation of a series of isolated sub-populations for which downstream gene flow may be the only direction of genetic exchange. Columbia River dams limit white sturgeon to redistribute individuals from areas of high densities or poor resources to seek out the best conditions for survival. Construction of hydropower dams throughout the basin have negatively impacted spawning and subsequent recruitment.
Water quantity	Dams	Historic flow records demonstrate that spring freshet flows have been reduced by about 50%, as water is stored for power generation and irrigation, and winter flows have increased about 30%. Reduced flows during spring and early summer (the spawning time of white sturgeon in the Columbia River basin) have been correlated to reduced recruitment of age-0 white sturgeon.
Habitat quality/quantity	Dams	Deposition of fine sediments in the preferred spawning habitats may result in white sturgeon egg hypoxia.

Section 4.3.1A.3 Strategies and Measures for Columbia Gorge White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Restore upstream and downstream movement	• A. Develop a regionally accepted White Sturgeon Conservation and Management Plan. This plan will describe current species status, population dynamics and data gaps. The plan will recommend management activities, research, monitoring, and evaluation necessary to achieve biological objectives and guide actions to effectively address uncertainties relevant to species status and current resource management impacts on individual white sturgeon populations throughout the Columbia and Snake rivers. Specific recommendations may include, though are not limited to, abundance, population densities, FCRPS influenced environmental conditions, supplementation rates, and fisheries management. This document will also address the Independent Scientific Review Panel's 2002 call for a "State of the Science" document that summarizes existing findings and information. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • B. Conduct annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville	Immediate	

	Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposals 198605000.] • C. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Concurrent with the development of the previously described White Sturgeon Conservation and Management Plan, begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. [Specific and detailed background, objectives and tasks are described in FY 2007-2009 BPA proposal 200715500; FERC Relicensing Agreements with Grant and Chelan Public Utility Districts (PUDs).] • D. Monitor and evaluate a) restoration actions designed to mitigate for		

	lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by: • E. Conducting assessments of the status of white sturgeon populations (e.g., abundance, size distribution, length-weight relationship, etc.) in Bonneville, The Dalles, or John Day Reservoirs every three (3) years and McNary, Ice Harbor, Lower Monumental and Little Goose reservoirs every five (5) years. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • F. Indexing annual levels of, and variation in, white sturgeon recruitment in the free-flowing Columbia River downstream of Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • G. Conduct research that addresses critical uncertainties, such as white sturgeon broodstock genetic contribution to recruits, identified in existing and future regional white sturgeon conservation and management plans related		

	to loss of white sturgeon productivity due to the construction and operation of the FCRPS		
Contaminants			
• Ensure water quality and contaminant loads in river substrates meet existing guidelines and regulations	• H. Development of a regionally accepted White Sturgeon Conservation and Management Plan. This plan will describe current species status, population dynamics and data gaps. It should recommend management activities, research, monitoring, and evaluation necessary to achieve biological objectives and guide actions to effectively address uncertainties relevant to species status and current resource management impacts on individual white sturgeon populations throughout the Columbia and Snake rivers. Specific recommendations may include, though not limited to, abundance, population densities, FCRPS influenced environmental conditions, supplementation rates, and fisheries management. This document will also address the Independent Scientific Review Panel's 2002 call for a "State of the Science" document that summarizes existing findings and information. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • I. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and	Immediate	

	operation of the FCRPS and b) population responses to environmental conditions by: • J. Conducting assessments of the status of white sturgeon populations (e.g., abundance, size distribution, length-weight relationship, etc.) in Bonneville, The Dalles, or John Day Reservoirs every three (3) years and McNary, Ice Harbor, Lower Monumental and Little Goose reservoirs every five (5) years. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • K. Indexing annual levels of, and variation in, white sturgeon recruitment in the free-flowing Columbia River downstream of Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • L. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans pertaining to quantification of contaminant accumulation in waters and sediments upstream of Bonneville Dam and their effects upon overall white		

	sturgeon productivity. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.]		
Harvest			
• Set harvest guidelines to ensure adequate escapement of harvestable-size fish to broodstock	• M. In consultation with the appropriate state agencies and tribes, fund intensive white sturgeon fishery management [Detailed background, objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] including: • N. Identify annual sustainable recreational and commercial harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance; • O. Conduct annual recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels. • P. Conduct annual tribal commercial and subsistence fishery monitoring that enables active in-season management to attain annual pre-determined sustainable harvest levels. • Q. Develop of a regionally accepted White Sturgeon Conservation and Management Plan. This plan will describe current species status, population dynamics and data gaps. It should recommend management activities, research, monitoring, and evaluation necessary to achieve biological objectives and guide actions to effectively address uncertainties	Immediate	

	relevant to species status and current resource management impacts on individual white sturgeon populations throughout the Columbia and Snake rivers. Specific recommendations may include, though not limited to, abundance, population densities, FCRPS influenced environmental conditions, supplementation rates, and fisheries management. This document will also address the Independent Scientific Review Panel's 2002 call for a "State of the Science" document that summarizes existing findings and information. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • R. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by: • S. Conducting assessments of the status of white sturgeon populations (e.g., abundance, size distribution, length-weight relationship, etc.) in Bonneville, The Dalles, or John Day Reservoirs every three (3) years and McNary, Ice Harbor, Lower Monumental and Little Goose reservoirs every five (5) years. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal		

	198605000.] • T. Indexing annual levels of, and variation in, white sturgeon recruitment in the free-flowing Columbia River downstream of Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • U. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans pertaining to Bio-energetic modeling of Bonneville Reservoir white sturgeon removal scenarios and their effects upon overall white sturgeon productivity due to the construction and operation of the FCRPS.		
Competition/Predation			
• Minimize egg and juvenile white sturgeon predation by native and introduced resident fishes • Characterize white sturgeon interactions with introduced species. • Document the usage of available prey species, including introduced species, and the food value of these species in comparison with native species they have replaced.	• V. Operate the Federal Columbia River Power System (FCRPS) to provide white sturgeon spawning habitat in Bonneville, The Dalles and John Day reservoirs by providing a minimum average April through July flow of 250 KCFS at McNary Dam • W. Develop of a regionally accepted White Sturgeon Conservation and Management Plan. This plan will describe	Immediate	

	current species status, population dynamics and data gaps. It should recommend management activities, research, monitoring, and evaluation necessary to achieve biological objectives and guide actions to effectively address uncertainties relevant to species status and current resource management impacts on individual white sturgeon populations throughout the Columbia and Snake rivers. Specific recommendations may include, though not limited to, abundance, population densities, FCRPS influenced environmental conditions, supplementation rates, and fisheries management. This document will also address the Independent Scientific Review Panel's 2002 call for a "State of the Science" document that summarizes existing findings and information. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • X. Implement annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposals 198605000.] • Y. Consistent with		

	existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Concurrent with the development of the previously described White Sturgeon Conservation and Management Plan, begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. [Specific and detailed background, objectives and tasks are described in FY 2007-2009 BPA proposal 200715500; FERC Relicensing Agreements with Grant and Chelan Public Utility Districts (PUDs).] • Z. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by indexing annual levels of, and variation in, white sturgeon recruitment in Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia		

	River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • AA. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS.		
Population Traits			
• Obtain consistent annual spawning and recruitment	• BB. Operate the Federal Columbia River Power System (FCRPS) to provide white sturgeon spawning habitat in Bonneville, The Dalles and John Day reservoirs by providing a minimum average April through July flow of 250 KCFS at McNary Dam. • CC. In consultation with the appropriate state agencies and tribes, fund intensive white sturgeon fishery management [Detailed background, objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] including: • DD. Identify annual sustainable recreational and commercial harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance; • EE. Conduct annual recreational creel surveys that enable active in-	Immediate	

	season management to attain pre-determined sustainable harvest levels. • FF. Conduct annual tribal commercial and subsistence fishery monitoring that enables active in-season management to attain annual pre-determined sustainable harvest levels. • GG. Develop a regionally accepted White Sturgeon Conservation and Management Plan. This plan will describe current species status, population dynamics and data gaps. It should recommend management activities, research, monitoring, and evaluation necessary to achieve biological objectives and guide actions to effectively address uncertainties relevant to species status and current resource management impacts on individual white sturgeon populations throughout the Columbia and Snake rivers. Specific recommendations may include, though not limited to, abundance, population densities, FCRPS influenced environmental conditions, supplementation rates, and fisheries management. This document will also address the Independent Scientific Review Panel's 2002 call for a "State of the Science" document that summarizes existing findings and information. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • II. Implement annual juvenile white sturgeon		

	transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposals 198605000.] • JJ. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Concurrent with the development of the previously described White Sturgeon Conservation and Management Plan, begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. [Specific and detailed background, objectives and tasks are described in FY 2007-2009 BPA proposal 200715500; FERC Relicensing Agreements with Grant and Chelan Public Utility Districts (PUDs).] • KK. Monitor and evaluate a) restoration actions		

	designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by indexing annual levels of, and variation in, white sturgeon recruitment in Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • LL. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS. These studies shall include (but are not limited to): - White sturgeon maturation work (in conjunction with and support of white sturgeon recovery in the Kootenai and upper Columbia rivers). [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] - Assessment of white sturgeon broodstock contribution to recruitment via genetic analysis.		
Water Quality			
• Create habitat conditions that will aid survival and	• MM. Operate the Federal Columbia River Power	Immediate	

development of white sturgeon eggs and larvae	System (FCRPS) to provide white sturgeon spawning habitat in Bonneville, The Dalles and John Day reservoirs by providing a minimum average April through July flow of 250 KCFS at McNary Dam. This flow regime is consistent with aggressive non-breach hydrosystem operations. • NN. Develop a regionally accepted White Sturgeon Conservation and Management Plan. This plan will describe current species status, population dynamics and data gaps. It should recommend management activities, research, monitoring, and evaluation necessary to achieve biological objectives and guide actions to effectively address uncertainties relevant to species status and current resource management impacts on individual white sturgeon populations throughout the Columbia and Snake rivers. Specific recommendations may include, though not limited to, abundance, population densities, FCRPS influenced environmental conditions, supplementation rates, and fisheries management. This document will also address the Independent Scientific Review Panel's 2002 call for a "State of the Science" document that summarizes existing findings and information. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • OO. Conduct annual		

	juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposals 198605000.] • PP. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Concurrent with the development of the previously described White Sturgeon Conservation and Management Plan, begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. [Specific and detailed background, objectives and tasks are described in FY 2007-2009 BPA proposal 200715500; FERC Relicensing Agreements with Grant and Chelan Public Utility Districts (PUDs).] • QQ. Monitor and evaluate		

	a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by indexing annual levels of, and variation in, white sturgeon recruitment in Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • RR. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS		
Water Quantity			
• Obtain consistent annual spawning and recruitment of white sturgeon in Bonneville Reservoir	• SS. Operate the Federal Columbia River Power System (FCRPS) to provide white sturgeon spawning habitat in Bonneville, The Dalles and John Day reservoirs by providing a minimum average April through July flow of 250 KCFS at McNary Dam In consultation with the appropriate state agencies and tribes, fund intensive white sturgeon fishery management [Detailed	Immediate	

	background, objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] including: • TT. Identify annual sustainable recreational and commercial harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance; • UU. Conduct annual recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels. • VV. Conduct annual tribal commercial and subsistence fishery monitoring that enables active in-season management to attain annual pre-determined sustainable harvest levels. • WW. Develop of a regionally accepted White Sturgeon Conservation and Management Plan. This plan will describe current species status, population dynamics and data gaps. It should recommend management activities, research, monitoring, and evaluation necessary to achieve biological objectives and guide actions to effectively address uncertainties relevant to species status and current resource management impacts on individual white sturgeon populations throughout the Columbia and Snake rivers. Specific recommendations may include, though not limited to, abundance, population densities, FCRPS influenced		

	environmental conditions, supplementation rates, and fisheries management. This document will also address the Independent Scientific Review Panel's 2002 call for a "State of the Science" document that summarizes existing findings and information. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • XX. Conduct annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposals 198605000.] • YY. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Concurrent with the development of the previously described White Sturgeon Conservation and Management Plan, begin commensurate Hatchery		

	Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. [Specific and detailed background, objectives and tasks are described in FY 2007-2009 BPA proposal 200715500; FERC Relicensing Agreements with Grant and Chelan Public Utility Districts (PUDs).] • ZZ. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by indexing annual levels of, and variation in, white sturgeon recruitment in Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • AAA. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS. These studies shall include (but are not limited to):		

	• BBB. White sturgeon maturation work (in conjunction with and support of white sturgeon recovery in the Kootenai and upper Columbia rivers). [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • CCC. Assessment of white sturgeon broodstock contribution to recruitment via genetic analysis. • DDD. Determination of minimum spawning flows for successful white sturgeon recruitment throughout the Columbia River Basin in areas where they are not currently defined.		
Habitat Quality/Quantity			
• Achieve habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• EEE. Operate the Federal Columbia River Power System (FCRPS) to provide white sturgeon spawning habitat in Bonneville, The Dalles and John Day reservoirs by providing a minimum average April through July flow of 250 KCFS at McNary Dam In consultation with the appropriate state agencies and tribes, fund intensive white sturgeon fishery management [Detailed background, objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] including: • FFF. Identify annual sustainable recreational and commercial harvest levels through population simulation that accounts for variable natural production, growth rate,	Immediate	

	and abundance; • GGG. Conduct annual recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels. • HHH. Conduct annual tribal commercial and subsistence fishery monitoring that enables active in-season management to attain annual pre-determined sustainable harvest levels. • III. Develop of a regionally accepted White Sturgeon Conservation and Management Plan. This plan will describe current species status, population dynamics and data gaps. It should recommend management activities, research, monitoring, and evaluation necessary to achieve biological objectives and guide actions to effectively address uncertainties relevant to species status and current resource management impacts on individual white sturgeon populations throughout the Columbia and Snake rivers. Specific recommendations may include, though not limited to, abundance, population densities, FCRPS influenced environmental conditions, supplementation rates, and fisheries management. This document will also address the Independent Scientific Review Panel's 2002 call for a "State of the Science" document that summarizes existing findings and information. [Detailed objectives and		

	tasks are described in FY 2007-2009 BPA proposal 198605000.] • JJJ. Conduct annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposals 198605000.] • KKK. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Concurrent with the development of the previously described White Sturgeon Conservation and Management Plan, begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. [Specific and detailed background, objectives and tasks are described in FY 2007-2009 BPA proposal 200715500; FERC Relicensing Agreements		

	with Grant and Chelan Public Utility Districts (PUDs).] • LLL. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by indexing annual levels of, and variation in, white sturgeon recruitment in Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • MMM. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans pertaining to quantification of contaminant accumulation in waters and sediments upstream of Bonneville Dam and their effects upon overall white sturgeon productivity. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.]		

Section 4.3.2 Crab Subbasin

A. Crab Kokanee

Section 4.3.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Recruitment		Number of local populations	Number of adults	Total number of adults
Banks and Bill Clapp lakes	1 million age-3+/annually		NA	NA	NA
	Standing Crop				
	3.5 million (125/acre) of age 1-4		NA	NA	NA
	Annual Harvest				
	500,000		NA	NA	NA
	Catch Rate				
	2.5 fish/hour		NA	NA	NA
	Egg Take				
	5+ million		NA	NA	NA

Status:

Population	Recruitment	Standing Crop	Annual Harvest	Catch Rate	Egg Take
Banks and Billy Clapp lakes	--	--	--	--	--

Section 4.3.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Dams	Operations of dams limit spawning habitat and productivity; increase entrainment
Competition	Other fish species	Lake whitefish compete for secondary productivity
Predation	Fish and birds	Walleye, smallmouth bass, and cormorants

Section 4.3.2A.3 Strategies and Measures for Crab Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Enhance population to compensate for lost natural spawning opportunity and entrainment losses	• A. Stock up to 5 million fingerlings or 3 million 1.5 year.olds • B. Identify productivity peaks spatially and temporally • C. Provide additional hatchery space or net pens to increase size/condition of released fish • D. Install barrier nets at outlet structures to avoid entraining recruited fish • E. Operate hydro-system to allow for a higher pool elevation during the fall (spawning period)	Immediate	0-5 years
Competition			
• Remove whitefish, especially broodstock	• F. Liberalize harvest regulations • G. Educate anglers regarding the opportunity and methods to harvest over-abundant species • H. Implement wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary	Immediate	5-10 years
Predation			
• Control predator populations	• I. Monitor predator population size and composition • J. Liberalize harvest regulations on walleye and smallmouth bass populations as appropriate • K. Educate anglers regarding the opportunity and methods for predator harvest	Immediate	5-10 years

	• L. Stock larger kokanee. Wholesale capture (nets, traps, electrofish, etc) of walleye and smallmouth bass populations during concentrations on spawning grounds if necessary • M. Use non-lethal means to harass cormorants to spread impacts evenly over all waters or direct impacts to waters capable of sustaining the predation • N. Work with federal and state authorities to define management goals for cormorant populations		

B. Crab Largemouth Bass

Section 4.3.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Moses, Potholes, Banks, and Billy Clapp lakes	2,000 (minimum)		NA	NA	NA
	Catch Rates				
	0.5 fish/hour		NA	NA	NA
	Catch-and-release catch rates				
	3 fish/hour		NA	NA	NA

Population	Harvest	Catch rates	Catch-and-release catch rates
Moses, Potholes, Banks, and Billy Clapp lakes	--	--	--

Section 4.3.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Fish and bird species	Largemouth bass, walleye, smallmouth bass, and cormorants
Predation	Fish species	Walleye and smallmouth bass
Habitat quality/quantity	Current land use and fish species	Residential development and carp

Section 4.3.2B.3 Strategies and Measures for Crab Largemouth Bass

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			
• Control predators	• A. Monitor species' condition, relative densities, and harvest rates • B. Use harvest regulations to adjust population densities • C. Educate anglers regarding the opportunity and methods to harvest over-abundant species • D. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary • E. Use non-lethal means to harass cormorants to spread impacts evenly over all waters or direct impacts to waters capable of sustaining the predation • F. Work with federal and state authorities to define management goals for cormorant populations	Immediate	5-10 years
• Maintain balanced mixed species populations	• G. Monitor species' condition, relative densities, and harvest rates • H. Monitor system secondary productivity • I. Use harvest regulations to adjust population densities	Immediate	5-10 years

	• J. Educate anglers regarding the opportunity and methods to harvest over-abundant species • K. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary		
Predation			
• Control size of walleye, and smallmouth bass populations as appropriate	• L. Monitor predator population size and composition. • M. Liberalize harvest regulations as appropriate • N. Educate anglers regarding the opportunity and methods for predator harvest • O. Wholesale capture (nets, traps, electrofish, etc) of predators during concentrations on spawning grounds if necessary	Immediate	5-10 years
Habitat Quality/Quantity			
• Protect critical spawning and rearing habitats	• P. Promote carp harvest through angler education • Q. Wholesale capture (nets, traps, electrofish, etc) of carp during concentrations on spawning grounds if necessary • R. Isolate spawning and rearing habitats from carp intrusion where feasible through use of fish barriers • S. Work with state and local shoreline management authorities to limit development impacts. • T. Install barrier nets at outlet structures to avoid entraining recruited fish	Immediate	5-10 years

C. Crab Smallmouth Bass

Section 4.3.2C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Moses, Potholes, Banks, and Billy Clapp lakes	5,000 (minimum)		NA	NA	NA
	Catch Rates				
	1 fish/hour		NA	NA	NA

Status:

Population	Harvest	Catch rates
Moses, Potholes, Banks, and Billy Clapp lakes	--	--

Section 4.3.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Fish and birds	Smallmouth bass, walleye, and cormorants
Population traits	Smallmouth bass	Overpopulation of smallmouth bass

Section 4.3.2C.3 Strategies and Measures for Crab Smallmouth Bass

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			
• Control other predators	• A. Monitor species' condition, relative densities, and harvest rates • B. Use harvest regulations to adjust population densities • C. Educate anglers regarding the opportunity and methods to harvest over-abundant	Immediate	5-10 years

	species • D. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary • E. Use non-lethal means to harass cormorants to spread impacts evenly over all waters or direct impacts to waters capable of sustaining the predation • F. Work with federal and state authorities to define management goals for cormorant populations		
Population Traits			
• Control size of smallmouth bass populations	• G. Monitor predator population size and composition • H. Liberalize harvest regulations on smallmouth bass populations as appropriate • I. Educate anglers regarding the opportunity and methods for predator harvest • J. Wholesale capture (nets, traps, electrofish, etc) of smallmouth bass populations during concentrations on spawning grounds if necessary	Immediate	5-10 years

D. Crab Bluegill

Section 4.3.2D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Moses and Potholes lakes	90,000 (minimum)		NA	NA	NA
	Catch Rates				

	2 fish/hour		NA	NA	NA

Status:

Population	Annual Harvest	Catch Rates
Moses and Potholes lakes	--	--

Section 4.3.2D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Predation	Fish species	Walleye and smallmouth bass
Competition	Fish species	Competition for secondary productivity between bluegill and other prey species may become acute if measures to increase populations of all species succeed
Habitat quality/quantity	Current land use and fish	Residential development and carp

Section 4.3.2D.3 Strategies and Measures for Crab Bluegill

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Predation			
• Control size of walleye, and smallmouth bass populations as appropriate	• A. Monitor predator population size and composition • B. Liberalize harvest regulations as appropriate. • C. Educate anglers regarding the opportunity and methods for predator harvest • D. Wholesale capture (nets, traps, electrofish, etc) of predators during concentrations on spawning grounds if necessary	Immediate	5-10 years
Competition			
• Maintain balanced mixed species populations	• E. Monitor species' condition, relative densities, and harvest rates • F. Monitor system secondary productivity • G. Use harvest regulations to	Immediate	5-10 years

	adjust population densities • H. Educate anglers regarding the opportunity and methods to harvest over-abundant species • I. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary		
Habitat Quality/Quantity			
• Protect critical spawning and rearing habitats	• J. Promote carp harvest through angler education. • K. Wholesale capture (nets, traps, electrofish, etc) of carp during concentrations on spawning grounds if necessary • L. Isolate spawning and rearing habitats from carp intrusion where feasible through use of fish barriers • N. Work with state and local shoreline management authorities to limit development impacts • O. Install barrier nets at outlet structures to avoid entraining recruited fish • P. Monitor species' condition, relative densities, and harvest rates • Q. Monitor system secondary productivity	Immediate	5-10 years

E. Crab Yellow Perch

Section 4.3.2E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Banks, Billy Clapp, Moses,	4,000,000		NA	NA	NA

and Potholes lakes	(minimum)				
	Catch Rate				
	4 fish/hour		NA	NA	NA

Status:

Population	Annual Harvest	Catch Rates
Banks, Billy Clapp, Moses, and Potholes lakes	--	--

Section 4.3.2E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Predation	Fish species	Walleye and smallmouth bass
Competition	Fish species	Competition for secondary productivity between perch and other prey species may become acute if measures to increase populations of all species succeed
Habitat quality/quantity	Current land use and fish	Residential development and carp

Section 4.3.2E.3 Strategies and Measures for Crab Yellow Perch

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Predation			
• Control size of walleye and smallmouth bass populations as appropriate	• A. Monitor predator population size and composition • B. Liberalize harvest regulations as appropriate • C. Educate anglers regarding the opportunity and methods for predator harvest • D. Wholesale capture (nets, traps, electrofish, etc) of predators during concentrations on spawning grounds if necessary	Immediate	5-10 years

Competition			
• Maintain balanced mixed species populations	• Monitor species' condition, relative densities, and harvest rates • E. Monitor system secondary productivity • F. Use harvest regulations to adjust population densities • G. Educate anglers regarding the opportunity and methods to harvest over-abundant species • H. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary	Immediate	5-10 years
Habitat Quality/Quantity			
• Protect critical spawning and rearing habitats	• I. Promote carp harvest through angler education • J. Wholesale capture (nets, traps, electrofish, etc) of carp during concentrations on spawning grounds if necessary • K. Isolate spawning and rearing habitats from carp intrusion where feasible through use of fish barriers • L. Work with state and local shoreline management authorities to limit development impacts • M. Install barrier nets at outlet structures to avoid entraining recruited fish • N. Monitor species' condition, relative densities, and harvest rates • O. Monitor system secondary productivity	Immediate	5-10 years

F. Crab Walleye

Section 4.3.2F.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Banks, Billy Clapp, Moses, and Potholes lakes	5,000 (Minimum)		NA	NA	NA
	Catch Rate				
	1 fish/hour		NA	NA	NA

Population	Annual Harvest	Catch Rate
Banks, Billy Clapp, Moses, and Potholes lakes	--	--

Section 4.3.2F.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Fish species	Overpopulation of walleye
Competition	Fish and birds	Smallmouth bass and cormorants

Section 4.3.2F.3 Strategies and Measures for Crab Walleye

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Control size of walleye populations as appropriate	• A. Monitor predator population size and composition • B. Liberalize harvest regulations on walleye populations as appropriate • C. Educate anglers regarding the opportunity and methods for predator harvest • D. Wholesale capture (nets, traps, electrofish, etc) of walleye populations during	Immediate	5-10 years

	concentrations on spawning grounds if necessary		
Competition			
• Limit competition	• E. Monitor species' condition, relative densities, and harvest rates • F. Use harvest regulations to adjust population densities • G. Educate anglers regarding the opportunity and methods to harvest over-abundant species • H. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary • I. Use non-lethal means to harass cormorants to spread impacts evenly over all waters or direct impacts to waters capable of sustaining the predation • J. Work with federal and state authorities to define management goals for cormorant populations	Immediate	5-10 years

G. Crab Crappie

Section 4.3.2G.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Banks, Moses, and Potholes lakes	180,000 (Minimum)		NA	NA	NA
	Catch Rate				
	3 fish/hour		NA	NA	NA

Population	Annual Harvest	Catch Rate

Banks, Billy Clapp, Moses, and Potholes lakes	--	--

Section 4.3.2G.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Predation	Other fish	Walleye ans smallmouth bass
Competition		
Habitat quality/quantity		

Section 4.3.2G.3 Strategies and Measures for Crab Crappie

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Predation			
• Control size of walleye, and smallmouth bass populations as appropriate	• A. Monitor predator population size and composition • B. Liberalize harvest regulations as appropriate • Educate anglers regarding the opportunity and methods for predator harvest • Wholesale capture (nets, traps, electrofish, etc) of predators during concentrations on spawning grounds if necessary	Immediate	5-10 years
Competition			
• Maintain balanced mixed species populations	• E. Monitor species' condition, relative densities, and harvest rates • F. Use harvest regulations to adjust population densities • G. Educate anglers regarding the opportunity and methods to harvest over-abundant species • H. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary • I. Monitor system secondary	Immediate	5-10 years

	productivity		
Habitat quality/quantity			
• Protect critical spawning and rearing habitats • Control carp populations	• Promote carp harvest through angler education. • Wholesale capture (nets, traps, electrofish, etc) of carp during concentrations on spawning grounds if necessary. • Isolate spawning and rearing habitats from carp intrusion where feasible through use of fish barriers. • Work with state and local shoreline management authorities to limit development impacts. • Install barrier nets at outlet structures to avoid entraining recruited fish.		

H. Crab Rainbow Trout

Section 4.3.2H.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Banks, Billy Clapp, Moses, and Potholes lakes	300,000 (Minimum)		NA	NA	NA
	Catch Rate				
	2.5 fish/hour		NA	NA	NA
	Annual recruitment (age-1+) (all waters)				
	450,000 (standing crop of 750,00 (75/acre)				

Status

Population	Annual Harvest	Catch Rate

Banks, Billy Clapp, Moses, and Potholes lakes	--	--

Section 4.3.2H.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Hydro-operations	Hydro-operations limit productivity and increase entrainment
Predation	Fish and birds	Walleye, smallmouth bass and cormorants
Competition	Fish	Competition for secondary productivity with other prey species

Section 4.3.2H.3 Strategies and Measures for Crab Crappie

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Stock rainbow to compensate for lack of natural spawning opportunity and entrainment losses. • Adjust stocking size and timing to take advantage of available productivity and minimize entrainment.	• A. Stock up to 100,000 fingerlings where feasible and 4-500,000 1+ yr.olds. • B. Provide additional hatchery space or net pens to increase size/condition of released fish. • C. Install barrier nets at outlet structures to avoid entraining recruited fish. • D. Identify productivity peaks spatially and temporally	Immediate	5-10 years
Predation			
• Increase the size of stocked rainbow. • Control size of walleye and smallmouth bass populations as appropriate. • Limit concentrated feeding by cormorants	• E. Monitor predator population size and composition. • F. Liberalize harvest regulations on walleye and smallmouth bass populations as appropriate. • G. Educate anglers regarding the opportunity and methods for predator harvest.	Immediate	5-10 years

	• H. Stock larger rainbow. • I. Wholesale capture (nets, traps, electrofish, etc) of walleye and smallmouth bass populations during concentrations on spawning grounds if necessary. • J. Use non-lethal means to harass cormorants to spread impacts evenly over all waters or direct impacts to waters capable of sustaining the predation. • K. Work with federal and state authorities to define management goals for cormorant populations.		
Competition			
• Maintain balanced mixed species populations	• L. Monitor species' condition, relative densities, and harvest rates. • M. Monitor system secondary productivity. • N. Use harvest regulations to adjust population densities. • O. Educate anglers regarding the opportunity and methods to harvest over-abundant species. • P. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary.		

Section 4.3.3 Deschutes Subbasin

A. Deschutes Bull Trout

Section 4.3.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Lower Deschutes	--			--	
	Local Populations				
	5 or more		5 or more		
	Total number of adults				
	1,500-3,000				1,500-3,000

Status:

Population	Number of adults/population	Number of local populations	Total Number of Adults
Lower Deschutes		2 (does not include Shitike Creek, Warm Springs River, and Whitewater River)	1,382 (estimate)

Section 4.3.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Residential and commercial development; unscreened water diversions
Population traits	Current land use	Agriculture and forestry practices have led to low population abundance
Competition	Non-native species	Brook trout and brown trout
Water quality	Current land use	Basin ground water extraction - Agriculture, industry, forestry, and residential
Water quantity	Current land use	Basin ground water extraction -

		Agriculture, industry, forestry, and residential

Section 4.3.3A.3 Strategies and Measures for Deschutes Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• See Water Quality/Quantity	• A. See Water Quality/Quantity.	Immediate	1-5 years
• Screen water diversions	• B. Work with Landowners, OWRD, Watershed Council and OWRD to screen diversions		
Population Traits			
• Maintain current management strategies	• C. Monitor population genetic parameters • D. Develop/implement additional population abundance index measures • E. Conduct five year update/review on genetic characteristics of population	Immediate	1-5 years
Competition			
• Remove or decrease number of non-native predators	• F. Actively remove through snorkeling or electro-fishing	Immediate	1-5 years
Water Quality			
• Enforce groundwater protection measures. (Oregon State Water Resources)	• G. Monitor stream/spring flows, Legislative or OWRD groundwater rules in place that adequately preserve the spring flows in the Metolius Basin	Immediate	1-5 years
Water Quantity			
• Enforce groundwater protection measures. (Oregon State Water Resources)	• H. Monitor stream/spring flows, Legislative or OWRD groundwater rules in place that adequately preserve spring/surface flows in the Metolius Basin	Immediate	1-5 years

B. Deschutes Redband Trout

Section 4.3.3B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Density (fish > 8 inches/mile)		Number of local populations	Number of adults	Total number of adults
Pelton Dam to Sherars Falls	1,500 – 2,500		NA	NA	NA
Below Sherars Falls	750-1,000		NA	NA	NA

Status:

Population	Density	Density
Pelton Dam to Sherars Falls	Unknown	
Below Sherars Falls		Unknown

Section 4.3.3B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Non-native species	
Population traits	Introgression	Hatchery releases
Habitat quality/quantity	Current and historic land use, hydro-operations	Agriculture, forestry, residential, industrial and hydro-operations
Water quality	Current and historic land use, hydro-operations	Agriculture, forestry, residential, industrial and hydro-operations have increased temperatures, pollutants, and sedimentation
Water quantity	Current and historic land use, hydro-operations	Agriculture, forestry, residential, industrial, and hydro-operations have altered flows and natural hydrograph
Habitat access	Current and historic land use, hydro-development	Hydroelectric, agricultural, roads, and other anthropogenic sources that limit access to historic fish habitats

Section 4.3.3B.3 Strategies and Measures for Deschutes Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			
• Prevent further introduction and spread of introduced species	• A. Ensure compliance with state and federal policies on introduced species	Immediate	1-5 years
Population Traits			
• Reduce the incidence of stray hatchery steelhead escaping into the Deschutes and reduce residualism of hatchery steelhead released into the Deschutes	• B. Adhere to state and federal hatchery protocols described in the Round Butte Hatchery HGMP • C. Investigate magnitude, cause, effects of out of basin stray hatchery steelhead	Immediate	1-5 years
Habitat Quality/Quantity			
• Protect and restore aquatic and riparian habitats	• D. Encourage land owners and managers to utilize best management practices that both protect and restore aquatic habitat • E. Implement conservation strategies developed in Mid-C steelhead recovery plan and other planning documents	Immediate	1-5 years
Water Quality			
• Reduce stream temperatures, and the influence of pollutants	• F. Encourage land owners and managers to utilize best management practices that do not increase temperatures, and cause point source pollution issues	Immediate	1-5 years
Water Quantity			
• Replicate natural hydrograph	• G. Implement water conservation and efficiency programs that reduce stream water withdrawals, and upland conservation measures designed to replicate the natural hydrograph	Immediate	1-5 years

	• H. Implement water conservation strategies developed in Mid-Columbia Steelhead Recovery Plan and other planning documents		
Habitat Access			
• Return fish to their historic habitats	• I. Implement measures identified in the Mid-Columbia Steelhead Recovery Plan, and other planning documents designed to return fish to previous utilized habitats	Immediate	1-5 years

Section 4.3.4 John Day Subbasin

A. John Day Bull Trout

Section 4.3.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of Adults/population		Number of local populations	Number of adults/population	Total number of adults
John Day	--			--	
	Number of Local Populations				
	12 or more		12 or more		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of adults/population	Number of local populations	Total number of adults
John Day			Unknown

Section 4.3.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry practices
Habitat access	Current land use	Culverts, irrigation push-up dams and diversions
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture
Nutrients	Anadromous fish returns	Loss of adult steelhead and Chinook salmon
Population traits	Hybridization	Brook trout

Section 4.3.4A.3 Strategies and Measures for John Day Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore habitat	• A. Increase amounts of large wood • B. Effectively manage grazing by livestock within riparian areas • C. Reduce width to depth ratios • D. Restore floodplain function and connectivity • E. Increase the amount of canopy cover and shade • F. Increase habitat diversity • G. Reintroduce beaver where they are absent and habitat conditions will support them	Immediate	1-5 years
• Protect existing high quality habitat	• H. Acquire through either fee title or through conservation easements critical high quality habitats • I. Sign cooperative management agreements with private landowners who voluntarily want to protect high quality habitats • J. Implement special management designations on public lands	Immediate	1-5 years

Habitat Access			
• Restore passage at non-natural barriers	• K. Replace culverts that do not meet fish passage criteria • L. Replace irrigation push up dams with permanent structures that meet fish passage criteria • M. Restore streamflow in streams that flow intermittently because of water withdrawals	Immediate	1-5 years
Water Quality			
• Reduce water temperatures during summer months	• N. Increase shading of streams • O. Lease water rights from willing sellers • P. Implement more efficient irrigation systems • Q. Reduce the amount of irrigation water that returns overland to the river	Immediate	1-5 years
Water Quantity			
• Restore stream flows during low flow periods	• R. Lease water rights from willing sellers • S. Convert flood irrigation systems to more efficient methods • T. Require measurement of water use • U. Investigate feasibility and effectiveness of floodplain aquifer recharge projects • V. Improve hydrologic connectivity of springs to streams where poorly designed roads, small impoundments and other disturbances have redirected spring flows away from drainages • W. Determine feasibility of off-stream storage, including ecological effects	Immediate	1-5 years

Nutrients			
• Increase abundance of juvenile and adult steelhead and Chinook	• X. Implement habitat restoration program Y. Improve water quality, restore streamflows, and same as habitat restoration above	Immediate	1-5 years
Population Traits			
• Remove brook trout	• Z. Prohibit stocking of brook trout in drainages where bull trout are present • AA. Investigate effective methods of brook trout removal • BB. Stock bull trout from select donor populations into areas with suitable habitat above naturally occurring barriers	Immediate	1-5 years

B. John Day Redband Trout

Section 4.3.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
John Day	None		NA	NA	NA

Status:

Population	Adult Abundance
John Day	Unknown

Section 4.3.4B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry practices
Habitat access	Current land use	Culverts, irrigation push-up dams, and diversions
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture

Section 4.3.4B.3 Strategies and Measures for John Day Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat			
Habitat Quality/Quantity			
• Restore habitat	• A. Increase amounts of large wood • B. Effectively manage grazing by livestock within riparian areas • C. Reduce width to depth ratios • D. Restore floodplain function and connectivity • E. Increase the amount of canopy cover and shade • F. Increase habitat diversity • G. Reintroduce beaver where they are absent and habitat conditions will support them	Immediate	1-5 years
• Protect existing high quality habitat	• H. Acquire through either fee title or through conservation easements critical high quality habitats • I. Sign cooperative management agreements with private landowners who voluntarily want to protect high quality habitats • J. Implement special management designations on public lands	Immediate	1-5 years
Habitat Access			
• Restore passage at non-natural barriers	• K. Replace culverts that do not meet fish passage criteria • L. Replace irrigation push up dams with permanent structures that meet fish passage criteria • M. Restore streamflow in	Immediate	1-5 years

	streams that flow intermittently because of water withdrawals		
Water Quality			
• Reduce water temperatures during summer months	• N. Increase shading of streams • O. Lease water rights from willing sellers • P. Implement more efficient irrigation systems • Q. Reduce the amount of irrigation water that returns overland to the river	Immediate	1-5 years
Water Quantity			
• Restore stream flows during low flow periods	• R. Lease water rights from willing sellers • S. Convert flood irrigation systems to more efficient methods • T. Require measurement of water use • U. Investigate feasibility and effectiveness of floodplain aquifer recharge projects • V. Improve hydrologic connectivity of springs to streams where poorly designed roads, small impoundments and other disturbances have redirected spring flows away from drainages • W. Determine feasibility of off-stream storage, including ecological effects	Immediate	1-5 years

C. John Day Westslope Cutthroat Trout

Section 4.3.4C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
John Day	None		NA	NA	NA

Status:

Population	Adult Abundance
John Day	Unknown

Section 4.3.4C.2 Primary Limiting Factors and Threats:

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry practices
Habitat access	Current land use	Culverts, irrigation push-up dams, and diversions
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture
Competition	Non-native species	Brook trout and rainbow trout competition
Population traits	Hybridization	Hybridization with native redband trout, steelhead, or historically stocked rainbow trout

Section 4.3.4C.3 Strategies and Measures for John Day Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore habitat	• A. Increase amounts of large wood • B. Effectively manage grazing by livestock within riparian areas	Immediate	1-5 years

	• C. Reduce width to depth ratios • D. Restore floodplain function and connectivity • E. Increase the amount of canopy cover and shade • F. Increase habitat diversity • G. Reintroduce beaver where they are absent and habitat conditions will support them		
• Protect existing high quality habitat	• H. Acquire through either fee title or through conservation easements critical high quality habitats • I. Sign cooperative management agreements with private landowners who voluntarily want to protect high quality habitats • J. Implement special management designations on public lands	Immediate	1-5 years
Habitat Access			
• Restore passage at non-natural barriers	• K. Replace culverts that do not meet fish passage criteria • L. Replace irrigation push up dams with permanent structures that meet fish passage criteria • M. Restore streamflow in streams that flow intermittently because of water withdrawals	Immediate	1-5 years
Water Quality			
• Reduce water temperatures during summer months	• N. Increase shading of streams • O. Lease water rights from willing sellers • P. Implement more efficient irrigation systems • Q. Reduce the amount of irrigation water that returns overland to the river	Immediate	1-5 years
Water Quantity			
• Restore stream flows during low flow periods	• R. Lease water rights from willing sellers • S. Convert flood irrigation systems to more efficient	Immediate	1-5 years

	methods • T. Require measurement of water use • U. Investigate feasibility and effectiveness of floodplain aquifer recharge projects • V. Improve hydrologic connectivity of springs to streams where poorly designed roads, small impoundments and other disturbances have redirected spring flows away from drainages • W. Determine feasibility of off-stream storage, including ecological effects		
Competition			
• Remove brook trout	• X. Prohibit stocking of brook and rainbow trout in drainages where cutthroat trout are present • Y. Investigate effective methods of brook trout removal where their distribution overlaps with cutthroat trout	Immediate	1-5 years
Population Trait			
• Determine origin of hybridization	• Z. Investigate options to minimize hybridization	Immediate	1-5 years

D. Snake Lower White Sturgeon

Section 4.3.4D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Increasing Productivity		Number of local populations	Number of adults	Total number of adults
Ice Harbor, Lower Monumental, and Little Goose reservoirs	Harvest Rate		NA	NA	NA
	Annual Recruitment (Productivity)				
	Increasing		NA	NA	NA

	Broodstock Abundance				
	Increasing		NA	NA	NA

Status:

Population	Productivity	Annual Recruitment	Broodstock Abundance
Ice Harbor Reservoir	N/A	Close to zero (measurable level only 1 out of 8 years from 1997-2005)	20
Lower Monumental Reservoir	N/A	N/A (has not been measured)	100
Little Goose Reservoir	N/A	Close to zero (measurable level only 2 out of 8 years from 1997-2005)	600

Section 4.3.4D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Dams	Creation of the mainstem dams has inundated historic spawning habitat
Population traits	Dams	Extensive development of hydropower dams throughout the Columbia River Basin have blocked sturgeon movement, which in turn, have isolated populations and disrupted genetic flow and recruitment of individuals from healthier downstream environments.
Harvest	Sport fishing	Vulnerable to unintended negative impacts resulting from inadequate harvest management.

Section 4.3.4D.3 Strategies and Measures for Columbia Snake Lower White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Provide suitable spawning and rearing habitat	• A. Operate the Federal Columbia River Power System (FCRPS) to provide suitable white sturgeon spawning and rearing habitat in Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells reservoirs by providing a minimum average April through July flow that translates to 250 KCFS at McNary Dam	Immediate	Immediate to 5 years
Population Traits			
• Develop a regionally-accepted white sturgeon management plan framework	• B. Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. This plan will describe current species status, population dynamics and data gaps. It should recommend management activities, research, monitoring, and evaluation necessary to achieve biological objectives and guide actions to effectively address uncertainties relevant to species status and current resource management impacts on individual white sturgeon populations throughout the Columbia and Snake rivers. Specific recommendations may include, though not limited to, abundance, population densities, FCRPS influenced environmental conditions, supplementation rates, and fisheries	Immediate	10+ years

	management. This document will also address the Independent Scientific Review Panel's 2002 call for a "State of the Science" document that summarizes existing findings and information. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000]		
• Evaluate the need for and monitor the success of restoration efforts	• C. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by: • D. Conducting assessments of the status of white sturgeon populations (e.g., abundance, size distribution, length-weight relationship, etc.) in McNary, Ice Harbor, Lower Monumental and Little Goose reservoirs every five (5) years. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.] • E. Indexing annual levels of, and variation in, white sturgeon recruitment in McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, and Little Goose reservoirs in the Snake River. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.]	Immediate Immediate Immediate	10+ years Immediate to 5 years Immediate to 5 years

• Identify and quantify the level of hatchery augmentation that will restore and enhance sturgeon populations and implement the Master Planning process to initiate the construction, operation and maintenance of regional facility(ies)	• F. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, identify and quantify regional hatchery augmentation needs and immediately implement Master Plan processes necessary to construct, operate and maintain hatchery production facilities to augment natural production of depressed white sturgeon populations in the impounded portions of the Columbia and Snake rivers. [Specific and detailed background, objectives and tasks are described in FY 2007-2009 BPA proposal 200715500]	Immediate	Immediate to 5 years
• Address critical uncertainties	• G. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS. These studies shall include (but are not limited to):	Immediate	
	• H. Determination of minimum spawning flows for successful white sturgeon recruitment throughout the Columbia River Basin in areas where they are not currently defined.	Immediate	6-10 years
	• I. Assessment of white sturgeon broodstock contribution to recruitment via genetic analysis.	6-10 years	6-10 years
	• J. Quantification of	6-10 years	10+ years

	contaminant accumulation in waters and sediments upstream of McNary Dam and their effects upon white sturgeon productivity. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000.]		
Harvest			
• Identify and maintain sustainable harvest levels to ensure adequate escapement of fish to broodstock	• K. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies, and tribes, fund white sturgeon fishery management including:	Immediate	
	• L. Identify sustainable recreational and Tribal harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance;	Immediate	Immediate to 5 years
	• M. Conduct recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels	Immediate	Immediate to 5 years
	• N. Conduct Tribal commercial and subsistence fishery monitoring that enables active in-season management to attain pre-determined sustainable harvest levels	Immediate	Immediate to 5 years

Section 4.3.5 Tucannon Subbasin

A. Tucannon Bull Trout

Section 4.3.5A.1 Biological Objectives and Status

	Subbasin/Management Plans		2004 Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Tucannon	--			--	
	Number of Local Populations				
			unknown	unknown	
	Total Number of Adults				
	1,000				1,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Tucannon	unknown	unknown	230 redds (2004 surveys)

Section 4.3.5A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Nutrients	Current land use and hydro-operations	Lack of spring Chinook carcasses
Population Traits/monitoring	Current Land Use	Population abundance, genetic structure, and general distribution are not well understood Agriculture, Forestry, Roads
Harvest	Sport fishing	Poaching
Habitat quality/quantity	Current land use	Agriculture, forestry practices
Habitat access	Current land use	Culverts, irrigation push-up dams, and diversions
Water quality	Current land use	Agriculture

Section 4.3.5A.3 Strategies and Measures for Tucannon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore habitat	• A. Improve stream flows in reaches partially dewatered for irrigation • B. Increase sinuosity • C. Restore large wood in the system • D. Protect, or restore riparian zones • E. Increase protective status of priority habitats in landuse regulations • F. Modify channel and increase flood-plain function, • G. Increase habitat diversity	Immediate	1-25 yrs
Habitat Access			
• Restore passage at non-natural barriers	• H. Restore stream flows in reaches dewatered for irrigation use • I. Replace culverts or bridges not meeting fish passage guidelines, • J. Screen irrigation diversions, maintain passage efficiency through ongoing O&M or additional activities, implement irrigation efficiency projects, and replace irrigation diversion structures with improved structures meeting fish passage standards • K. Continue to monitor and remove dams and barriers made by recreationists	Immediate	1-10 yrs
Water Quality			
• Reduce water temperatures during summer months	• L. Restore priority restoration and protection reach attributes to improve downstream conditions, • M. Modify channel and increase flood-plain function	Immediate	10-25 yrs

	• N. Modify detrimental land use activities.		
Water Quantity			
• Restore stream flows during low flow periods	• O. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners	Immediate	1-15 yrs
Nutrients			
• Increase nutrients	• P. Increase spring Chinook returns • Q. Outplant hatchery spring chinook carcasses or fish cubes	Immediate	1-25 yrs
Harvest			
• Curtail poaching	• R. Continue and enhance WDFW, USFS and USFWS enforcement to prevent illegal harvest/harassment of bull trout	Immediate	1-5 yrs
• Monitoring Population Identification genetic structure, abundance, movements and general distribution are not well understood. Population status and trend information is needed to appropriately set criteria for recovery and to determine recovery status	• S. Conduct DNA analysis to identify populations and set recovery goals • T. Continue, and expand, spawning surveys to determine relative spawning abundance and distribution • U. Expand Electrofishing or snorkeling to determine • V. Determine habitat conditions and trends • W. Complete the draft recovery plan	Immediate	1-10 yrs

Section 4.3.6 Umatilla Subbasin

A. Umatilla Bull Trout (North Fork Umatilla, South Fork Umatilla, and North Fork Meacham Creek)

Section 4.3.6A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Umatilla	--			--	
	Number of Local Populations				
	3		3		
	Total Number of Adults				
	500 – 5,000				500 – 5,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Umatilla			25 redds (2006)

Section 4.3.6A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry practices
Habitat access	Current land use	Culverts, irrigation push-up dams, and diversions
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture

Section 4.3.6A.3 Strategies and Measures for Umatilla Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore habitat	• A. Restore stream flows in reaches dewatered for irrigation • B. Restore large wood in the system • C. Fence and plant riparian zones • D. Increase protective status of priority habitats • E. Modify channel and flood-plain function, and increase habitat diversity	Immediate	1-5 years
Habitat Access			
• Restore passage at non-natural barriers	• F. Maintain Phase I and II and implement Phase III of the Umatilla Basin Project, restore stream flows in reaches dewatered for irrigation use, replace culverts not meeting fish passage guidelines, screen irrigation diversions, maintain passage efficiency through ongoing O&M activities, implement irrigation efficiency projects, and replace temporary irrigation diversion dams with structures that meet fish passage standards	Immediate	1-5 years
Water Quality			
• Reduce water temperatures during summer months	• G. Restore headwater attributes to improve downstream conditions, modify channel and flood-plain function, and modify detrimental land use activities.	Immediate	1-5 years

Water Quantity			
• Restore stream flows during low flow periods	• H. Maintain Phase I and II and implement Phase III of the Umatilla Basin Project, increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners	Immediate	1-5 years

B. Freshwater Mussels (western pearlshell, western ridged mussel, and *Anodonta spp.*)

Section 4.3.6B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Distribution		Number of local populations	Number of adults	Total number of adults
Umatilla	Re-establish self-sustaining populations of all three species in at least 50% of historical habitat		NA	NA	NA
	Abundance (all life stages)				
	Achieve reproduction and recruitment in all three species				

Status:

Population	Distribution	Abundance
Umatilla	The western ridged mussel is known to occur at only 2 downstream sites and no tributaries; *Anodonta spp*. are known from 3 downstream sites and several tributaries; the western pearlshell has not been recently found in the Umatilla River drainage (2006), but based on shell material it probably historically occurred in the river.	Unknown

Section 4.3.6B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Agricultural and forestry practices
Water quality	Land use	Agricultural and forestry practices
Population traits	Lack of host fish	Specific host fish and population levels unknown
	Taxonomic resolution	Genera unknown

Section 4.3.6B.3 Strategies and Measures for Umatilla Mussels

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Determine and restore preferred habitat	• Conduct field studies and re-location efforts to identify preferred physical habitat of all three genera, determine optimal stream flows, especially in reaches dewatered for irrigation, determine habitat preferences through re-location experiments; increase habitat diversity	Immediate	0-5 years
Water quality			
• Determine if existing water quality in Umatilla will maintain viable and self-sustaining mussel populations	• Conduct physiological and condition experiments to determine lethal limits for mussels in regards to summer temperatures, dislodging flows, food availability and composition, and overall water quality requirements	Immediate	0-5 years
Population traits			
• Determine host fish and minimum host fish population levels needed to maintain self-sustaining mussel populations	• Determine host fish through laboratory experiments, culture juvenile mussels in hatchery setting for possible re-introduction trials, determine optimal habitats for both fish hosts and mussel species.	Immediate	0-5 years
• Determine which genera and species occur in	• Determine genetically which genera of *Anodonta* occur in the Umatilla River (a recent	Immediate	0-5 years

Umatilla drainage, and which stocks of the western pearlshell may be best suited for reintroduction efforts.	new genus has been discovered) • Determine where stocks of western pearlshell can be obtained that are best suited for reintroduction efforts • Match existing genetic makeup of Umatilla populations of western ridge mussel and *Anodonta* spp. with extant populations in nearby drainages to find most suitable candidates for re-introduction efforts		

C. Umatilla Redband Trout

Section 4.3.6C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Umatilla	None		NA	NA	NA

Status:

Population	Adult Abundance
Umatilla	Unknown

Section 4.3.6C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Culverts, irrigation push-up dams, and diversions
Habitat access	Current land use	Agriculture and forestry practices
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture

Section 4.3.6C.3 Strategies and Measures for Umatilla Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore degraded habitat	• A. Restore stream flows in reaches dewatered for irrigation • B. Restore large wood in the system, fence and plant riparian zones • C. Increase protective status of priority habitats • D. Restore floodplain function and channel complexity, and increase habitat diversity	Immediate	1-5 years
Habitat Access			
• Restore passage at non-natural barriers	• E. Maintain Phase I and II and implement Phase III of the Umatilla Basin Project • F. Restore stream flows in reaches dewatered for irrigation use • G. Replace culverts not meeting fish passage guidelines • H. Screen irrigation diversions • I. Maintain passage efficiency through ongoing O&M activities • J. Implement irrigation efficiency projects • K. Replace temporary irrigation diversion dams with structures that meet fish passage standards	Immediate	1-5 years
Water Quality			
• Reduce water temperatures during summer months	• L. Restore headwater attributes to improve downstream conditions • M. Modify channel and flood-plain function • N. Modify detrimental land use activities	Immediate	1-5 years

Water Quantity			
• Restore stream flows during low flow periods	• O. Maintain Phase I and II and implement Phase III of the Umatilla Basin Project • P. Increase water conservation and irrigation efficiency • Q. Purchase or lease water rights from willing landowners	Immediate	1-5 years

Section 4.3.7 Walla Walla Subbasin

A. Walla Walla Bull Trout (Oregon – Walla Complex, Mill Creek, and Touchet Complex)

Section 4.3.7A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Walla Walla					
	Number of Local Populations				
	3 or more		3 or more		
	Total Number of Adults				
	3,000 – 5,000				3,000-5,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Walla Walla			209 redds (2006, Walla Walla Complex only)

Section 4.3.7A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use	Culverts, irrigation push-up dams, and diversions
Habitat quality/quantity	Current land use	Agriculture and forestry practices
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture

Section 4.3.7A.3 Strategies and Measures for Walla Walla Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Restore passage at non-natural barriers	• A. Restore stream flows in reaches dewatered for irrigation use • B. Replace culverts not meeting fish passage guidelines • C. Screen irrigation diversions • D. Monitor fish passage improvement projects • E. Implement irrigation efficiency projects • F. Replace temporary irrigation diversion dams with structures meeting fish passage standards	Immediate	1-5 years
Habitat Quality/Quantity			
• Restore degraded habitat	• G. Restore stream flows in reaches dewatered for irrigation • H. Restore large wood in the system • I. Reduce grazing impacts • J. Restore floodplain function and channel complexity, and increase habitat diversity	Immediate	1-5 years
Water Quality			
• Reduce water temperatures during summer months	• K. Increase stream flows • L. Lease water rights from willing sellers	Immediate	1-5 years

	• M. Implement more efficient irrigation systems, and improve watershed function		
Water Quantity			
• Restore stream flows during low flow periods	• N. Implement irrigation efficiency project • O. Initiate point of diversion transfers • P. Evaluate shallow aquifer recharge projects • Q. Lease or purchase water rights	Immediate	1-5 years

Section 4.3.8 Walla Walla Subbasin

A. Walla Walla Bull Trout (Washington)

Section 4.3.8A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Walla Walla					
	Number of Local Populations				
	Total Number of Adults				
Mill Creek					
Touchet					

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Walla Walla	Unknown	Unknown	209 redds (2006) Where? This looks too low to include SF Walla Walla, Mill Creek and Touchet River, and all tribs?

Section 4.3.8A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use	Culverts, irrigation push-up dams, diversions and water quality or quantity
Habitat quality/quantity	Current land use	Agriculture, forestry practices, development
Water quality	Current land use	Agriculture, rural and urban development, roads
Population Traits/monitoring	Current land use	Population adundance, genetic structure, and general distribution are not well understood Agriculture, Forestry, Roads
Nutrients	Current land use and Hydro actions	Lack of adequate salmon carcasses
Predation	Current land use and exotic species	Exotic species
Harvest	Sport Fishing	Poaching

Section 4.3.8A.3 Strategies and Measures for Walla Walla Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Restore passage at non-natural barriers	• A. Restore stream flows in reaches dewatered for irrigation use • B. Replace irrigation diversion structures with improved structures meeting fish passage standards	Immediate	1-10 yrs

	• C. Replace culverts not meeting fish passage guidelines • D. Screen irrigation diversions, maintain passage efficiency through on-going O&M or additional activities, • E. Monitor effectiveness of fish passage improvement projects • F. Implement irrigation efficiency projects • G. Replace temporary irrigation diversion dams with structures meeting fish passage standards • H. Continue to monitor and remove dams and barriers made by recreationists		
Habitat Quality/Quantity			
• Restore degraded habitat	• I. Improve stream flows in reaches partially or completely dewatered for irrigation • J. Increase sinuosity • K. Restore large wood in the system • L. Protect, or restore riparian zones • M. Restore floodplain function and channel complexity, and increase habitat diversity • N. Increase protective status of priority habitats in landuse regulations	Immediate	1-25
Water Quality			
• Reduce water temperatures during summer months	• O. Increase stream flows • P. Restore priority restoration and protection reach attributes to improve downstream conditions • Q. Modify channel and increase floodplain functions • R. Reduce detrimental land	Immediate	1-25 yrs

	use activities • S. Lease water rights from willing sellers • T. Implement more efficient irrigation systems, and improve watershed function		
Water Quantity			
• Restore stream flows during low flow periods	• U. Implement irrigation efficiency projects • V. Initiate point of diversion transfers • W. Evaluate shallow aquifer recharge projects • X. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners	Immediate	1-15 yrs
Nutrients			
• Increase nutrients	• Y. Increase spring chinook returns • Z. Outplant hatchery spring chinook carcasses or fish cubes	Immediate	1-25 yrs
Harvest			
• Curtail Poaching and fishery impacts	• AA. Continue and enhance WFDW, CTUIR, and USFWS enforcement	Immediate	1-5 yrs
Predators			
• Decrease predators and exotic species	• BB. Increase stream flows • CC. Restore priority restoration and protection reach attributes to improve downstream conditions • DD. Modify channel and increase floodplain functions • EE. Reduce detrimental land use activities • FF. Lease water rights from willing sellers • GG. Implement more efficient irrigation systems, and improve watershed function	Immediate	1-25 yrs

	• HH. Decrease water temperatures • II. Evaluate shallow aquifer recharge projects • JJ. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners • KK. Liberalize fishing regulations on exotic species		
Monitoring			
• Monitoring • Populations identification, genetic structure, abundance, movements and general distribution are not well understood Population status and trend information is needed to appropriately set criteria for recovery and to determine recovery status	• LL. Conduct DNA analysis to identify populations and set recovery goals • MM. Continue, and expand, spawning surveys to determine relative spawning abundance and distribution • NN. Expand Electrofishing or snorkeling to determine distribution • OO. Determine habitat conditions and trends • PP. Complete the draft recovery plan	Immediate	1-10 yrs

B. Walla Walla Whitefish

Section 4.3.8B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Walla Walla	None		NA	NA	NA

Status:

Population	Adult Abundance
Walla Walla	Apparently very uncommon and limited distribution

Section 4.3.8B.2 Primary Limiting Factors and Threats

Unknown, but presumed to be the same as for salmon and steelhead.

C. Walla Walla Redband Trout (Oregon)

Section 4.3.8C.1 Biological Objectives and Status

Biological Objectives:

	Subbasin Plan		Draft Recovery Plan		
Population			Number of local populations	Number of adults	Total number of adults
Walla Walla	None		NA	NA	NA

Status:

Population	Abundance
Walla Walla	Unknown

Section 4.3.8C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use	Passage barriers
Habitat quality/quantity	Current land use	Culverts, irrigation push-up dams, and diversions
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture

Section 4.3.8C.3 Strategies and Measures for Walla Walla Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Restore passage at non-natural barriers	• A. Restore stream flows in reaches dewatered for irrigation use • B. Replace culverts not meeting fish passage guidelines	Immediately	1-5years

	• C. Screen irrigation diversions • D. Monitor fish passage improvement projects • E. Implement irrigation efficiency projects • F. Replace temporary irrigation diversion dams with structures meeting fish passage standards		
Habitat Quality/Quantity			
• Restore habitat	• G. Restore stream flows in reaches dewatered for irrigation • H. Restore large wood in the system • I. Reduce grazing impacts • J. Restore floodplain function and channel complexity • K. Increase habitat diversity	Immediately	1-5years
Water Quality			
• Reduce water temperatures during summer months	• L. Increase stream flows • M. Lease water rights from willing sellers • N. Implement more efficient irrigation systems • O. Improve watershed function	Immediately	1-5years
Water Quantity			
• Restore stream flows during low flow periods	• P. Implement irrigation efficiency projects • Q. Transfer point(s) of diversion • R. Evaluate shallow aquifer recharge projects • S. Lease or purchase water rights	Immediately	1-5years

Section 4.3.9 Yakima Subbasin

A. Yakima Bull Trout

Section 4.3.9A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Number of		Number of	Number of	Total

(core)	adults/population		local populations	adults/population	number of adults
Yakima	100 spawners (min.)			100 spawners (min.)	
	Number of Local Populations				
	16		16		
	Total Number of Adults				
	3,350				3,350

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Yakima	3 populations with average spawners >100 (2 populations average = 50-100 spawners)	14	1,082 spawners (1998-2007 arithmetic mean)

Section 4.3.9A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Livestock grazing, private forestland residential development, and federal/state forestland management (primarily road management);
Water quality	Current land use	U.S. Bureau of Reclamation irrigation storage development
Habitat access	Current land use	Storage dams, irrigation diversion dams and dispersed recreational dams in tributaries have disrupted migrations and fragmented bull trout populations
Harvest	Illegal fishing; mis-identification with other trout species	Poaching has been identified as a serious concern in Gold Creek (Keechelus Lake tributary), Box Canyon Creek (Kachess Lake tributary), Deep Creek (Bumping Lake tributary), South

		Fork Tieton River and Indian Creek (Rimrock Lake tributaries); also misidentification of bull trout by recreational anglers who confuse with eastern brook trout

Section 4.3.9A.3 Strategies and Measures for Yakima Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protect properly functioning habitat	• A. Utilize conservation agreements and/or fee simple acquisition opportunistically to protect local bull trout population habitat that meets the definition of "properly functioning condition", • B. Negotiate provisions in the USFS – Naches Ranger District lease renewal for the S.F. Tieton River grazing allotment to reduce or prevent livestock damage in bull trout spawning areas, • C. Negotiate with the USFS – Naches Ranger District for the permanent abandonment of F.S. Rd. 1800 west of the Deep Cr. culvert crossing for motorized vehicle traffic • D. Remove the culverts, restore the creek bed and provide a suitable ford for horses and non-motorized recreational use (hiking, mountain biking) of the road west of Deep Creek	Immediate	Ongoing 0-5 years 0-5 years 0-5 years
Water Quality			
• Modify reservoir and flow regime	• E. Use the ESA Section 7 consultation process between the USFWS and the Bureau of Reclamation (Reclamation) to develop a new Biological Assessment (BA) with proposed actions that substantively address specific reservoir and flow	Immediate	0-5 years

	regime problems that adversely impact local bull trout populations • F. USFWS shall issue a Biological Opinion (BiOp) that obligates Reclamation to implement negotiated proposed actions to recover bull trout local populations with certainty and in a timely manner • G. Improve irrigation and other water user efficiency that moves flow toward normative conditions • H. Return flow regimes to more normative conditions through increased natural and artificial storage • I. Modify or eliminate the annual "Flip-flop" flow operation		0-5 years Ongoing 5-10 years (optimistic); 10+ years (realistic) 0-5 years
Habitat Access			
• Provide effective fish passage to restore connectivity between the sixteen local bull trout populations and restore anadromous fish runs to boost ecosystem productivity	• J. Participate in and support Reclamation's efforts to develop technically feasible and economically viable engineering designs for upstream and downstream fish passage facilities at Cle Elum Dam, Bumping Lake Dam and Clear Lake Dam (and other storage dams in future years) • K. Assist BOR in securing funding from Congress, NPCC/BPA and other federal, state and local partners for passage facility construction, operation and maintenance • L. The fish co-managers, WDFW and Yakama Nation, shall implement an anadromous fish re-introduction plan using hatchery supplementation to accelerate restoration of salmon populations upstream of Reclamation storage dams equipped with fish passage	Immediate	0-5 years 0-5 years 0-5 years (Cle Elum and Bumping Dams); other BOR storage dams 5-10+ years

	• M. Investigate the potential of a pilot bull trout hatchery supplementation project (or capture and redistribution of adult bull trout spawners from “healthy” local populations to “critical” populations (SaSI definitions)), to accelerate restoration of critical and depressed local populations • N. Work with the USFS (Naches and Cle Elum R.D.’s) and DNR (Ahtanum Cr. basin) to educate the public about the threat to bull trout populations caused by constructing numerous low rock dams in spawning tributaries during the summer months immediately prior to spawning migrations • O. WDFW and USFS monitor spawning tributaries adjacent to campgrounds and other areas of high recreation use during the summer and de-construct recreational dams to restore upstream passage for adult bull trout • P. Monitor passage conditions at the mouths of Reclamation storage reservoir bull trout spawning tributaries (Gold Cr., Box Canyon Cr., Indian Cr., S.F. Tieton R.) and take measures to concentrate flow and assure passage across the reservoir lakebed during summer drawdown • Q. Coordinate with Reclamation to fund the deployment of labor and materials to accomplish this measure		0-5 years 0-5 years 0-5 years 0-5 years 0-5 years
Harvest			
• Improve compliance with conservation-oriented fishing regulations that	• R. Continue and enhance WDFW and USFWS enforcement to prevent illegal harvest/harassment of bull trout	Immediate	0-5 years

close bull trout spawning/rearing areas in tributaries to fishing year-round	• S. Close the regulatory "loophole" unique to the Yakima Basin adfluvial populations (Deep Cr., S.F. Tieton R., Indian Cr., N.F. Tieton R., Gold Cr., Box Canyon Cr., Kachess R.) that some fishermen have exploited. Extend the "closed water" rule downstream in these tributaries to include those portions of the creek flowing across the dry lakebed during irrigation season reservoir drawdown • T. Continue to publish the "bull trout vs. brook trout" identification illustration in WDFW's annual sport fishing rules pamphlet • U. Continue to produce and post the bull trout vs. brook trout identification sign prominently in areas where bull trout and brook co-exist		Completed Feb. 2008 Ongoing Ongoing

Section 4.4 Columbia Cascade Province

Section 4.4.1 Columbia Upper Middle Subbasin

A. Columbia Upper Middle Bull Trout

Section 4.4.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Columbia Upper Middle	NA		NA	NA	NA

Status:

Population	Number of adults/populations	Number of local populations	Total number of adults
Columbia Upper Middle	Unknown	Unknown	Unknown

Section 4.4.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use; dams	Mainstem hydrosystem
Population traits	Lack of information	Population density, composition, and distribution unknown

Section 4.4.1A.3 Strategies and Measures for Columbia Upper Middle Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Evaluate passage at hydro-facilities	• A. Conduct telemetry studies to determine migration patterns and potential problems at hydro-facilities	Immediate	1-5 years
Population Traits			
• Identify status and distribution	• B. Conduct surveys to determine population density,	Immediate	1-5 years

	composition, and distribution		

B. Columbia Upper Middle White Sturgeon

Section 4.4.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Productivity		Number of local populations	Number of adults	Total number of adults
Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells reservoirs	Increasing		NA	NA	NA
	Annual Recruitment (Productivity)				
	Natural reproduction reached via natural recruitment		NA	NA	NA
	Broodstock Abundance				
	Increase the white sturgeon population in project reservoirs to a level commensurate with available habitat.		NA	NA	NA

Status:

Population	Productivity	Annual Recruitment	Broodstock Abundance
Priest Rapids Reservoir	Essentially zero (based on stock structure)	Essentially zero (based on stock structure)	125 (1999-2001)
Wanapum Reservoir	Sporadic and extremely low	Sporadic and extremely low	330 (1999-2001)
Rock Island Reservoir	Zero (based on stock structure)	Zero (based on stock structure)	Just a few fish
Rocky Reach Reservoir	Essentially zero (based on stock structure)	Essentially zero (based on stock structure)	13 (2001-2002)

Well Reservoir	Essentially zero (based on stock structure)	Essentially zero (based on stock structure)	18 (2001-2002)

Section 4.4.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Dams	Creation of the mainstem dams has inundated historic spawning habitat, eliminated upstream and downstream adult and sub-adult movement, and impedes juvenile downstream passage.
Population traits	Dams	Natural production has been reduced to such an extent that population extirpation is likely in this reach of the Columbia River
Harvest	Sport fishing	Vulnerable to unintended negative impacts resulting from inadequate harvest management

Section 4.4.1B.3 Strategies and Measures for Columbia Upper Middle White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Provide suitable spawning and rearing habitat	• A. Operate the Federal Columbia River Power System (FCRPS) to provide suitable white sturgeon spawning and rearing habitat in Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells reservoirs by providing a minimum average April through July flow that translates to 250 KCFS at McNary Dam	Immediate	Immediate to 5 years
• Conduct research to addresses critical uncertainties	• B. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans related	Immediate	6-10 years

	to loss of white sturgeon productivity due to the construction and operation of the FCRPS. These studies shall include (but are not limited to) determination of minimum spawning flows for successful white sturgeon recruitment throughout the Columbia River Basin in areas where they are not currently defined		
Population Traits			
• Implement hatchery based white sturgeon augmentation program(s)	• C. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies, tribes, and PUDs, implement regional hatchery augmentation to restore white sturgeon populations in the impounded portions of the Columbia River upstream of Priest Rapids Dam. [Specific and detailed background, objectives and tasks are described in FERC Relicensing documents – Priest Rapids Project Final 401 Certification, as amended, March 2008; Grant PUD FLA 2003, White Sturgeon Conservation Aquaculture Plan; Chelan PUD Rocky Reach Settlement Agreement, White Sturgeon Management Plan, 2005]	Immediate	10+ years
• Evaluate and monitor white sturgeon population restoration efforts	• Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies, tribes, and PUDs, monitor and evaluate a) restoration actions designed to mitigate for lost white	Immediate	10+ years

	sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by conducting periodic assessments of the status of white sturgeon populations (e.g., abundance, size distribution, length-weight relationship, etc.) in Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells reservoirs. [Detailed objectives and tasks are described in FERC Relicensing documents –]		
• Develop a regionally-accepted white sturgeon management plan framework	• Fund the development of a regionally accepted White Sturgeon Conservation and Management Plan. This plan will describe current species status, population dynamics and data gaps. It should recommend management activities, research, monitoring, and evaluation necessary to achieve biological objectives and guide actions to effectively address uncertainties relevant to species status and current resource management impacts on individual white sturgeon populations throughout the Columbia and Snake rivers. Specific recommendations may include, though not be limited to, abundance, population densities, FCRPS influenced environmental conditions, supplementation rates, and fisheries management. This document will also address the Independent Scientific Review Panel's	Immediate	10+ years

	2002 call for a "State of the Science" document that summarizes existing findings and information. [Detailed objectives and tasks are described in FY 2007-2009 BPA proposal 198605000]		
Harvest			
• Identify and maintain sustainable harvest levels to ensure adequate escapement of fish to broodstock	• D. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies, tribes, and PUDs, fund white sturgeon fishery management including:	10+ years	10+ years
	• E. Identify sustainable recreational and Tribal harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance;	10+ years	10+ years
	• F. Conduct recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels	10+ years	10+ years
	• G. Conduct Tribal subsistence fishery monitoring that enables active in-season management to attain pre-determined sustainable harvest levels	10+ years	10+ years

Section 4.4.2 Entiat Subbasin

A. Entiat Bull Trout

Section 4.4.2A.1 Biological Objective and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Entiat	--			--	
	Number of Local Populations				
	2		2		
	Total Number of Adults				
	836 – 1,364				836 – 1,364

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Entiat			77 redds (2005)

Section 4.4.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Non-native species	Competition with brook trout
Population traits	Non-native species	Hybridization with brook trout
Habitat quality/quantity	Current land use	forestry
Harvest	Current and past fishing	Overharvest and poaching

Section 4.4.2A.3 Strategies and Measures for Entiat Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			
• Reduce non-natives	• A. Remove brook trout through harvest or other means (e.g., chemical and	Immediate	0-5 years

	trapping) • B. Increase agency presence through creel surveys and enforcement		
Population Traits			
• Reduce non-natives	• C. Remove brook trout through harvest or other means (e.g., chemical and trapping) • D. Increase agency presence through creel surveys and enforcement	Immediate	0-5 years
Habitat Quality/Quantity			
• Evaluate habitat and current use	• E. Quantify habitat needs and implement restoration measures	Immediate	5-10 years
Harvest			
• Curtail poaching activities	• F. Evaluate and control harvest activities	Immediate	10+ years

B. Entiat Westslope Cutthroat Trout

Section 4.4.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Entiat	None		NA	NA	NA

Status:

Population	Adult Abundance
Entiat	Unknown

Section 4.4.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Non-native species	Rainbow trout
Habitat quality/quantity	Current land use	Forestry
Harvest	Current and past fishing	Overharvest

Section 4.4.2B.3 Strategies and Measures for Entiat Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Non-Native Species			
• Reduce non-native species	• A. Reduce rainbow trout population through harvest or other means (e.g., chemical and trapping) • B. Increase agency presence through creel surveys and enforcement	Immediate	0-5 years
Habitat Quality/Quantity			
• Evaluate habitat and current use	• C. Quantify habitat needs and implement restoration measures	Immediate	5-10 years

C. Entiat Rainbow Trout

Section 4.4.2C.1 Biological Objectives

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Entiat	None		NA	NA	NA

Status:

Population	Adult Abundance
Entiat	Unknown

Section 4.4.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Population traits	Population structure	Overpopulation or size-specific harvest

Section 4.4.2C.3 Strategies and Measures for Entiat Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Improve population structure (i.e., age and growth)	• A. Conduct biological and creel surveys • B. Implement regulation changes to reduce rainbow trout population or limit harvest of larger fish • C. Determine best options in relation to westslope cutthroat trout objectives	Immediate	0-5 years

Section 4.4.3 Lake Chelan Subbasin

A. Lake Chelan Bull Trout

Section 4.4.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Lake Chelan	None		NA	NA	NA

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Lake Chelan	Likely extirpated	Likely extirpated	Likely extirpated

Section 4.4.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Population size	Probable extirpation
Predation	Non-native species	Lake trout
Harvest	Fishing	Overharvest and poaching

Section 4.4.3A.3 Strategies and Measures for Lake Chelan Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Seek/create a refuge population	• A. Survey for remnant populations in Stehekin • B. Identify reason for population crash or extirpation • C. Identify stock for reintroduction to Stehekin refuge population	Immediate	0-5 years
Predation			
• Reduce predator populations	• D. Reduce lake trout populations through harvest or other means where feasible • E. Evaluate regulation modifications	Immediate	5-10 years

B. Lake Chelan Westslope Cutthroat Tout

Section 4.4.3B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Lake Chelan	None		NA	NA	NA

Status:

Population	Adult Abundance
Lake Chelan	Unknown

Section 4.4.3B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population trait	Population structure	Lack of broodstock and age-0 fish
Competition/predation	Non-native species	Lake trout and rainbow trout
Habitat access	Hydro-operations	Reservoir operations block access to spawning and rearing habitat

Section 4.4.3B.3 Strategies and Measures for Lake Chelan Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Trait			
• Enhance numbers of broodstock and age-0 fish	• A. Obtain better estimate of production, especially for Stehekin • B. Stock 100,000 catchable-sized fish annually or use net pen rearing to attain desirable size • C. Deploy remote site incubators and/or fry stocking in tributaries	Immediate	5-10 years
Competition/Predation			
• Reduce introduced species	• D. Reduce predator populations through harvest or other means where feasible • E. Regulation evaluation and consider closing tributary sections	Immediate	5-10 years
Habitat Access			
• Enhance access to tributaries	• F. Modify current hydro-operations to preserve access to spawning/rearing tributaries • G. Remove alluvial barriers	Immediate	5-10 years

C. Lake Chelan Kokanee

Section 4.4.3C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Escapement		Number of local populations	Number of adults	Total number of adults
Lake Chelan	None		NA	NA	NA

Status:

Population	Adult Escapement
Lake Chelan	94,039 (2005)

Section 4.4.3C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits		
Competition/predation	Non-native species	Mysis shrimp, lake trout, and rainbow trout

Section 4.4.3C.3 Strategies and Measures for Lake Chelan Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Develop a management plan	• A. Conduct population surveys to better estimate natural production and adjust stocking for proper harvest size and catch per unit effort • B. Conduct genetic surveys to identify the best broodstock source for culture purposes	Immediate	5-10 years
Competition/Predation			
• Reduce introduced species	• C. Reduce introduced species (i.e., mysis shrimp, lake trout, and rainbow trout) through harvest or other means where feasible	Immediate	5-10 years

D. Lake Chelan Burbot

Section 4.4.3D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Lake Chelan	None		NA	NA	NA

Status:

Population	Adult Abundance
Lake Chelan	Unknown

Section 4.4.3D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Population characteristics	Lack comprehensive baseline data

Section 4.4.3D.3 Strategies and Measures for Lake Chelan Burbot

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Develop a management plan	• A. Conduct extensive surveys to obtain baseline population data, habitat use information, and pathology data	Immediate	0-5 years

Section 4.4.4 Methow Subbasin

A. Methow Bull Trout

Section 4.4.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Methow	--			--	
	Number of Local Populations				
	8		8		
	Total Number of Adults				
	3,600-5,886				3,600-5,886

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Methow			215 redds (2005)

Section 4.4.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Non-native species	Competition with brook trout
Population trait	Non-native species	Hybridization with brook trout
Habitat quality/quantity	Legacy land use	Forest management practices and roads
Harvest (Lost River Population)	Sport fishing	Poaching

Section 4.4.4A.3 Strategies and Measures for Methow Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			
• Reduce competitive species populations	• A. Evaluate species interactions and status • B. Remove brook trout through harvest or other means (e.g. chemical, trapping) • C. Increase agency presence through creel surveys and enforcement • D. Evaluate regulation effectiveness	Immediate	0-5 years
Population Traits			
• Reduce hybridizing species populations	• E. Evaluate species interactions and status • F. Remove brook trout through harvest or other means (e.g. chemical, trapping) • G. Increase agency presence through creel surveys and enforcement • H. Evaluate regulation effectiveness	Immediate	0-5 years
Habitat Quality/Quantity			
• Improve spawning and rearing conditions	• I. Survey current habitat, quantify needs, and evaluate current uses • J. Implement appropriate restoration actions	Immediate	5-10 years
Harvest (Lost River Population)			
• Estimate impact of harvest	• K. Conduct yearly surveys to determine population health • L. Develop a population estimate to management purposes • M. Work with federal biologists to develop a database for the Lost River population	Immediate	0-5 years

B. Methow Westslope Cutthroat Trout

Section 4.4.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Methow	None		NA	NA	NA

Status:

Population	Adult Abundance
Methow	Unknown

Section 4.4.4B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/predation	Non-native species	Rainbow trout competition
Population traits	Non-native species	Hybridization with rainbow trout
Harvest	Sport fishing	Current and past overharvest
Habitat quality/quantity	Legacy land use	Forest management practices and roads

Section 4.4.4B.3 Strategies and Measures for Methow Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition/Predation			
• Reduce competitive species populations	• A. Reduce rainbow trout populations through harvest or other means (e.g., chemical and trapping) • B. Investigate re-introduction to increase distribution	Immediate	0-5 years
Population Traits			
• Reduce hybridizing species populations	• C. Reduce rainbow trout populations through harvest or other means (e.g., chemical and trapping) and investigate re-introduction to increase distribution	Immediate	0-5 years

Harvest			
• Control harvest practices	• D. Evaluate harvest practices through increased agency presence using creel surveys and law enforcement	Immediate	0-5 years
Habitat Quality/Quantity			
• Improve spawning and rearing conditions	• E. Survey current habitat, quantify needs, and evaluate current uses • F. Implement appropriate restoration actions	Immediate	5-10 years

Section 4.4.5 Okanogan Subbasin

A. Okanogan Rainbow Trout

Section 4.4.5A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	CPUE		Number of local populations	Number of adults	Total number of adults
Rufus Woods	1.0 fish/hour		NA	NA	NA
	Annual fry production				
	2.8-11.5 million		NA	NA	NA
	Annual par production				
	826,000-3.4 million		NA	NA	NA
	Annual recruitment of adults				
	5,000-20,000		NA	NA	NA
	CPUE				
Other waters	0.5-1.0 fish/hour		NA	NA	NA

Status:

Population	CPUE
Rufus Woods	0.3 (2007)
Other waters	--

Section 4.4.5A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Population structure	Data gaps lead to insufficient information to make all management decision needed
Water quality	Current land use	Agriculture, forestry, and roads
Water quantity	Current land use	Agriculture, forestry, and roads

Section 4.4.5A.3 Strategies and Measures for Okanogan Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Address population and reservoir-specific data gaps to better inform decision making processes	• A. Implement a feminized triploid rainbow trout stocking and creel survey program for Lake Rufus Woods	Immediate	Continuous
	• B. Monitor fishery to determine angler catch rates, optimal number and size of fish to be released		0-5 years
	• C. Determine origin of fish caught with marking identification, stomach content analysis, and radio isotope studies		0-5 years
	• D. Determine primary factors affecting the quality of the Rufus Woods fishery including the study of the primary productivity of the reservoir		5-10 years
Water Quality			
• Modify actions associated with current land-use activities	• E. Work with local ranchers to develop cost share projects with Natural Resource and Conservation Service (NRCS) that will stabilize streams and stream banks	Implementing	5-10 years
	• F. Re-establish riparian vegetation, and exclude cattle from riparian zones	Immediate	5-10 years
	• G. Work with Colville Tribes integrated review process and land use board to reduce	Immediate	5-10 years

	impacts from proposed timber harvest, range plans and projects, and road construction projects to reduce road densities and water quality impacts from proposed projects and land uses		
Water Quantity			
• Protect and enhance in-stream flows	• H. Work with Colville Tribes integrated review process and land use board to reduce impacts from proposed timber harvest, range plans and projects, and road construction projects to reduce road densities and water quality impacts from proposed projects and land uses • I. Work with Colville Tribal Council to purchase water rights and protect and enhance in-stream flows	Implementing Immediate	5-10 years 10+ years

B. Okanogan Lahotan Cutthroat Trout

Section 4.4.5B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	CPUE		Number of local populations	Number of adults	Total number of adults
Omak Lake	1 fish/hour		NA	NA	NA
	Broodstock Release				
	100 males and 100 females				

Status:

Population	CPUE
Omak Lake	0.46 fish/hour (2006)

Section 4.4.5B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use	Diversion of flows for agricultural irrigation and altered hydrology from timber harvest and road construction reduces in-stream flows during spawning preventing access into tributaries
Population traits	Population structure	Poor year-class representation

Section 4.4.5B.3 Strategies and Measures for Okanogan Lahotan Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Improve flows to provide access to spawning habitat	• A. Coordinate the participation, planning, and implementation of proposed timber harvest, range plans and projects, and road construction projects to reduce road densities and hydrological impacts from proposed projects and land uses • B. Purchase property, water rights, and conservation agreements, for the protection and enhancement of in-stream flows • C. Continue collection of brood stock and harvest of fertile eggs to be raised in the hatchery and planted into Omak Lake annually and monitor harvest	Implementing Immediate	5-10 years 5-10 years 0-5 years (continuous)
Population Traits			
• Enhance Omak Lake population	• D. Continue collection of brood stock and harvest of fertile eggs to be raised in the hatchery and planted into Omak Lake annually • E. Monitor harvest	Immediate	0-5 years (continuous) 5-10 years

C. Okanogan Kokanee

Section 4.4.5C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Recruitment		Number of local populations	Number of adults	Total number of adults
Lake Rufus Wood and Nespelem River	5,000-20,000 adults		NA	NA	NA
	Annual fry production				
	2.8-11.5		NA	NA	NA
	Annual parr production				
	862,000-3.4 million		NA	NA	NA

Status:

Population	Adult Abundance
Lake Rufus Wood and Nespelem River	25 in the Nespelem (2006)

Section 4.4.5C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Population structure	Information on kokanee population lacking and strictly limited to the spawning population in Nespelem River
Competition/predation	Non-native species	Walleye and smallmouth bass
Hydro-operations	Dams	Entrainment at Chief Joseph Dam
Habitat quality/quantity	Current land use	Agriculture, grazing, and logging

Section 4.4.5C.3 Strategies and Measures for Okanogan Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Address reservoir-specific population data gaps to better inform decision making processes	• A. Continue monitoring Nespelem River and develop sampling and monitoring plan for entire reservoir addressing key factors such as limnology, primary productivity, secondary productivity, and fish productivity	Immediate	5-10 years
Predation			
• Identify magnitude of predatory impacts on natural origin kokanee	• B. Investigate predators effects on kokanee in Lake Rufus Woods	Immediate	0-5 years
Hydro-operation			
• Assess entrainment at Chief Joseph Dam determine corrective measures	• C. Develop and implement an assessment addressing entrainment at Chief Joseph Dam	Immediate	5-10 years
Habitat Quality/Quantity			
• Modify current land-use practice	• D. Work with local ranchers to develop cost share projects with Natural Resource Conservation Service (NRCS) that will stabilize streams and stream banks, re-establish riparian vegetation, and exclude cattle from riparian zones • E. Work with Colville Tribes integrated review process and land use board to reduce impacts from proposed timber harvest, range plans and projects, and road construction projects to reduce road densities and water quality impacts from proposed projects and land uses	Immediate	10+ years 10+ years
• Improve habitat	• F. Work with Colville Tribal	Immediate	5-10 years

conditions	Council and NRCS to identify conservation actions that protect and enhance in stream habitat. Determine the feasibility of constructing spawning channels in the Nespelem sub basin and other areas • G. Coordinate the participation, planning, and implementation of proposed timber harvest, range plans and projects, and road construction projects to reduce road densities and hydrological impacts from proposed projects and land uses. Purchase property, water rights, and conservation agreements and easements, for the protection and enhancement of in-stream habitat		10+ years

Section 4.4.6 Wenatchee Subbasin

A. Wenatchee Bull Trout

Section 4.4.6A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Wenatchee				--	
	Number of Local Populations				
	6		6		
	Total Number of Adults				
	1,876 – 3,176				1,876 – 3,176

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Wenatchee			342 redds (2005)

Section 4.4.6A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/predation	Native and non-native species	Brook trout and pikeminnow competition
Habitat quality/quantity	Legacy land use	Forest management practices and roads
Population traits	Non-native species	Hybridization with brook trout
Harvest	Sport fishing	Poaching

Section 4.4.6A.3 Strategies and Measures for Wenatchee Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition/Predation			
• Reduce competitive species populations	• A. Evaluate species interactions and status • B. Remove brook trout through harvest or other means (e.g. chemical, trapping)	Implementation	0-5 years
Habitat Quality/Quantity			
• Increase/improve spawning and rearing habitat	• C. Quantify habitat needs • D. Identify habitat currently being used • E. Implement restoration measures	Implementation	5-10 years
Population Traits			
• Reduce hybridizing species populations	• F. Evaluate species interactions and status • G. Conduct biological surveys (population estimates) in Lake Wenatchee, the Wenatchee River and its tributaries • H. Remove brook trout through harvest or other	Implementation	0-5 years

	means (e.g. chemical, trapping)		
Harvest			
• Reduce poaching activities	• I. Evaluate harvest practices through creel surveys and the presence of law enforcement • J. Evaluate regulation effectiveness and modify if warranted	Implementation	5-10 years

B. Wenatchee Westslope Cutthroat Trout

Section 4.4.6B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Wenatchee	None		NA	NA	NA
Headwater	None		NA	NA	NA

Status:

Population	Adult Abundance
Wenatchee	Unknown
Headwater	Unknown

Section 4.4.6B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/predation	Non-native species	Rainbow trout and brook trout competition
Population traits	Non-native species	Hybridization with rainbow trout
Harvest	Sport fishing	Overharvest
Habitat quality/quantity	Legacy land use	Past forest management practices and roads

Section 4.4.6B.3 Strategies and Measures for Wenatchee Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition/Predation			
• Reduce competitive species populations	• A. Reduce rainbow trout populations through harvest or other means (e.g., chemical and trapping) • B. Investigate re-introduction to increase distribution	Implementation	0-5 years
Population Trait			
• Reduce hybridizing species populations	• C. Reduce rainbow trout populations through harvest or other means (e.g., chemical and trapping) • D. Investigate re-introduction to increase distribution	Implementation	0-5 years
Harvest			
• Control harvest practices	• E. Evaluate harvest practices through increased agency presence using creel surveys and law enforcement	Implementation	5-10 years
Habitat Quality/Quantity			
• Improve spawning and rearing conditions	• F. Survey current habitat, quantify needs, and evaluate current uses • G. Implement appropriate restoration actions	Implementation	5-10 years

C. Wenatchee Rainbow Trout (redband) Trout

Section 4.4.6C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Wenatchee	None		NA	NA	NA

Status:

Population	Adult Abundance
Wenatchee	Unknown

Section 4.4.6C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/predation	Introduced species	Cutthroat trout competition
Population traits	Introduced species	Hybridization with cutthroat trout emigrating from high lakes into headwater streams

Section 4.4.6C.3 Strategies and Measures for Wenatchee Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition/Predation			
• Reduce competitive species populations	• A. Perform population surveys • B. Reduce cutthroat trout populations through harvest or other means (e.g., chemical and trapping) • C. Reduce or eliminate high lakes stocking program	Implementation	0-5 years
Population Trait			
• Reduce hybridizing species populations	• D. Perform population and genetic surveys	Implementation	5-10 years

Section 4.5 Intermountain Province

Section 4.5.1 Coeur d'Alene Subbasin

A. Coeur d'Alene Bull Trout

Section 4.5.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Coeur d'Alene Lake	--			--	
	Number of Local Populations				
	8 (5 local populations in Red Ives Creek and 3 local populations from Ives Creek downstream to Big Creek)		8 (5 local populations in Red Ives Creek and 3 local populations from Ives Creek downstream to Big Creek)		
	Total Number of Adults				
	800 (500 above and/or in Red Ives Creek and 300 From Red Ives Creek downstream to Big Creek)				800 (500 above and/or in Red Ives Creek and 300 From Red Ives Creek downstream to Big Creek)

Coeur d'Alene River	Number of adults/population				
	Number of Local Populations				
	At least 3		At least 3		
	Total Number of Adults				
	300				300

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Coeur d'Alene Lake			
Coeur d'Alene River			--
St. Joe River			301 redds

Section 4.5.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Loss or destruction of important floodplain/riparian habitat and excess sediment delivery due to agriculture, forestry, and residential practices
Competition/predation	Non-native species	Northern pike, smallmouth bass, and brook trout
Water quality	Current and legacy land use	Elevated heavy metal concentrations in the South Fork Coeur d'Alene River and Coeur d'Alene River. Elevated water temperatures in smaller low elevation tributaries in the Coeur d'Alene and St. Joe Rivers
Habitat access	Current land uses	Roads, railroads and dikes

Section 4.5.1A.3 Strategies and Measures for Coeur d'Alene Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Reduce impacts from past mining operations and development along river and stream corridors and reduce sediment delivery to the stream network	• A. Work with the Idaho Department of Fish and Game, Coeur d'Alene Tribe, Forest Service, other agencies, private developers and landowners, county planners and interested angling groups to make protection of fisheries habitat a primary concern in land use decisions • B. Incorporate evaluations of existing habitat into project plans whenever possible. • C. Develop a database to demonstrate the magnitude of habitat loss and more effectively influence land use decisions • D. Work with the Idaho Department of Fish and Game, Coeur d'Alene Tribe, Forest Service, Department of Transportation, Silver Valley Natural Resource Trustees, Environmental Protection Agency, Department of Lands, Department of Environmental Quality, and others to insure mitigation of habitat loss or restoration of habitat whenever possible • E. Promote lessons learned from past research to improve habitat critical to bull trout survival	Immediate	10+ years
Competition /Predation			
• Reduce impacts from introduced species	• F. Set liberal regulations on northern pike, smallmouth bass and brook trout to reduce their numbers and limit their spread • G. Develop informational	Immediate	10+ years

	programs to educate anglers and the public to risks of random introductions of exotic species • H. Through planning, use enforcement efforts to curtail illegal introductions • I. Work with anglers to reach a balance between exotic species and bull trout		
Water Quality			
• Reduce heavy metal concentrations. Restore functional riparian habitat	• J. Work with Idaho Fish and Game, Coeur d'Alene Tribe, Forest Service, Department of Environmental Quality, Environmental Protection Agency, U.S. Fish and Wildlife Service, Bureau of Land Management and other agencies in reducing heavy metal loading into the Coeur d'Alene River watershed. Monitor the fish populations to show benefits from reductions in heavy metal concentrations and water temperatures	Immediate	10+ years
Habitat Access			
• Restore connectivity to important spawning, rearing and refugia habitat	• K. Work with the Idaho Fish and Game, Coeur d'Alene Tribe, Forest Service, Idaho Department of Lands, other agencies, private developers and landowners, county planners and interested angling groups to make protection of fisheries habitat a primary concern in land-use decisions. Incorporate evaluations of roads, railroads and dikes in survey projects to assess where access to important habitat has been lost • L. Develop a data base to demonstrate the magnitude of habitat loss and more effectively influence land use decisions • M. Work with the Idaho Department of Fish and Game, Coeur d'Alene Tribe,	Immediate	10+ years

	Forest Service, Department of Transportation, Silver Valley Natural Resource Trustees, Environmental Protection Agency, Department of Lands, Department of Environmental Quality and others to insure mitigation of habitat loss or to restore access whenever possible		

B. Coeur d'Alene Kokanee

Section 4.5.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Population Estimate		Number of local populations	Number of adults	Total number of adults
Coeur d'Alene Lake	7.5 million		NA	NA	NA
	Harvest				
	200,000		NA	NA	NA

Status:

Population	Population Estimate	Harvest
Coeur d'Alene Lake	34,200 age-3 (2007)	

Section 4.5.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Predation	Non-native species	Smallmouth bass and Chinook salmon
Harvest	Sport fishing	Overharvest
Habitat quality/quantity	Current lands use	Lakeshore encroachment, pollution, and nutrient loading

Section 4.5.1B.3 Strategies and Measures for Coeur d'Alene Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response

			Timeframe
Predation			
• Reduce impacts from introduced species	• A. Set liberal regulations on smallmouth bass to reduce their numbers and limit their spread • B. Determine habitat use, movement and feeding habits of smallmouth bass to assess impacts on kokanee and other desired game fishes • C. Evaluate chinook survival and recruitment to the fishery by monitoring chinook derbies and conducting redd count surveys • D. Adjust chinook stocking as necessary to meet kokanee goals	Immediate	0-10+ years
Harvest			
• Modify angler harvest to meet kokanee abundance and size goals	• E. Evaluate angler harvest of kokanee through creel surveys • F. Continue to evaluate kokanee abundance and size through trawling and/or hydroacoustics. • G. Seek public input on whether anglers desire to harvest more kokanee of smaller size or fewer kokanee of a larger size • H. Develop a model that uses kokanee exploitation, Chinook abundance and the number and size of spawning kokanee to predict the expected number and size of mature kokanee three years later. This model could be used to help adjust angler harvest of kokanee and introductions of Chinook salmon to maintain the desired size and number of mature kokanee	Immediate	0-10+ years
Habitat Quality/Quantity			
• Minimize impacts to lake fisheries due to lakeshore encroachment, pollution and	• I. Work with Idaho Department of Fish and Game, Coeur d'Alene Tribe, county planners and Department of Lands to make protection of	Immediate	0-10+ years

nutrient loading	fish habitat and water quality a primary concern in land use decisions		

C. Coeur d'Alene Westslope Cutthroat Trout

Section 4.5.1C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Catch Rate		Number of local populations	Number of adults	Total number of adults
St. Joe River, Coeur d'Alene River, and St. Maries River	1.0 fish/hour		NA	NA	NA
	Harvest				
Coeur d'Alene Lake	>1,000		NA	NA	NA

Status:

Population	Catch rates	Harvest
St. Joe River, Coeur d'Alene River, and St. Maries River	--	--
Coeur d'Alene Lake	--	--

Section 4.5.1C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Residential development
Competition/predation	Non-native species	Northern pike, smallmouth bass, brook trout, and rainbow trout
Harvest	Fishing	Illegal harvest
Habitat access	Current land uses	Roads, railroads and dikes
Water quality	Current land use	Elevated heavy metal concentrations in the South Fork Coeur d'Alene River and Coeur d'Alene River. Elevated water temperatures in the smaller tributaries of Coeur d'Alene Lake the Coeur d'Alene and St. Joe Rivers.

Section 4.5.1C.3 Strategies and Measures for Coeur d'Alene Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Reduce impacts from development along river and stream corridors and reduce sediment delivery to the stream network	• A. Collaboratively work with all agencies (including Forest Service, Coeur d'Alene Tribe and Idaho Fish and Game), private developers and landowners, county planners and interested angling groups to make protection of fisheries habitat a primary concern in land use decisions • B. Incorporate evaluations of existing habitat into project plans whenever possible • C. Develop a database to demonstrate the magnitude of habitat loss and more effectively influence land use decisions • D. Work with the Forest Service, Department of Transportation, Silver Valley Natural Resource Trustees, Environmental Protection Agency, Department of Lands, Department of Environmental Quality, Coeur d'Alene Tribe, Idaho Department of Fish and Game and others to insure mitigation of habitat loss or restoration of habitat whenever possible • E. Promote lessons learned from cutthroat trout research in the Coeur d'Alene Subbasin to improve habitat critical to cutthroat trout survival	Immediate	10+ years
Competition/Predation			
• Reduce impacts from introduced species	• F. Set liberal regulations on northern pike, smallmouth bass, brook trout and rainbow trout to reduce their numbers and limit their spread • G. Develop informational programs to educate anglers and the public to risks of random introductions of exotic species • H. Through planning, use enforcement efforts to curtail illegal	Immediate	10+ years

	introductions • I. Evaluate potential impacts that high kokanee densities may have on restoration of adfluvial cutthroat trout • J. Work with anglers to reach a balance between exotic species and cutthroat trout		
Harvest			
• Reduce illegal harvest	• K. Work with the Idaho Fish and Game, Coeur d'Alene Tribe, Forest Service, Idaho Department of Lands, other agencies, private developers and landowners, county planners and interested angling groups to make protection of fisheries habitat a primary concern in land use decisions • L. Incorporate evaluations of roads, railroads and dikes into survey projects to assess where access to important habitat has been lost • M. Develop a database to demonstrate the magnitude of habitat loss and more effectively influence land use decisions • N. Work with the Idaho Fish and Game, Coeur d'Alene Tribe, Forest Service, Department of Transportation, Silver Valley Natural Resource Trustees, Environmental Protection Agency, Department of Lands, Department of Environmental Quality, and others to insure mitigation of habitat loss or to restore access whenever possible.	Immediate	10+ years
Water Quality			
• Reduce heavy metal concentrations	• O. Work with the Idaho Department of Fish and Game, Coeur d'Alene Tribe, Department of Environmental Quality, Environmental Protection Agency, U.S. Fish and Wildlife Service, Bureau of Land Management and other agencies in reducing heavy metal loading into the Coeur d'Alene River watershed.	Immediate	10+ years
• Reduce in-stream water temperatures during the warm summer months	• P. Work to restore functional riparian areas in order to facilitate lower summer temperatures with higher mean flows	Immediate	10+ years

	• Q. Monitor the fish populations to show benefits to reductions in heavy metal concentrations and water temperatures		

Section 4.5.2 Columbia Upper Subbasin

A. Columbia Upper Redband/Rainbow Trout

Section 4.5.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Harvest Rate		Number of local populations	Number of adults	Total number of adults
Lake Roosevelt	0.15 fish/hour (hatchery fish)		NA	NA	NA
	Adult Abundance				
			NA	NA	NA

Status:

Population	Harvest Rate	Adult Abundance
Lake Roosevelt	0.15	Unknown

Section 4.5.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Entrainment at Grand Coulee and reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/Predation	Non-native species	Walleye and smallmouth bass
Population traits	Stocking	Hybridization of wild fish with

		hatchery releases
Harvest	Sport fishing	Overharvest
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem

Section 4.5.2A.3 Strategies and Measures for Columbia Upper Redband/Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations	Immediate	5-10 years
	• B. Quantify levels of primary, secondary and benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios, and identify critical areas for habitat protection, enhancement, and restoration,		5-10 years
	• C. Experiment with release strategies to maximize recruitment to fishery		5-10 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• D. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat	Immediate	5-10 years
	• E. Enhance and restore physical in-stream and riparian habitat		10+ years
Water Quantity			
• Ensure adequate water for all life stages	• F. Establish minimum in-stream flow rules for tributaries and all life stages	Immediate	10+ years

Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels throughout Lake Roosevelt	• G. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • H. Experiment with release strategies to maximize recruitment to fishery • I. Negotiate hydro-operations and facility improvements	Immediate	10+ years 5-10 years 10+ years
Nutrients			
• Increase nutrients	• J. Identify streams and populations that would benefit from nutrient enhancement • K. Implement a nutrient addition program • L. Modify hydro-operations to increase retention times to allow for nutrient assimilation and increased primary and secondary production • N. Develop a nutrient enhancement program including levels needed, application strategy, monitoring and evaluation, and public outreach and education • O. Quantify impacts of hydro-operations on primary and secondary production related to retention times • P. Negotiate hydro-operations.	Immediate	5-10 years 10+ years 10+ years 10+ years 5-10 years 10+ years
• Reduce nutrient loading	• Q. Identify sources of point and non-point nutrient addition • R. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-	• S. Determine types, extent,	Immediate	5-10 years

point sources of contaminants	and impacts of all potential contaminants, and develop cleanup strategies for pollution sources		
Competition/Predation			
• Reduce or eliminate non-native predators	• T. Quantify rates of predation/competition by non-native predators • U. Develop fishing regulation changes • V. Experiment with release strategies to maximize recruitment to fishery • W. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 0-5 years 5-10 years
Population Traits			
• Maintain wild-type genetic diversity and minimize hybridization	• X. Utilize triploid/sterile hatchery fish for stocking programs • Y. Maximize harvest of hatchery fish • Z. Use marking methods to differentiate hatchery and wild fish for regulation of angler harvest • AA. Develop a breeding program to ensure only pure native stocks are used	Immediate	0-5 years 0-5 years 0-5 years 0-5 years
Harvest			
• Reduce harvest on sensitive stocks	• BB. Quantify angling impacts on wild stocks • CC. Develop fishing regulation changes • DD. Increase enforcement to prevent poaching, and Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years
Habitat Access			
• Restore fish passage for all life stages to all habitats	• EE. Identify critical areas for tributary access / passage protection, enhancement, and restoration • FF. Identify barriers	Immediate	0-5 years 0-5 years

	preventing access to tributaries under different hydro-operation scenarios • GG. Enhance or restore access as appropriate • HH. Identify barriers preventing access to habitat • II. Negotiate hydro-operations		5-10 years 0-5 years 5-10 years

B. Columbia Upper Kokanee

Section 4.5.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	CPUE		Number of local populations	Number of adults	Total number of adults
Upper Columbia, Sheep Creek, and Barnaby Creek	1 fish/hour this value is not realistic WDFW doesn't agree		NA	NA	NA
	Annual Harvest				
	10,000 – 40,000 adults from the San Poil this should be in the San Poil sub-basin		NA	NA	NA

Status:

Population	CPUE	Annual Harvest
Upper Columbia, Sheep Creek, and Barnaby Creek	0-5 less than 0.1 fish per hour currently	0-5 current harvest estimate is unknown.

Section 4.5.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Entrainment at Grand Coulee and reservoir level fluctuations
Competition/Predation	Non-native species	Walleye and smallmouth bass

Population traits	Stocking	Hybridization of wild fish with hatchery releases
Harvest	Sport Fishing	Overharvest
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations

Section 4.5.2B.3 Strategies and Measures for Columbia Upper Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Maximize water retention times to increase rearing capacity and maintain high water elevation	Immediate	5-10 years
Competition/Predation			
• Reduce non-native population	• B. Increase removal efficiency by liberalizing bag limits for non-native species (walleye and smallmouth bass)	Immediate	5-10 years
Population Traits			
• Maintain wild-type genetic diversity and minimize hybridization	• C. Utilize triploid/sterile hatchery fish for stocking programs • D. Maximize harvest of hatchery fish • E. Use marking methods to differentiate hatchery and wild fish for regulation of angler harvest • F. Develop a breeding program to ensure only pure native stocks are used	Immediate	0-5 years
Harvest			
• Reduce harvest	• G. Decrease bag limit from 2 to 0 (natural origin only) in Lake Roosevelt	Immediate	Don't support this reg. change not scientifically merited

Habitat Access			
• Restore fish passage for all life stages to all habitats	• H. Identify critical areas for tributary access / passage protection, enhancement, and restoration • I. Identify barriers preventing access to tributaries under different hydro-operation scenarios • J. Enhance or restore access as appropriate • K. Identify barriers preventing access to habitat	Immediate	0-5 years 0-5 years 5-10 years 0-5 years
Habitat Quality/Quantity			
• Increase available habitat	• L. Develop a habitat improvement plan that identifies specific sites, action, and prioritization for each action • M. Develop a community outreach plan with the primary	Immediate	0-5 years 0-5 years

C. Columbia Upper Kokanee

Section 4.5.2C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Lake Roosevelt and other lakes	300,000		NA	NA	NA
	Harvest Rate				
	0.5 fish/hour (excluding Lake Roosevelt)		NA	NA	NA

Status:

Population	Annual Harvest	Harvest Rate
Lake Roosevelt and other lakes	less than 0.1	less than 3000

Section 4.5.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Entrainment at Grand Coulee and reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	Walleye and smallmouth bass
Population traits	Stocking	Hybridization of wild fish with hatchery releases
Harvest	Sport fishing	Overharvest

Section 4.5.2C.3 Strategies and Measures for Columbia Upper Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations • B. Quantify levels of primary, secondary and benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios, and identify critical areas	Immediate	5-10 years 0-5 years

	for habitat protection, enhancement, and restoration, • C. Experiment with release strategies to maximize recruitment to fishery		0-5 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• D. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • E. Enhance and restore physical in-stream and riparian habitat	Immediate	5-10 years 10+ years
Water Quantity			
• Ensure adequate water for all life stages	• F. Establish minimum in-stream flow rules for tributaries and all life stages	Immediate	10+ years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels throughout Lake Roosevelt	• G. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • H. Experiment with release strategies to maximize recruitment to fishery • I. Identify lakes with hypolimnetic anoxia and develop strategies to address dissolved oxygen limitation • J. Negotiate hydro-operations and facility improvements	Immediate	5-10 years 0-5 years 5-10 years 5-10 years

Nutrients			
• Increase nutrients	• K. Identify streams and populations that would benefit from nutrient enhancement • L. Implement a nutrient addition program • N. Modify hydro-operations to increase retention times to allow for nutrient assimilation and increased primary and secondary production • O. Develop a nutrient enhancement program including levels needed, application strategy, monitoring and evaluation, and public outreach and education • P. Quantify impacts of hydro-operations on primary and secondary production related to retention times • Q. Negotiate hydro-operations.	Immediate	5-10 years 5-10 years 10+ years 10+ years 5-10 years 10+ years
• Reduce nutrient loading	• R. Identify sources of point and non-point nutrient addition • S. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• T. Determine types, extent, and impacts of all potential contaminants • U. Develop cleanup strategies for pollution sources	Immediate	5-10 years 5-10 years
Competition/Predation			
• Reduce or eliminate non-native species	• V. Quantify rates of predation/competition by non-native competitors • W. Develop fishing regulation changes • X Experiment with release strategies to maximize	Immediate	0-5 years 0-5 years 0-5 years

	recruitment to fishery • Y. Establish a removal/ reduction program		5-10 years
Harvest			
• Reduce harvest on sensitive stocks	• Z. Quantify angling impacts on wild stocks • AA. Develop fishing regulation changes • BB. Increase enforcement to prevent poaching • CC. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years 0-5 years

D. Columbia Upper Burbot

Section 4.5.2D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Lake Roosevelt	Unknown		NA	NA	NA
	Relative Weight				
	75-85		NA	NA	NA
	Harvest Rate				
	0.04 fish/hour				
	Mean Length				
	490 mm				

Status:

Population	Adult Abundance	Relative Weight
Lake Roosevelt	Stable	Wr less than 75

Section 4.5.2D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	Walleye and smallmouth bass
Population traits	Stocking	Hybridization of wild fish with hatchery releases

Section 4.5.2D.3 Strategies and Measures for Columbia Upper Burbot

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations • B. Quantify levels of primary, secondary and benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios, and identify critical areas for habitat protection, enhancement, and restoration	Immediate	5-10 years 5-10 years

Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• C. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • D. Enhance and restore physical in-stream and riparian habitat	Immediate	5-10 years 10+ years
Water Quantity			
• Ensure adequate water for all life stages	• E. Establish minimum in-stream flow rules for tributaries and all life stages • F. Purchase water rights • G. Develop water conservation program, and public outreach and education about water conservation	Immediate	10+ years 10+ years 10+ years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels throughout Lake Roosevelt	• H. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • I. Negotiate hydro-operations and facility improvements	Immediate	5-10 years 5-10 years
Nutrients			
• Increase nutrients	• J. Identify streams and populations that would benefit from nutrient enhancement • K. Implement a nutrient addition program • L. Modify hydro-operations to increase retention times to allow for nutrient assimilation and increased primary and secondary production • M. Develop a nutrient enhancement program	Immediate	5-10 years 5-10 years 10+ years 10+ years

	including levels needed, application strategy, monitoring and evaluation, and public outreach and education • N. Quantify impacts of hydro-operations on primary and secondary production related to retention times • O. Negotiate hydro-operations.		5-10 years 10+ years
• Reduce nutrient loading	• P. Identify sources of point and non-point nutrient addition • Q. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• R. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	5-10 years
Competition/Predation			
• Reduce non-native predator densities	• S. Quantify rates of predation/competition by non-native predators • T. Develop fishing regulation changes • U. Establish a removal/ reduction program	Immediate	0-5 years 5-10 years 5-10 years

E. Columbia Upper Westslope Cutthroat Trout

Section 4.5.2E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Columbia Upper	stable or increasing		NA	NA	NA

Status:

Population	Adult Abundance
Columbia Upper	Unknown

Section 4.5.2E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Current land use; dams	Agriculture, forestry, and hydro-operations
Competition/predation	Current land use; dams	Agriculture, forestry, and hydro-operations
Population traits	Stocking	Hybridization of wild fish with hatchery releases

Section 4.5.2E.3 Strategies and Measures for Columbia Upper Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• A. Identify critical areas for habitat protection, enhancement, and restoration, • B. Purchase lands, easements or conservation agreements to protect and enhance existing habitat • C. Maintain, restore, and enhance physical in-stream and riparian habitat	Immediate	5-10 years 10+ years 10+ years
Water Quality			
• Increase dissolved oxygen levels	• D. Identify lakes with hypolimnetic anoxia • E. Develop strategies to address dissolved oxygen limitation	Immediate	0-5 years 0-5 years
Contaminants			

• Remove point and non-point sources of contaminants	• F. Determine types, extent, and impacts of all potential contaminants • G. Develop cleanup strategies for pollution sources	Immediate	5-10 years 10+ years
Competition/Predation			
Reduce non-native predator densities	• H. Quantify rates of predation by non-native predators, develop fishing regulation changes • I. Establish a removal/reduction program	Immediate	5-10 years 5-10 years
Population Traits			
• Modify stocking strategy	• J. Experiment with release strategies to maximize recruitment to fishery	Immediate	0-5 years

F. Columbia Upper White Sturgeon

Section 4.5.2F.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Columbia Upper	5,000		NA	NA	NA

Status:

Population	Adult Abundance
Columbia Upper	3000 adults

Section 4.5.2F.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use;	Agriculture, forestry, and hydro-

	dams	operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	Walleye and smallmouth bass
Population traits	Stocking	Hybridization of wild fish with hatchery releases
Harvest	Sport fishing	Overharvest
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem

Section 4.5.2F.3 Strategies and Measures for Columbia Upper White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Quantify levels of primary, secondary and benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios, and identify critical areas for habitat protection, enhancement, and restoration,	Immediate	0-5 years
	• B. Experiment with release strategies to maximize recruitment to fishery		0-5 years
	• C. Conduct research to examine the relationships between spring and summer discharge and recruitment rates (in relation to increase mean daily discharge at the international border in the spring and summer)		5-10 years
	• D. Conduct research to determine if delayed reservoir re-fill results in more riverine habitat and/or recruitment		0-5 years

Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• E. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat	Immediate	10+ years
Water Quantity			
• Ensure adequate water for all life stages	• F. Maintain current hydrograph with a peak during the freshet to cue spawning		0-5 years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen for spawning, incubation, and rearing	• G. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios, experiment with release strategies to maximize recruitment to fishery, and negotiate hydro-operations and facility improvements	Immediate	5-10 years
Nutrients			
• Increase nutrients	• H. Develop a nutrient enhancement program including levels needed, application strategy, monitoring and evaluation, and public outreach and education • I. Quantify impacts of hydro-operations on primary and secondary production related to retention times • J. Negotiate hydro-operations	Immediate	5-10 years 0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• K. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources		5-10 years
Non-native Species			
• Reduce non-native predator densities	• L. Quantify rates of predation/competition by non-native predators • M. Develop fishing regulation changes	Immediate	0-5 years 0-5 years

	• N. Experiment with release strategies to maximize recruitment to fishery • O. Establish a removal/ reduction program		0-5 years 5-10 years
Harvest			
• Reduce or eliminate harvest	• P. Quantify angling impacts on wild stocks • Q. Develop fishing regulation changes • R. Increase enforcement to prevent poaching • S. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years 0-5years

Section 4.5.3 Pend Oreille Subbasin

A. Pend Oreille Bull Trout

Section 4.5.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Lake Pend Oreille	>100			>100	
	Number of Local Populations				
	At least 6		At least 6		
	Total Number of Adults				
	2,500				2,500
Priest Lakes	Number of adults/populations			>100	
	>100				
	Number of Local Populations				
	At least 5		At least 5		
	Total Number of				

	Adults				
	1,000				1,000
Pend Oreille River	Number of adults/populations				
	Number of Local Populations				
	8		8		
	Total Number of Adults				
	1,575-2,625				1,575-2,625

Status:

Population	Number of adults/populations	Number of Local Populations	Total Number of Adult Abundance Estimate
Lake Pend Oreille			4,173 (2007)
Priest Lakes			7 redds (2007)
Pend Oreille River			--

Section 4.5.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/Predation	Non-native species	Bull trout, lake trout, and rainbow trout are competing for an increasingly limited forage base of kokanee in Lake Pend Oreille. If kokanee are extirpated, lake trout will likely replace bull trout in the lake. In addition, lake trout predation on young bull trout will likely increase as forage becomes scarce.
Habitat access	Dams	Albeni Falls Dam (federal) and Cabinet Gorge Dam (private) are barriers to bull trout migration above and below Lake Pend Oreille, and block

		access to historic spawning areas.

Section 4.5.3A.3 Strategies and Measures for Pend Oreille Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition/Predation			
• Remove non-native predators (lake trout and rainbow trout)	• A. Continue program of removing lake trout by trap netting and gillnetting • B. Locate concentrations of lake trout by sonic telemetry to improve harvest • C. Keep liberal regulations for the sport fishery on lake and rainbow trout (no harvest limits, no season, and no size limits) • D. Pay anglers to harvest lake trout and rainbow trout to increase harvest • E. Allow harvest of rainbow trout in tributary streams where rainbow trout spawn • F. Evaluate removal program through an adaptive management approach and change methodology as needed • G. Research the potential for lake level changes to impact lake trout spawning • H. Monitor predator and kokanee populations in the lake to determine if measures are working • I. Research and implement other alternatives for lake trout and rainbow trout management as they are developed in an attempt to reduce the forage demand of predators	Immediate	0-10+ years
Habitat Access			
• Provide passage	• J. The US Army Corps of Engineers, the State of Idaho, Bonneville Power	Immediate	0-10+ years

	Administration, and US Fish and Wildlife Service shall work cooperatively to evaluate, develop and implement a method to allow bull trout passage at Albeni Falls Dam • K. At Cabinet Gorge Dam, Avista Corps, the State of Idaho, and US Fish and Wildlife Service should continue its efforts for the evaluation and implementation of bull trout passage		

Section 4.5.4 Pend Oreille Subbasin

A. Pend Oreille Bull Trout (Northeast Washington)

Section 4.5.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Pend Oreille (Northeast Washington)	--			--	
	Number of Local Populations		At least 9		
	At least 9				
	Total Number of Adults				
	1,575-2,625				1,575-2,625

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Pend Oreille (Northeast Washington)	Unknown	1 potential	Unknown

Section 4.5.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	Brook trout
Population traits	Stocking	Hybridization of wild fish with hatchery releases
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem

Section 4.5.4A.3 Strategies and Measures for Pend Oreille Bull Trout (Northeast Washington)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations • B. Quantify levels of primary, secondary and benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios,	Immediate	0-5 years 0-5 years

	and identify critical areas for habitat protection, enhancement, and restoration, • C. Experiment with release strategies to maximize recruitment to fishery		5-10 years
Habitat Quality/Quantity			
• Provide adequate water temperatures and dissolved oxygen levels	• D. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • E. Enhance and restore physical in-stream and riparian habitat	Immediate	0-5 years 10+ years
Water Quality			
Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels throughout Pend Oreille River	• F. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • G. Experiment with release strategies to maximize recruitment to fishery • H. Negotiate hydro-operations and facility improvements	Immediate	0-5 years 5-10 years 5-10 years
Nutrients			
• Reduce nutrient loading	• I. Identify sources of point and non-point nutrient addition • J. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• K. Determine types, extent, and impacts of all potential contaminants • L. Develop cleanup strategies for pollution sources	Immediate	0-5 years 5-10 years

Competition/Predation			
• Reduce non-native predator densities	• M. Quantify rates of predation/competition by non-native predators • N. Develop fishing regulation changes • O. Experiment with release strategies to maximize recruitment to fishery • P. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 5-10 years 5-10 years
Population Traits			
• Minimize hybridization	• Q. Maximize harvest of hatchery fish • R. Modify stocking strategies to reduce potential genetic interaction • S. Limit non-native species expansion	Immediate	0-5 years 0-5 years 10+ years
Harvest			
• Reduce take on sensitive stocks	• T. Quantify angling impacts on wild stocks • U. Increase enforcement to stop poaching • Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years
Habitat Access			
• Restore fish passage and habitat connectivity for all life history stages	• V. Identify barriers preventing access to tributaries under different hydro-operations • W. Where appropriate install fish passage at hydropower projects to provide access to tributaries to allow for expression of all life histories • X. Implement fish passage program where appropriate • Y. Negotiate hydro-operations	Immediate	0-5 years 10+ years 10+ years 5-10 years

B. Pend Oreille Kokanee

Section 4.5.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Lake Pend Oreille	300,000		NA	NA	NA
	Catch Rate				
	1.5 fish/hour by 2015		NA	NA	NA
Pend Oreille River	Catch Rate				
	0.5 fish/hour		NA	NA	NA

Status:

Population	Annual Harvest	Catch Rate
Lake Pend Oreille	Closed	Closed
Pend Oreille River	Unknown	Unknown

Section 4.5.4B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Predation	Non-native species	Lake trout and rainbow trout
Habitat quality/quantity	Hydro-operations	Hydropower operations affect spawning habitat and egg incubation

Section 4.5.4B.3 Strategies and Measures for Pend Oreille Kokanee (Lake Pend Oreille)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Predation			
• Reduce predation on kokanee by non-native predators until kokanee recover	• A. Continue the program of removing lake trout by trap netting and gillnetting. • B. Locate concentrations of lake trout by sonic telemetry to improve harvest • C. Maintain liberal	Immediate	0-10+ years

	regulations for the sport fishery for predatory fish (no harvest, no season, and no size limits) • D. Pay anglers to harvest lake trout and rainbow trout • E. Allow harvest of rainbow trout in tributary streams where rainbow trout spawn • F. Monitor the abundance of lake trout, rainbow trout, bull trout and kokanee to determine the effectiveness of the recovery efforts • G. Evaluate removal program through an adaptive management approach and change methodology as needed. Investigate establishing a commercial lake whitefish fishery and increasing by-catch of lake trout as one additional way to suppress lake trout abundance and predation on kokanee • H. Research the potential for lake level changes to impact lake trout spawning. • I. Assess potential benefits of fertilizing a section of the lake to: 1) increase kokanee growth to help them avoid predation, and 2) change their distribution in the lake and avoid the north end where lake trout are more numerous • J. Implement a fertilization project if the evaluation shows potential benefits and acceptable risks • K. Research kokanee stocking strategies for methods to improve kokanee recovery		

Hydro-operations			
• Modify hydro-operations	• L. In some years, lower the winter elevation of the lake to the minimum pool level to allow wave action to clean and re-sort shoreline gravel. Then in subsequent years, hold the lake 4 feet higher to allow kokanee to spawn in the previously cleaned gravel. In any given year consideration should be given to adult kokanee abundance, precipitation forecast, the success of chum salmon spawning during the previous year, and previous frequency of draw downs in deciding on a winter lake level • M. Annually, during August or September, the IDFG, USACE, BPA, USFWS, NOAA, and the Lakes Commission should meet to decide on winter lake elevations that benefit both kokanee and chum salmon below Bonneville Dam. A decision tree has been developed to assist in the section of a pool level. To assist in the selection of a lake level, the abundance of kokanee spawners should be estimated annually. • N. Examine kokanee spawning habitat annually by core sampling to determine if lake level changes are having the desired effect of improving habitat quality	Immediate	0-10+ years
Habitat Quality/Quantity			
• Protect and improve shoreline spawning habitat	• O. Work with regulatory agencies to ensure kokanee spawning areas are protected by the established regulatory process • P. Establish a fund for purchasing land or obtaining conservation easements to kokanee spawning areas that occur on private property, and to do habitat work on the	Immediate	0-10+ years

	shoreline to protect nearby spawning areas		

Section 4.5.4B.4 Strategies and Measures for Pend Oreille Kokanee (Washington portion)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations • B. Quantify levels of primary, secondary and benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios, and identify critical areas for habitat protection, enhancement, and restoration, • C. Experiment with release strategies to maximize recruitment to fishery	Immediate	0-5 years 0-5 years 0-5 years
Habitat Quality/Quantity			
• Provide adequate water temperatures and dissolved oxygen levels	• D. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • E. Enhance and restore physical in-stream and riparian habitat	Immediate	0-5 years 10+ years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels throughout Pend Oreille River Drainage	• F. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • G. Experiment with release strategies to	Immediate	0-5 years 0-5 years

	maximize recruitment to fishery • H. Negotiate hydro-operations and facility improvements		5-10 years
Nutrients			
• Reduce nutrient loading	• I. Identify sources of point and non-point nutrient addition • J. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• K. Determine types, extent, and impacts of all potential contaminants • L. Develop cleanup strategies for pollution sources	Immediate	0-5 years 5-10 years
Competition/Predation			
• Reduce non-native predator densities	• M. Quantify rates of predation/competition by non-native predators • N. Develop fishing regulation changes • O. Experiment with release strategies to maximize recruitment to fishery • P. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 0-5 years 5-10 years
Population Traits			
• Minimize hybridization	• Q. Maximize harvest of hatchery fish • R. Modify stocking strategies to reduce potential genetic interaction • S. Limit non-native species expansion	Immediate	0-5 years 0-5 years 10+ years

Harvest			
• Reduce take on sensitive stocks	• T. Quantify angling impacts on wild stocks • U. Increase enforcement to stop poaching • V. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years
Habitat Access			
• Restore fish passage and habitat connectivity for all life history stages	• W. Identify barriers preventing access to tributaries under different hydro-operations • X. Where appropriate install fish passage at hydropower projects to provide access to tributaries to allow for expression of all life histories • Y. Implement fish passage program where appropriate • Z. Negotiate hydro-operations	Immediate	0-5 years 10+ years 10+ years 5-10 years

C. Pend Oreille Mountain Whitefish (Idaho)

Section 4.5.4C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Pend Oreille	None		NA	NA	NA

Status:

Population	Adult Abundance
Pend Oreille	Unknown

Section 4.5.4C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use; hydropower	Dams, culverts, and other man-made barriers
Habitat quality/quantity	Current land use; hydropower	Forestry, agriculture, residential, and hydro-operations

Section 4.5.4C.3 Strategies and Measures for Pend Oreille Whitefish (Idaho)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Improve passage	• A. Prioritize streams with habitat access problems and implement projects to remove the barrier	Immediate	0-10+ years
Habitat Quality/Quantity			
• Improve the habitat in tributary streams	• B. Prioritize streams where the most benefit for mountain whitefish and other native species can be obtained • C. Conduct stream improvement projects to repair damaged habitat	Immediate	0-10+ years

D. Pend Oreille Mountain Whitefish (Washington)

Section 4.5.4D.1Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Pend Oreille	None		NA	NA	NA

Status:

Population	Adult Abundance
Pend Oreille	Unknown

Section 4.5.4D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality./quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	All introduced species
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem
Harvest	Sport fishing	Overharvest

Section 4.5.4D.3 Strategies and Measures for Pend Oreille Whitefish (Washington)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Identify critical areas for habitat protection, enhancement, and restoration • B. Negotiate hydro-operations	Immediate	0-5 years 5-10 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• C. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • D. Enhance and restore physical in-stream and riparian habitat	Immediate	5-10 years 10+ years

Water Quantity			
• Ensure adequate water for all life stages	• E. Establish minimum in-stream flow rules for tributaries and all life stages • F. Purchase water rights • G. Develop water conservation program, and public outreach and education about water conservation	Immediate	5-10 years 10+ years 0-5 years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels	• H. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • I. Negotiate hydro-operations and facility improvements	Immediate	0-5 years 5-10 years
• Increase dissolved oxygen in lakes	• J. Identify lakes with hypolimnetic anoxia and develop strategies to address dissolved oxygen limitation	Immediate	0-5 years
Nutrients			
• Reduce nutrient loading	• K. Identify sources of point and non-point nutrient addition • L. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 0-5 years
Contaminants			
• Remove point and non-point sources of contaminants	• M. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	5-10 years
Predation/Competition			
• Reduce non-native predator densities	• N. Quantify rates of predation/competition by non-native predators • O. Develop fishing regulation changes • P. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 5-10 years

Harvest			
• Reduce harvest on sensitive stocks	• Q. Quantify angling impacts on wild stocks • R. Develop fishing regulation changes • S. Increase enforcement to prevent poaching • T. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years 0-5 years
Habitat Access			
• Restore fish passage for all life stages to all habitats	• U. Identify critical areas for tributary access/passage protection, enhancement, and restoration • V. Identify barriers preventing access to tributaries under different hydro-operation scenarios, and enhance or restore access as appropriate, identify barriers preventing access to habitat • W. Negotiate hydro-operations • X. Implement fish passage restoration programs where appropriate • Y. Where appropriate, install volitional fish passage facilities at all hydropower projects to provide access to tributaries to allow for expression of all life histories	Immediate	0-5 years 0-5 years 5-10 years 5-10 years 10+ years

E. Pend Oreille Westslope Cutthroat Trout (Idaho)

Section 4.5.4E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or enhance existing populations of westslope cutthroat trout and insure their persistence. Expand indigenous pure strain westslope cutthroat trout populations, once determined, to insure genetic integrity and persistence		Number of local populations	Number of adults	Total number of adults
Pend Oreille			NA	NA	NA

Status:

Population	Annual Harvest
Pend Oreille	166 (2007)

Section 4.5.4E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/Predation	Non-native species	Lake trout and rainbow trout
Habitat access	Hydropower facilities	Cabinet Gorge Dam blocks access to spawning and rearing habitat in the Clark Fork River. Barriers have eliminated cutthroat trout runs in small drainages critical for reproduction
Habitat quality/quantity	Current land use	Development, logging and mining
Population traits	Non-native species	Introgression with rainbow trout

Section 4.5.4E.3 Strategies and Measures for Pend Oreille Westslope Cutthroat Trout (Idaho)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe

Predation			
• Reduce the abundance of lake trout in Lake Pend Oreille	• A. Continue the program of removing lake trout by trap netting and gillnetting • B. Locate concentrations of lake trout by sonic telemetry to improve harvest • C. Maintain liberal regulations for the sport fishery on lake trout (no harvest, no season, and no size limits) • D. Pay anglers to harvest lake trout • E. Monitor the abundance of lake trout to evaluate the removal program through an adaptive management approach and change methodologies as needed • F. Investigate establishing a commercial lake whitefish fishery and increasing by-catch of lake trout as one additional way to suppress lake trout abundance and predation on cutthroat • G. Research the potential for lake level changes to impact lake trout spawning	Immediate	0-10+ years
Habitat Access			
• Identify options for fish passage above Cabinet Gorge Dam	• H. Idaho Fish and Game will work with Montana Fish Wildlife and Parks and Avista Corps to evaluate the benefits and risks of passing fish above Cabinet Gorge Dam. If benefits outweigh the risks, begin passing fish around the dam. The results of these efforts should be monitored to determine their effectiveness	Immediate	0-10+ years
• Identify/correct barriers	• I. Inventory migration barriers on cutthroat spawning streams, and prioritize their importance to improve stream and population connectivity	Immediate	0-10+ years
Habitat Quality/Quantity			

• Address habitat limitations where feasible	• J. Inventory cutthroat habitat throughout the subbasin • K. Develop a prioritized list of habitat improvement projects that gives priority to genetically pure populations and economically feasible solutions to habitat problems • L. Implement habitat projects and evaluate cutthroat population response to habitat improvement efforts	Immediate	0-10+ years
Population Traits			
• Identify pure westslope cutthroat trout populations and implement measures to protect the genetic integrity of remaining pure populations	• M. Conduct a drainage-wide inventory to evaluate the distribution, population status and genetic purity of westslope cutthroat trout populations • N. Implement a program to expand genetically pure populations in cutthroat trout in key spawning tributaries and monitor the effectiveness of these efforts	Immediate	0-10+ years

F. Pend Oreille Westslope Cutthroat Trout (Washington)

Section 4.5.4F.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Harvest Rate (healthy wild stocks)		Number of local populations	Number of adults	Total number of adults
Pend Oreille	0.15 fish/hour		NA	NA	NA
	Harvest Rate (hatchery origin)				
	0.5 fish/hour		NA	NA	NA

Status:

Population	Harvest Rate (wild)	Harvest Rate (hatchery)
Pend Oreille	Unknown	est. 0.1 fish per hours (lakes)

Section 4.5.4F.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	Introduced species
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem
Population traits	Stocking	Hybridization of wild fish with hatchery releases
Harvest	Sport fishing	Overharvest

Section 4.5.4F.3 Strategies and Measures for Pend Oreille Westslope Cutthroat Trout (Washington)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations • B. Quantify impacts of hydro-operations on	Immediate	0-5 years 0-5 years

	primary and secondary production related to retention times (Boundary Reservoir) • C. Identify critical areas for habitat protection, enhancement, and restoration • D. Experiment with release strategies to maximize recruitment to fishery, • E. Negotiate hydro-operations		0-5 years 0-5 years 5-10 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• F. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • G. Enhance and restore physical in-stream and riparian habitat	Immediate	0-5 years 10+ years
Water Quantity			
• Ensure adequate water for all life stages	• H. Establish minimum in-stream flow rules for tributaries and all life stages • I. Purchase water rights • J. Develop water conservation program, and public outreach and education about water conservation	Immediate	0-5 years 5-10 years 0-5 years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels	• K. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • L. Experiment with release strategies to maximize recruitment to fishery • M. Negotiate hydro-operations and facility improvements	Immediate	0-5 years 0-5 years 5-10 years

• Increase dissolved oxygen in lakes	• N. Identify lakes with hypolimnetic anoxia and develop strategies to address dissolved oxygen limitation		0-5 years
Nutrients			
• Reduce nutrient loading	• O. Identify sources of point and non-point nutrient addition • P. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 0-5 years
Contaminants			
• Remove point and non-point sources of contaminants	• Q. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	5-10 years
Competition/Predation			
• Reduce non-native predator densities	• R. Quantify rates of predation/competition by non-native predators • S. Develop fishing regulation changes • T. Experiment with release strategies to maximize recruitment to fishery • U. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 0-5 years 5-10 years
Habitat Access			
• Restore fish passage for all life stages to all habitats	• V. Identify critical areas for tributary access/passage protection, enhancement, and restoration • W. Identify barriers preventing access to tributaries under different hydro-operation scenarios, and enhance or restore access as appropriate • X. Identify barriers preventing access to habitat • Y. Negotiate hydro-operations	Immediate	0-5 years 0-5 years 0-5 years 5-10 years

	• Z. Implement fish passage restoration programs where appropriate • AA. Where appropriate, install volitional fish passage facilities at all hydropower projects to provide access to tributaries to allow for expression of all life histories		10+ years 10+ years
Population Traits			
• Minimize hybridization	• BB. Utilize triploid/sterile hatchery fish for stocking programs • CC. Maximize harvest of hatchery fish • DD. Modify stocking strategies to reduce potential genetic interaction • EE. Limit non-native species expansion • FF. Use marking methods to differentiate hatchery and wild fish for regulation of angler harvest • GG. Develop a breeding program to ensure only pure native stocks used, and establish an active removal/reduction program		0-5 years 0-5 years 0-5 years 5-10 years 0-5 years 0-5 years
Harvest			
• Reduce harvest on sensitive stocks	• HH. Quantify angling impacts on wild stocks • II. Develop fishing regulation changes • JJ. Increase enforcement to prevent poaching • KK. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years 0-5 years

G. Pend Oreille Gerrard Trout (Idaho)

Section 4.5.4G.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Catch Rate		Number of local populations	Number of adults	Total number of adults
Lake Pend Oreille	30 hours/fish		NA	NA	NA
	Annual Harvest				
	3,000 fish > 24 inches and 3% (90) over 20 pounds by 2015		NA	NA	NA

Status:

Population	Catch Rate	Annual Harvest
Lake Pend Oreille	--	3,761 (2007)

Section 4.5.4G.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Non-native species	Lake trout, rainbow trout, and bull trout are collapsing the kokanee forage base, which is forcing fish managers to limit the rainbow trout population and reduce the number of trophy rainbow trout in the sport fishery.
Habitat access	Hydro-operations	Cabinet Gorge Dam and Albeni Falls Dam limit rainbow trout access to tributary streams for spawning and rearing

Section 4.5.4G.3 Strategies and Measures for Pend Oreille Gerrard Trout (Idaho)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			
• Implement a short-term	• A. Reduction efforts include maintaining liberalized	Immediate	0-10+ years

reduction of the rainbow trout population such that age 1-2 kokanee survival is over 50% by 2010. Continue efforts to reduce the predation of kokanee by lake trout to reduce lake trout-rainbow trout competition	fishing regulations for rainbow trout on the lake and in the tributaries. Investigate and implement other means of population control (tributary weiring, redd removal) if a sport fishery is not successful at reducing rainbow trout abundance. • B. Annually estimate the kokanee abundance within Lake Pend Oreille and calculate survival rates, production, and yield from the previous year as well as periodically estimating the abundance of lake trout and rainbow trout to see if efforts to reduce predacious fish are having the desired effect. • C. Once kokanee are recovered, implement management strategies to restore the trophy rainbow trout fishery in Lake Pend Oreille. Strategies may include special rules on harvest, re-stocking with pure strain Gerrard rainbow trout, or other means necessary to meet stated objectives		
Habitat Access			
• The strategy is to not improve spawning habitat for rainbow trout until kokanee recover	• D. Following kokanee recovery, improve connectivity and condition of Gerrard rainbow trout spawning habitat	Immediate	10+ years

H. Pend Oreille Burbot (Washington)

Section 4.5.4H.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Pend Oreille	Unknown		2	Unknown	Unknown

Status:

Population	Adult Abundance
Pend Oreille	Unknown

Section 4.5.4H.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	All introduced species
Harvest	Sport fishing	Overharvest

Section 4.5.4H.3 Strategies and Measures for Pend Oreille Burbot (Washington)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations	Immediate	0-5 years

	• B. Quantify levels of primary, secondary and benthic acroinvertebrate production in near-shore habitats under various hydro-operation scenarios • C. Identify critical areas for habitat protection, enhancement, and restoration • D. Negotiate hydro-operations		0-5 years 0-5 years 0-5 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• E. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • F. Enhance and restore physical in-stream and riparian habitat	Immediate	0-5 years 5-10 years
Water Quality			
• Maintain dissolved oxygen levels	• G. Develop strategies to address potential future dissolved oxygen limitation due to increased development and land use		0-5 years
Nutrients			
• Increase nutrients in Lake Sullivan	• H. Develop a nutrient enhancement program including levels needed, application strategy, monitoring and evaluation, and public outreach and education • I. Quantify impacts of hydro-operations on primary and secondary production related to retention times, negotiate hydro-operations	Immediate	10+ years 0-5 years
• Reduce nutrient loading	• J. Identify sources of point and non-point nutrient addition • K. Develop strategies and programs to reduce	Immediate No reduced nutrient loading to Sullivan	0-5 years 5-10 years

	nutrient additions	lake	
Contaminants			
• Remove point and non-point sources of contaminants	• L. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	5-10 years
Competition/Predation			
• Reduce non-native predator densities	• M. Quantify rates of predation/competition by non-native predators • N. Develop fishing regulation changes • O. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 5-10 years
Harvest			
• Reduce harvest on sensitive stocks	• P. Quantify angling impacts on wild stocks • Q. Develop fishing regulation changes • R. Increase enforcement to prevent poaching • S. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years 0-5 years

I. Pend Oreille Pygmy Whitefish (Washington)

Section 4.5.4I.1Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Pend Oreille	None		NA	NA	NA

Status:

Population	Adult Abundance
Pend Oreille	Unknown

Section 4.5.4I.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	All introduced species

Section 4.5.4I.3 Strategies and Measures for Pend Oreille Pygmy Whitefish (Washington)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations	Immediate	0-5 years
	• B. Quantify levels of primary, secondary and benthic acroinvertebrate production in near-shore habitats under various hydro-operation scenarios		0-5 years
	• C. Identify critical areas for habitat protection, enhancement, and restoration		0-5 years
	• D. Negotiate hydro-operations		0-5 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• E. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat	Immediate	0-5 years
	• F. Enhance and restore physical in-stream and riparian habitat		5-10 years
Water Quality			

• Maintain dissolved oxygen levels in laes	• G. Develop strategies to address potential future dissolved oxygen limitation due to increased development and land use	Immediate	0-5 years
Nutrients			
• Increase nutrients in Lake Sullivan	• H. Develop a nutrient enhancement program including levels needed, application strategy, monitoring and evaluation, and public outreach and education • I. Quantify impacts of hydro-operations on primary and secondary production related to retention times, negotiate hydro-operations	Immediate	10+ years 0-5 years
• Reduce nutrient loading	• J. Identify sources of point and non-point nutrient addition • K. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• L. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	5-10 years
Competition/Predation			
• Reduce non-native predator densities	• M. Quantify rates of predation/competition by non-native predators • N. Develop fishing regulation changes • O. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 5-10 years
Population Traits			
• Reduce incidental impact	• P. Increase public outreach and education	Immediate	0-5 years

Section 4.5.5 Sanpoil Subbasin

A. Sanpoil Rainbow Trout

Section 4.5.5A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Sanpoil	None		NA	NA	NA

Status:

Population	Adult Abundance
Sanpoil	Unknown

Section 4.5.5A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Section 4.5.5A.3 Strategies and Measures for Sanpoil Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			

B. Sanpoil Kokanee

Section 4.5.5B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Catch Rate		Number of local populations	Number of adults	Total number of adults
Sanpoil	1 fish/hour		NA	NA	NA
	Annual Harvest				
	10,000 - 40,000				

Status:

Population	Catch Rate	Annual Harvest

Sanpoil	--	3 (2007)

Section 4.5.5B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Competition/predation	Non-native species	Walleye and smallmouth bass
Hydro-operations	Dams	Water retention time and reservoir level fluctuations
Harvest	Sport fishing	Overharvest

Section 4.5.5B.3 Strategies and Measures for Sanpoil Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Increase available habitat	• A. Develop habitat improvement strategy that identifies specific sites and actions and prioritization of each action • B. Restore fish passage at all major barriers (i.e., dams, dikes, weirs, etc.) and culvert crossing • C. Restore habitat complexity (in-stream and riparian),relocate, obliterate, or reconstruct road segments, restore flow • D. Develop community outreach plan with the primary purpose of educating land owners on land use practices	Immediate	
Competition/Predation			
• Reduce non-native population	• E. Increase removal efficiency by liberalizing bag limits for non-native species (walleye and smallmouth bass)	Immediate	
Hydro-operations			
• Modify hydro-	• F. Maximize water	Immediate	

operations	retention times to increase rearing capacity • G. Maintain higher water elevation		
Harvest			
• Reduce angler harvest	• H. Decrease bag limit from 2 to 0 kokanee/day (natural origin kokanee only) in Lake Roosevelt	Immediate	

Section 4.5.6 Spokane Subbasin

A. Spokane Redband Trout

Section 4.5.6A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Abundance (age 1+)		Number of local populations	Number of adults	Total number of adults
Spokane (Upiver Dam to Stateline)	10,000		NA	NA	Na
	Harvest Rate				
	No hatchery fish in this area. Catch and release only		NA	NA	NA
Monroe Street to Nine Mile Dam (includes all Hangman Creek tributaries)	Abundance				
	NA		NA	NA	NA

Status:

Population	Abundance (age 1+)	Harvest Rate
Spokane (Upiver Dam to Stateline)	1100	N/A
Monroe Street to Nine Mile Dam (includes all Hangman Creek tributaries)	Unknown	NA

Section 4.5.6A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations (does not apply to Hangman Creek)	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	Walleye and smallmouth bass
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem
Harvest	Sport fishing	Overharvest
Population traits	Stocking	Hybridization of wild fish with hatchery releases

Section 4.5.6A.3 Strategies and Measures for Spokane Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations • B. Identify critical areas for habitat protection, enhancement and restoration • C. Experiment with release strategies to maximize recruitment to fishery • D. Negotiate hydropower operations at Post Falls HED to provide optimal	Immediate	5-10 years 0-5 years 10+ years 0-10 years

	discharge for spawning and emergence		
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• E. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • F. Enhance and restore physical in-stream and riparian habitat	Immediate	0-5 years 10+ years
Water Quantity			
• Ensure adequate water for all life stages	• G. Establish minimum in-stream flow rules for tributaries and all life stages • H. Purchase water rights • I. Develop water conservation program, and public outreach and education about water conservation	Immediate	5-10 years 5-10 years 0-5 years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels in the mainstem Spokane River	• J. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • K. Experiment with release strategies to maximize recruitment to fishery • L. Negotiate hydro-operations and facility improvements	Immediate	0-5 years 10+ years 5-10 years
• Implement TMDL	• M. Work with DOE to develop and implement TMDL for temperature, dissolved oxygen, and nutrients	Immediate	0-10 years
Nutrients			
• Reduce nutrient loading	• N. Identify sources of point and non-point nutrient addition • O. Develop strategies and	Immediate	0-5 years 5-10 years

	programs to reduce nutrient additions		
Contaminants			
• Remove point and non-point sources of contaminants	• P. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	10+ years
Competition/Predation			
• Reduce non-native predator densities	• Q. Quantify rates of predation/competition by non-native predators • R. Develop fishing regulation changes • S. Experiment with release strategies to maximize recruitment to fishery • T. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 10+ years 0-5 years
Habitat Access			
• Restore fish passage for all life stages to all habitats	• U. Identify critical areas for tributary access / passage protection, enhancement, and restoration • V. Identify barriers preventing access to tributaries under different hydro-operation scenarios, and enhance or restore access as appropriate • W. Identify barriers preventing access to habitat • X. Negotiate hydro-operations, and implement fish passage restoration programs where appropriate	Immediate	0-5 years 0-5 years 0-5 years 5-10 years
Harvest			
• Reduce harvest on sensitive stocks	• Y. Quantify angling impacts on wild stocks • Z. Develop fishing regulation changes • AA. Increase enforcement to prevent poaching	Immediate	0-5 years 0-5 years 0-5 years

	• BB. Increase public outreach and education		0-5 years
Population Traits			
• Minimize hybridization	• CC. Utilize triploid/sterile hatchery fish for stocking programs • DD. Maximize harvest of hatchery fish • EE. Modify stocking strategies to reduce potential genetic interaction • FF. Limit non-native species expansion, use marking methods to differentiate hatchery and wild fish for regulation of angler harvest	Immediate	0-5 years 0-5 years 0-5 years 0-5
• Maintain wild-type genetic diversity and population structure	• GG. Develop a breeding program that ensures wild-type genetic structure and diversity of the target population are fully represented		5-10 years

B. Spokane Mountain Whitefish

Section 4.5.6B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Spokane and tributaries	None		NA	NA	Na

Status:

Population	Adult Abundance
Spokane and tributaries	Unknown

Section 4.5.6B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	All introduced species
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem
Harvest	Sport fishing	Overharvest

Section 4.5.6B.3 Strategies and Measures for Spokane Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations	Immediate	5-10 years
	• B. Identify critical areas for habitat protection, enhancement and restoration		0-5 years
	• C. Experiment with release strategies to maximize recruitment to fishery		10+ years
	• D. Negotiate hydropower operations at Post Falls HED to provide optimal discharge for spawning and emergence		0-10 years

Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• E. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • F. Enhance and restore physical in-stream and riparian habitat	Immediate	0-5 years 10+ years
Water Quantity			
• Ensure adequate water for all life stages	• G. Establish minimum in-stream flow rules for tributaries and all life stages • H. Purchase water rights • I. Develop water conservation program, and public outreach and education about water conservation	Immediate	5-10 years 5-10 years 0-5 years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels in the mainstem Spokane River	• J. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • K. Experiment with release strategies to maximize recruitment to fishery • L. Negotiate hydro-operations and facility improvements	Immediate	0-5 years 10+ years 5-10 years
• Implement TMDL	• M. Work with DOE to develop and implement TMDL for temperature, dissolved oxygen, and nutrients	Immediate	0-10 years
Nutrients			
• Reduce nutrient loading	• N. Identify sources of point and non-point nutrient addition • O. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years

Contaminants			
• Remove point and non-point sources of contaminants	• P. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	10+ years
Competition/Predation			
• Reduce non-native predator densities	• Q. Quantify rates of predation/competition by non-native predators • R. Develop fishing regulation changes • S. Experiment with release strategies to maximize recruitment to fishery • T. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 10+ years 0-5 years
Habitat Access			
• Restore fish passage for all life stages to all habitats	• U. Identify critical areas for tributary access / passage protection, enhancement, and restoration • V. Identify barriers preventing access to tributaries under different hydro-operation scenarios, and enhance or restore access as appropriate • W. Identify barriers preventing access to habitat • X. Negotiate hydro-operations, and implement fish passage restoration programs where appropriate	Immediate	0-5 years 0-5 years 0-5 years 5-10
Harvest			
• Reduce harvest on sensitive stocks	• Y. Quantify angling impacts on wild stocks • Z. Develop fishing regulation changes • AA. Increase enforcement to prevent poaching • BB. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years 0-5 years

C. Spokane Kokanee

Section 4.5.6C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Harvest Rate (excluding sensitive stocks)		Number of local populations	Number of adults	Total number of adults
Spokane (Chain Lake and Little Spokane River)	0.5 fish/hour		NA	NA	Na

Status:

Population	Harvest Rate
Chain Lake	N/A closed to kokanee harvest
Little Spokane River /Horseshoe Lake	Unknown

Section 4.5.6C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	Walleye and smallmouth bass
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem
Harvest	Sport fishing	Overharvest
Population traits	Stocking	Hybridization of wild fish with hatchery releases

Section 4.5.6C.3 Strategies and Measures for Spokane Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations • B. Identify critical areas for habitat protection, enhancement and restoration • C. Experiment with release strategies to maximize recruitment to fishery	Immediate	5-10 years 0-5 years 0-5 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• D. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • E. Enhance and restore physical in-stream and riparian habitat	Immediate	0-5 years 10+ years
Water Quantity			
• Ensure adequate water for all life stages	• F. Establish minimum in-stream flow rules for tributaries and all life stages • G. Purchase water rights • H. Develop water conservation program, and public outreach and education about water conservation	Immediate	5-10 years 5-10 years 0-5 years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels	• I. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios	Immediate	0-5 years

	• J. Experiment with release strategies to maximize recruitment to fishery • K. Negotiate hydro-operations and facility improvements		0-5 years 5-10 years
• Implement TMDL	• L. Work with DOE to develop and implement TMDL for temperature, dissolved oxygen, and nutrients	Immediate	0-10 years
• Increase dissolved oxygen levels in lakes	• M. Identify lakes with hypolimnetic anoxia and develop strategies to address dissolved oxygen limitation	Immediate	0-5 years
Nutrients			
• Reduce nutrient loading	• N. Identify sources of point and non-point nutrient addition • O. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• P. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	10+ years
Predation/Competition			
• Reduce non-native predator densities	• Q. Quantify rates of predation/competition by non-native predators • R. Develop fishing regulation changes • S. Experiment with release strategies to maximize recruitment to fishery • T. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 0-5 years 0-5 years
Habitat Access			
• Restore fish passage for all life stages to all habitats	• U. Identify critical areas for tributary access / passage protection, enhancement, and restoration	Immediate	0-5 years

	• V. Identify barriers preventing access to tributaries under different hydro-operation scenarios, and enhance or restore access as appropriate • W. Identify barriers preventing access to habitat • X. Negotiate hydro-operations, and implement fish passage restoration programs where appropriate • Y. Implement fish passage restoration programs where appropriate		0-5 years 0-5 years 5-10 years 10+ years
Harvest			
• Reduce harvest on sensitive stocks	• Z. Quantify angling impacts on wild stocks • AA. Develop fishing regulation changes • BB. Increase enforcement to prevent poaching • CC. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years 0-5 years
Population Traits			
• Minimize hybridization	• DD. Modify stocking strategies to reduce potential genetic interaction	Immediate	0-5 years

D. Spokane Largemouth Bass

Section 4.5.6D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Catch Rate		Number of local populations	Number of adults	Total number of adults
Spokane	1 fish/hour		NA	NA	Na

Status:

Population	Catch Rate
Spokane	1 fish / hr.

Section 4.5.6D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Contaminants	Legacy land use	Industry, agriculture, and forestry

Section 4.5.6D.3 Strategies and Measures for Spokane Largemouth Bass

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Quantify levels of primary, secondary, and benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios	Immediate	0-5 years
	• B. Negotiate hydro-operations		0-5 years
Contaminants			
• Remove point and non-point sources of contaminants	• C. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	10+ years

Section 4.6 Mountain Columbia Province

Section 4.6.1 Flathead Subbasin

A. Flathead Bull Trout

Section 4.6.1A.1 Biological Objectives and Status

	Subbasin Plan		Draft Recovery Plan		
Populations (cores)	Number of Adults		Number of local populations	Number of adults	Total number of adults
Flathead & Swan	2500 individuals per population		21 tributary drainages&32 named streams	>100 individuals per population	2500-Flathead&5000-Swan
	Number of Local Populations				
	At Least 5		At least 5 per core	There are 5 in Flathead with >100 annually	There are currently 4 with >100 in Swan annually
	Total Number of Adults				
	≥ 1,000				≥ 1,000

Status:

Population	Number of Adults	Number of Local Populations	Total Number of Adults
Flathead Lake	2500	21	What's the difference between number of adults & total number of adults?
Swan Lake	5000	10	?

Hungry Horse	4875	11	?

Section 4.6.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro Power Operations	Alteration of natural flows/processes; Reservoir drawdown;	Timing, duration, and volume of releases from Hungry Horse; downstream flows and temperatures; Lost in-lake habitat due to Hungry Horse operations; volumetric turnover rates
Competition/Predation	Non-native species	Lake trout predation & competition
Population traits	Non-native species	Hybridization & competition with brook trout; isolation
Habitat quality/quantity	Current land use; loss of habitat associated with construction & inundation of HH Dam	Residential development, forestry, high road density, livestock grazing, floodplain development; loss of over 40% of spawning habitat to the interconnected Flathead System due to the construction of HH Dam; loss of 125.8 km of habitat due to inundation caused by HH Dam

Section 4.6.1A.3 Strategies and Measures for Flathead Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydropower Operation			
• Restore natural hyrologic conditions (ie. flow, timing and duration); operate Hungry Horse Dam to minimize negative impacts	• A. Implement integrated rule curves (IRC's) at Hungry Horse Dam • B. Adopt flood control provisions of the IRC's (VAR-Q) approach	Immediate	5-10 years
• Reduce reservoir operational impacts	• C. Reduce reservoir drawdown and reduce frequency of Hungry Horse refill failure to within five feet of full pool • D. Maintain or exceed recommended instream	Immediate	5-10 years

	flows in the South Fork Flathead River • E. Consider bull trout and westslope cutthroat trout when developing flood control release patterns		
• Increase/Improve in-lake habitat	• F. Revegetate top ten feet of varial zone • G. Place artificial habitat structures where they are likely to benefit native fish	Immediate	5-10 years
• Increase seasonal or in-seasonal reservoir retention time	• H. Work with action agencies to adjust operations to increase retention time by five days relative to past	Immediate	5-10 years
Competition/Predation			
• Reduce the level of competition/ predation by non-native lake trout in Flathead Lake	• I. Conduct public-involved lake trout removal efforts in Flathead Lake • J. Monitor lake trout status and harvest levels in Flathead Lake	Immediate	5-10 years
• Identify status of newly discovered lake trout population in Swan Lake •	• K. Quantify lake trout population size and habitat utilization in Swan Lake • L. Develop and implement strategies to reduce or eliminate lake trout • M. Develop a management direction for bull trout protection in the Swan Drainage	Immediate	5-10 years
• Reduce competition with brook trout	• N. Implement liberal harvest regulations on brook trout • O. Develop/Implement fish stocking policies • P. Suppress/eradicate brook trout where feasible •	Immediate	>10 years

Population Traits			
• Minimize risk of brook trout hybridization in critical bull trout spawning and rearing tributaries	• Q. Assess current status and hybridization in bull trout spawning and rearing tributaries • R. Determine the life history and habitat utilization of the hybrid fish • S. Maintain liberal angling regulations for brook trout • T. Increase educational efforts on proper fish identification • U. Develop and enforce fish stocking policies and private fish pond licensing requirements • V. Suppress/eradicate brook trout where feasible	Immediate	>10 years
Habitat Quality/Quantity			
• Protect and maintain spawning and rearing habitat quality and the connectivity necessary for the migratory life history	• W. Work with willing landowners to provide long-term habitat protection through acquisition or easement • X. Implement stream restoration/enhancement projects where feasible • Y. Fulfill statutory obligations relative to streambed and bank protection • Z. Assure that rural residential development of private lands in alluvial valleys does not negatively impact migratory corridors connecting upstream spawning and rearing areas with the lake and river system • AA. Participate in the evaluation of forestry "best management practices" as stipulated	Immediate	5-10 years

	by the legislature		
• Mitigate for the 125.8 km of habitat inundated by the construction of Hungry Horse Dam	• BB. Acquire and restore the equivalent amount of habitat lost by acquiring fee title and/or conservation easements at fair market value	Immediate	5-10 years
• Mitigate for the loss of over 40% of the spawning habitat blocked by Hungry Horse Dam	• CC. Acquire and restore the equivalent amount of habitat lost by acquiring fee title and/or conservation easements at fair market value	Immediate	5-10 years

B. Flathead Westslope Cutthroat Trout

Section 4.6.1B.1 Biological Objectives and Status

	Subbasin Plan		Draft Recovery Plan		
Populations	Adults per conservation unit		Number of local populations	Number of adults	Total number of adults
Hungry Horse tributaries and Flathead Drainage	500 individuals per population (minimum of 50 in each subpopulation))		NA	NA	NA
	Genetically pure Populations				
	20		NA	NA	NA

Status:

Population	Adult Abundance	Genetic Purity
Hungry Horse Reservoir Tributaries	NA	95%+
Flathead Drainage	NA	80%
Hungry Horse Reservoir Tributaries	NA	95%+

Section 4.6.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Alteration of natural flows/processes; Reservoir drawdown	Timing, duration, and volume of releases from Hungry Horse; downstream flows and temperatures; limnological conditions
Competition/Predation	Non-native species	Lake trout predation; competition with

		rainbow trout and brook trout
Population traits	Non-native species	Hybridization with rainbow trout
Physical habitat quality/quantity	Current land use; loss of habitat associated with construction & inundation of HH Dam	Residential development, forestry, high road density, livestock grazing, floodplain development; loss of over 40% of spawning habitat to the interconnected Flathead System due to the construction of HH Dam; loss of 125.8 km of habitat due to inundation caused by HH Dam

Section 4.6.1B.3 Strategies and Measures for Flathead Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Restore and maintain natural hydrologic conditions (i.e., flow, timing, and duration), and operate the dam to minimize negative impacts	• A. Implement integrated rule curves (IRCs) for operation of Hungry Horse Dam and pursue adoption of the flood control provisions of the IRCs (VAR-Q approach)	Immediate	5-10 years
• Reduce reservoir operational impacts	• B. Reduce reservoir drawdown and reduce frequency of Hungry Horse refill failure to within five feet of full pool • C. Maintain or exceed recommended instream flows in the South Fork Flathead River • D. Consider bull trout and westslope cutthroat trout when developing flood control release patterns	Immediate	5-10 years
• Increase seasonal or in-seasonal reservoir retention time	• E. Work with action agencies to adjust operations to increase retention time by five days relative to past	Immediate	5-10 years
• Increase/Improve in-lake habitat	• F. Revegetate top ten feet of varial zone; improve shoreline habitat in Flathead Lake by implementing Kerr Project FWIS • G. Place artificial habitat structures where they are likely to benefit native fish	Immediate	>10 years
Competition/Predation			

• Reduce the level of predation by non-native lake trout in Flathead Lake and mainstem Flathead River	• H. Conduct public-involved lake trout removal efforts in Flathead Lake • I. Monitor lake trout status and harvest levels in Flathead Lake	Immediate	0-5 years
• Reduce competition with rainbow & brook trout	• J. Implement liberal harvest regulations on rainbow trout and brook • K. Develop/Implement fish stocking policies • L. Suppress/eradicate rainbow trout where feasible • M. Assess current status of competition with brook trout in westslope cutthroat spawning and rearing tributaries. • N. Increase educational efforts on proper fish identification	Immediate	5-10 years
Population Traits			
• Protect existing genetically pure populations of westslope cutthroat trout in the South Fork Drainage	• O. Remove all of the exotic trout from lakes and their associated streams where possible • P. Rely on genetically pure fish stocked in the headwater lakes to repopulate the stream systems and move them towards a genetically pure state • Q. Increase educational and enforcement activities to discourage illegal fish introduction • R. Characterize, conserve and monitor genetic diversity and gene flow among local populations • S. Conduct genetic inventory to understand the genetic baseline and monitor genetic strategies • T. Establish conservation	Immediate	5-10 years

	refuge areas for stronghold species assemblages • U. Incorporate conservation of genetic and behavioral attributes of westslope cutthroat trout into recovery and management plans • V. Manage local populations to maintain long-term viability		

Section 4.6.2 Kootenai Subbasin

A. Kootenai Bull Trout

Section 4.6.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Lake Koocanusa and Kootenai River/Kootenay Lake	>99			>100	
	Number of Local Populations				
	At least 5 each		5 each		
	Total Number of Adults				
	>999				1,000 each
Bull Lake	Number of adults/population				
	>99				
	Number of Local Populations				
	1				

	Total Number of Adults				
	>99				
Sophie Lake	Number of adults/population				
	>99				
	Number of Local Populations				
	1				
	Total Number of Adults				
	>99				

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Lake Koocanusa	6	6	>1,000 Upper Kootenay
Kootenay Lake and River	6	1	<500
Sophie Lake	1	1	Unknown
Bull Lake	1	1	>100

a: Information based on annual redd counts. Estimates of the total number of adults was based on an expansion of annual redd counts by a factor of 1.55 fish per redd (Baxter and Westover 2000) and averaged over the past five years.

Section 4.6.2A.2 Primary Limiting Factors and Threats

Limiting Factor	**General Threat**	**Specific Threats**
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	<u>Physical Threats</u> Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime

		Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Gas super saturation during spill Volumetric turnover rate (Libby reservoir) Biological Threats: Reduced nutrients/system productivity Reduced number of individuals and populations Reduced population stability Entrainment at Libby Dam Reduced recruitment
Non-native species introductions	Demographic stress	Biological Threats: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size
Habitat quality/quantity	Current and past land use practices; loss of habitat associated with inundation habitats from the construction of Libby Dam	Physical Threats: Altered thermograph Channel stability Connectivity Habitat diversity Riparian habitat condition Turbidity, sediment regime Quantity of habitat due to the inundation of 240 km of habitat due to the construction of Libby Dam

Section 4.6.2A.3 Strategies and Measures for Kootenai Bull Trout

Strategy (SBP Obj.)	**Measure**	**Implementation Timeframe**	**Expected Response Timeframe**
Physical Habitat Restoration To improve the altered hydrograph: • Bring Libby Dam operations 50% closer to normative conditions during summer and spring while providing flood control (M1a). • Determine opportunities for hydro operations to	• A. Operate Libby Dam and the downstream hydropower system in ways that restore normative river functions in the lower Kootenai River, including hydrograph cycles that promote and maintain habitat diversity, and floodplain	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

<table>
<tr>
<td>remove delta blockages from tributary streams (M1b, T7b).

• Improve hydrographs to meet QHA-generated high/low flow habitat restoration scores of reference streams (T7a).</td>
<td>connectivity.

• B. Evaluate alternatives for Libby Dam operations to provide more appropriate water temperatures and increased flexibility in flow management, especially during winter and spring.

• C. Develop, evaluate, and implement more normative seasonal flow windows and flow ramping rates.</td>
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<td>To improve the altered thermograph:

• Modify the mainstem thermal regime to be more normative, within current thermal limitations imposed by Libby Dam and Koocanusa Reservoir, to be more within the tolerance range of all life stages of various aquatic and focal fish species (M4a).

• Research, develop, and test new operational strategies for Libby Dam that could expand its role in more effectively providing a more normative downstream thermograph (M4b)

• Protect and revegetate riparian areas to maintain shading and cool water temperatures (T5a).

• Improve the thermograph to a level equivalent to the QHA-generated thermograph scores of reference and Class 1 streams (T5b)</td>
<td>• D. Use models to evaluate responses of habitat and fish populations to alternative dam operating strategies.

• E. Monitor temperatures within the reservoir and downstream sites during flow augmentation and normative flow operations.

• F. Develop multi-year experimental discharge agreements for Libby Dam operations to evaluate the effectiveness of restoring more natural thermographs for natural spawning, development, and recruitment for white sturgeon, burbot, bull trout and other important species and ecological functions.</td>
<td>Immediate (0-5 yrs)</td>
<td>Immediate (0-5 yr)
Medium (5-10 yr)
Long term (10+ yr)</td>
</tr>
<tr>
<td>To improve channel stability:

• Improve channel stability to a level equivalent to the</td>
<td>See details of the 11 associated measures (listed as strategies) on Page 28 of the Management Plan</td>
<td>Immediate (0-5 yrs)</td>
<td>Immediate (0-5 yr)
Medium (5-10 yr)
Long term (10+ yr)</td>
</tr>
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QHA-generated, channel stability habitat-restoration scores of reference streams (M6). • Improve channel stability to a level equivalent to the QHA-generated channel stability scores of reference and Class 1 streams. (T4).	section of the Kootenai River Subbasin Plan.		
To improve connectivity: • Restore, provide, and maintain passage to migratory fish by removing potential man-caused barriers, i.e. impassable culverts, hydraulic headcuts, water diversion blockages, landslides, and impassable deltas (T8).	• G. Identify, monitor, and maintain existing barriers necessary to keep introduced species at bay install new barriers where necessary to prevent invasion of introduced species. • H. Identify barriers or sites of entrainment for focal species, and implement tasks to provide passage and eliminate entrainment. • I. Eliminate entrainment in diversions and provide fish passage around diversions. • J. Install appropriate fish passage structures around diversions and/or remove related migration barriers. • K. Eliminate culvert barriers. Monitor road crossings for blockages to upstream passage and replace existing culverts that impede passage.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To increase habitat diversity: • Improve habitat diversity to levels equivalent to the QHA-generated habitat diversity habitat restoration scores, and habitat diversity conditions based on ecological primary	• L. Periodically alter Kootenai River hydrograph to restore hydraulic energy needed to create increase habitat diversity. • M. Design and implement re-	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

literature and possible references rivers (M5). • Protect habitat diversity in Class 1 streams and reaches (T6a). • Improve habitat diversity to a level equivalent to the QHA-generated habitat diversity scores of reference streams (T6b).	connection of side channel, slough, backwater and, in-river habitats.		
To restore the hydraulic regime: • Reduce reservoir drawdown and reduce the frequency of Koocanusa Reservoir refill failure to within five feet of full pool as compared to previous post-dam operation. (R1)	• N. Work with action agencies to improve reservoir refill probability and reduce maximum drawdown and increase seasonal and in-seasonal reservoir retention time by at least five days relative to past operations during similar water years.		
For habitat protection: • Protect and maintain prime, functioning tributary habitat identified as Class 1 in QHA analysis (T1).	• O. Implement actions necessary to maintain Class 1 status. • P. Periodically evaluate and update habitat condition.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To improve shoreline condition: • Revegetate the varial zone using best available techniques (R2)	• Q. Plan, coordinate, implement cost-effective means of revegetating the river and reservoir varial zones with appropriate techniques, agencies, and organizations.	Immediately (0-5 yr)	Immediately (0-5 yr) Medium term (5-10 yrs) Long Term (10+ yr)
To improve riparian habitat condition: • Improve riparian function and complexity of mainstem riparian habitat to support or contribute to sustainable population levels of focal species that function naturally and may be capable of supporting appropriate forms of human use (M2). • Restore riparian habitats to levels equivalent to the	• R. Develop a consolidated riparian and wetland habitat map for the Kootenai Subbasin. • S. Investigate and analyze historic losses of riparian and wetland habitats in the Kootenai Subbasin. • U. Identify associated losses in biological functions and performance (e.g.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

QHA-generated riparian condition habitat restoration scores of reference streams (T2).	riparian dependent fish, animals, birds). • V. Coordinate efforts with natural resource managers to develop a comprehensive riparian and wetland habitat protection, rehabilitation, and enhancement plan for the Kootenai River mainstem.		
To address turbidity, fine sediments: • Achieve turbidity levels in the mainstem that support sustainable population levels of focal species that function naturally and may be capable of supporting appropriate forms of human use (M3a). • Reduce the delivery of fine sediments in the mainstem to support sustainable population levels of focal species that function naturally and may be capable of supporting appropriate forms of human use (M3b) • Reduce the delivery of fine sediments to a level equivalent to the QHA-generated fine sediment habitat attribute scores of reference streams or reaches (T3).	See details of the 19 associated measures (listed as strategies) on pages 23 and 24, and the 20 associated measures (listed as strategies) on pages 31-32 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To improve reservoir volumetric turnover rate: • Improve reservoir refill probability and reduce maximum drawdown to increase reservoir retention time by at least five days relative to past operations during similar water years (R1).	• W. Work with action agencies to improve reservoir refill probability and reduce maximum drawdown and increase seasonal and in-seasonal reservoir retention time by at least five days relative to past operations during similar water years.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

Bull Trout - Biological Restoration			
To address number of local populations: • Maintain or increase the total number of identified local populations and maintain the broad distribution of local populations across all four existing core areas (BT1).	See details of the 14 associated measures (listed as strategies) on pages 41-42 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To address small population size: • Achieve at least 5 local populations (including British Columbia tributaries) with 100 adults in each of the primary Lake Koocanusa and Kootenai River/Kootenay Lake core areas, with each of these primary core areas containing at least 1,000 adult bull trout (BT2a). • Achieve at least 1 local population of bull trout containing 100 or more adult fish in each of the Bull Lake and Sophie Lake secondary core areas (BT2b).	See details of the 13 measures (listed as strategies) on pages 43-44 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To address population stability: • Achieve an overall bull trout population trend in the Kootenai River Recovery Unit that is accepted, under contemporary standards, to be stable or increasing, based on at least 10 years of monitoring data (BT3).	See details of the 13 associated measures (listed as strategies) on pages 44-45 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To address affects of non-native species introductions: • Suppress and prevent expansion of populations of non-native fish species beyond current levels in Koocanusa Reservoir (BT4a).	• X. Take actions necessary to suppress and prevent expansion of populations of non-native fish species	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

• Support and coordinate with suppression and removal activities for nonnative fish species in British Columbia waters of the Kootenai Subbasin to reduce relative and total abundance of non-native fishes in the Subbasin (BT4b).			
To address the effects of reduced nutrients/ system productivity: • Restore system productivity (BT5)	• Y. Nutrient restoration in Kootenay Lake and Kootenai River • Z. Implement ongoing annual nutrient addition water quality monitoring program • AA. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • BB. Implement annual fish survey.	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding continued nutrient addition after 2009	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/productivity Months to years
• To mitigate for the 240 km of habitat inundated by the construction of Libby Dam	• CC. Acquire and restore the equivalent amount of habitat lost by acquiring fee title and/or conservation easements at fair market value	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
• Address critical uncertainties	• DD. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

B. Kootenai Burbot

Section 4.6.2B.1 Biological Objectives and Status

	Subbasin/Management Plans	Draft Recovery Plan[a]		
Population	Adult Abundance (> 350 mm)	Number of local populations	Number of adults	Total number of adults

Kootenai	9,500	Consistent natural recruitment in at least three different spawning areas with net recruitment and juvenile population size sufficient to support desired adult population size.	Minimum adult number of 2,500 adults in the burbot population of the Kootenai River and South Arm of Kootenay Lake	2,500
	CPUE	NA	NA	NA
	1/24 hr hoop net set	NA	NA	NA

a: Source: KVRI Burbot Committee 2005. Kootenai River/Kootenay Lake Conservation Strategy. Prepared by the Kootenai Tribe of Idaho with assistance from S. P. Cramer and Associates. 77 pp. plus appendices.

Status:

Population	Adult Abundance	CPUE
Lower Kootenai (ID/BC)	47 +/- (2006)[a]	0.002 (2007)
Kootenai River (MT portion)	Unknown	0.01 (2007)
Koocanusa Reservoir	Unknown	0.07 (2005)

a: Source: Pyper et al. 2008

Section 4.6.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	<u>Physical Threats</u> Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby reservoir)

		Biological Threats: Reduced nutrients/system productivity Reduced number of individuals and populations Entrainment at Libby Dam Reduced population stability Reduced recruitment Water quality
Non-native species introductions	Demographic stress	Biological Threats: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size

Section 4.6.2B.3 Strategies and Measures for Kootenai Burbot

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Physical Habitat Restoration			
SAME FOR ALL FOCAL SPECIES (See physical habitat restorations strategies and measures for bull trout above)			
To address altered winter hydro and thermal regime: • Develop and implement an experimental Kootenai River flow/water temperature operation	• A. Document specific temperature and flow requirements • B. Investigate existing hydrological models to evaluate effects of operational alternatives life stages. • C. Evaluate use of selective withdrawal to affect thermograph • D. Develop and implement multi-year plan for experimental operations	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)

Burbot- Biological Restoration			
To improve reduced nutrients/system productivity: • Restore system productivity (BUR1)	• F. Nutrient restoration in Kootenay Lake and Kootenai River • G. Implement ongoing annual nutrient addition water quality monitoring program • H. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • I. Implement annual fish survey.	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding continued nutrient addition after 2009	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/productivity Months to years
To compensate for post-dam community composition shifts: • Rehabilitate mainstem Kootenai River fish community structure and density to better approximate pre-Libby Dam ecological community characteristics (BUR2).	• J. Develop, evaluate, implement, and monitor improvements to hydro operations, physical habitats, and ecological community components to restore ecological and environmental selection pressures to favor native assemblages of fish and wildlife taxa in the mainstem Kootenai River and associated and historical floodplain areas. • K. Restore lower winter water temperatures.	Immediate (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address recruitment failure:		Immediate (0-5 yrs)	Medium (5-10 yr) Long term (10+ yr)

• Achieve consistent natural recruitment in at least three different spawning areas with net recruitment and juvenile population size sufficient to support desired adult population size (BUR3a). • BUR3b. Achieve stable size and age distributions as determined by an upward trend in a 6-year moving average of population abundance (BUR3b).	• L. Restore natural recruitment and/or develop, refine, implement, and evaluate a conservation aquaculture program for burbot.		
To address small population size: • Achieve a minimum number of 2,500 adults in the burbot population (BUR4).	• M. Develop, refine, implement, and evaluate a conservation aquaculture program for burbot.	Immediately Ongoing since early 2000s	Medium (5-10 yr) To Long-term (10+ yr)
To address the effects of contaminants (altered water quality: • Evaluate lethal and sublethal effects of environmental contaminants (including reproductive and behavioral effects) on white sturgeon and burbot (BUR5a) • Seek remedies for contaminant problems if warranted (BUR5b)	See details of the 5 associated measures (listed as strategies) on page 71 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
Address critical uncertainties	• N. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

C. Kootenai Redband Trout

Section 4.6.2C.1 Biological Objectives and Status

	Subbasin/Management Plans	Draft Recovery Plan		
Population	Density	Number of local populations	Number of adults	Total number of adults
Kootenai	150 fish/rkm	NA	NA	NA
	Catch Rate			
	Minimum of 0.5 fish/hour	NA	NA	NA
	Relative Weight			
	95-100	NA	NA	NA
	Genetically Pure Populations			
	2 each with at least 250 fish	NA	NA	NA

Status:

Population	Density	Catch Rate	Relative Weight	Genetically Pure Populations
Kootenai				5

Section 4.6.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	<u>Physical Threats</u> Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby reservoir) <u>Biological Threats:</u>

		Reduced nutrients/system productivity Reduced number of populations Reduced population stability Reduced recruitment
Non-native species introductions	Demographic stress	Biological Threats: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size
Habitat quality/quantity	Current and past land use practices; loss of habitat associated with inundation of habitats from the construction of Libby Dam	Physical Threats: Altered thermograph Channel stability Connectivity Habitat diversity Riparian habitat condition Turbidity, sediment regime Quantity of habitat due to the inundation of 240 km of habitat due to the construction of Libby Dam

Section 4.6.2C.3 Strategies and Measures for Kootenai Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Physical Habitat Restoration			
SAME FOR ALL FOCAL SPECIES (See physical habitat restorations strategies and measures for bull trout above)			
Redband Trout- Biological Restoration			
To address number of local populations: • Maintain and/or increase the total number of genetically pure local populations (RBT1a). • Replicate genetically pure redband stocks for use in restoration actions throughout their historic range (RBT1b).	• A. Protect remaining redband populations by enacting conservation measures in sport angling regulations and fisheries management plans, guidelines, and policies to minimize unintentional mortality of redband trout in Kootenai River tributaries. • B. Evaluate potential effects of introduced fishes on bull trout recovery, westslope cutthroat trout, redband trout, and kokanee conservation and implement tasks to minimize negative effects. • C. Evaluate effects of existing and proposed sport harvest regulations on redband trout. • D. Characterize, conserve, and monitor genetic diversity in isolate populations. • E. Incorporate conservation of genetic and behavioral attributes of redband trout into recovery and management plans. • F. Maintain long-term viability of conservation populations (numbers and lifecycle strategies) and establish wild populations where native stocks have been extirpated.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)

To address small population size: • Achieve a minimum of two genetically pure conservation populations, each containing at least 250 adult redband trout (including British Columbia tributaries). In Kootenai Subbasin redband trout populations that have subpopulations, subpopulations should contain at least 50 adult individuals to improve the probability of subpopulation persistence (RBT2).	• G. Rear genetically pure redband trout in restored natural rearing habitat at the Libby Area Office. • H. Use F1 progeny for restoration projects within their historic range. • I. Evaluate effects of existing and proposed sport harvest regulations on redband trout populations. • J. Maintain long-term viability of conservation populations. • L. Where necessary, isolate pure populations to prevent invasion of nonnative species or genetically introgressed populations • M. Evaluate available over-winter rearing habitat for young redband trout and determine means of improving or optimizing available over winter rearing	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address affects of non-native species introductions: • Suppress and prevent expansion of populations of non-native fish species (RBT3a). • Support and coordinate with suppression and removal activities for nonnative fish species in British Columbia waters of the Kootenai Subbasin to reduce relative and total abundance of non-native fishes in the Subbasin (RBT3b).	• N. Take actions necessary to suppress and prevent expansion of populations of non-native fish species • O. Rehabilitate habitat to favor native species assemblages.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address the effects of reduced nutrients/ system productivity: • Restore system	• P. Nutrient restoration in Kootenay Lake and Kootenai River • Q. Implement ongoing	Immediate, 0-5 yrs. Ongoing 5-year experimental	Nutrient Addition Response timeframe by trophic level: Within years:

productivity	annual nutrient addition water quality monitoring program • R. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • S. Implement annual fish survey.	period (2005-2009) By/during 2009: Recommendation/ decision made regarding continued nutrient addition after 2009	1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community /productivity Months to years
To mitigate for the 240 km of habitat inundated by the construction of Libby Dam	• T. Acquire and restore the equivalent amount of habitat lost by acquiring fee title and/or conservation easements at fair market value	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
Address critical uncertainties	• U. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

D. Kootenai Kokanee

Section 4.6.2D.1 Biological Objectives and Status

	Subbasin/Management Plans	Draft Recovery Plan		
Population	Adult Abundance	Number of local populations	Number of adults	Total number of adults
Kootenai (lower Kootenai River reservoirs and tributaries)	>100 (2020), >250 (2030)	NA	NA	NA

Status:

Population	Adult Abundance
Kootenai (lower Kootenai River reservoirs and tributaries)	200 (Smith Creek), 150 (Long Canyon Creek Creek), 10 (Parker Creek), 325 (Trout Creek), and 2 (Myrtle Creek)

Section 4.6.2D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	Physical Threats Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby reservoir) Biological Threats: Reduced nutrients/system productivity Reduced number of populations Reduced population stability Reduced recruitment
Non-native species introductions	Demographic stress	Biological Threats: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size

Section 4.6.2D.3 Strategies and Measures for Kootenai Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Physical Habitat Restoration			
SAME FOR ALL FOCAL SPECIES (See physical habitat restorations strategies and measures for bull trout above)			
Kokanee: Biological Restoration			
To address the effects of reduced nutrients/ system productivity: • Restore system productivity (KOK1)	• A. Nutrient restoration in Kootenay Lake and Kootenai River • B. Implement ongoing annual nutrient addition water quality monitoring program	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decisi on made regarding	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton

	• C. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • D. Implement annual fish survey.	continued nutrient addition after 2009	accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/productivity Months to years
To address the effects of community composition shifts: • Rehabilitate tributary fish community structure and density to better approximate pre-Libby Dam ecological community characteristics (KOK2).	• E. Develop, evaluate, implement, and monitor improvements to hydro operations, physical habitats, and ecological community components to restore ecological and environmental selection pressures to favor native assemblages of fish & wildlife in the mainstem Kootenai R. and associated historical floodplain areas.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address small population size: • Document greater than 50 adult spawning kokanee in each tributary by 2007. • Document greater than 100 adult spawning kokanee in each tributary by 2020. • Develop a multi-year average of 250 adult spawning kokanee in each tributary by 2030 (KOK3).	• F. Implement a combination of nutrient addition, habitat restoration, and reintroduction efforts.	Immediately (0-5 yr) (Ongoing, success in 2007 returns, highest by orders of magnitude in up to 6 ID streams).	Immediate (0-5 yr) and Medium (5-10 yr)
Address critical uncertainties	G. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

E. Kootenai Westslope Cutthroat Trout

Section 4.6.2E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Genetically Pure Populations		Number of local populations	Number of adults	Total number of adults
Kootenai	5		NA	NA	NA
	Adults/ Subpopulation				
	50		NA	NA	NA
	Adults/ Conservation Population				
	500		NA	NA	NA

Status:

Population	Genetically Pure Populations	Adults/Subpopulation	Adults/Conservation Population
Kootenai	Unknown	Unknown	Unknown

Section 4.6.2E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	Physical Threats Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby reservoir) Biological Threats: Reduced nutrients/system productivity Reduced number of populations Reduced population stability Reduced recruitment

Non-native species introductions	Demographic stress	Biological Threats: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size
Habitat quality/quantity	Current and past land use practices; loss of habitat associated with inundation habitats from the construction of Libby Dam	Physical Threats: Altered thermograph Channel stability Connectivity Habitat diversity Riparian habitat condition Turbidity, sediment regime Quantity of habitat due to the inundation of 240 km of habitat due to the construction of Libby Dam

Section 4.6.2E.3 Strategies and Measures for Kootenai Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Physical Habitat Restoration			
SAME FOR ALL FOCAL SPECIES (See physical habitat restorations strategies and measures for bull trout above)			
Westslope Cutthroat Trout: Biological restoration			
To address number of local populations: • Maintain or increase the total number of genetically pure local populations, and maintain the broad distribution of local populations in existing metapopulations (WCT1).	See details of the 12 associated measures (listed as strategies) on pages 52-53 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address small population size: • Achieve at least five genetically pure conservation populations (including British Columbia tributaries) with 50	See details of the 5 associated measures (listed as strategies) on page 54 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)

adults in each of the subpopulations in Lake Koocanusa, Kootenai River and Kootenay Lake, with each of these conservation populations containing at least 500 adult westslope cutthroat trout (WCT2).			
To address the effects of non-native species introductions: • Suppress and prevent expansion of populations of non-native fish species (WCT3a). • Support and coordinate with suppression and removal activities for nonnative fish species in British Columbia waters of the Kootenai Subbasin to reduce relative and total abundance of non-native fishes in the Subbasin (WCT3b).	See details of the 10 associated measures (listed as strategies) on pages 54-55 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address the effects of reduced nutrients/ system productivity: • Restore system productivity	• A. Nutrient restoration in Kootenay Lake and Kootenai River • B. Implement ongoing annual nutrient addition water quality monitoring program • C. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • D. Implement annual fish survey.	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding continued nutrient addition after 2009	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/productivity Months to years
To mitigate for the 240 km of habitat inundated by the construction of Libby Dam	• E. Acquire and restore the equivalent amount of habitat lost by	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

	acquiring fee title and/or conservation easements at fair market value		
Address critical uncertainties	• F. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

J. Kootenai White Sturgeon

Section 4.6.2F.1 Biological Objectives and Status

	Subbasin/Management Plans	Recovery Plan (1999 USFWS down listing recovery criteria)		
Population	Adult Abundance	Frequency of recruitment	Definition	
Kootenai	7,000			
	Minimum Year-class Recruitment	Achieve natural production of white sturgeon in at least 3 different years of a 10 year period	20 juveniles > Age 1	
	40 Age 1 recruits per 100 adults			

Status:

Population	Adult Abundance	Year-Class Recruitment	Year-class Capture
Kootenai	< 500 +/-	None to insignificant	Insignificant

Section 4.6.2F.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	Physical Threats Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby

		reservoir) Altered water quality Biological Threats: Reduced nutrients/system productivity Reduced number of populations Reduced population stability Reduced recruitment
Non-native species introductions	Demographic stress	Biological Threats: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size

Section 4.6.2F.3 Strategies and Measures for Kootenai White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Physical Habitat Restoration			
SAME FOR ALL FOCAL SPECIES (See physical habitat restorations strategies and measures for bull trout above)			
White sturgeon: Biological Restoration			
To address the effects of reduced nutrients/ system productivity: • Restore system productivity (WST1)	• A. Nutrient restoration in Kootenay Lake and Kootenai River • B. Implement ongoing annual nutrient addition water quality monitoring program • C. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • D. Implement annual fish survey.	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding continued nutrient addition after 2009	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/ productivity Months to years
To address recruitment failure: • Implement	See details of the 27 associated measures (listed as strategies) on pages 730-	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

conservation aquaculture and habitat restoration efforts (WST2)	732 of the Management Plan section of the Kootenai River Subbasin Plan.		
To address small population size: • Achieve an estimated white sturgeon population that is stable or increasing with juveniles reared through a conservation aquaculture program available to be added to the wild population each year for a 10-year period. For this purpose, a year class will be represented by the equivalent of 1,000 one-year old fish from each of 6 to 12 families, i.e. 3 to 6 female parents. Each of these year classes must be large enough to produce 24 to 120 white sturgeon surviving to sexual maturity (WST3a). • Evaluate establishment of experimental non-essential white sturgeon population (WST3b).	• E. Implement conservation aquaculture and habitat restoration efforts See details of the 5 associated measures (listed as strategies) on page 63 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To address the effects of contaminants (altered water quality: • Evaluate lethal and sublethal effects of environmental contaminants (including reproductive and behavioral effects) on white	See details of the 5 associated measures (listed as strategies) on page 64 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

sturgeon and burbot (WST4a) • Seek remedies for contaminant problems if warranted (WST4b)			
• Address critical uncertainties	• F. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

G. Kootenai Mountain Whitefish

Section 4.6.2G.1Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Abundance		Number of local populations	Number of adults	Total number of adults
Kootenai (Hemlock Bar Reach)	14,000 – 16,000		NA	NA	NA
	CPUE				
	850 fish/hour		NA	NA	NA
	BPUE				
	165 kg/hour		NA	NA	NA
	Relative Weight				
	90-95		NA	NA	NA

Status:

Population	Abundance	CPUE	BPUE	Relative Weight
Kootenai River (MT portion RKM 325-328))	5,224 fish per mile (2008)			

Section 4.6.2G.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	Physical Threats Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby reservoir) Biological Threats: Reduced nutrients/system productivity Reduced number of populations Reduced population stability Reduced recruitment
Non-native species introductions	Demographic stress	Biological Threats: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size

Section 4.6.2G.3 Strategies and Measures for Kootenai Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
		Immediate (0-5 yrs)	Medium (5-10 yr) Long term (10+ yr)
To address the effects of reduced nutrients/ system productivity: • Restore system productivity	• A. Nutrient restoration in Kootenay Lake and Kootenai River • B. Implement ongoing annual nutrient addition water quality monitoring program • C. Implement ongoing Biomonitoring Program to	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding continued nutrient addition after 2009	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks

	measure water quality, algal accrual, macroinvertebrate community condition. • D. Implement annual fish survey.		2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/productivity Months to years
• Address critical uncertainties	• E. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

Section 4.7 Blue Mountain Province

Section 4.7.1 Asotin Subbasin

A. Asotin Bull Trout

Section 4.7.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Asotin					
	Number of Local Populations				
	Total Number of Adults				
	700				700

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Asotin	Unknown	Unknown	12 redds in 2006

Section 4.7.1A.2 Primary Limiting Factors and Threats and Status

Limiting Factor	General Threat	Specific Threats
Population traits	Current land use	Population abundance, genetic structure, and general distribution not well understood
Water quantity	Current land use	Agriculture practices and rural development
Water quality	Current Land use	Agriculture and Forestry practices, Roads, rural development
Habitat Access	Current Land use	Culverts, diversions, water quality and quantity
Habitat quality/quantity	Current land use	Agriculture and forestry

		practices, roads, rural development
Nutrients	Current land use and hydro-operations	Lack of salmon carcasses

Section 4.7.1A.3 Strategies and Measures for Asotin Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Identify populations, and assess abundance, distribution, genetic similarities, and populations status/tends	• A. Conduct genetic analyses to map genetic similarities and differences within and among populations • B. Expand redd counts to better assess spawning distribution and relative abundance • C. Expand electrofishing and snorkeling to further define bull trout distribution and relative abundance • D. Complete the Draft Recovery Plan	Immediate	1-5 yrs
Water Quantity			
• Restore stream flows during low flow periods	• E. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners	Immediate	1-15 yrs
	• F. Implement irrigation efficiency projects	Immediate	1-10 yrs
Nutrients			
• Increase nutrients	• G. Increase spring Chinook returns • H. Complete a spring chinook reintroduction plan	Immediate	1-15 yrs
Habitat Access			
• Restore passage at non-natural barriers	• I. Restore stream flows in reaches dewatered for irrigation use • J. Replace irrigation diversion structures with improved structures meeting fish passage standards	Immediate	

	• K. Replace culverts not meeting fish passage guidelines • L. Screen irrigation diversions, maintain passage efficiency through on-going O&M or additional activities, • M. Monitor effectiveness of fish passage improvement projects • N. Implement irrigation efficiency projects • O. Continue to monitor and remove dams and barriers made by recreationists		
Habitat Quality/Quantity			
• Restore degraded habitat	• P. Improve stream flows in reaches partially or completely dewatered for irrigation • Q. Increase sinuosity • R. Restore large wood in the system • S. Protect, or restore riparian zones • T. Restore floodplain function and channel complexity, and increase habitat diversity • U. Increase protective status of priority habitats in landuse regulations	Immediate	
Water Quality	•		
• Reduce water temperatures during summer months	• V. Increase stream flows to decease temperatures • W. Restore priority restoration and protection reach attributes to improve downstream conditions • X. Modify channel and increase floodplain functions • Y. Reduce detrimental land use activities • Z. Lease water rights from	Immediate	

	willing sellers • AA. Implement more efficient irrigation systems, and improve watershed function		
Nutrients			
• Increase nutrients	• BB. Increase spring chinook returns • CC. Outplant hatchery spring chinook carcasses or fish cubes	Immediate	
Harvest			
• Curtail Poaching and fishery impacts	• DD. Continue and enhance WFDW, CTUIR, and USFWS enforcement	Immediate	
Monitoring			
• Monitoring • Populations identification, genetic structure, abundance, movements and general distribution are not well understood Population status and trend information is needed to appropriately set criteria for recovery and to determine recovery status	• EE. Conduct DNA analysis to identify populations and set recovery goals • FF. Continue, and expand, spawning surveys to determine relative spawning abundance and distribution • GG. Expand Electrofishing or snorkeling to determine distribution • HH. Determine habitat conditions and trends • II. Complete the draft recovery plan	Immediate	

Section 4.7.2 Grande Ronde Subbasin

A. Grande Ronde Bull Trout (Oregon)

Section 4.7.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Populations (cores)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Grande	>100 individuals per			>100	

Ronde	population				
	Number of Local Populations				
	8		8		
	Total Number of Adults				
	5,000				5,000
Little Minam	Number of Adults				
	>100 individuals per population			>100	
	Number of Local Populations				
	1		1		
	Total Number of Adults				
	1,000				1,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Grande Ronde			Unknown
Little Minam			Unknown

Section 4.7.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry
Water quantity	Current land use	Agriculture
Water quality	Current land use	Agriculture practices
Habitat access	Current land use	Culverts
Competition	Non-native species	Brook Trout

Section 4.7.2A.3 Strategies and Measures for Grande Ronde Bull Trout (Oregon)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Improve grazing management	• A. Provide infrastructure and develop agreements to address grazing related issues on Catherine and Indian creeks and upper Grande Ronde River	Immediate	1-5 years
Water Quantity			
• Increase summer streamflow	• B. Water conservation or lease (Little Bear, Indian and Catherine creeks)	Immediate	1-5 years
Water Quality			
• Improve grazing management	• C. Protect existing good quality riparian and watershed areas, provide infrastructure and develop agreements to address grazing related issues on Catherine and Indian creeks and the upper Grande Ronde River	Immediate	1-5 years
Habitat Access			
• Improve passage at road crossings	• D. Improve passage conditions on Deer and Sage creeks at USFS Road crossings, and address passage issues in Catherine, Indian and Lookingglass (hatchery) creeks	Immediate	1-5 years
Competition			
• Reduce incidence of brook trout	• E. Focus harvest on brook trout, restrict stocking of brook trout, and manage brook trout introduction at Langdon Lake/Lookingglass Creek	Immediate	1-5 years

B. Grande Ronde Bull Trout (Washington and Oregon (according to WDFW)

Section 4.7.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Populations (cores)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Grande Ronde					
	Number of Local Populations				
	8		8		
	Total Number of Adults				
	5,000				5,000
Little Minam	Number of Adults				
	Number of Local Populations				
	1		1		
	Total Number of Adults				
	1,000				1,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Grande Ronde	unknown	8+	unknown
Little Minam			

Section 4.7.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry
Water quantity	Current land use	Agriculture

Water quality	Current land use	Agriculture practices
Habitat access	Current land use	Culverts
Competition	Non-native species	Brook Trout
Population traits	Current land use	Population density, genetic structure, and general distribution not well understood
Nutrients	Current land use and hydro-operations	Lack of spring Chinook salmon carcasses
Harvest	Sport fishing	Poaching

Section 4.7.2B.3 Strategies and Measures for Grande Ronde Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Identify species distribution, genetic similarities, and status/tends	• A. Conduct genetic analyses to map genetic similarities and differences within and among populations • B. Expand reed counts to better assess spawning distribution and relative abundance • C. Expand electrofishing and snorkeling to further define bull trout distribution and relative abundance • D. Complete the Draft Recovery Plan	Immediate	1-10 yrs
Nutrients			
• Increase nutrients	• E. Increase spring Chinook returns • F. Outplant hatchery chinook carcasses	Immediate	1-25 yrs
Harvest			
• Curtail poaching	• G. Continue and enhance USFS and USFWS enforcement to prevent illegal harvest/harassment of bull trout	Immediate	1-10 yrs
Habitat Access			
• Restore passage at non-natural	• H. Restore stream flows in reaches dewatered for	Immediate	

barriers	irrigation use • I. Replace irrigation diversion structures with improved structures meeting fish passage standards • J. Replace culverts not meeting fish passage guidelines • K. Screen irrigation diversions, maintain passage efficiency through on-going O&M or additional activities, • L. Monitor effectiveness of fish passage improvement projects • M. Implement irrigation efficiency projects • N. Continue to monitor and remove dams and barriers made by recreationists		
Improve passage at road crossings	• O. Improve passage conditions on Deer and Sage creeks at USFS Road crossings, and address passage issues in Catherine, Indian and Lookingglass (hatchery) creeks	Immediate	
Habitat Quality/Quantity			
• Restore degraded habitat	• P. Improve stream flows in reaches partially or completely dewatered for irrigation • Q. Increase sinuosity • R. Restore large wood in the system • S. Protect, or restore riparian zones • T. Restore floodplain function and channel complexity, and increase habitat diversity • U. Increase protective status of priority habitats in land use regulations	Immediate	
Improve grazing management	• V. Provide infrastructure and develop agreements to	Immediate	

	address grazing related issues on Catherine and Indian creeks and upper Grande Ronde River		
Water Quality			
• Reduce water temperatures during summer months	• W. Increase stream flows • X. Restore priority restoration and protection reach attributes to improve downstream conditions • Y. Modify channel and increase floodplain functions • Z. Reduce detrimental land use activities • AA. Lease water rights from willing sellers • BB. Implement more efficient irrigation systems, and improve watershed function	Immediate	
Improve grazing management	• CC. Protect existing good quality riparian and watershed areas, provide infrastructure and develop agreements to address grazing related issues on Catherine and Indian creeks and the upper Grande Ronde River	Immediate	
Water Quantity			
• Restore stream flows during low flow periods	• DD. Implement irrigation efficiency projects • EE. Initiate point of diversion transfers • FF. Evaluate shallow aquifer recharge projects • GG. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners • HH. Water conservation or lease (Little Bear, Indian and Catherine creeks)	Immediate	
Predators			

• Decrease predators and exotic species	• II. Increase stream flows • JJ. Restore priority restoration and protection reach attributes to improve downstream conditions • KK. Modify channel and increase floodplain functions • LL. Reduce detrimental land use activities • MM. Lease water rights from willing sellers • NN. Implement more efficient irrigation systems, and improve watershed function • OO. Decrease water temperatures • PP. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners • QQ. Liberalize fishing regulations on exotic species	Immediate	
Monitoring			
• Monitoring Populations identification, genetic structure, abundance, movements and general distribution are not well understood Population status and trend information is needed to appropriately set criteria for recovery and to determine recovery status	• RR. Conduct DNA analysis to identify populations and set recovery goals • SS. Continue, and expand, spawning surveys to determine relative spawning abundance and distribution • TT. Expand Electrofishing or snorkeling to determine distribution • UU. Determine habitat conditions and trends • VV. Complete the draft recovery plan	Immediate	
Competition			
• Reduce incidence of brook trout	• WW. Focus harvest on brook trout, restrict stocking of brook trout, and manage	Immediate	

	brook trout introduction at Langdon Lake/Lookingglass Creek		

C. Grande Ronde Kokanee

Section 4.7.2C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Catch Rate		Number of local populations	Number of adults	Total number of adults
Wallowa Lake	1 fish/angler/hour		NA	NA	NA

Status:

Population	Catch Rate
Wallowa Lake	Unknown

Section 4.7.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Current land use	residential, commercial, and recreational development	Along the Wallowa River above the lake and the lake shoreline
Habitat quality/quantity	Current land use	Bedload accumulation and movement associated with recent landslide is reducing channel capacity and causing instability in the Wallowa River above the lake.
Competition/predation	Non-native species	Mysid shrimp

Section 4.7.2C.3 Strategies and Measures for Wallowa Lake Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Current land-use			
• Enforce land use regulations and ordinances	• A. Work with County, State, and Federal regulators to assure that existing regulations are applied in a way that reduces potential for	Immediate	1-5 years

	impact to aquatic resources in the river and lake		
Habitat Quality/Quantity			
• Develop a comprehensive approach to address channel conditions in the river above the lake	• B. Recruit a fluvial geomorphologist to design and implement a project to address channel and bedload problems in the Wallowa River above Wallowa Lake	Immediate	1-5 years
Competition/Predation			
• Evaluate effects of non-native species	• C. Conduct annual monitoring of Mysid population in Wallowa Lake • D. Monitor abundance and species composition of zooplankton and conduct investigations of trophic dynamics in Wallowa Lake • E. Determine lake trout population dynamics, size and age structure, and kokanee consumption rates as part of investigation of Wallowa Lake trophic dynamics, • F. Modify angling regulations, if necessary, to achieve management objectives for kokanee and lake trout	Immediate	1-5 years

D. Grande Ronde Redband Trout

Section 4.7.2D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Grande Ronde	None		NA	NA	NA

Status:

Population	Adult Abundance
Grande Ronde	Unknown

Section 4.7.2D.2 Primary Limiting Factors and Threats:

Section 4.7.2D.3 Strategies and Measures for Grande Ronde Redband Trout

Note: Limiting factors, Threats and Measures for redband trout are the same as those for steelhead in the Grande Ronde.

Section 4.7.3 Imnaha Subbasin

A. Imnaha Bull Trout

Section 4.7.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Imnaha	--			--	
	Number of Local Populations		--		
	--				
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Imnaha			Unknown

Section 4.7.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture practices
Water quantity	Current land use	Agriculture practices

Section 4.7.3A.3 Strategies and Measures for Imnaha Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protection/ Restoration	• A. Improve grazing management (Big Sheep/ Little Sheep system) • B. Restore channel complexity (Big Sheep system)	Immediate	1-5 years
Water Quantity			
• Increase summer streamflow	• C. Implement water conservation and water lease/purchases	Immediate	1-5 years

B. Imnaha Redband Trout

Section 4.7.3B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Imnaha	Maintain population distribution and abundance		NA	NA	NA

Status:

Population	Adult Abundance
Imnaha	Adequate

Section 4.7.3B.2 Primary Limiting Factors and Threats

Section 4.7.3B.3 Strategies and Measures for Imnaha Redband Trout

Strategy and Measures: Same as Imnaha summer steelhead

Section 4.7.4 Snake Hells Canyon Subbasin

A. Snake Hells Canyon Bull Trout

Section 4.7.4A.1Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Snake Hells Canyon	--			--	
	Number of Local Populations				
	17		17		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of adults/populations	Number of Local Populations	Total Number of Adults
Snake Hells Canyon			

Section 4.7.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Section 4.7.4A.3 Strategies and Measures for Snake Hells Canyon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity – hydrograph			
• Restore connectivity, food base, and nutrients to historic levels.	• A. Provide funding for on-the-ground actions to restore habitat connectivity. Provide funding to determine the feasibility of using nutrients to improve food base.	Immediate	0-10+ years

Physical habitat quality/quantity			
• Increase fish productivity and production, as well as life stage specific survival, through in-subbasin habitat improvement and protection.	• B. Provide funding for on-the-ground actions to restore habitat quality.	Immediate	0-10+ years
Water quality			
• Improve water quality and quantity	• C. Provide funding for on-the-ground actions to improve riparian conditions, improve stream flow and improve water quality.	Immediate	0-10+ years

B. Snake Hells Canyon Redband Trout (Oregon)

Section 4.7.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Snake Hells Canyon	Maintain population distribution and abundance		NA	NA	NA

Status:

Population	Adult Abundance
Snake Hells Canyon	Adequate

Section 4.7.4B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Same as Hells Canyon Snake summer steelhead	Same as Hells Canyon Snake summer steelhead	Same as Hells Canyon Snake summer steelhead

Section 4.7.4B.3 Strategies and Measures for Snake Hells Canyon Redband Trout (Oregon)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Same as Hells Canyon Snake summer steelhead	Same as Hells Canyon Snake summer steelhead	Immediate	1-5 years

C. Snake Hells Canyon Redband Trout (Idaho)

Section 4.7.4C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)			Number of local populations	Number of adults	Total number of adults
Snake Hells Canyon			NA	NA	NA

Status:

Population	Adult Abundance
Snake Hells Canyon	

Section 4.7.4C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Section 4.7.4C.3 Strategies and Measures for Snake Hells Canyon Redband Trout (Idaho)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity – hydrograph			
• Restore upstream and downstream connectivity.	• Provide funding for on-the-ground actions to restore habitat connectivity.	Immediate	0-10year

Physical habitat quality/quantity			
• Increase fish productivity and production, as well as life stage specific survival, through in-subbasin habitat improvement and protection.	• B. Provide for on-the-ground actions to restore habitat quality.	Immediate	0-10 years
Water quality			
• Improve water quality and quantity.	• C. Provide funding for on-the-ground actions to improve riparian conditions, improve stream flow and improve water quality.	Immediate	0-10 years

D. Snake Hells Canyon White Sturgeon

Section 4.7.4D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Snake Hells Canyon			NA	NA	NA

Status:

Population	Adult Abundance
Snake Hells Canyon	

Section 4.7.4D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Section 4.7.4D.3 Strategies and Measures for Snake Hells Canyon White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity – hydrograph			

• Improve flow regimes to provide adequate flows for spawning and proper conditions for eggs and juveniles, connectivity, and food base.	• A. Provide funding to restore habitat connectivity as well as to determine the feasibility of using nutrients to improve the food base.	Immediate	0-10 years
Water quality			
• Reduce sediment and nutrient delivery from irrigation return flows, aquaculture operations, and municipal discharge.	• B. Provide funding to identify sources of sedimentation and actions to mitigate. Work with appropriate agencies and land owners to develop a strategy for reducing sedimentation.	Immediate	0-10 years
Physical habitat quality/quantity			
• Restore and manage demographic and genetic interchange among white sturgeon populations.	• C. Provide funding to determine the need to develop volitional passage facilities or the need for a periodic trap and transplant program to maintain population structure.	Immediate	0-10 years
Population traits			
• Increase abundance and size structure where necessary to maintain angling opportunity and promote natural spawning.	• D. Provide funding to determine the contribution of hatchery-reared fish and translocated wild fish to spawning populations. Maintain no-harvest angling regulations.	Immediate	0-10 years
Fishing			
• Quantify catch-and-release hooking mortality, illegal harvest, as well as direct tribal harvest levels.	E. Provide funding to determine the magnitude of loss associated with catch-and-release fishing. Provide funding to examine alternate sport gear types (hooks). Provide funding to collaborate with Washington and Oregon enforcement agencies and the Nez Perce Tribe to quantify levels of tribal harvest. Provide funding to determine the magnitude of loss associated with illegal sturgeon harvest.	Immediate	0-10 years

E. Snake Hells Canyon Smallmouth Bass

Section 4.7.4E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number

					of adults
Snake Hells Canyon			NA	NA	NA

Status:

Population	Adult Abundance
Snake Hells Canyon	

Section 4.7.4E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Section 4.7.4E.3 Strategies and Measures for Snake Hells Smallmouth Bass

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity – hydrograph			
• Quantify smallmouth predation on rainbow trout.	• A. Provide funding to assess smallmouth bass population status and distribution as well as to determine the level of predation on rainbow trout.	Immediate	0-10+

Section 4.8 Mountain Snake Province

Section 4.8.1 Clearwater Subbasin (North Fork Clearwater River)

A. Clearwater Bull Trout

Section 4.8.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
North Fork Clearwater River	--			--	
	Number of Local Populations				
	11 (2 potential)		11 (2 potential)		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of Adults	Number of Local Populations	Total Number of Adults (redds) Fluivial fish (2007)
Lund Creek	--	--	30
Little Lost Creek	--	--	31
Lost Lake Creek	--	--	13
Lund Lake to Lost Lake Creek	--	--	21
Lost Lake Creek to Headwaters	--	--	8
Buck Creek	--	--	--
Canyon Creek	--	--	--

Population	Number of Adults	Number of Local Populations	Total Number of Adults (redds) Fluivial fish (2007)
Butte Creek	--	--	--
Rutledge Creek	--	--	--
Rocky Run Creek	--	--	6
1268 Bridge to Lund Creek	--	--	20
301 Bridge to 760 Bridge	--	--	--
Bostonia Creek	--	--	26
Boundary Creek	--	--	--
Goose Creek	--	--	1
Isabella Creek	--	--	1
Lake Creek	--	--	3
Long Creek	--	--	6
Moose Creek	--	--	0
Niagra Gulch	--	--	2
Placer Creek	--	--	2
Quartz Creek	--	--	0
Skull Creek	--	--	4
Swamp Creek	--	--	1
Vanderbilt Gulch	--	--	39
Orogrande Creek	--	--	--
Slate Creek	--	--	--
Floodwater Creek	--	--	--
Glover Creek	--	--	--
Stony Creek	--	--	--

Section 4.8.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Agriculture and forestry practices destructed floodplain, riparian and in-stream habitat, reduced recruitment of large woody debris, and led to excess sedimentation
Population traits	Introduced species	Hybridization with brook trout
Competition	Introduced species	Competition with brook trout for available resources
Water quality	Land use	High summer water temperatures due to agriculture and forestry practices
Water quantity	Hydro-operations	Operation of Dworshak Dam results in loss of connectivity
Harvest	Illegal harvest	Illegal harvest of bull trout
Habitat access	Land use	Loss of habitat access

Section 4.8.1A.3 Strategies and Measures for Clearwater Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning, and historic mine cleanup • B. Work with grazing unit permit holders and the USFS to retire grazing permits in key tributaries within the Middle Fork • C. Work with the USFS, other state and federal agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat.	Immediate	0-10+ years

Population traits			
• Reduce impacts from introduced species	• D. Develop informational programs to educate anglers and the public to risks of introductions of exotic species • E. Develop methods to remove exotic populations • F. Determine levels of hybridization and distribution of exotic species • G. Set liberal regulations on brook trout to reduce their numbers and limit their spread	Immediate	0-10+ years
Competition			
• Reduce impacts of competition with invasive species	• H. Develop methods to remove exotic populations and to determine levels of hybridization and distribution of exotic species	Immediate	0-10+ years
Water quality			
• Improve water quality	• I. Improve riparian cover and land use practices to reduce water temperatures • J. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • K. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups	Immediate	0-10+ years
Water quantity			
• Restore connectivity, food base, and nutrients to historic levels	• L. Restore connectivity and develop fish passage • M. Determine the feasibility of using nutrients to improve the food base	Immediate	0-10+ years
Harvest			
• Reduce illegal harvest	• N. Install easy to read road side signs that will inform anglers of the fishing regulations	Immediate	0-10+ years

	• O. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem • P. Simplify the fishing regulations		
Habitat access			
• Improve habitat access	• Q. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

B. Clearwater Westslope Cutthroat Trout

Section 4.8.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain populations at stable or increasing numbers		Number of local populations	Number of adults	Total number of adults
Clearwater			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
North Fork Clearwater	NA
Isabella Creek	0.83
Skull Creek	1.34

Section 4.8.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Agriculture and forestry practices destructed floodplain, riparian and in-stream habitat, reduced recruitment of large woody debris, and led to excess sedimentation
Population traits	Introduced species	Hybridization with hatchery rainbow trout

Competition	Introduced species	Competion with rainbow trout for available resources
Water quality	Land use	High summer water temperatures due to agriculture and forestry practices
Water quantity	Hydro-operations	Operation of Dworshak Dam results in loss of connectivity
Habitat access	Land use	Loss of habitat access

Section 4.8.1B.3 Strategies and Measures for Clearwater Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Address legacy sedimentation issues, such as road obliteration/ decommissioning • B. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decision, and to improve/restore habitat • C. Incorporate evaluations of existing habitat in survey projects whenever possible	Immediate	0-10+ years
Population traits			
• Reduce impacts from introduced species	• D. Develop methods to remove exotic species • E. Determine the distribution of exotic species • F. Emphasize use of Westslope cutthroat trout for stocking mountain lakes in the Clearwater River drainage	Immediate	0-10+ years

Competition			
• Reduce impacts of competition with invasive species	• G. Develop methods to remove exotic species • H. Determine the distribution of exotic species	Immediate	0-10+ years
Water quality			
• Improve water quality	• I. Improve riparian cover and land use practices to reduce water temperatures • J. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • K. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups	Immediate	0-10+ years
Water quantity			
• Reconnect population to main-stem Clearwater River to restore access to overwinter habitat, and allow mixing with other populations	• L. Restore connectivity and develop fish passage	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• M. Remove or modify culverts which have been identified as fish barriers.	Immediate	0-10+ years

C. Clearwater Kokanee

Section 4.8.1C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Density		Number of local populations	Number of adults	Total number of adults
Dworshak Reservoir	30-50 fish/hectare		NA	NA	NA
	Catch Rate (10 inch minimum)				
	0.7 fish/hour		NA	NA	NA

Status:

Population	Adult Density (fish/ha)	Catch Rate
Dworshak Reservoir	21 (2005)	--

Section 4.8.1C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Nutrients	Hydro-operations	Lack of salmon carcasses. Low nutrients and nutrient imbalance limit the growth of kokanee and the recruitment of kokanee into the fishery.
Predation	Non-native species	Smallmouth bass
Habitat quality/quantity	Hydro-operations	During years of high discharge, entrainment losses of kokanee into Dworshak Dam reduce the kokanee population

Section 4.8.1C.3 Strategies and Measures for Clearwater Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Nutrients			
• Improve water quality and increase zooplankton production	• A. Enhance the nutrients in Dworshak Reservoir. Supplement and balance annual levels of base nutrients (nitrogen and phosphorus) • B. Water quality will be monitored so that the proper balance of nutrients can be maintained • C. Examine kokanee abundance, growth, and survival rates in an effort to evaluate the nutrient enhancement program	Immediate	0-10+ years
Predation			
• Assess potential impacts of smallmouth bass on kokanee and define the magnitude of the problem	• D. Document smallmouth bass food habits and a bioenergetic evaluation of the amount of gamefish that are eaten annually • E. Perform annual kokanee monitoring studies that determine the survival rate of kokanee to determine if it is below normal	Immediate	0-10+ years
Habitat quality/quantity			
• Modify hydro-operations and facilities	• F. Install strobe lights near the spillway and penstock intakes to Dworshak Dam to prevent kokanee entrainment • G. Work shall be a cooperative effort between BPA, Idaho Fish and Game, the Army Corps of Engineers, and the Nez Perce Tribe • H. Selectively withdraw water from the reservoir at depths to avoid kokanee, while providing the appropriate temperature water for the river and hatcheries downstream • I. Identify the depth of	Immediate	0-10+ years

	kokanee during the day and at night, throughout the year, and determine a profile of water temperatures. The Corps of Engineers will then use this information to decide if water can be withdrawn at depths where kokanee entrainment would be minimized		

D. Clearwater Redband

Section 4.8.1D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
North Fork Clearwater			NA	NA	NA

Status:

Population	Adult Density Estimate (fish/100m^2)
North Fork Clearwater	NA
Isabella Creek	5.32
Skull Creek	0.80

Section 4.8.1D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Agriculture and forestry practices destructed floodplain, riparian and in-stream habitat, reduced recruitment of large woody debris, and led to excess sedimentation
Population traits	Introduced species	Introgression with hatchery rainbow trout
Water quality	Land use	High summer water temperatures due to agriculture

		and forestry practices
Water quantity	Hydro-operations	Operation of Dworshak Dam results in loss of connectivity
Habitat access	Land use	Loss of habitat access

Section 4.8.1D.3 Strategies and Measures for Clearwater Redband

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Provide funding to address legacy sedimentation issues, such as road obliteration/ decommissioning • B. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decision, and to improve/restore habitat • C. Incorporate evaluations of existing habitat in survey projects whenever possible	Immediate	0-10+ years
Population traits			
• Reduce impacts from introduced species	• D. Develop methods to remove exotic species • E. Determine the distribution of exotic species	Immediate	0-10+ years
Water quality			
• Improve water quality	• F. Improve riparian cover and land use practices to reduce water temperatures • G. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources. • H. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's	Immediate	0-10+ years

	groups		
Water quantity			
• Reconnect population to main-stem Clearwater River to restore access to over-winter habitat, allow mixing with other populations, and restore nutrient levels	• I. Restore connectivity and develop fish passage • J. Determine the feasibility of using nutrients to improve the food base	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• K. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

E. Clearwater Mountain Whitefish

Section 4.8.1E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
North Fork Clearwater			NA	NA	NA

Status:

Population	Adult Density Estimate (fish/100m^2)
North Fork Clearwater	NA
Isabella Creek	0.83
Skull Creek	1.47

Section 4.8.1E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Agriculture and forestry practices destructed floodplain, riparian and in-stream habitat, reduced recruitment of large woody debris, and led to excess sedimentation
Water quality	Land use	High summer water temperatures due to agriculture and forestry practices
Water quantity	Hydro-operations	Operation of Dworshak Dam results in loss of connectivity
Habitat access	Land use	Loss of habitat access due to culverts

Section 4.8.1E.3 Strategies and Measures for Clearwater Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Address legacy sedimentation issues, such as road obliteration/ decommissioning • B. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decision, and to improve/restore habitat • C. Incorporate evaluations of existing habitat in survey projects whenever possible	Immediate	0-10+ years
Water quality			
• Improve water quality	• D. Improve riparian cover and land use practices to reduce water temperatures • E. Secure conservation easements in riparian and	Immediate	0-10+ years

	floodplain areas to protect vegetation and protect coldwater spring sources • F. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups		
Water quantity			
• Reconnect population to main-stem Clearwater River to restore access to overwinter habitat, and allow mixing with other populations	• G. Restore connectivity and develop fish passage	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• H. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

Section 4.8.1 Clearwater Subbasin (Selway River)

F. Clearwater Bull Trout

Section 4.8.1F.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Selway River	--			--	
	Number of Local Populations				
	10 (4 potential)		10 (4 potential)		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of Adults	Number of Local Populations	Density Estimate (fish/100m^2) (2007)
Upper Selway River	--	--	0.10
White Cap Creek	--	--	0.00
Moose Creek Drainage	--	--	0.00
Little Clearwater	--	--	0.28

Section 4.8.1F.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Introduced species	Hybridization with brook trout
Nutrients	Legacy effcets	Loss of native forage due to decline of anadromous fish populations
Competition	Introduced species	Competition with brook trout for available resources
Harvest	Illegal harvest	Illegal harvest of bull trout
Habitat access	Land use	Loss of habitat access

Section 4.8.1F.3 Strategies and Measures for Clearwater Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population traits			
• Reduce impacts from introduced species	• A. Develop informational programs to educate anglers and the public to risks of introductions of exotic species • B. Develop methods to remove exotic populations • C. Determine levels of hybridization and distribution of exotic species • D. Set liberal regulations on brook trout to reduce their numbers and limit their spread	Immediate	0-10+ years

Nutrients			
• Increase abundance of native forage	• E. Determine the feasibility of using nutrients to improve the food base		
Competition			
• Reduce impacts of competition with invasive species	• F. Develop methods to remove exotic populations and to determine levels of hybridization and distribution of exotic species	Immediate	0-10+ years
Harvest			
• Reduce illegal harvest	• G. Install easy to read road side signs that will inform anglers of the fishing regulations • H. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem • I. Simplify the fishing regulations	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• J. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

G. Clearwater Westslope Cutthroat Trout

Section 4.8.1G.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain populations at stable or increasing numbers		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	0.33
White Cap Creek	0.46
Moose Creek Drainage	0.70
Little Clearwater	0.41

Section 4.8.1G.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Introduced species	Hybridization with hatchery rainbow trout
Competition	Introduced species	Competition with rainbow trout for available resources
Habitat access	Land use	Loss of habitat access

Section 4.8.1G.3 Strategies and Measures for Clearwater Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population traits			
• Reduce impacts from introduced species	• A. Develop methods to remove exotic species • B. Determine the distribution of exotic species • C. Emphasize use of Westslope cutthroat trout for stocking mountain lakes in the Clearwater River drainage	Immediate	0-10+ years
Competition			
• Reduce impacts of competition with invasive species	• D. Develop methods to remove exotic species • E. Determine the distribution of exotic species	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• F. Remove or modify culverts which have been identified as fish barriers.	Immediate	0-10+ years

H. Clearwater Redband

Section 4.8.1H.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	1.01
White Cap Creek	0.61
Moose Creek Drainage	1.58
Little Clearwater	1.40

Section 4.8.1H.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Introduced species	Introgression with hatchery rainbow trout

Section 4.8.1H.3 Strategies and Measures for Clearwater Redband

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population traits			
• Reduce impacts from introduced species	• A. Develop informational programs to educate anglers and the public to risks of introductions of exotic species • B. Develop methods to remove exotic populations • C. Provide funding to	Immediate	0-10+ years

	determine levels of hybridization and distribution of exotic species		

I. Clearwater Mountain Whitefish

Section 4.8.1I.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	0.29
White Cap Creek	0.00
Moose Creek Drainage	0.00
Little Clearwater	0.84

Section 4.8.1I.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Land use	Loss of habitat access due to culverts

Section 4.8.1I.3 Strategies and Measures for Clearwater Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat access			
• Improve habitat access	• A. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

J. Clearwater Westslope Cutthroat Trout

Section 4.8.1J.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain populations at stable or increasing numbers		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	0.33
White Cap Creek	0.46
Moose Creek Drainage	0.70
Little Clearwater	0.41

Section 4.8.1J.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Introduced species	Hybridization with hatchery rainbow trout
Competition	Introduced species	Competion with rainbow trout for available resources
Habitat access	Land use	Loss of habitat access

Section 4.8.1J.3 Strategies and Measures for Clearwater Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population traits			
• Reduce impacts from introduced species	• A. Develop methods to remove exotic species • B. Determine the distribution of exotic species • C. Emphasize use of Westslope cutthroat trout for stocking mountain lakes in	Immediate	0-10+ years

	the Clearwater River drainage		
Competition			
• Reduce impacts of competition with invasive species	• D. Develop methods to remove exotic species • E. Determine the distribution of exotic species	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• F. Remove or modify culverts which have been identified as fish barriers.	Immediate	0-10+ years

K. Clearwater Redband

Section 4.8.1K.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	1.01
White Cap River	0.61
Moose Creek Drainage	1.58
Little Clearwater	1.40

Section 4.8.1K.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Introduced species	Introgression with hatchery rainbow trout

Section 4.8.1K.3 Strategies and Measures for Clearwater Redband

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population traits			
• Reduce impacts from introduced species	• A. Develop informational programs to educate anglers and the public to risks of introductions of exotic species • B. Develop method to remove exotic populations • C. Determine levels of hybridization and distribution of exotic species	Immediate	0-10+ years

L. Clearwater Mountain Whitefish

Section 4.8.1L.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	0.29
White Cap Creek	0.00
Moose Creek Drainage	0.00
Little Clearwater	0.84

Section 4.8.1L.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Land use	Loss of habitat access due to culverts

Section 4.8.1L.3 Strategies and Measures for Clearwater Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat access			
• Improve habitat access	• A. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

Section 4.8.1 Clearwater Subbasin (Potlatch River)

M. Clearwater Redband

Section 4.8.1M.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Potlatch River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Potlatch Drainage	1.60

Section 4.8.1M.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices
Water quality	Legacy effects	Increased water temperatures and altered hydrograph due to agriculture and forestry practices
Habitat access	Land use	Loss of habitat access due to culverts

Section 4.8.1M.3 Strategies and Measures for Clearwater Redband

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Restore riparian habitat and function, and reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Address legacy sedimentation issues, such as road obliteration/ decommissioning • B. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decision, and to improve/restore habitat • C. Incorporate evaluations of existing habitat in survey projects whenever possible	Immediate	0-10+ years
Water quality			
• Improve water quality, and restore natural hydrograph	• D. Improve riparian cover and land use practices to reduce water temperatures • E. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • F. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• G. Provide funding to remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

Section 4.8.1 Clearwater Subbasin (South Fork Clearwater River)

N. Clearwater Bull Trout

Section 4.8.1N.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
South Fork Clearwater River	--			--	
	Number of Local Populations				
	5 (2 potential)		5 (2 potential)		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of Adults	Number of Local Populations	Density Estimate (fish/100m^2) 2007
American River	--	--	0.06
Crooked River	--	--	0.07
Red River	--	--	0.00
West Fork Crooked River	--	--	0.21

Section 4.8.1N.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices
Population traits	Introduced species	Hybridization with brook trout
Water quality	Legacy effects	High summer water temperatures and low flows due to past agriculture and forestry practices
Competition	Introduced species	Competition with brook trout for available resources
Harvest	Illegal harvest	Illegal harvest of bull trout
Habitat access	Land use	Loss of habitat access

Section 4.8.1N.3 Strategies and Measures for Clearwater Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning, and historic mine cleanup • B. Work with grazing unit permit holders and the USFS to retire grazing permits in key tributaries within the Middle Fork • C. Work with the USFS, other state and federal agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat		

Population traits			
• Reduce impacts from introduced species	• D. Develop informational programs to educate anglers and the public to risks of introductions of exotic species • E. Develop methods to remove exotic populations • F. Determine levels of hybridization and distribution of exotic species • G. Set liberal regulations on brook trout to reduce their numbers and limit their spread	Immediate	0-10+ years
Water quality			
• Improve water quality	• H. Improve riparian cover and land use practices to reduce water temperatures • I. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • J. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups.		
Competition			
• Reduce impacts of competition with invasive species	• K. Develop methods to remove exotic populations and to determine levels of hybridization and distribution of exotic species	Immediate	0-10+ years
Harvest			
• Reduce illegal harvest	• L. Install easy to read road side signs that will inform anglers of the fishing regulations • M. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem • N. Simplify the fishing regulations	Immediate	0-10+ years

Habitat access			
• Improve habitat access	• O. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

O. Clearwater Redband

Section 4.8.1O.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
South Fork Clearwater River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
American River	1.53
Crooked River	3.58
Red River	1.38
West Fork Crooked River	0.00

Section 4.8.1O.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices
Water quality	Legacy effects	High summer water temperatures and low flows due to past agriculture and forestry practices
Habitat access	Land use	Loss of habitat access

Section 4.8.1O.3 Strategies and Measures for Clearwater Redband

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning, and historic mine cleanup • B. Work with grazing unit permit holders and the USFS to retire grazing permits in key tributaries within the Middle Fork • C. Work with the USFS, other state and federal agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat	Immediate	0-10+ years
Water quality			
• Improve water quality	• D. Improve riparian cover and land use practices to reduce water temperatures • E. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • F. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• G. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

P. Clearwater Westslope Cutthroat Trout

Section 4.8.1P.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain populations at stable or increasing numbers		Number of local populations	Number of adults	Total number of adults
South Fork Clearwater River	Restore critical habitat for fluvial component		NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
American River	0.06
Crooked River	0.47
Red River	0.11
West Fork Crooked River	0.04

Section 4.8.1P.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices
Water quality	Legacy effects	High summer water temperatures and low flows due to past agriculture and forestry practices
Population traits	Introduced species	Hybridization with hatchery rainbow trout
Competition	Introduced species	Competion with rainbow trout for available resources
Habitat access	Land use	Loss of habitat access

Section 4.8.1P.3 Strategies and Measures for Clearwater Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning, and historic mine cleanup • B. Work with grazing unit permit holders and the USFS to retire grazing permits in key tributaries within the Middle Fork • C. Work with the USFS, other state and federal agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat		
Water quality			
• Improve water quality	• D. Improve riparian cover and land use practices to reduce water temperatures • E. Provide funding to secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • F. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups		
Population traits			
• Reduce impacts from introduced species	• G. Develop methods to remove exotic species • H. Determine the distribution of exotic species • I. Emphasize use of westslope cutthroat trout for	Immediate	0-10+ years

	stocking mountain lakes in the Clearwater River drainage		
Competition			
• Reduce impacts of competition with invasive species	• J. Develop methods to remove exotic species • K. Determine the distribution of exotic species	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• L. Remove or modify culverts which have been identified as fish barriers.	Immediate	0-10+ years

Q. Clearwater Mountain Whitefish

Section 4.8.1Q.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
South Fork Clearwater River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
American River	0.96
Crooked River	0.72
Red River	0.76
West Fork Crooked River	0.00

Section 4.8.1Q.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices
Water quality	Legacy effects	High summer water temperatures and low flows due to past agriculture and forestry practices
Habitat access	Land use	Loss of habitat access due to culverts

Section 4.8.1Q.3 Strategies and Measures for Clearwater Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Restore riparian habitat and function, and reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning, and historic mine cleanup • B. Work with grazing unit permit holders and the USFS to retire grazing permits in key tributaries within the Middle Fork • C. Work with the USFS, other state and federal agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat.	Immediate	0-10+ years
Water quality			
• Improve water quality	• D. Improve riparian cover and land use practices to reduce water temperatures • E. Secure conservation	Immediate	0-10+ years

	easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • F. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups		
Habitat access			
• Improve habitat access	• G. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

Section 4.8.1 Clearwater Subbasin (Lochsa River)

R. Clearwater Bull Trout

Section 4.8.1R.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Lochsa River	--			--	
	Number of Local Populations				
	16 (9 potential)		16 (9 potential)		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of Adults	Number of Local Populations	Density Estimate (fish/100m^2) 2007
White Sands Creek	--	--	0.00
Brushy Creek	--	--	0.20
Crooked Fork	--	--	0.02

Section 4.8.1R.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices
Population traits	Introduced species	Hybridization with brook trout
Water quality	Legacy effects	High summer water temperatures and low flows due to past agriculture and forestry practices
Competition	Introduced species	Competition with brook trout
Harvest	Illegal harvest	Illegal harvest of bull trout
Habitat access	Land use	Culverts

Section 4.8.1R.3 Strategies and Measures for Clearwater Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Address legacy sedimentation issues, such as road obliteration/ decommissioning • B. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decision, and to improve/restore habitat • C. Incorporate evaluations of existing habitat in survey projects whenever possible		
Population traits			
• Reduce impacts from introduced	• D. Develop informational programs to educate anglers	Immediate	0-10+ years

species	and the public to risks of introductions of exotic species • E. Develop methods to remove exotic populations • F. Determine levels of hybridization and distribution of exotic species • G. Set liberal regulations on brook trout to reduce their numbers and limit their spread		
Water quality			
• Improve water quality	• H. Improve riparian cover and land use practices to reduce water temperatures • I. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • J. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups.		
Competition			
• Reduce impacts of competition with invasive species	• K. Develop methods to remove exotic populations and to determine levels of hybridization and distribution of exotic species	Immediate	0-10+ years
Harvest			
• Reduce illegal harvest	• L. Install easy to read road side signs that will inform anglers of the fishing regulations • M. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem • N. Simplify the fishing regulations	Immediate	0-10+ years

Habitat access			
• Improve habitat access	• O. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

S. Clearwater Redband

Section 4.8.1S.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Lochsa			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Mainstem Lochsa River	0.04
Brushy Creek	9.09
Crooked Fork	3.22

Section 4.8.1S.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices
Water quality	Legacy effects	High summer water temperatures and low flows due to past agriculture and forestry practices
Habitat access	Land use	Culverts

Section 4.8.1S.3 Strategies and Measures for Clearwater Redband

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning • B. Work with the USFS, other state and federal agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat • C. Incorporate evaluations of existing habitat in survey projects whenever possible	Immediate	0-10+ years
Water quality			
• Improve water quality	• D. Improve riparian cover and land use practices to reduce water temperatures • E. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • F. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• G. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

T. Clearwater Westslope Cutthroat Trout

Section 4.8.1T.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain populations at stable or increasing numbers		Number of local populations	Number of adults	Total number of adults
Lochsa	Restore critical habitat for fluvial component		NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Mainstem Lochsa River	0.16
Brushy Creek	1.09
Crooked Fork	1.37

Section 4.8.1T.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices
Water quality	Legacy effects	High summer water temperatures and low flows due to past agriculture and forestry practices
Population traits	Introduced species	Hybridization with hatchery rainbow trout
Competition	Introduced species	Competion with rainbow trout for available resources
Habitat access	Land use	Culverts

Section 4.8.1T.3 Strategies and Measures for Clearwater Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning, and historic mine cleanup • B. Work with the USFS, other state and federal agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat		
Water quality			
• Improve water quality	• C. Improve riparian cover and land use practices to reduce water temperatures • D. Provide funding to secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • E. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups		
Population traits			
• Reduce impacts from introduced species	• F. Develop methods to remove exotic species • G. Determine the distribution of exotic species • H. Emphasize use of westslope cutthroat trout for	Immediate	0-10+ years

	stocking mountain lakes in the Clearwater River drainage		
Competition			
• Reduce impacts of competition with invasive species	• I. Develop methods to remove exotic species • J. Determine the distribution of exotic species	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• L. Remove or modify culverts which have been identified as fish barriers.	Immediate	0-10+ years

U. Clearwater Mountain Whitefish

Section 4.8.1U.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Lochsa			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Mainstem Lochsa River	0.75
Brushy Creek	0.99
Crooked Fork	0.34

Section 4.8.1U.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices
Water quality	Legacy effects	High summer water temperatures and low flows due to past agriculture and forestry practices
Habitat access	Land use	Loss of habitat access due to culverts

Section 4.8.1U.3 Strategies and Measures for Clearwater Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Restore riparian habitat and function, and reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning, and historic mine cleanup • B. Work with the USFS, other state and federal agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat.	Immediate	0-10+ years
Water quality			
• Improve water quality	• C. Improve riparian cover and land use practices to reduce water temperatures • D. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • E. Work with the USFS,	Immediate	0-10+ years

	other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups		
Habitat access			
• Improve habitat access	• F. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

Section 4.8.2 Salmon Subbasin (Lower Salmon River, mouth to Little Salmon River

A. Salmon Bull Trout

Section 4.8.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Little-Lower Salmon River	--			--	
	Number of Local Populations				
	7 (3 potential)		7 (3 potential)		
	Total Number of Adults				
	2,000				2,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2007)
Slate Creek	--	--	0.26
John Day Creek	--	--	NA
Skookumchuck Creek	--	--	NA
Little Salmon	--	--	NA

Section 4.8.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Agriculture and forestry practices destroy floodplain and riparian habitat, reduce recruitment of large woody debris, and create excess sedimentation
Water quality	Land use	Irrigation return flows, aquaculture operations, and municipal discharge
Habitat access	Land use	Culverts

Section 4.8.2A.3 Strategies and Measures for Salmon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Address legacy sedimentation issues, such as road obliteration/ decommissioning • B. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decision, and to improve/restore habitat • C. Incorporate evaluations of existing habitat in survey projects whenever possible.	Immediate	0-10+ years
Water quality			
• Reduce sediment and nutrient delivery from irrigation return flows, aquaculture operations, and municipal discharge	• D. Identify sources of sedimentation and actions to mitigate • E. Provide funding to improve riparian cover to reduce water temperatures • F. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and	Immediate	0-10+ years

	sportsman's groups		
Habitat access			
• Improve habitat access.	• G. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

B. Salmon Redband Trout

Section 4.8.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Lower Salmon River, mouth to Little Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Slate Creek	5.01
John Day Creek	NA
Skookumchuck Creek	NA
Little Salmon	NA

Section 4.8.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Agriculture and forestry practices destroy floodplain and riparian habitat, reduce recruitment of large woody debris, and create excess sedimentation

Water quality	Land use	Irrigation return flows, aquaculture operations, and municipal discharge
Habitat access	Land use	Culverts

Section 4.8.2B.3 Strategies and Measures for Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Address legacy sedimentation issues, such as road obliteration/ decommissioning • B. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decision, and to improve/restore habitat • C. Incorporate evaluations of existing habitat in survey projects whenever possible.	Immediate	0-10+ years
Water quality			
• Reduce sediment and nutrient delivery from irrigation return flows, aquaculture operations, and municipal discharge	• D. Identify sources of sedimentation and actions to mitigate • E. Provide funding to improve riparian cover to reduce water temperatures • F. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups	Immediate	0-10+ years
Habitat access			
• Improve habitat access.	• G. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

C. Salmon Westslope Cutthroat Trout

Section 4.8.2C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Lower Salmon River, mouth to Little Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Slate Creek	0.00
John Day Creek	NA
Skookumchuck Creek	NA
Little Salmon	NA

Section 4.8.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Agriculture and forestry practices destroy floodplain and riparian habitat, reduce recruitment of large woody debris, and create excess sedimentation
Water quality	Land use	Irrigation return flows, aquaculture operations, and municipal discharge
Habitat access	Land use	Culverts

Section 4.8.2C.3 Strategies and Measures for Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	• A. Address legacy sedimentation issues, such as road obliteration/ decommissioning • B. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decision, and to improve/restore habitat • C. Incorporate evaluations of existing habitat in survey projects whenever possible.	Immediate	0-10+ years
Water quality			
• Reduce sediment and nutrient delivery from irrigation return flows, aquaculture operations, and municipal discharge	• D. Identify sources of sedimentation and actions to mitigate • E. Provide funding to improve riparian cover to reduce water temperatures • F. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups	Immediate	0-10+ years
Habitat access			
• Improve habitat access.	• G. Remove or modify culverts which have been identified as fish barriers	Immediate	0-10+ years

D. Salmon White Sturgeon

Section 4.8.2D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	6,800 fish with a composition of 60% between 60 and 90cm total length, 30% between 92 and 183cm total length, and 10% greater than 183cm total length		Number of local populations	Number of adults/populations	Total number of adults
Hells Canyon			NA	NA	NA

Status:

Population	Abundance
Lower Snake River	Unknown

Section 4.8.2D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Hydro-operations	Hydro-operations alter flow regimes
Water quality	Legacy issues	Irrigation return flows, aquaculture operations, and municipal discharge
Population traits	Hydro-operations	Hydro-operations limit recruitment
Harvest	Fishing	Hooking mortality from sport fishery

Section 4.8.2D.3 Strategies and Measures for White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Improve flow regimes to provide adequate flows for spawning and proper conditions for eggs and	• A. Identify on-the-ground actions that could be implemented to optimize white sturgeon spawning success, incubation, and juvenile rearing conditions. This is especially critical in	Immediate	0-10+ years

juveniles, and to restore connectivity, food base, and nutrients to historic levels	core conservation areas where populations are supported entirely by natural recruitment • B. Continue to provide technical support and input to state and federal regulatory agencies regarding land management, water quality, hydropower operations, and flow management • C. Restore connectivity and food base		
Water quality			
• Reduce sediment and nutrient delivery from irrigation return flows, aquaculture operations, and municipal discharge	• D. Identify sources of sedimentation and actions to mitigate • E. Improve riparian cover to reduce water temperatures • F. Work with appropriate agencies and land owners to develop a strategy for reducing sedimentation	Immediate	0-10+ years
Population traits			
• Increase abundance and size structure where necessary to maintain angling opportunity and promote natural spawning	• G. Determine the contribution of hatchery-reared fish and translocated wild fish to spawning populations • H. Maintain no-harvest angling regulations	Immediate	0-10+ years
Harvest			
• Quantify catch-and-release hooking mortality, illegal harvest, as well as direct tribal harvest levels	• I. Determine the magnitude of loss associated with catch-and-release fishing • J. Examine alternate sport gear types (hooks) • K. Collaborate with Washington and Oregon enforcement agencies and the Nez Perce Tribe to quantify levels of tribal harvest • L. Determine the magnitude of loss associated with illegal sturgeon harvest		

Section 4.8.2 Salmon Subbasin (Little Salmon River to Middle Fork Salmon River)

E. Salmon Redband Trout

Section 4.8.2E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Protect and conserve existing population		Number of local populations	Number of adults/populations	Total number of adults
Little Salmon River to Middle Fork Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Little Salmon River to Middle Fork Salmon River	Unknown

Section 4.8.2E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Legacy effects	Past agricultural and forestry practices have blocked access to habitat

Section 4.8.2E.3 Strategies and Measures for Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat access			
• Ensure connectivity is maintained from mainstem to all tributaries	• A. Identify instream structures and diversions that negatively impact stream connectivity • B. Prioritize and fund remedial actions	Immediate	0-10+ years

	• C. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern		

F. Salmon Bull Trout

Section 4.8.2F.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Salmon	--			--	
	Number of Local Populations				
	--		--		
	Total Number of Adults				
	--				--

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2007)
Little salmon River to Middle Fork Salmon River	Unknown	Unknown	Unknown

Section 4.8.2F.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Legacy effects	Man-made in-stream barriers
Water quality	Land use	Development and construction have led to sedimentation and high water temperatures
Competition	Introduced species	Brook trout

Section 4.8.2F.3 Strategies and Measures for Salmon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat access			
• Ensure connectivity is maintained from mainstem to all tributaries	• A. Identify manmade instream barriers that negatively impact stream connectivity • B. Prioritize and fund remedial actions • C. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern	Immediate	0-10+ years
Water quality			
• Reduce impacts from development and construction along stream corridors and reduce sedimentation	• D. Identify sources of sedimentation • E. Work with jurisdictional agencies to identify priority needs and fund corrective actions • F. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern • G. Promote the value and protection of functioning riparian zones and flood plains to reduce sedimentation, flood control, and solar heating	Immediate	0-10+ years
Competition			
• Reduce impacts from introduced species	• H. Provide funding to identify where introduced species pose risks to populations of native species • I. Where feasible, remove introduced species • J. Develop informational programs to educate anglers and the public to risks of random introductions of exotic species • K. Provide liberal regulations on	Immediate	0-10+ years

	brook trout • L. Through planning, use enforcement efforts to curtail illegal introductions		

G. Salmon Westslope Cutthroat Trout

Section 4.8.2G.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Protect and conserve existing population		Number of local populations	Number of adults/populations	Total number of adults
Little Salmon River to Middle Fork Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Little Salmon River to Middle Fork Salmon River	Unknown

Section 4.8.2G.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quality	Land use	Sedimentation and high water temperature from agriculture, forestry, and municipal practices
Habitat access	Legacy effects	Instream barriers

Section 4.8.2G.3 Strategies and Measures for Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quality			
• Reduce impacts	• A. Identify sources of	Immediate	0-10+ years

from development and construction along stream corridors and reduce sedimentation	sedimentation • B. Work with jurisdictional agencies to identify priority needs and fund corrective actions. • C. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern • D. Promote the value and protection of functioning riparian zones and flood plains to reduce sedimentation, flood control, and solar heating		
Habitat access			
• Ensure connectivity is maintained from mainstem to all tributaries	• E. Identify manmade instream barriers that negatively impact stream connectivity • F. Prioritize and fund remedial actions • G. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern	Immediate	0-10+ years

Section 4.8.2 Salmon Subbasin (Upper and Lower Middle Fork Salmon River)

H. Salmon Bull Trout

Section 4.8.2H.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Middle Fork Salmon River	--			--	

	Number of Local Populations				
	28		28		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2007)
Mainstem Middle Fork	--	--	0.25
Loon Creek	--	--	NA
Camas Creek	--	--	NA
Marsh Creek	--	--	NA

Section 4.8.2H.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, mining activities, and agriculture
Population traits	Introduced species	Hybridization and competition with brook trout
Harvest	Current harvest practices	Illegal harvest
Habitat access	Land use	Diversions and hydro facilities

Section 4.8.2H.3 Strategies and Measures for Salmon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Reduce habitat fragmentation	• A. Remove or modify culverts which have been identified as fish barriers • B. Provide passage at irrigation and hydroelectric diversions on tributaries to the Middle Fork	Immediate	0-10+ years
Population traits			

• Reduce impacts from introduced species	• C. Develop informational programs to educate anglers and the public to risks of introductions of exotic species • D. Develop methods to remove exotic populations • E. Determine levels of hybridization and distribution of exotic species • F. Set liberal regulations on brook trout to reduce their numbers and limit their spread	Immediate	0-10+ years
Harvest			
• Reduce illegal harvest	• G. Install easy to read road side signs that will inform anglers of the fishing regulations • H. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem • I. Simplify the fishing regulations • J. Provide river floaters with educational material regarding fish conservation needs	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• K. Identify and screen high entrainment diversion locations in tributary areas • L. Work with private landowners / irrigators		

I. Salmon Redband Trout

Section 4.8.2I.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Upper and Lower			NA	NA	NA

Middle Fork Salmon River					

Status:

Population	Density Estimate (fish/100m^2) (2007)
Mainstem Middle Fork	0.36
Loon Creek	NA
Camas Creek	NA
Marsh Creek	NA

Section 4.8.2I.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads and grazing
Harvest	Illegal harvest	Sport fishing
Habitat access	Land use	Diversions and hydro facilties

Section 4.8.2I.3 Strategies and Measures for Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing healthy riparian habitat and restore riparian habitat that is currently compromised. Reduce sediment delivery to the stream network by reducing impacts of past land use practices along primarily stream corridors	• A. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning, and historic mine cleanup • B. Work with grazing unit permit holders and the USFS to retire grazing permits in key tributaries within the Middle Fork • C. Work with the USFS, other state and federal agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian	Immediate	0-10+ years

	habitat		
• Reduce habitat fragmentation	• D. Remove or modify culverts which have been identified as fish barriers • E. Provide fish passage at irrigation and hydroelectric diversions on tributaries to the Middle Fork		
Water quality			
• Reduce illegal harvest	• F. Install easy to read road side signs that will inform anglers of the fishing regulations • G. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem • H. Simplify the fishing regulations • I. Provide river floaters with educational material regarding fish conservation needs	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• J. Remove or modify entrainment diversions which have been identified as fish barriers	Immediate	0-10+ years

J. Salmon Westslope Cutthroat Trout

Section 4.8.2J.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Salmon			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Mainstem Middle Fork	0.73
Loon Creek	NA
Camas Creek	NA
Marsh Creek	NA

Section 4.8.2J.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads and grazing
Harvest	Illegal harvest	Sport fishing
Habitat access	Land use	Diversions and hydro facilties

Section 4.8.2J.3 Strategies and Measures for Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Reduce habitat fragmentation	• A. Remove or modify culverts which have been identified as fish barriers • B. Provide fish passage at irrigation and hydroelectric diversions on tributaries to the Middle Fork	Immediate	0-10+ years
• Protect existing healthy riparian habitat and restore riparian habitat that is currently compromised. Reduce sediment delivery to the stream network by reducing impacts of past land use practices along primarily	• C. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning, and historic mine cleanup • D. Work with grazing unit permit holders and the USFS to retire grazing permits in key tributaries within the Middle Fork • E. Work with the USFS, other state and federal		

stream corridors	agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat		
Harvest			
• Reduce illegal harvest	• F. Install easy to read road side signs that will inform anglers of the fishing regulations • G. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem • H. Simplify the fishing regulations • I. Provide river floaters with educational material regarding fish conservation needs.		
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• J. Identify and screen high entrainment diversion locations in tributary areas • K. Work with private landowners / irrigators	Immediate	0-10+ years

K. Salmon Mountain Whitefish

Section 4.8.2K.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Upper and Lower Middle Fork Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Mainstem Middle Fork	0.70
Loon Creek	NA
Camas Creek	NA
Marsh Creek	NA

Section 4.8.2K.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, mining, and grazing
Habitat access	Land use	Culverts

Section 4.8.2K.3 Strategies and Measures for Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing healthy riparian habitat and restore riparian habitat that is currently compromised. Reduce sediment delivery to the stream network by reducing impacts of past land use practices along primarily stream corridors	• A. Develop projects to address legacy sedimentation issues, such as road obliteration/ decommissioning, and historic mine cleanup • B. Work with grazing unit permit holders and the USFS to retire grazing permits in key tributaries within the Middle Fork • C. Work with the USFS, other state and federal agencies, and private landowners to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat	Immediate	0-10+ years

Habitat access			
• Improve habitat access	• D. Remove or modify culverts which have been identified as fish barriers • E. Improve fish passage at irrigation and hydroelectric diversions on tributaries to the Middle Fork	Immediate	0-10+ years
• Reduce and/or eliminate entrainment threats at key locations.	• F. Identify and screen high entrainment diversion locations in tributary areas • G. Work with private landowners / irrigators.	Immediate	0-10+ years

Section 4.8.2 Salmon Subbasin (Middle Salmon River, Middle Fork to Panther Creek)

L. Salmon Bull Trout

Section 4.8.2L.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Middle Salmon River-Panther	--			--	
	Number of Local Populations				
	20		20		
	Total Number of Adults				
	3,000				3,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2007)
Panther Creek	--	--	NA

Moyer Creek	--	--	NA
North Fork Salmon River	--	--	NA

Section 4.8.2L.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads and agriculture
Water quality	Land use	Irrigation
Habitat access	Land use	Diversions and hydro facilities

Section 4.8.2L.3 Strategies and Measures for Salmon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries	• A. Reconnect strategic tributaries to the main-stem Salmon River • B. Work with local landowners, irrigators, land management agencies, Lemhi County, and the highway administration to implement reconnects as manpower allows and as funding levels permit • C. Improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Coordinate with land management agencies, Lemhi County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon tributary stream reconnect • E. Develop water conservation agreements with irrigation districts to reduce levels of stream diversion	Immediate	0-10+ years
• Protect existing healthy, intact riparian habitat and enhance and rehabilitate riparian habitats that are currently	• F. Remove riprap, reopen isolated side channels and spring sources to provide flows to the historic floodplain • G. Work with private landowners to protect and		

degraded. Restore proper floodplain function	enhance riparian resources • H. Improve grazing management, improve fencing, and purchase conservation easements • I. Restore riparian vegetation via planting native vegetation in locations requiring shading and bank stability		
Water quality			
• Reduce summer water temperatures	• J. Improve riparian cover and land use practices to reduce water temperatures • K. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • L. Work with the private landowners / irrigators	Immediate	0-10+ years
• Improve water quality in the Panther Creek watershed.	• M. Implement habitat and fish population mitigation actions to replace lost resources within the watershed • N. Continue to work with the private, federal, and state entities on improving water quality in the Panther Creek watershed by reducing mine effluents into the watershed		
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations.	• O. Identify and screen high entrainment diversion locations in tributary areas • P. Work with private landowners / irrigators	Immediate	0-10+ years

M. Salmon Redband Trout

Section 4.8.2M.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Increase the population and potentially use redband to recover steelhead		Number of local populations	Number of adults/populations	Total number of adults
Middle Salmon – Panther			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Panther Creek	0.62
Moyer Creek	1.76
North Fork Salmon River	0.76

Section 4.8.2M.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, and grazing
Water quality	Land use and legacy effects	Irrigation
Habitat access	Land use	Diversions

Section 4.8.2M.3 Strategies and Measures for Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries.	• A. Reconnect strategic tributaries to the main-stem Salmon River • B. Work with local landowners, irrigators, land management agencies, Lemhi County, and the highway	Immediate	0-10+ years

	administration to implement reconnects as manpower allows and as funding levels permit • C. Improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Coordinate with land management agencies, Lemhi County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon tributary stream reconnect • E. Develop water conservation agreements with irrigation districts to reduce levels of stream diversion		
• Protect existing healthy, intact riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function	• F. Remove riprap, reopen isolated side channels and spring sources to provide flows to the historic floodplain • G. Work with private landowners to protect and enhance riparian resources • H. Improve grazing management, improve fencing, and purchase conservation easements • I. Restore riparian vegetation via planting native vegetation in locations requiring shading and bank stability	Immediate	0-10+ years
Water quality			
• Improve water quality in the Panther Creek watershed.	• J. Improve water quality in the Panther Creek watershed by reducing mine effluents into the watershed • K. Implement habitat improvement work to replace lost resources within the watershed.	Immediate	0-10+ years
• Reduce summer water temperatures	• L. Improve riparian cover and land use practices to reduce water temperatures • M. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources		

	• N. Work with the private landowners / irrigators		
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• O. Identify and screen high entrainment diversion locations in tributary areas • P. Work with private landowners / irrigators	Immediate	0-10+ years

N. Salmon Westslope Cutthroat Trout

Section 4.8.2N.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Middle Salmon – Panther			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Panther Creek	NA
Moyer Creek	NA
North Fork Salmon River	NA

Section 4.8.2N.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Agriculture and development
Habitat access	Land use	Diversions

Section 4.8.2N.3 Strategies and Measures for Westslope Cutthroat Trout

Strategy	Measure	Implementation	Expected Response

		Timeframe	Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries.	• A. Reconnect strategic tributaries to the main-stem Salmon River • B. Work with local landowners, irrigators, land management agencies, Lemhi County, and the highway administration to implement reconnects as manpower allows and as funding levels permit • C. Improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Coordinate with land management agencies, Lemhi County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon tributary stream reconnect • E. Develop water conservation agreements with irrigation districts to reduce levels of stream diversion.	Immediate	0-10+ years
• Protect existing healthy, intact riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function	• F. Remove riprap, reopen isolated side channels and spring sources to provide flows to the historic floodplain • G. Work with private landowners to protect and enhance riparian resources • H. Improve grazing management, improve fencing, and purchase conservation easements • I. Restore riparian vegetation via planting native vegetation in locations requiring shading, and bank stability.		

Water quality			
• Improve water quality in the Panther Creek watershed	• J. Improve water quality in the Panther Creek watershed by reducing mine effluents into the watershed • K. Habitat improvement work to replace lost resources within the watershed	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• L. Identify and screen high entrainment diversion locations in tributary areas • M. Work with private landowners / irrigators	Immediate	0-10+ years

O. Salmon Mountain Whitefish

Section 4.8.2O.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Middle Salmon – Panther			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Panther Creek	
Moyer Creek	
North Fork Salmon River	

Section 4.8.2O.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Agriculture and development
Habitat access	Land use	Diversions

Section 4.8.2O.3 Strategies and Measures for Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries.	• A. Reconnect strategic tributaries to the main-stem Salmon River • B. Work with local landowners, irrigators, land management agencies, Lemhi County, and the highway administration to implement reconnects as manpower allows and as funding levels permit • C. Improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Coordinate with land management agencies, Lemhi County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon tributary stream reconnect • E. Develop water conservation agreements with irrigation districts to reduce levels of stream diversion.	Immediate	0-10+ years
• Protect existing healthy, intact riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function	• F. Remove riprap, reopen isolated side channels and spring sources to provide flows to the historic floodplain • G. Work with private landowners to protect and enhance riparian resources • H. Improve grazing management, improve fencing, and purchase conservation easements		

	• I. Restore riparian vegetation via planting native vegetation in locations requiring shading, and bank stability.		
Water quality			
• Improve water quality in the Panther Creek watershed	• J. Improve water quality in the Panther Creek watershed by reducing mine effluents into the watershed • K. Habitat improvement work to replace lost resources within the watershed	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• L. Identify and screen high entrainment diversion locations in tributary areas • M. Work with private landowners / irrigators	Immediate	0-10+ years

Section 4.8.2 Salmon Subbasin (Lemhi River)

P. Salmon Bull Trout

Section 4.8.2P.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Lemhi River	--			--	
	Number of Local Populations				
	6 (3 potential)		6 (3 potential)		
	Total Number of Adults				
	2,000				2,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2006)
Lemhi River	--	--	0.13
Big Springs Creek	--	--	NA
Hayden Creek	--	--	0.23
Bear Valley Creek	--	--	0.13

Section 4.8.2P.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Land use	Irrigation
Habitat quality/quantity	Legacy effects	Roads and floodplain development
Water quality	Land use	Irrigation
Habitat access	Land use	Diversions

Section 4.8.2P.3 Strategies and Measures for Salmon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Restore natural hydrographs in key tributaries to ensure adequate base flows are available for fish migration at all life stages	• A. Provide funding to reconnect strategic tributaries to the main-stem Lemhi River • B. Work with local landowners, irrigators, land management agencies, and the highway administration to implement reconnects as manpower and funding levels permit • C. Work with irrigators to improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Strategies such as dry year lease options, conveyance improvements, change in water application techniques,		

<table>
<tr><td></td><td>and water banking can be employed
• E. Coordinate with land management agencies, Lemhi County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon reconnect
• F. Develop water conservation agreements with water districts to reduce levels of stream diversion</td><td></td><td></td></tr>
<tr><td colspan="4">Habitat quality/quantity</td></tr>
<tr><td>• Protect existing healthy and intact riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors</td><td>• G. Provide funding to complete improvements to irrigation diversions to provide stable diversion points and reduce erosion (stream sedimentation)
• H. Work with private landowners to protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements.
• I. Work with water users to mimic or restore natural hydrographs in the main-stem to transport and recruit gravels to spawning and rearing habitats</td><td>Immediate</td><td>0-10+ years</td></tr>
<tr><td colspan="4">Water quality</td></tr>
<tr><td>• Improve water quality and quantity to provide adequate flows to support spawning and rearing life history stages of bull trout in river and stream reaches that support these life history stages.</td><td>• J. Provide funding to improve riparian cover and land use practices to improve flows and reduce water temperatures
• K. Fund improved water conveyance systems using pipelines and/or lined ditch systems
• L. Lease or acquire water rights to be dedicated in-stream
• M. Work with irrigators to develop water management plans that create the most efficient program based on crop needs and soil types to preserve water for in-stream needs
• N. Work with irrigation</td><td>Immediate</td><td>0-10+ years</td></tr>
</table>

	districts to ensure that diverted water is returned to the natural channel at the end of the irrigation season • O. Work with private landowners/ irrigators		
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations.	• P. Provide funding to identify and screen high entrainment diversion locations in tributary areas • Q. Work with private landowners / irrigators	Immediate	0-10+ years

Q. Salmon Redband Trout

Section 4.8.2Q.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase the population		Number of local populations	Number of adults/populations	Total number of adults
Lemhi			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Lemhi River	0.34
Big Springs Creek	1.01
Hayden Creek	0.21
Bear Valley Creek	0.17

Section 4.8.2Q.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Land use	Irrigation
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Agriculture and development
Habitat access	Land use	Diversions

Section 4.8.2Q.3 Strategies and Measures for Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Restore natural hydrographs in key tributaries to ensure adequate base flows are available for fish migration at all life stages.	• A. Reconnect strategic tributaries to the main-stem Lemhi River • B. Work with local landowners, irrigators, land management agencies, and the highway administration to implement reconnects as manpower and funding levels permit • C. Work with irrigators to improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Strategies such as dry year lease options, conveyance improvements, change in water application techniques, and water banking can be employed • E. Coordinate with land management agencies, Lemhi County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon reconnect • F. Develop water conservation agreements with water districts to reduce levels of stream diversion.	Immediate	0-10+ years
Habitat quality/quantity			
• Protect existing healthy and intact riparian habitat and enhance and	• G. Protect and enhance riparian resources with grazing management strategies, fencing and/or	Immediate	0-10+ years

rehabilitate riparian habitats that are currently degraded. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors.	conservation easements • H. Work with water users to mimic or restore natural hydrographs in the main-stem to transport and recruit gravels to spawning and rearing habitats • I. Improve to irrigation diversions to provide stable diversion points and reduce erosion (stream sedimentation)		
Water quality			
• Improve water quality and quantity to provide adequate flows to support spawning and rearing life history stages of westslope cutthroat trout in river and stream reaches that support these life history stages.	• J. Improve riparian cover and land use practices to improve flows and reduce water temperatures • K. Fund improved water conveyance systems using pipelines and/or lined ditch systems • L. Lease or acquire water rights to be dedicated in-stream • M. Work with irrigators to develop water management plans that create the most efficient program based on crop needs and soil types to preserve water for in-stream needs • N. Work with irrigation districts to ensure that diverted water is returned to the natural channel at the end of the irrigation season • O. Work with private landowners/ irrigators.	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• P. Identify and screen high entrainment diversion locations in tributary areas • Q. Work with private landowners / irrigators	Immediate	0-10+ years

R. Salmon Westslope Cutthroat Trout

Section 4.8.2R.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan

Population	Increase populations in the mainstem Lemhi and mainstain stable populations in the tributaries		Number of local populations	Number of adults/populations	Total number of adults
Lemhi			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Lemhi River	NA
Big Springs Creek	NA
Hayden Creek	0.09
Bear Valley Creek	0.10

Section 4.8.2R.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Land use	Irrigation
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Agriculture and development
Habitat access	Land use	Diversions

Section 4.8.2R.3 Strategies and Measures for Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Restore natural hydrographs in key tributaries to ensure adequate base flows are available for fish migration at all life stages.	• A. Reconnect strategic tributaries to the main-stem Lemhi River • B. Work with local landowners, irrigators, land management agencies, and the highway administration to implement reconnects as manpower and funding levels permit • C. Work with irrigators to improve water diversion and	Immediate	0-10+ years

	irrigation systems to conserve water for fish migration and passage • D. Strategies such as dry year lease options, conveyance improvements, change in water application techniques, and water banking can be employed • E. Coordinate with land management agencies, Lemhi County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon reconnect • F. Develop water conservation agreements with water districts to reduce levels of stream diversion.		
Habitat quality/quantity			
• Protect existing healthy and intact riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors.	• G. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements • H. Work with water users to mimic or restore natural hydrographs in the main-stem to transport and recruit gravels to spawning and rearing habitats • I. Improve to irrigation diversions to provide stable diversion points and reduce erosion (stream sedimentation)	Immediate	0-10+ years
Water quality			
• Improve water quality and quantity to provide adequate flows to support spawning and rearing life history stages of westslope cutthroat trout in river and stream reaches that support these life history stages.	• J. Improve riparian cover and land use practices to improve flows and reduce water temperatures • K. Fund improved water conveyance systems using pipelines and/or lined ditch systems • L. Lease or acquire water rights to be dedicated in-stream • M. Work with irrigators to develop water management plans that create the most efficient program based on	Immediate	0-10+ years

	crop needs and soil types to preserve water for in-stream needs • N. Work with irrigation districts to ensure that diverted water is returned to the natural channel at the end of the irrigation season • O. Work with private landowners/ irrigators.		
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• P. Identify and screen high entrainment diversion locations in tributary areas • Q. Work with private landowners / irrigators	Immediate	0-10+ years

S. Salmon Mountain Whitefish

Section 4.8.2S.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Lemhi River			NA	NA	NA

Status:

Population	Density Estimate ($fish/100m^2$) (2006)
Lemhi River	1.22
Big Springs Creek	NA
Hayden Creek	0.12

Section 4.8.2S.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Land use	Irrigation
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Agriculture and development
Habitat access	Land use	Diversions

Section 4.8.2S.3 Strategies and Measures for Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Restore natural hydrographs in key tributaries to ensure adequate base flows are available for fish migration at all life stages.	• A. Reconnect strategic tributaries to the main-stem Lemhi River • B. Work with local landowners, irrigators, land management agencies, and the highway administration to implement reconnects as manpower and funding levels permit • C. Work with irrigators to improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Strategies such as dry year lease options, conveyance improvements, change in water application techniques, and water banking can be employed • E. Coordinate with land management agencies, Lemhi County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon reconnect • F. Develop water conservation agreements with water districts to reduce levels of stream diversion.	Immediate	0-10+ years
Habitat quality/quantity			
• Protect existing healthy and intact riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Reduce sediment delivery to the stream network by reducing impacts of land use practices along	• G. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements • H. Work with water users to mimic or restore natural hydrographs in the main-stem to transport and recruit gravels to spawning and rearing habitats • I. Improve to irrigation diversions to provide stable diversion points and reduce	Immediate	0-10+ years

river and stream corridors.	erosion (stream sedimentation)		
Water quality			
• Improve water quality and quantity to provide adequate flows to support spawning and rearing life	• J. Improve riparian cover and land use practices to improve flows and reduce water temperatures • K. Fund improved water conveyance systems using pipelines and/or lined ditch systems • L. Lease or acquire water rights to be dedicated in-stream • M. Work with irrigators to develop water management plans that create the most efficient program based on crop needs and soil types to preserve water for in-stream needs • N. Work with irrigation districts to ensure that diverted water is returned to the natural channel at the end of the irrigation season • O. Work with private landowners/ irrigators.	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• P. Identify and screen high entrainment diversion locations in tributary areas • Q. Work with private landowners / irrigators	Immediate	0-10+ years

Section 4.8.2 Salmon Subbasin (Pahsimeroi River)

T. Salmon Bull Trout

Section 4.8.2T.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Pahsimeroi	--			--	
	Number of Local				

	Populations				
	9		9		
	Total Number of Adults				
	3,000				3,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2006)
Pashimeroi River	--	--	NA

Section 4.8.2T.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects and land use	Roads, irrigation, grazing
Water quality	Land use	Irrigation
Habitat access	Land use	Diversions

Section 4.8.2T.3 Strategies and Measures for Salmon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries.	• A. Improve water diversion and irrigation systems to conserve water for fish migration and passage. • B. Remove or modify culverts at road and highway crossings which may be fish barriers upon reconnect. • C. Develop water conservation agreements to reduce levels of stream diversion.	Immediate	0-10+ years
• Improve water diversion and irrigation systems to conserve water and facilitate the connection of isolated river reaches. Protect existing healthy	• D. Improve water diversion and irrigation systems to conserve water and connect isolated river reaches. • E. Strategies such as dry year lease options, conveyance improvements, change in application techniques, and water banking can be	Immediate	0-10+ years

riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	employed • F. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements • G. Work with water users to mimic or rehabilitate natural hydrographs in the main-stem to transport and recruit gravels to spawning and rearing habitats • H. Complete improvements to irrigation diversions to provide stable diversion points and reduce erosion (stream sedimentation		
Water quality			
• Improve water quality and quantity to provide adequate flows to support spawning and rearing life history stages of bull trout in river and stream reaches that support these life history stages	• I. Improve riparian cover and land use practices to improve flows and reduce water temperatures • J. Improve of water conveyance systems • K. Lease or acquire water rights to be dedicated in-stream • L. Work with irrigators to develop water management plans that create the most efficient program based on crop needs and soil types to preserve water for in-stream needs • M. Work with irrigation districts to ensure that diverted water is returned to the natural channel at the end of the irrigation season	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• N. Identify and screen high entrainment diversion locations in tributary areas • O. Work with private landowners / irrigators	Immediate	0-10+ years

U. Salmon Redband Trout

Section 4.8.2U.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan

Population	Maintain or increase the population		Number of local populations	Number of adults/populations	Total number of adults
Pahsimeroi			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Pahsimeroi River	3.19

Section 4.8.2U.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Irrigation
Habitat access	Land use	Diversions

Section 4.8.2U.3 Strategies and Measures for Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries	• A. Improve water diversion and irrigation systems to conserve water for fish migration and passage • B. Remove or modify culverts at road and highway crossings which may be fish barriers upon reconnect • C. Develop water conservation agreements to reduce levels of stream diversion.	Immediate	0-10+ years
• Improve water diversion and irrigation systems to conserve water and facilitate the connection of isolated river reaches. Protect existing healthy riparian habitat	• D. Improve water diversion and irrigation systems to conserve water and connect isolated river reaches • E. Strategies such as dry year lease options, conveyance improvements, change in application techniques, and water banking can be employed	Immediate	0-10+ years

and enhance and rehabilitate riparian habitats that are currently degraded. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors.	• F. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements • G. Work with water users to mimic or rehabilitate natural hydrographs in the main-stem to transport and recruit gravels to spawning and rearing habitats • H. Complete improvements to irrigation diversions to provide stable diversion points and reduce erosion (stream sedimentation).		
Water quality			
• Improve water quality and quantity to provide adequate flows to support spawning and rearing life history stages of redband trout in river and stream reaches that support these life history stages.	• I. Provide funding to improve riparian cover and land use practices to improve flows and reduce water temperatures • J. Fund the improvement of water conveyance systems • K. Provide funding to lease or acquire water rights to be dedicated in-stream • L. Work with irrigators to develop water management plans that create the most efficient program based on crop needs and soil types to preserve water for in-stream needs • M. Work with irrigation districts to ensure that diverted water is returned to the natural channel at the end of the irrigation season.	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• N. Provide funding to identify and screen high entrainment diversion locations in tributary areas • O. Work with private landowners / irrigators	Immediate	0-10+ years

V. Salmon Westslope Cutthroat Trout

Section 4.8.2V.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Increase populations		Number of local populations	Number of adults/populations	Total number of adults
Pahsimeroi			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Pahsimeroi River	0.18

Section 4.8.2V.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Agriculture and development
Habitat access	Land use	Diversions

Section 4.8.2V.3 Strategies and Measures for Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries	• A. Improve water diversion and irrigation systems to conserve water for fish migration and passage • B. Remove or modify culverts at road and highway crossings which may be fish barriers upon reconnect • C. Develop water conservation agreements to reduce levels of stream diversion	Immediate	0-10+ years
• Improve water diversion and irrigation systems to conserve water and facilitate the connection of	• D. Improve water diversion and irrigation systems to conserve water and connect isolated river reaches. • E. Strategies such as dry year lease options, conveyance	Immediate	0-10+ years

isolated river reaches. Protect existing healthy riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	improvements, change in application techniques, and water banking can be employed • F. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements • G. Work with water users to mimic or rehabilitate natural hydrographs in the main-stem to transport and recruit gravels to spawning and rearing habitats • H. Complete improvements to irrigation diversions to provide stable diversion points and reduce erosion (stream sedimentation)		
Water quality			
• Improve water quality and quantity to provide adequate flows to support spawning and rearing life history stages of westslope cutthroat trout in river and stream reaches that support these life history stages. •	• I. Improve riparian cover and land use practices to improve flows and reduce water temperatures • J. Improve of water conveyance systems • K. Lease or acquire water rights to be dedicated in-stream • L. Work with irrigators to develop water management plans that create the most efficient program based on crop needs and soil types to preserve water for in-stream needs • M. Work with irrigation districts to ensure that diverted water is returned to the natural channel at the end of the irrigation season.	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• N. Identify and screen high entrainment diversion locations in tributary areas • O. Work with private landowners / irrigators	Immediate	0-10+ years

W. Salmon Mountain Whitefish

Section 4.8.2W.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Pahsimeroi			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Pahsimeroi River	1.74

Section 4.8.2W.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Agriculture and development
Habitat access	Land use	Diversions

Section 4.8.2W.3 Strategies and Measures for Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries	• A. Improve water diversion and irrigation systems to conserve water for fish migration and passage • B. Remove or modify culverts at road and highway crossings which may be fish barriers upon reconnect • C. Develop water conservation agreements to reduce levels of stream diversion	Immediate	0-10+ years
• Improve water diversion and irrigation systems to conserve water and facilitate the connection of	• D. Improve water diversion and irrigation systems to conserve water and connect isolated river reaches. • E. Strategies such as dry year lease options, conveyance	Immediate	0-10+ years

isolated river reaches. Protect existing healthy riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors	improvements, change in application techniques, and water banking can be employed • F. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements • G. Work with water users to mimic or rehabilitate natural hydrographs in the main-stem to transport and recruit gravels to spawning and rearing habitats • H. Complete improvements to irrigation diversions to provide stable diversion points and reduce erosion (stream sedimentation)		
Water quality			
• Improve water quality and quantity to provide adequate flows to support spawning and rearing life history stages of mountain whitefish in river and stream reaches that support these life history stages.	• I. Improve riparian cover and land use practices to improve flows and reduce water temperatures • J. Improve of water conveyance systems • K. Lease or acquire water rights to be dedicated in-stream • L. Work with irrigators to develop water management plans that create the most efficient program based on crop needs and soil types to preserve water for in-stream needs • M. Work with irrigation districts to ensure that diverted water is returned to the natural channel at the end of the irrigation season.	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• N. Identify and screen high entrainment diversion locations in tributary areas • O. Work with private landowners / irrigators	Immediate	0-10+ years

Section 4.8.2 Salmon Subbasin (Upper Salmon River)

X. Salmon Bull Trout

Section 4.8.2X.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Upper Salmon River	--			--	
	Number of Local Populations				
	18 (1 potential)		18 (1 potential)		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2006)
East Fork	--	--	0.04
Mainstem	--	--	NA
Alturas Creek	--	--	NA
Redfish Creek	--	--	NA
Valley Creek	--	--	NA

Section 4.8.2X.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects and land use	Roads, irrigation, grazing
Water quality	Land use	Irrigation
Habitat access	Land use	Diversions

Section 4.8.2X.3 Strategies and Measures for Salmon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries	• A. Reconnect strategic tributaries to the main-stem upper Salmon River • B. Work with local landowners, irrigators, land management agencies, and the highway administration to implement reconnects as manpower and funding levels permit • C. Work with irrigators to improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Strategies such as dry year lease options, conveyance improvements, change in water application techniques, and water banking can be employed. • E. Coordinate with land management agencies, Custer County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon reconnect • F. Develop water conservation agreements with water districts to reduce levels of stream diversion	Immediate	0-10+ years
• Protect existing healthy and intact riparian habitat, and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function.	• G. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements • H. On-the-ground actions including: the reopening of isolated side channels and spring sources to provide flows to the historic floodplain, planting native vegetation in locations requiring shading and bank stability, and determining the feasibility and cost effectiveness of reclaiming and restoring habitats	Immediate	0-10+ years

	damaged by historic mining activities		
Water quality			
• Reduce summer water temperatures	• I. Improve riparian cover and land use practices to reduce water temperatures • J. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • K. Reconnect of tributary habitat to provide cold water refugia to fishes in the main-stem Salmon River • L. Work with private landowners/ irrigators.	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations.	• M. Identify and screen high entrainment diversion locations in tributary areas • N. Work with private landowners / irrigators	Immediate	0-10+ years

Y. Salmon Redband Trout

Section 4.8.2Y.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase the population		Number of local populations	Number of adults/populations	Total number of adults
Upper Salmon			NA	NA	NA

Status:

Population	Density Estimate ($fish/100m^2$) (2006)
East Fork	0.52
Mainstem	0.49
Alturas Creek	0.09

Redfish Creek	0.21
Valley Creek	0.23

Section 4.8.2Y.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Irrigation
Habitat access	Land use	Diversions

Section 4.8.2Y.3 Strategies and Measures for Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries	• A. Reconnect strategic tributaries to the main-stem upper Salmon River • B. Work with local landowners, irrigators, land management agencies, and the highway administration to implement reconnects as manpower and funding levels permit • C. Work with irrigators to improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Strategies such as dry year lease options, conveyance improvements, change in water application techniques, and water banking can be employed • E. Coordinate with land management agencies, Custer County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon reconnect • F. Develop water conservation agreements with water districts to reduce levels of stream diversion.	Immediate	0-10+ years
• Protect existing healthy and intact	• G. Protect and enhance riparian resources with	Immediate	0-10+ years

riparian habitat, and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function.	grazing management strategies, fencing and/or conservation easements • H. Implement on-the-ground actions including: the reopening of isolated side channels and spring sources to provide flows to the historic floodplain, planting native vegetation in locations requiring shading and bank stability, and determining the feasibility and cost effectiveness of reclaiming and restoring habitats damaged by historic mining activities		
Water quality			
• Reduce summer water temperatures	• J. Improve riparian cover and land use practices to reduce water temperatures • K. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • L. Reconnect of tributary habitat to provide cold water refugia to fishes in the main-stem Salmon River • M. Work with private landowners/ irrigators.	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• N. Identify and screen high entrainment diversion locations in tributary areas • O. Work with private landowners / irrigators	Immediate	0-10+ years

Z. Salmon Westslope Cutthroat Trout

Section 4.8.2Z.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Increase populations		Number of local populations	Number of adults/populations	Total number of adults
Upper Salmon			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
East Fork	NA
Mainstem	0.02
Alturas Creek	NA
Redfish Creek	NA
Valley Creek	NA

Section 4.8.2Z.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Irrigation
Habitat access	Land use	Diversions

Section 4.8.2Z.3 Strategies and Measures for Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries	• A. Reconnect strategic tributaries to the main-stem upper Salmon River • B. Work with local landowners, irrigators, land management agencies, and the highway administration to implement reconnects as manpower and funding levels permit • C. Work with irrigators to improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Strategies such as dry year lease options, conveyance improvements, change in water application techniques, and water banking can be employed • E. Coordinate with land management agencies, Custer	Immediate	0-10+ years

	County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon reconnect • F. Develop water conservation agreements with water districts to reduce levels of stream diversion.		
• Protect existing healthy and intact riparian habitat, and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function.	• G. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements • H. Implement on-the-ground actions including: the reopening of isolated side channels and spring sources to provide flows to the historic floodplain, planting native vegetation in locations requiring shading and bank stability, and determining the feasibility and cost effectiveness of reclaiming and restoring habitats damaged by historic mining activities	Immediate	0-10+ years
Water quality			
• Reduce summer water temperatures	• J. Improve riparian cover and land use practices to reduce water temperatures • K. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • L. Reconnect of tributary habitat to provide cold water refugia to fishes in the main-stem Salmon River • M. Work with private landowners/ irrigators.	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• N. Identify and screen high entrainment diversion locations in tributary areas • O. Work with private landowners / irrigators	Immediate	0-10+ years

AA. Salmon Mountain Whitefish

Section 4.8.2AA.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Upper Salmon			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
East Fork	1.06
Mainstem	2.36
Alturas Creek	2.04
Redfish Creek	0.09
Valley Creek	0.31

Section 4.8.2AA.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing
Water quality	Land use	Irrigation
Habitat access	Land use	Diversions

Section 4.8.2AA.3 Strategies and Measures for Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries	• A. Reconnect strategic tributaries to the main-stem upper Salmon River • B. Work with local landowners, irrigators, land management agencies, and the highway administration to implement reconnects as	Immediate	0-10+ years

	manpower and funding levels permit • C. Work with irrigators to improve water diversion and irrigation systems to conserve water for fish migration and passage • D. Strategies such as dry year lease options, conveyance improvements, change in water application techniques, and water banking can be employed • E. Coordinate with land management agencies, Custer County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon reconnect • F. Develop water conservation agreements with water districts to reduce levels of stream diversion.		
• Protect existing healthy and intact riparian habitat, and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function.	• G. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements • H. Implement on-the-ground actions including: the reopening of isolated side channels and spring sources to provide flows to the historic floodplain, planting native vegetation in locations requiring shading and bank stability, and determining the feasibility and cost effectiveness of reclaiming and restoring habitats damaged by historic mining activities	Immediate	0-10+ years
Water quality			
• Reduce summer water temperatures	• J. Improve riparian cover and land use practices to reduce water temperatures • K. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • L. Reconnect of tributary habitat to provide cold water refugia to fishes in the main-	Immediate	0-10+ years

	stem Salmon River • M. Work with private landowners/ irrigators.		
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• N. Identify and screen high entrainment diversion locations in tributary areas • O. Work with private landowners / irrigators	Immediate	0-10+ years

Section 4.9 Middle Snake Province

Section 4.9.1 Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Subbasin

A. Bruneau, Boise, Owyhee, Payette,Snaje Upper Middle, Weiser Bull Trout

Section 4.9.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Boise, Payette, Weiser					
	Number of Local Populations				
	Total Number of Adults				

Status:

Population	Estimated Abundance	Number of Local Populations
Anderson Ranch	10,412	15
Arrowrock	53,028	15
Lucky Peak	1,532	1
Deadwood River	4,007	5
Squaw Creek	17,251	2
Upper South Fork Payette River	21,303	9
Middle Fork Payette River	NA	1

North Fork Payette River	467	1
Weiser River	NA	5

Section 4.9.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quality	Legacy issues	
Habitat quality/quantity	Land use	
Habitat access	Legacy issues	
Competition	Introduced species	Brook trout
Nutrients	Hydro-operations	Reduced stream productivity due to hydrosystem development and the resultant loss of anadromous fish nutrient inputs

Section 4.9.1A.3 Strategies and Measures for Bruneau, Boise, Owyhee, Payette, Snake Upper Middle Weiser Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			

B. Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Redband Trout

Section 4.9.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Enhance persistence and resilience of existing populations and expand the range and productivity of native redband trout		Number of local populations	Number of adults	Total number of adults
Snake River and Tributaries			NA	NA	NA

Status:

Population	Mean density estimate (fish/m^2)
Snake River and tributaries	0.095

Section 4.9.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Hydro-operations	Reduced stream flows and altered hydrographs due to reservoir development, water storage, and irrigation withdrawals
Water quality	Legacy issues	Sedimentation and high water temperatures due to road development
Habitat quality/quantity	Land use	Loss of instream and riparian habitat due to development
Habitat access	Legacy issues	Instream barriers
Nutrients	Legacy issues	Reduced stream productivity due to hydrosystem development and the resultant loss of anadromous fish nutrient inputs

Section 4.9.1B.3 Strategies and Measures for Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Reduce or eliminate impacts associated with surface water storage, diversion and adjacent land use along stream corridors	• A. Assess entrainment losses at diversions and to describe population impacts • B. Prioritize and implement measures to reduce/eliminate entrainment loss • C. Work with Federal agencies, State agencies, irrigation districts and landowners to improve flow regimes where native redband trout occur • D. Promote efficient water	Immediate	0-10+ years

	use		
Water quality			
• Reduce sedimentation impacts from road development and maintenance and construction along stream corridors	• E. Identify sedimentation sources and work with jurisdictional agencies to mitigate • F. Restore riparian areas to control erosion and reduce solar heating • G. Implement TMDLs where appropriate • H. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern	Immediate	0-10+ years
Habitat quality/quantity			
• Avoid or mitigate habitat impacts from development and land use along stream corridors	• I. Conduct standard population and habitat surveys • J. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern • K. Incorporate habitat assessment into standard population surveys	Immediate	0-10+ years
Habitat access			
• Maintain or restore population connectivity throughout mainstem reaches, between mainstem rivers and tributaries, and within tributaries	• L. Identify and prioritize the removal of in stream barriers	Immediate	0-10+ years
Nutrients			
• Restore ecosystem productivity and redband trout abundance and	• M. Refine methods and describe ecological benefits of nutrient supplementation to redband trout as well as other resident fish, aquatic,	Immediate	0-10+ years

resiliency by nutrient supplementation in key habitats	and terrestrial species • N. Develop and fund a marine nutrient mitigation program to benefit redband trout and other resident fish, riparian, and upland species		

C. Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Mountain Whitefish

Section 4.9.1C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Protect and conserve existing populations		Number of local populations	Number of adults	Total number of adults
Boise, Payette, Weiser			NA	NA	NA

Status:

Population	Abundance (estimate)
Weiser River	992
Payette River	1,499,216
Boise River	322,691
Owyhee River	0
Bruneau River	8,664
Big Wood River	2,876
Salmon Falls Creek	0
Rock Creek	0

Section 4.9.1C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Residential development and construction
Water quality	Land use	Residential development
Water quantity	Land use	Water diversions and irrigation

Section 4.9.1C.3 Strategies and Measures for Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Reduce impacts from development and construction along stream corridors and reduce sedimentation	• A. Conduct standard population and habitat surveys • B. Work with Federal agencies, State agencies, local city planners, developers, and landowners to implement protection and conservation of wetland, riparian, and instream habitats • C. Prevent the removal of woody debris critical to the development and maintenance of winter habitat (i.e pools) • D. Preserve and restore side channel habitat. Incorporate habitat assessment into standard population surveys	Immediate	0-10+ years
Water quality			
• Reduce impacts from development and construction along stream corridors and reduce sedimentation	• E. Identify sedimentation sources and work with jurisdictional agencies to mitigate • F. Work with Federal agencies, State agencies, local city planners, developers, and landowners to implement protection and conservation of wetland, riparian, and instream habitats • G. Promote the value, restoration and protection of functioning riparian zones, wetlands, and flood plains to reduce sedimentation, solar heating and increase flood control	Immediate	0-10+ years

Water quantity			
• Reduce impacts from development and surface water diversion along stream corridors	• H. Determine the extent of entrainment loss at major diversions and identify the level of population loss that is occurring • I. Work with Federal agencies, State agencies, local city planners, developers, irrigation districts and landowners to make the protection of fisheries habitat a primary concern • J. Promote efficient water use	Immediate	0-10+ years

D. Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser White Sturgeon (Shoshone Falls to Hells Canyon Dam)

Section 4.9.1D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Conserve, restore, and enhance viable white sturgeon populations capable of providing sport-fishing opportunity		Number of local populations	Number of adults	Total number of adults
Snake River			NA	NA	NA

Status:

Population	Population Estimate
C.J. Strike	566 (2007)

Section 4.9.1D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Hydro-operations	Altered hydrograph and reduced total Snake River discharge due to hydro-operations
Water quality	Legacy issues	Sediment and high organic loads due to irrigation return flows, aquaculture operations, and municipal discharge
Habitat quality/quantity	Hydro-operations	Hydroelectric facilities have

		created slackwater reservoirs that are seasonally unusable
Population traits	Hydro-operations	Lack of recruitment

Section 4.9.1D.3 Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser White Sturgeon (Shoshone Falls to Hells Canyon Dam)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Improve flow regimes to provide adequate flows for spawning and proper conditions for eggs and juveniles, connectivity, and food base	• A. Implement management actions that optimize white sturgeon spawning success, incubation, and juvenile rearing conditions, with emphasis on core conservation populations supported entirely by natural recruitment.	Immediate	0-10+ years
Water quality			
• Reduce sediment and nutrient delivery from irrigation return flows, aquaculture operations, and municipal discharge	• B. Identify sources of sedimentation and actions to mitigate • C. Work with appropriate agencies and land owners to develop a strategy for reducing sedimentation • D. Implement TMDL	Immediate	0-10+ years
Habitat quality/quantity			
• Restore and manage demographic and genetic interchange among white sturgeon populations	• E. Determine the need to develop volitional passage facilities or the need for a periodic trap and transplant program to maintain population structure	Immediate	0-10+ years

Population traits			
• Increase abundance and size structure where necessary to maintain angling opportunity and promote natural spawning	• F. Determine the contribution of hatchery-reared fish and translocated wild fish to spawning populations • G. Maintain no-harvest angling regulations	Immediate	0-10+ years

E. Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Wood River Sculpin

Section 4.9.1E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Big Wood River, Little Wood River, and Camas Creek	Maintain and restore populations of WRS in suitable waters and historic habitat to ensure a high probability of long-term persistence in appropriate numbers to perform ecological functions.		NA	NA	NA

Status:

Population	Estimated Abundance
Wood River Basin	1,356,600 (2003)

Section 4.9.1E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Predation	Introduced species	Brown trout
Water quantity	Land use	Surface water diversion
Water quality	Legacy issues	Sedimentation and high water temperatures due to development
Habitat quality/quantity	Land use	Loss or destruction of instream and riparian habitat due to development

Section 4.9.1E.3 Strategies and Measures for Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Wood River Sculpin

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Predation			
• Prevent/reduce upstream expansion of brown trout	• A. Determine the distribution and abundance of brown trout	Immediate	0-10+ years
Water quantity			
• Reduce or eliminate impacts associated with surface water diversion and adjacent land use along stream corridors	• B. Evaluate entrainment loss at major diversions • C. Describe the magnitude of the problem and prioritize actions to correct • D. Work with jurisdictional agencies to mitigate • E. Work with Federal agencies, State agencies, irrigation districts and landowners to make the protection of fisheries habitat a primary concern • F. Promote efficient water use	Immediate	0-10+ years
Water quality			
• Reduce impacts from development and construction along stream corridors and reduce sedimentation	• G. Identify sources of sedimentation and work with jurisdictional agencies to mitigate • H. Work with Federal agencies, State agencies,	Immediate	0-10+ years

	local city planners, developers, irrigation districts and landowners to make the protection of fisheries habitat a primary concern • I. Promote the value and protection of functioning riparian zones and flood plains to reduce sedimentation, flood control, and solar heating		
Habitat quality/quantity			
• Reduce impacts from development and land use along stream corridors and reduce sedimentation (i.e. embeddedness)	• J. Conduct standard population and habitat surveys • K. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern. • M. Incorporate habitat assessment into standard population surveys • N. Preserve existing side channel habitat.	Immediate	0-10+ years

Section 4.9.2 Malheur Subbasin

A. Malheur Bull Trout (Oregon)

Section 4.9.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Malheur	--			--	
	Number of Local Populations				
	2 or more		2 or more		
	Total Number of Adults				
	2,000 – 3,000				2,000-3,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Upper Malheur	--	1	194 (for both populations)
North Fork Malheur	--	1	

Section 4.9.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Livestock grazing, timber harvest, road building, dispersed recreation, and agriculture practices
Habitat access	Current land use	Culverts, irrigation dams, and diversion dams
Water quality	Current land use	Livestock grazing, timber harvest, road building, dispersed recreation, and agriculture practices.
Water quantity	Current land use	Irrigation withdrawals
Contaminants	Current land use	Livestock grazing, timber harvest, road building, dispersed recreation, and agriculture practices.
Competition	Non-native fish	Hybridization, introgression and competition with brook trout
Nutrients	Current land use; dams	Construction and operation of hydropower and irrigation dams

Section 4.9.2A.3 Strategies and Measures for Malheur Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore and protect riparian habitats	• A. Improve instream habitat, incorporate bull trout recovery actions into The Oregon Plan for Salmon and Watersheds and the Northwest Power and Conservation Council Subbasin/Management Plans	Immediate	10+ years

	• B. Identify site-specific threats that may be limiting bull trout in watersheds with historical bull trout habitat • C. Identify and pursue opportunities to implement recovery strategies • D. Restore shade and canopy, riparian cover, and native vegetation in all bull trout spawning areas • E. Reduce grazing impacts in all bull trout spawning areas • F. Identify and prioritize opportunities for channel restoration in Lake Creek • G. Determine life history requirements of resident and migratory bull trout local population in the Malheur Core Area • H. Provide long-term habitat protection through land purchase or easements • I. Develop educational materials on bull trout and their habitat needs to provide to landowners and interested public parties • J. Integrate watershed analyses and assessments and restoration activities on public and private lands • K. Coordinate bull trout recovery with recovery efforts, management plans, etc. of other species such as redband trout • L. Improve and implement fisheries management guidelines and policies designed to protect native species • M. Evaluate effectiveness of different habitat restoration techniques in restoring channel functions and local bull trout populations in the Malheur Core Area		

	• N. Determine the movement and seasonality of use of different habitat types by adult and sub-adult migratory bull trout in multiple streams, with emphasis on reservoirs and mainstem rivers • O. Work cooperatively with the Burns-Paiute tribal government to implement recovery actions, periodically review progress towards recovery goals and assess recovery tasks • P. Conduct regular surveys in potential habitat in the Malheur Core Area where bull trout status is unknown or re-colonization is anticipated		
Habitat Access			
• Re-establish historical connectivity and migratory corridors for all native fish species	• Q. Identify and implement opportunities for two-way passage at major dams • R. Install appropriate fish screen and passage structures around diversions and/or remove related migration barriers • S. Provide passage at transportation/road-related barriers • T. Incorporate bull trout recovery actions into The Oregon Plan for Salmon and Watersheds and the Northwest Power and Conservation Council Subbasin/Management Plans • U. Review reservoir operational concerns and provide operating recommendation through Federal consultation or other means • V. Coordinate bull trout recovery with recovery efforts, management plans, etc. of other species such as redband trout, work cooperatively with the Burns-Paiute tribal government to implement recovery actions,	Immediate	5-10 years

	and periodically review progress towards recovery goals and assess recovery tasks		
Population Traits			
• Genetic identification of populations	• W. Develop genetic management plan for bull trout population isolated by human made barriers • X. Determine consequences of genetic fragmentation/isolation due to human-made barriers, identify and pursue opportunities to implement recovery strategies	Immediate	0-5 years
Water Quality			
• Meet water quality standards set by the Malheur River DEQ TMDL's	• Y. Assess sediment sources in Malheur Subbasin • Z. Stabilize roads, crossings, and other sources of sediment delivery • AA. Incorporate bull trout recovery actions into The Oregon Plan for Salmon and Watersheds and the Northwest Power and Conservation Council Subbasin/Management Plans • BB. Identify and pursue opportunities to implement recovery strategies, increase monitoring of sediment inputs on the Malheur National Forest • CC. Coordinate bull trout recovery with recovery efforts, management plans, etc. of other species such as redband trout, improve and implement fisheries management guidelines and policies designed to protect native species, work cooperatively with the Burns-Paiute tribal government to implement recovery actions, and periodically review progress towards recovery	Immediate	10+ years

	goals and assess recovery tasks		
Water Quantity			
• Restore historical stream discharge hydrograph to mainstem and tributary habitats	• DD. Assess current and historical effects of upland management on changes to the hydrograph in all spawning tributaries • EE. Incorporate bull trout recovery actions into The Oregon Plan for Salmon and Watersheds and the Northwest Power and Conservation Council Subbasin/Management Plans • FF. Identify and pursue opportunities to implement recovery strategies, establish/provide instream flows downstream from reservoirs and stabilize flow regimes • GG. Restore connectivity and opportunities for migration by improving instream flows and/or water rights, • HH. Coordinate bull trout recovery with recovery efforts, management plans, etc. of other species such as redband trout, improve and implement fisheries management guidelines and policies designed to protect native species • II. Work cooperatively with the Burns-Paiute tribal government to implement recovery actions, and periodically review progress towards recovery goals and assess recovery tasks	Immediate	10+ years
Contaminants			
• Identify non-point sources	• JJ. Assess and mitigate effects on bull trout from non-point source pollution	Immediate	5-10 years
Competition			
• Remove or control non-native fish populations that impact native	• KK. Implement brook trout removal efforts • LL. Incorporate bull trout recovery actions into The	Immediate	10+ years

fish populations	Oregon Plan for Salmon and Watersheds and the Northwest Power and Conservation Council Subbasin/Management Planss • MM. Determine site-specific levels of competition and hybridization with introduced sport fish and assess impacts of those interactions • NN. Identify and pursue opportunities to implement recovery strategies • OO. Develop and implant an educational effort to address problems and consequences of unauthorized fish introductions • PP. Increase information outreach to anglers • QQ. Improve and implement fisheries management guidelines and policies designed to protect native species • RR. Determine the movement and seasonality of use of different habitat types by adult and sub-adult migratory bull trout in multiple streams, with emphasis on reservoirs and mainstem rivers • SS. Work cooperatively with the Burns-Paiute tribal government to implement recovery actions, periodically review progress towards recovery goals and assess recovery tasks		
Nutrients			
• Restore nutrient cycle and prey base interactions	• TT. Investigate potential for restoring historic prey base by reintroducing anadromous species • UU. Identify and pursue opportunities to implement recovery strategies • VV. Develop an annual work plan to support implementation in the	Immediate	0-5 years

	Malheur Recovery Unit • WW. Review reservoir operational concerns and provide operating recommendation through Federal consultation or other means • XX. Improve and implement fisheries management guidelines and policies designed to protect native species • YY. Evaluate food web interactions in drainages most affected by introduced fishes, reservoir operations, loss of anadromous species (prey base/nutrients), etc, • ZZ. Work cooperatively with the Burns-Paiute tribal government to implement recovery actions, and periodically review progress towards recovery goals and assess recovery tasks		

B. Malheur Redband Trout

Section 4.9.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Malheur	Insufficient evaluation and monitoring data to determine estimate		NA	NA	NA

Status:

Population	Adult Abundance
Malheur	156,200

Section 4.9.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Habitat quality/quantity	Current land use	Livestock grazing, timber harvest, road building, dispersed recreation, urban development and agriculture practices
Habitat access	Current land use	Irrigation diversions, irrigation dams, and road crossings
Water quality	Current land use	Livestock grazing, timber harvest, road building and agriculture practices.
Water quantity	Current land use	Irrigation practices
Competition	Non-native species	Hybridization, introgression and competition with rainbow trout
Nutrients	Current land use; dams	Loss of marine derived nutrients

Section 4.9.2B.3 Strategies and Measures for Malheur Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore and protect instream habitat and stream channel processes	• A. Allow stream flow processes to maintain channels through restoration of natural flow regimes and floodplain connection • B. Improve instream channel habitat through placement of large woody debris and boulders, bank stabilization efforts and flow augmentation/improvements • C. Develop off-channel habitat • D. Remove or modify levies, berms, roads or dikes where appropriate • E. Re-configure modified channels through active restoration • F. Restore shade and canopy, riparian cover, and native vegetation in all redband trout spawning areas • G. Reduce grazing impacts in all redband trout spawning	Immediate	10+ years

	areas • H. Provide long-term habitat protection through land purchase or easements, • I. Evaluate effectiveness of different habitat restoration techniques • J. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan		
Habitat Access			
• Improve habitat connectivity and fish passage	• K. Create fish passage at dams and irrigation water diversion structures • L. Remove unnecessary dams and diversion structures, remove barriers at roads • M. Repair/improve culverts to allow fish passage, eliminate barriers created by dewatered reaches and poor water quality • N. Install approved fish screens at irrigation diversions • O. Identify and implement opportunities for two-way passage at major dams, • P. Determine consequences of genetic fragmentation/isolation due to human-made barriers • Q. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan	Immediate	0-5 years
Water Quality			
• Improve riparian, floodplain and wetland habitats	• R. Maintain/protect existing riparian, floodplain and wetland habitats • S. Restore and maintain connection of stream channels to their floodplains	Immediate	10+ years

	and restore floodplain function • T. Plant native vegetation, reestablish wetlands through easements, restoration and enhancement • U. Establish buffers to improve riparian areas through conservation easements, riparian fencing and implementation of setbacks, and implement proper grazing management • V. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan		
• Improve water quality	• W. Maintain or create adequate vegetation in buffers to intercept overland and subsurface sources of pollution • X. Appropriate application of herbicides and insecticides to protect water quality and aquatic resources • Y. Implement nutrient management • Z. Implement sewage and stormwater management • AA. Increase monitoring of sediment inputs • BB. Assess and mitigate effects on redband trout from non-point source pollution • CC. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan	Immediate	10+ years
• Reduce upland erosion and sedimentation	• DD. Assess sediment sources in Malheur Subbasin • EE. Stabilize roads, crossings, and other sources of sediment delivery	Immediate	5-10 years

	• FF. Encourage improvements in grazing management • GG. Encourage improvements in timber management • HH. Encourage improvements in agricultural practices including methods such as no till farming or cover crops • II. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan		
Water Quantity			
• Reduce out-of-stream water use through efficiency, conservation, lease or purchase	• JJ. Assess current and historical effects of upland management on changes to the hydrograph in all spawning tributaries • KK. Establish/provide instream flows downstream from reservoirs and stabilize flow regimes • LL. Improve irrigation efficiency and water management to increase instream flows (may include lease and purchase of water where necessary and available) • MM. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan	Immediate	10+ years
Competition			
• Remove or control non-native fish populations that impact native fish populations	• NN. Determine site-specific levels of competition and hybridization with introduced sport fish and assess impacts of those interactions • OO. Develop and implant an educational effort to address problems and consequences of unauthorized fish	Immediate	10+ years

	introductions • PP. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan		
Nutrients			
• Restore nutrient cycle and prey base interactions	• QQ. Investigate potential for restoring historic prey base by reintroducing anadromous species • RR. Evaluate food web interactions in drainages most affected by introduced fishes, reservoir operations, loss of anadromous species (prey base/nutrients), etc • SS. Utilize anadromous fish carcass planting methodologies to restore lost marine derived nutrients and monitor effectiveness of these actions • TT. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan	Immediate	0-5 years

Section 4.9.3 Owyhee Subbasin

A. Owyhee Redband Trout

Section 4.9.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Maintain a healthy fishery		Number of local populations	Number of adults/population	Total number of adults
Owyhee			NA	NA	NA

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Owyhee			Unknown

Section 4.9.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Livestock grazing and ATV use
Water quality	Current land use	Livestock grazing
Population traits	Hatchery fish	Introgression with hatchery rainbow trout
Habitat access	Current land use	Road crossings

Section 4.9.3A.3 Strategies and Measures for Powder Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Identify all potential redband trout habitat	• A. Survey all streams that allow for permanent residence, spawning, and rearing of young • B. Classify streams by proper functioning condition	Immediate	1-5 years
• Protect existing properly functioning streams.	• C. Exclude livestock from critical areas using fences, stock troughs, and strategically placed salt licks • D. Reduce sedimentation from roads by improving road crossings, maintaining culverts, and restricting access during wet portions of the year		
• Improve streams with inadequate proper functioning condition	• E. Exclude livestock from critical areas using fences, troughs, and strategically placed salt licks • F. Reduce sedimentation from roads by improving road crossings, maintaining culverts, and restricting access during wet seasons of the year		

	• G. Improve bank stabilization by reestablishing native vegetation such as willows and other hydrophilic plants		
Water Quality			
• Bank stabilization, road maintenance, and livestock exclusion from critical areas	• H. Revegetating shore and banks by active planting • I. Requesting road maintenance as needed • J. Constructing livestock fences, water troughs, and strategically placing salt licks to reduce impacts from livestock	Immediate	1-5 years
Population traits			
• Change stocking practices to include only triploid rainbow trout	• K. Purchasing of only triploid rainbow trout to minimize interbreeding of redband strains and other strains	Immediate	1-5 years
Habitat Access			
• Ensuring that sufficient flows are maintained in road crossings to allow migration upstream and downstream	• L. Installation of culverts, rock crossings, and other types of stream crossings at each location roads intersect streams and designed to maintain adequate flows through each structure to allow fish passage	Immediate	1-5 years

Section 4.9.4 Powder Subbasin

A. Powder Bull Trout

Section 4.9.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Powder	NA			NA	
	Number of Local Populations				
	NA		NA		

	Total Number of Adults				
	NA			NA	

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Powder			Unknown

Section 4.9.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agricultural and urban development
Water quality	Current land use	Livestock grazing and agriculture
Water quantity	Current land use	Irrigation
Habitat access	Current land use	Irrigation diversions and road crossings

Section 4.9.4A.3 Strategies and Measures for Powder Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Improve stream channel processes	• A. Allow stream flow processes to maintain channels through restoration of natural flow regimes and floodplain connection • B. Improve instream channel habitat through placement of large woody debris and boulders, bank stabilization efforts and flow augmentation/improvement • C. Develop off-channel habitat, remove or modify levies, berms, roads or dikes where appropriate • D. Re-configure modified channels through active restoration	Immediate	1-5 years

Water Quality			
• Improve riparian, floodplain and wetland habitats	• E. Maintain/protect existing riparian, floodplain and wetland habitats • F. Implement proper grazing management • G. Establish buffers to improve riparian areas through conservation easements, riparian fencing and implementation of setbacks • H. Reestablish wetlands through easements, restoration and enhancement • I. Plant native vegetation • J. Restore and maintain connection of stream channels to their floodplains and restore floodplain function	Immediate	1-5 years
• Improve water quality	• K. Maintain or create adequate vegetation in buffers to intercept overland and subsurface sources of pollution • L. Appropriate application of herbicides and insecticides to protect water quality and aquatic resources • M. Implement nutrient management, and implement sewage and stormwater management	Immediate	1-5 years
• Reduce upland erosion and sedimentation	• N. Encourage improvements in road management to reduce erosion • O. Encourage improvements in grazing management • P. Encourage improvements in timber management • Q. Encourage improvements in agricultural practices including methods such as not till farming or cover crops	Immediate	1-5 years

Water Quantity			
• Reduce out-of-stream water use through efficiency, conservation, lease or purchase	• R. Improve irrigation and water management to increase flow (may include lease and purchase of water where necessary and available)	Immediate	1-5 years
Habitat Access			
• Improve habitat connectivity and fish passage	• S. Create fish passage at dams and irrigation water diversion structures • T. Remove unnecessary dams and diversion structures • U. Remove barriers at roads; repair/improve culverts to allow fish passage, eliminate barriers created by dewatered reaches and poor water quality • V. Install approved fish screens at irrigation diversions	Immediate	1-5 years

B. Powder Redband Trout

Section 4.9.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Abundance		Number of local populations	Number of adults	Total number of adults
Powder	None		NA	NA	NA

Status:

Population	Abundance
Powder	Unknown

Section 4.9.4B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use	Agricultural and urban development
Water quality	Current land use	Livestock grazing and agriculture
Water quantity	Current land use	Irrigation
Habitat access	Current land use	Irrigation diversions and road crossings

Section 4.9.4B.3 Strategies and Measures for Powder Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Improve stream channel processes	• A. Allow stream flow processes to maintain channels through restoration of natural flow regimes and floodplain connection, and improve instream channel habitat through placement of large woody debris and boulders, bank stabilization efforts and flow augmentation/improvement • B. Develop off-channel habitat, remove or modify levies, berms, roads or dikes where appropriate, and re-configure modified channels through active restoration	Immediate	

Water Quality			
• Improve riparian, floodplain and wetland habitats	• C. Maintain/protect existing riparian, floodplain and wetland habitats • D. Implement proper grazing management • E. Establish buffers to improve riparian areas through conservation easements, riparian fencing and implementation of setbacks, • F. Reestablish wetlands through easements, restoration and enhancement • G. Plant native vegetation • H. Restore and maintain connection of stream channels to their floodplains and restore floodplain function	Immediate	
• Improve water quality	• I. Maintain or create adequate vegetation in buffers to intercept overland and subsurface sources of pollution • J. Appropriate application of herbicides and insecticides to protect water quality and aquatic resources • K. Implement nutrient management • L. Implement sewage and stormwater management	Immediate	
• Reduce upland erosion and sedimentation	• M. Encourage improvements in road management to reduce erosion • N. Encourage improvements in grazing management • O. Encourage improvements in timber management, • P. Encourage improvements in agricultural practices including methods such as not till farming or cover crops	Immediate	
Water Quantity			
• Reduce out-of-stream water use through efficiency, conservation, lease or purchase	• Q. Improve irrigation and water management to increase flow (may include lease and purchase of water where necessary and available)	Immediate	

Habitat Access			
• Improve habitat connectivity and fish passage	• R. Create fish passage at dams and irrigation water diversion structures • S. Remove unnecessary dams and diversion structures • T. Remove barriers at roads; repair/improve culverts to allow fish passage, eliminate barriers created by dewatered reaches and poor water quality • U. Install approved fish screens at irrigation diversions	Immediate	

Section 4.10 Upper Snake Province

Section 4.10.1 Upper, Headwaters, Closed Subbasins

A. Upper, Headwaters, Closed Yellowstone Cutthroat Trout

Section 4.10.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Decrease rainbow or hybrid trout abundance and maintain at no more than 10% of species composition in the South Fork of the Snake River, as indexed by the Conant electrofishing reach		Number of local populations	Number of adults/population	Total number of adults
	Identify and reduce artificially blocked streams or unscreened diversions		NA	NA	NA
	Protect and enhance existing CORE (<1% hybridized) populations and associated habitat emphasizing connectivity and expanded distribution where feasible				
South Fork of the Snake River					
Teton River					
Blackfoot River					
Portneuf River					

	Subbasin/Management Plans		Draft Recovery Plan		
Raft River					
Goose Creek					
Big Cottonwood Creek					
Dry Creek					

Status:

Population	Rainbow/hybrid abundance	Yellowstone Cutthroat trout Abundance
South Fork of the Snake River	1,328 age-1+ fish/mile (2007) Contant Reach	2,244 age-1+ fish/mile (2007) Contant Reach
Teton River	422 age-1+ fish/mile (2007) Teton Valley 50 age-1+ fish/mile(2007) Lower Teton (South Fork)	48 age-1+ fish/mile (2007) Teton Valley 149 age-1+ fish/mile(2007) Lower Teton (South Fork)
Blackfoot River	NA	19 adults collected at migration trap
Portneuf River	Unknown	Unknown
Raft River	Unknown	Unknown
Goose Creek	Unknown	Unknown
Big Cottonwood Creek	Unknown	Unknown
Dry Creek	Unknown	Unknown

Section 4.10.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Hydro-operations and land-use	Loss of peak flows due to hydro-operations and loss of mid- and late-summer flows in small streams due to withdrawals for irrigation
Habitat quality/quantity	Legacy issues	Loss or destruction of important floodplain/riparian habitat and excess sediment delivery
Population traits	Introduced species	Hybridization with rainbow trout
Predation/competition	Birds and introduced fish species	Competition with brook trout and American white pelican predation on spawning Yellowstone cutthroat trout
Harvest	Illegal harvest	Illegal harvest of Yellowstone cutthroat trout
Habitat access	Land-use	Roads, residential development, railroads, dikes, irrigation diversions
Water quality	Legacy issues	Forest and agriculture management practices

Section 4.10.1A.3 Strategies and Measures for Upper, Headwaters, Closed Yellowstone Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Restore peak springtime flows in the South Fork of the Snake River	• A. Monitor fish populations to evaluate effectiveness of managed flow regimes • B. Obtain sufficient normative river flows and river processes to minimize survival bottlenecks of Yellowstone cutthroat trout, and to hinder successful reproduction of rainbow trout • C. Provide a maximum springtime: minimum winter flow ratio of at least 15:1 in at least two of every three years	Immediate	0-10+ years
• Increase stream flows during	• D. Identify opportunities to increase stream flows and	Immediate	0-10+ years

critical periods for migration or mid-late summer rearing	provide funding (e.g., water purchase programs, donated water rights, more efficient irrigation practices, and possibly conversion to groundwater use) • E. Provide access to thermal refugia by restoring connectivity in key systems		
Habitat quality/quantity			
• Reduce impacts from development along river and stream corridors and reduce sediment delivery to the stream network	• F. Identify on-the-ground habitat projects to protect key riparian habitats and stream corridors (e.g., through conservation easements, acquisitions, and technical guidance to prospective developers		0-10+ years
Population traits			
• Reduce impacts from introduced species	• G. Conserve the genetic integrity of the YCT population through development and operation of fish trapping facilities on the four main cutthroat trout spawning tributaries to the South Fork of the Snake River • H. Continue efforts to encourage harvest of rainbow and hybrid trout in the South Fork of the Snake River and in other areas where they pose direct threat to the genetic integrity of Yellowstone cutthroat trout • I. Where rainbow or hybrid trout are stocked in waters supporting native Yellowstone cutthroat trout populations, only triploid (sterile) fish will be used • J. Develop informational programs to educate anglers and the public to risks of random introductions of exotic species • K. Through planning, use enforcement efforts to curtail illegal introductions • L. Consider drainage	Immediate	0-10+ years

	restoration projects that result in the removal of hybridized rainbow trout X Yellowstone cutthroat trout population and the subsequent transplant of genetically pure YCY in naturally or artificially isolated populations		
Predation/competition			
• Reduce impacts from introduced species	• M. Control impacts of introduced fish species • N. Where brook trout are stocked in waters supporting native Yellowstone cutthroat trout populations, only triploid (sterile) fish will be used • O. Develop informational programs to educate anglers and the public to risks of random introductions of exotic species • P. Through planning, use enforcement efforts to curtail illegal introductions • Q. Provide liberal regulations on brook trout	Immediate	0-10+ years
• Reduce pelican predation on spawning YCT	• R. Develop management strategies that will balance conservation and recreation interests for both fish and pelican populations in Idaho.	Immediate to mid-term	0-10+ years
Harvest			
• Reduce impacts associated with the illegal harvest of cutthroat trout	• S. Produce and install easy to read road side signs that inform anglers of what the fishing regulations are when traveling the major roads within the Upper Snake subbasin • T. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem	Immediate	0-10+ years

Habitat access			
• Restore connectivity to important spawning, rearing and refugia habitat	• U. Identify and inventory, impassible roads crossings, subdivisions, railroads, dikes and other man-caused developments that potentially jeopardize fish populations • V. Develop a data base to demonstrate the magnitude of habitat loss and more effectively influence land use decisions • W. Work with the Forest Service, Idaho Department of Lands, other agencies, water users, non-governmental organizations, private developers, landowners, county planners and interested angling groups to make protection of fisheries habitat a primary concern in land use decisions. Work with the above entities to insure mitigation of habitat loss or to restore access whenever possible.	Immediate	0-10+ years
• Unscreened irrigation diversions that entrain fish	• X. Reduce entrainment to irrigation diversions in systems where native fish populations are adversely impacted	Immediate	0-10+ years
Water quality			
• Improve water quality	• Y. Determine levels of in stream contaminants • Z. Work with Department of Environmental Quality, Environmental Protection Agency, U.S. Fish and Wildlife Service, Bureau of Land Management, U.S. Forest Service, private developers, landowners, and other agencies to improve riparian habitat conditions	Immediate	0-10+ years

B. Upper, Headwaters, Closed Northern leatherside chub

Section 4.10.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Maintain and restore populations of Northern leatherside chubin suitable waters and historic habitat to ensure a high probability of long-term persistence in appropriate numbers to perform ecological functions		Number of local populations	Number of adults	Total number of adults
Raft River			NA	NA	NA
Goose Creek					

Status:

Population	Adult Abundance
Raft River	Unknown
Goose Creek	Unknown

Section 4.10.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water Quality	Land-use	Increased water temperatures, sedimentation, and riparian degradation due to livestock grazing
Population traits	Distribution and genetic composition	Distribution and genetic composition unknown

Section 4.10.1B.3 Strategies and Measures for Upper, Headwaters, Closed Northern leatherside chub

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quality			
• Enhance and preserve riparian habitat	• A. Assess population status and linkages to potentially critical habitat • B. Provide information to land management agencies and public on identification, population status and distribution of leatherside chub in the drainages. • C. Work with local regulatory agencies and landowners to minimize impacts of livestock grazing on riparian areas	Immediate	0-10+ years
Population traits			
• Identify current distribution and evaluate genetic composition	• D. Develop baseline population structure information • E. Work with local regulatory agencies and collection permit applicants to document the presence of Northern leatherside chub in the Raft and Goose creek drainages and to secure tissue samples for genetic evaluation	Immediate	0-10+ years

C. Upper, Headwaters, Closed Mountain Yellowstone Cutthroat Trout

Section 4.10.1C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Fort Hall Reservation	15 yct per 100m		NA	NA	NA

Status:

Population	Adult Abundance
Ross Fork (mountain streams)	25/100m
Mill Creek (mountain creek)	12/100m
West Fork Bannock Creek	3/100m
Fort Hall Bottoms (spring creeks)	14/200m

Section 4.10.1C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Introduced species	Hybridization with rainbow trout
Water quality	Land use	Overgrazing of riparian areas contribute to high water temperature and increase sedimentation
Habitat quality/quantity	Land use	Agriculture
Contaminants	Land use	Mining and industry produce selenium and industry bi-products
Water quantity	Land use	Irrigation

Section 4.10.1C.3 Strategies and Measures for Upper, Headwaters, Closed Yellowstone Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population traits			
• Increase species composition to greater than 90% pure Yellowstone cutthroat all sample sites (mountain streams	• A. Evaluate the role of hatcheries for YCT restoration and enhancement in streams once populated by pure YCT • B. Remove all non-native salmonids through harvest,	Immediate	1-5 years

and Bottoms)	and weirs • C. Continue stocking native cutthroat only • D. Continue with on-going restoration projects • E. Inform public of YCT conservation importance • F. Develop and implement Fort Hall fish management plan • G. Protect and enhance YCT core populations (0% hybridized) in the Ross Fork Creek watershed • H. Restore creeks in the Bannock Creek watershed from 25% to greater than 90% YCT and increase trout densities at all sites: West Fork .01m^2 to 1.0m^2 for trout >300mm; restore 0 back to .40m^2 at site on Moonshine cr.; restore back to 1.0m^2 from .27m^2 at Rattlesnake Creek • I. Utilize hatchery facility to assist enhancement of core and conservation populations of YCT on the Reservation, and restoring I/E streams in closed systems • J. Protect all spawning sites • K. Identify and evaluate limiting factors of adult trout on the Fort Hall Bottoms		
• Increase catch per hour from .10 to 2.5 for the Bottoms streams.	• L. Supplement fishery through stocking of native cutthroat trout • M. Utilize hatchery facility to assist enhancement of core and conservation populations of YCT on the Reservation, and restoring I/E streams in closed systems		
Water Quality			

• Protect and enhance fish and wildlife habitat.	• N. Meet TMDLs.	Immediate	1-5 years
Contaminants			
• Reduce contamination	• O. Identify areas of contamination and determine any contamination to aquatic and terrestrial spp. and ecosystems. • P. Enforce existing laws. • Q. Inform public and tribal membership	Immediate	1-5 years
Habitat quality/quantity			
• Improve riparian habitat	• R. Land acquisitions, conservation easements, transfers and exchanges • S. Regional planning, interagencies and private landowners • T. Protect and enhance fish and wildlife habitat through altered grazing practices		
Water Quantity			
• Increase flows	• U. Establish criteria for instream flows • V. Improve irrigation management (water delivery) • W. Screen diversions • X. Develop and implement Fort Hall Fish Management Plan	Immediate	1-5 years

Section 4.11 Systemwide

Section 4.11.1 Systemwide (all applicable subbasins)

A. Freshwater Mussels (western pearlshell, western ridged mussel and the genus Anodonta spp.)

Section 4.11.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Re-establish self-sustaining populations of all three genera in at least 50% of historical habitat		Number of local populations	Number of adults	Total number of adults
Systemwide	Achieve reproduction and recruitment in all three genera		NA	NA	NA
	Increased understanding of factors that led to extirpation of shellfish from drainages within the Columbia River Basin				
	Monitor mussel populations for unique learning opportunities and possible applications elsewhere				

Status:

Population	Distribution	Reproduction and recruitment	Abundance
Systemwide	Unknown	Unknown	Unknown

Section 4.11.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Agriculture, forestry, and residential practices
Population traits	Population structure unknown	Population structure unknown
Water quality	Land use	Agriculture, forestry, and residential practices

Section 4.11.1A.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Determine and restore preferred habitat	• A. Conduct field studies and re-location efforts to identify preferred physical habitat of all three genera • B. Determine optimal stream flows, especially in reaches dewatered for irrigation or impacted by dams • C. Determine habitat preferences through re-location experiments; increase habitat diversity	Immediate	1 – 5 years
• Design and implement a basic monitoring program to determine trends in river mussel populations throughout the Columbia River drainage. Determine what factors may positively and negatively influence recruitment	• D. Determine if recruitment is occurring, through cohort studies, in selected mussel populations throughout the basin for all three genera of river mussels • E. Determine age structure of selected populations. Investigate which factors positively (e.g., abundance of host fish) or negatively (water quality thresholds) impact recruitment into existing mussel beds	Immediate	1 – 5 years
• Determine which genera and species occur in the Columbia River Basin, and which stocks of mussels in the basin, based partly on genotypic	• F. Determine genetically which genera of *Anodonta* occur in the Columbia River Basin (a recent new genus has been discovered) • G. Conduct systematic genetic surveys of mussels in the basin to match existing genetic makeup of populations with extant	Immediate	1 – 5 years

diversity, may be best suited for targeted reintroduction efforts	populations in nearby drainages to find most suitable candidates for re-introduction efforts		
• Determine host fish and minimum host fish population levels needed to maintain self-sustaining mussel populations	• H. Determine host fish through laboratory experiments, culture juvenile mussels in hatchery setting for possible re-introduction trials, determine optimal habitats for both fish hosts and mussel species	Immediate	1 – 5 years
Population traits			
• Determine host fish and minimum host fish population levels needed to maintain self-sustaining mussel populations	• I. Determine host fish through laboratory experiments, culture juvenile mussels in hatchery setting for possible re-introduction trials • J. Determine optimal habitats for both fish hosts and mussel species	Immediate	1 – 5 years
Water quality			
• Determine if existing water quality in selected reaches of the Columbia River Basin will maintain viable and self-sustaining mussel populations	• K. Conduct physiological and condition experiments to determine lethal limits for mussels in regards to summer temperatures, dislodging flows, food availability and composition, and overall water quality requirements	Immediate	1 – 5 years

Section 5.0. Amendments to the Implementation Provisions

Section 5.1. Implementation Funding Provisions[1]

Amendment 5.1.1 The Program Should Define BPA's In-Lieu Funding Restrictions

Include the following language in Implementation Provisions section of the Program:

> The Northwest Power Act authorizes the Council, "in appropriate circumstances," to include off-site enhancement measures in the program to achieve protection from -- and mitigation for -- development and operation of hydroelectric facilities. However, the Northwest Power Act prevents BPA from making expenditures where ratepayer funding merely substitutes for funding from other sources. Specifically, section 4(h)(10)(A) states:
>
> > *The Administrator shall use the Bonneville Administration Fund and the authorities available to the Administrator under this chapter and other laws administered by the Administrator to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project of the Columbia River and its tributaries in a manner consistent with the power plan, the fish and wildlife program adopted by the Council under this subsection, and the purposes of this chapter. Expenditures of the Administrator pursuant to this paragraph shall be in addition to, not in lieu of, other expenditures authorized or required from other entities under other agreements or provisions of law*[1].
>
> The Council will work with BPA, fish and wildlife managers and other interested parties to develop principles guiding BPA in its interpretation of the in-lieu funding restrictions of the Northwest Power Act. We recommend the following factors be considered:
>
> - The in-lieu principles will be included in the Fish and Wildlife Program.
> - The in-lieu principles will focus on whether expenditures are authorized and funding is available for another entity, not merely on whether an action is authorized.
> - The first clause (i.e., "*expenditures authorized … from other entities under other agreements or provisions of law*"), will be interpreted to apply only to public entities, and restricts BPA funding only when funding is available for the same activity, not merely when an agency is authorized to conduct an activity.

)(

[1] NOAA Fisheries abstain from Section 5.1 of the CBFWA amendment recommendations.

- The second clause (i.e., *“expenditures … required from other entities under other agreements or provisions of law”)* will be interpreted to apply when expenditures are required under a FERC license or a court-ordered remediation, or under a provision of law that imposes a non-discretionary duty.

Amendment 5.1.2 The Program Should Ensure that Funding for Fish and Wildlife Actions can be Carried Over to Spend on Fish and Wildlife

Include the following language in Implementation Provisions section of the Program:

> Bonneville will ensure that any funds that are made available for fish and wildlife expenditures, including payments for anticipated capitalization, should be reserved for fish and wildlife actions. If all the fish and wildlife funds are not expended within a fiscal year, BPA will carry those funds, in addition to anticipated future expenditures, into the next fiscal year to be spent on Program priorities. In addition, BPA is obligated to set rates sufficient to recover its costs for protection, mitigation and enhancement of fish and wildlife. Bonneville will carry over from one rate period to the next unspent ratepayer funds that were collected during a rate period to recover fish and wildlife costs.

Amendment 5.1.3 The Program Should Include a Capitalization Policy for Fish and Wildlife-related Expenditures

Include the following language in Implementation Provisions section of the Program:

> In accordance with sound business principles, BPA will capitalize investments for fish and wildlife over the useful life of such investments. Bonneville will use its permanent borrowing authority to finance construction of capital facilities acquisition and improvements to land, water or other real property, even if the costs of each project are less than $1 million, or if the project has a useful life of less than 15 years, so long as such expenditures otherwise qualify as capital investments under commonly-accepted accounting principles. These projects include, for example, buildings, roads, culverts, stream bank stabilization, fences, utilities, sewage treatment and discharge, diversion screens and ladders, instream structures, fish propagation facilities, and other physical improvements. They also include the acquisition of real property, including water rights and conservation easements. Term acquisitions, such as multi-year water right leases, should be capitalized over the term of the acquisition. Section 4(h)(10(A) of the Northwest Power Act requires BPA to use its borrowing authority under the Federal Columbia River Transmission System Act to finance the construction of capital facilities with an estimated useful life of greater than 15 years and an estimate costs of at least $1,000,000. Bonneville will not interpret this requirement to prohibit the use of its borrowing authority to finance projects that otherwise qualify as capital investments under commonly-accepted accounting principles.

Include the following language in Implementation Provisions section of the Program:

> The Council and the fish and wildlife managers should avoid the distinction between "capital" and "expense" when making project recommendations. When the Council implements the Fish and Wildlife Program, their primary task is to ensure that the highest priority fish and wildlife projects are forwarded to the BPA for funding, consistent with the current Fish and Wildlife Program and the established budget. The BPA has the responsibility to decide how to pay for the recommended fish and wildlife projects. Neither the Council nor the fish and wildlife managers should have a role in deciding the mechanism by which the BPA funds those projects. There are specific rules that govern the use of capital funding and the strategic decision to use capital or expense funding may depend on factors beyond the scope of the Fish and Wildlife Program and the Council's expertise. Therefore, when deciding on which fish and wildlife projects to fund, the Council should focus strictly on the highest priority projects, regardless of whether those projects may or may not qualify as "capital" or "expense".

Amendment 5.1.4 The Council Should Investigate Innovative Ways to Ensure Cost Effective Administration of Program

Include the following language in Implementation Provisions section of the Program:

> As part of the on-going effort to ensure cost-effectiveness of the Fish and Wildlife Program, and to minimize duplicative implementation efforts the Council will explore the potential for improving Program implementation. In these discussions, the Council will consider the following innovations:
>
> - Using biological objectives as performance measures, and the means to secure a commitment on the part of the implementing entities to carry out the Program.
> - Developing mechanisms to hold the funding and implementing entities and agencies accountable for results, perhaps through the use of independent audits.
> - Exploring an implementation work plan development process, which identifies measures to be funded tied to limiting factors with expected biological outcomes, and an implementation budget and planning target covering a five-year period.
> - Delegating federal environmental compliance responsibilities to the project sponsors, where appropriate, and transferring other responsibilities from BPA's Fish and Wildlife Division to fish and wildlife managers in an effort to reduce Program costs and to better align Program implementation with existing and future activities of the region's fish and wildlife agencies and appropriate Indian Tribes.
> - Considering alternative methods of financing, including the establishment of long-term trust funds to support acquisition and management of mitigation projects.

Amendment 5.1.5 The Program Should Discuss the Relationship Between Project Funding and BPA Rate Case

Include the following language in Implementation Provisions section of the Program:

> The Northwest Power Act requires the Bonneville Administrator to recover total system costs through BPA's power rates. The Northwest Power Act requires Bonneville and other federal agencies to provide equitable treatment for fish and wildlife with the other purposes for which the FCRPS is managed. Rates must be sufficient for BPA to recover its costs for protection, mitigation and enhancement of fish and wildlife. In addition, the Northwest Power Act requires BPA to periodically revise its rates if necessary to ensure that it recovers its costs.
>
> The Council will use the 2008 Program as a basis for working with the fish and wildlife agencies and Tribes to develop an implementation budget, with allocations across categories and geographic provinces, to be submitted into the 2010 BPA rate process. Bonneville will use the 2008 Program measures – and cost estimates for implementing the Program provided by the fish and wildlife managers -- as the basis to estimate its fish and wildlife costs, and to periodically revise its cost estimates to protect, mitigate and enhance fish and wildlife as provided under this Program and other applicable laws.

Amendment 5.2. The Project Solicitation Process

The fish and wildlife agencies and tribes intend to consult with BPA and Council to streamline and improve the project solicitation process during this Program amendment cycle. The agencies and tribes expect that this consultation will be based on full recognition of their deference due under the statute, including the principles articulated in sections 4(h)(2), 4(h)(6), and 4(h)(8).

Section 6.0. Appendix: Supporting Documentation

The documents in the appendix, and in some cases, portions of preliminary drafts of these documents, were discussed by the Fish and Wildlife Agencies and Tribes in the development of our recommendations, but are not a part of the consensus recommendations. These documents do not necessarily reflect the views of the Agencies' and Tribes' technical, policy, or legal staff.

Additional supporting documentation will be provided within individual Agency and Tribe's amendment recommendations and during the public comment process.

Section 1.0. Amendments to the Introduction of the Program

Amendment 1.1. Include the Statutory Basis for the Federal and the region's state fish and wildlife agencies and appropriate Indian Tribes participation in the Program

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Amendment 1.2. Maintain the Geographic Program Structure and Include Anadromous Fish, Resident Fish, and Wildlife Sections at Each Level

See http://www.nwcouncil.org/fw/program/2008amend/Default.asp

Amendment 1.3. Combine the Elements of the Existing Program into One Document

See http://www.nwcouncil.org/fw/program/2008amend/Default.asp

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http://www.adaptivemanagement.net/abstracts.htm#symposium

Adaptive learning approaches to fisheries enhancement:

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The Role of Adaptive Management as an Operational Approach for Resource Management Agencies: http://www.ecologyandsociety.org/vol3/iss2/art8/

Amendment 1.5. Integrate Program the with the Plans of the Fish and Wildlife Managers (including Endangered Species Act)

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Amendment 1.8. Clearly Define BPA's Obligations in the Program, consistent with the Northwest Power Act.

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Section 2.0. Amendments to the Basinwide Provisions

Amendment 2.0.1 Add Language to the Objectives for Biological Performance

Amendment 2.0.2 Reorganize the Strategies Section of the Program

Amendment 2.0.3 Include a Research, Monitoring and Evaluation Plan in the Overarching Strategies Section

Amendment 2.0.3.1 Status of the Resource Report

See the Status of the Resource website: http://www.cbfwa.org/sotr/

Amendment 2.0.3.2 Cooperative data compilation, development, distribution and reporting

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Amendment 2.0.5 Add Language Discussing the Impacts of Climate Change and Human Population Growth in the Overarching Strategies and Measures Section

Amendment 2.0.6 Add Language Supporting State Aquatic Nuisance Species Plans State ANS Plans

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Amendment 2.0.8 Add Provisions to Support the Fish and Wildlife Strongholds

Amendment 2.0.9 Add Provisions to Reduce Sea Lion Predation

Section 2.1. Anadromous Fish

Amendment 2.1.1 Current Biological Condition

Amendment 2.1.2 Biological Objectives

Amendment 2.1.3 Limiting Factors

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Amendment 2.1.4 Strategies and Measures

Amendment 2.1.4.4 Consider Results from Hatchery Review Processes

Amendment 2.1.4.5 Add Language Supporting Water Quality Measures in the Overarching Strategies and Measures Section

Amendment 2.1.5 Monitoring

Amendment 2.1.5.1 Monitoring Measures

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Amendment 2.1.5.6 Columbia River PIT Tag Information System

Amendment 2.1.5.7 Regional Mark Processing Center (RMPC) (Evaluation Context)

Amendment 2.1.5.8 Anadromous Fish Evaluation Program (AFEP) (Level 3a)

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Amendment 2.1.6 Identify Specific Reporting Requirements for the Program

Amendment 2.1.7 Evaluation

Amendment 2.1.8 Adjustment in Program Direction

Section 2.2. Resident Fish

Amendment 2.2.1 Report the Current Biological Condition for Resident Fish Populations

Amendment 2.2.2 Maintain the Current Basinwide Objectives for Biological Performance in the Program

Amendment 2.2.3 Outline the Current Limiting Factors Affecting Resident Fish Populations

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Amendment 2.2.4 Provide Priorities and Principles for Resident Fish Strategies and Measures

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Amendment 2.2.5 Include a Statement Regarding Monitoring of Resident Fish Populations

Amendment 2.2.6 Identify Specific Reporting Requirements for the Program

Amendment 2.2.7 Identify How Evaluation of the Resident Fish Section of the Program Will Occur

Amendment 2.2.8 Explain How Adjustment in Program Direction Will Occur Over Time

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Amendment 2.3.6 Identify and Support Specific Reporting Requirements for the Program

Amendment 2.3.7 Identify How Evaluation of the Wildlife Section of the Program Will Occur

Amendment 2.3.8 Explain How Adjustment in Program Direction Will Occur Over Time

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