Grande Ronde Subbasin Plan

Supplement

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Table of Contents

List of Tables

List of Figures

Appendices

INTRODUCTION

The review of the Draft Grande Ronde Subbasin Plan recommendations, public comment, and independent science report by the Northwest Power and Conservation Council (the Council) identified several issues that bear upon the adoptability of the plan. The Council staff proposed how the issues could be addressed by planners to bring the plan to an adoptable condition. The specific issues identified as needing to be addressed are as follows:

- Artificial Production: Clearly address how Artificial Production relates to the Subbasin Plan objectives.
- Expand the assessment to address the role of Harvest, Artificial Production and Passage in the context of the habitat conditions.
- Linkages: Develop clear, explicit linkages between the limiting factors listed in the Assessment, the Inventory gaps, and the Management Plan.
    - EDT: Check model input for accuracy
    - Complete the following scenario runs: 1) PFC, 2) No Action, Status Quo and, 3) Short Term Restoration Program. Integrate the EDT results into the Assessment and Management Plans.
    - Objectives: Express the objectives in terms of VSP parameters by population and where possible develop measurable targets. Where measurable targets are not possible develop a process to get to them.
- Prioritization: Develop an approach to prioritization of projects and clearly state how priorities for what should be done are determined.
- ESA/CWA conformance: Develop text demonstrating compliance to ESA/ CWA.

Most of these issues were due to a lack of adequate time to populate the EDT model, run and analyze the results. This supplement was developed to remedy these issues. This supplement contains revised portions of the Aquatic Assessment Section and a revised Aquatic Management Plan. Instead of editing the entire subbasin plan this supplement was developed to present only the revised sections which can be viewed as replacements for the sections in the draft subbasin plan. The section numbering in the supplement is identical to the Draft Grande Ronde Subasin Plan, thus the sections in this supplement are designed to entirely replace the sections in the Draft Plan with the same numbers. For Example section "5.4 Consistency with ESA/CWA Requirements" in the Draft Subbasin Plan can be removed and replaced with the text included in this supplement.

3.0 SUBBASIN ASSESSMENT

* Sections highlighted in Blue indicate no changes from Original Plan. See original plan for the text.

3.1 Subbasin Overview – *No change to this entire section*

3.2 Focal Species Characterization and Status

3.2.1 Native/non-native Wildlife, Plant and Resident/ Anadromous Fish of Ecological Importance

3.2.2 Focal Species Selection

3.2.3 Aquatic Focal Species Population Delineation and Characterization

3.2.3.1 Spring Chinook

Spring Chinook Population Data and Status
Spring Chinook Unique Population Units
Spring Chinook Life History
Spring Chinook Harvest & Supplementation
Spring Chinook Current & Historic Distribution
Identification of Differences in Distribution Due to Human Disturbance

Spring Chinook Population Risk Assessment

In order to support the planning decision process and address the whole array of potential habitat factors within the subbasin, the Ecosystem Diagnosis and Treatment (EDT) Model was utilized for all six Chinook and four steelhead populations. EDT was developed to evaluate aquatic habitat with respect to the requirements of a particular fish species. EDT follows a medical diagnosis and treatment model where the "patient" is compared to an idealized "template." EDT does this by tracking habitat over the entire life cycle of a fish population and assessing the quantity and quality of the habitat in terms of survival at each of several life stages. This is done for both current (patient) and potential or historic (template) conditions. The inputs for the analysis include a set of environmental data covering the range of physical and biological factors that might describe the environment of the fish. These factors are assessed through a series of species-habitat "rules" based on the available scientific knowledge. The products of this analysis include an indication of the health of the environment in terms of the potential capacity and productivity of a fish population.

In order to run the EDT model, the stream network in the Grande Ronde subbasin was divided into 509 discrete reaches. Each of these 509 reaches was rated for 46 environmental attributes for current conditions and another 45 attributes for historical conditions. Over 45,000 ratings were assigned to reaches within the basin. Empirical observations within these reaches were not available for all of these ratings; approximately 20% of these ratings are from empirical data. Much of the remaining data was based on the expert opinion of local biologists within the basin.

Due to time constraints, the large subbasin size and large amount of available information, it was difficult to fully analyze available data and adjust the data to fit EDT definitions. As part of the Subbasin Plan response to comments, the EDT database was independently reviewed by staff at Mobrand Biometrics. They found no significant errors in the input data used for this analysis and recommended utilizing these results for the current condition evaluation.

Based on this review of the EDT data there were no changes in the EDT analysis presented in the May Subbasin Plan.

EDT HABITAT PRIORITIES FOR GRANDE RONDE SPRING CHINOOK BY POPULATION

Wenaha Spring Chinook

Minam Spring Chinook

Wallowa-Lostine Spring Chinook

Lookingglass Creek Spring Chinook

Catherine Creek Spring Chinook

Upper Grande Ronde Spring Chinook

3.2.3.2 Summer Steelhead

SUMMER STEELHEAD POPULATION DATA AND STATUS

SUMMER STEELHEAD UNIQUE POPULATION UNITS

SUMMER STEELHEAD LIFE HISTORY

SUMMER STEELHEAD CURRENT & HISTORIC DISTRIBUTIONS

HARVEST & SUPPLEMENTATION

The Wenaha and Minam rivers and Joseph Creek are wild fish management areas for summer steelhead in the subbasin, and thus receive no hatchery supplementation. In the lower Grande Ronde there is no intentional supplementation. It is likely there are strays but not in large numbers. There has been no harvest of wild steelhead in sport fisheries since late 1970's and no recent substantial tribal harvest of Joseph Creek Steelhead. Fishing has been open for harvest of adipose fin-clipped hatchery adults since 1986. Joseph Creek has been closed to steelhead angling since the mid-1970's.

Some supplementation of Deer Creek, Catherine Creek, and upper Grande Ronde occurred in late 1980's and early 90's. Releases of hatchery steelhead into upper Grande Ronde and Catherine Creek. were discontinued in the late 1990's. Releases are now confined to acclimation facilities in Spring Creek (Wallowa Hatchery), Cottonwood Acclimation Facility and Deer Creek. Only wild adults are released above Deer Creek weir for natural spawning. Sport harvest is restricted to only adipose fin-clipped hatchery adults.

IDENTIFICATION OF DIFFERENCES IN DISTRIBUTION DUE TO HUMAN DISTURBANCE

STEELHEAD POPULATION RISK ASSESSMENT

As part of the Subbasin Plan response to comments, the EDT database was independently reviewed by staff at Mobrand Biometrics. They found no significant errors in the input data used for this analysis and recommended utilizing these results for the current condition evaluation.

Based on this review of the EDT data there were no changes in the EDT analysis presented in the May Subbasin Plan.

EDT Habitat Priorities for Grande Ronde Steelhead by Population

Lower Grande Ronde Steelhead
Joseph Creek Steelhead
Wallowa Steelhead
Upper Grande Ronde Steelhead

3.2.3.3 Bull Trout

3.2.3.4 Description of Aquatic Introductions, Artificial Production and Captive-breeding Programs

3.2.3.4.1 Aquatic Introductions

3.2.3.4.2 Artificial Production: Current

3.2.3.4.3 Artificial Production: Historic

3.2.3.4.4 Artificial Production and Introduction: Ecological Consequences

3.2.3.4.5 Relationship between Naturally- and Artificially-produced Populations

The Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, and Oregon Department of Fish and Wildlife feel that artificial propagation may be capable of increasing natural production of Grande Ronde subbasin Chinook salmon and steelhead populations. There is not, however, universal acceptance of the recovery benefits of hatchery supplementation. Indeed, traditional hatchery programs have not always met with success in the past.

NOAA Fisheries recently completed an evaluation of the effects of artificial propagation on the status and likelihood of extinction of west coast salmon and steelhead populations (NOAA Fisheries 2004). This evaluation provides a framework for understanding the relationship between natural and artificially produced Grande Ronde subbasin spring/summer Chinook salmon and steelhead populations. The evaluation determined the impact on the natural population and the extent of divergence between natural and hatchery-origin fish by assessing key factors, including genetic data, life-history and population dynamics information, and characteristic propagation program practices (the source of broodstock and broodstock mating protocols in particular). The evaluation focused on The Snake River ESU and individual population units and was based on NOAA Fisheries Viable Salmon Population Criteria (VSP): Abundance, productivity, diversity, and spatial distribution.

Snake River Spring/Summer-Run Chinook salmon

Overall, the Snake River ESU's spring/summer Chinook salmon hatchery programs have contributed to the increases in the ESU's total abundance and the number of natural spawners observed in recent years (NOAA Fisheries 2004). All of the hatchery stocks are derived from local natural populations and employ management practices designed to preserve genetic diversity. In the Grande Ronde subbasin, the Lostine River, Catherine Creek, Upper Grande Ronde, and Lookingglass Creek artificial propagation programs were evaluated. Each of these programs are integrated with the local natural populations which are identified as independent populations by the Technical Recovery Team. There is still significant genetic differentiation between the hatchery and natural populations and within the basin between the Minam, Wenaha, Grande Ronde and Lostine Rivers and Catherine Creek natural spawners.

Abundance of natural spawners has increased in the Lostine and Catherine Creek populations while the Upper Grande Ronde River is responding slowly. The Grande Ronde Captive Broodstock programs likely have prevented the extirpation of the local natural populations and are now providing a level of preservation of the genetic stock. Additionally, there is a balanced mix of natural fish reserves and propagation programs within the subbasin. Hatchery releases are managed to maintain wild fish reserves (i.e., the Wenaha and Minam populations) in an effort to preserve natural local adaptation and genetic variability. These hatchery operations have not reduced the spatial distribution of the Grande Ronde spring/summer Chinook populations. NOAA Fisheries concluded that the spring/summer Chinook salmon artificial propagation programs in the Grande Ronde subbasin (and collectively in the Snake River ESU) provide a beneficial effect to the basin's abundance, spatial structure, and diversity. The program provides a neutral or uncertain effect to the subbasin's productivity.

The benefits of the artificial propagation program, however, do not alter the ESA risk assessment: The Snake River spring/summer-run Chinook salmon ESU in total, and within the Grande Ronde subbasin, is likely to become endangered in the foreseeable future (NOAA Fisheries 2004). NOAA Fisheries has concluded that there are serious in-basin and out-of-basin non-hatchery issues that continue to impact the subbasin. Habitat loss and instream flow issues continue to limit recovery efforts and affect both hatchery and natural origin fish survival. Parent-replacement or lambda values are less than 1.0 for natural spring/summer Chinook salmon spawners long term due to migration corridor and other out-side-the-basin factors.

The following is a summary of the impacts of the Grande Ronde subbasin spring/summer Chinook salmon artificial propagation programs on the VSP criteria (NOAA Fisheries 2004):

Lostine River Spring Chinook Salmon Propagation Program

The broodstock objectives of Lostine River Chinook Salmon Propagation Program are to collect adults throughout the run and be representative of the natural population. The program is designed to increase the number of adults on the spawning grounds leading to natural production. Additional objectives are to provide state and tribal harvest opportunities in the Grande Ronde subbasin. Best management practices are applied to program implementation. No captive-propagation adults are used in the conventional broodstock.

<u>Abundance</u> – The program has successfully increased the number of individual fish in this population short-term, with total captive and conventional smolt releases approaching 250,000 in recent years, and increasing the number of adults released for natural spawning escapement.

<u>Productivity</u> – With only a few years of completed brood years of limited adult returns from the captive and conventional smolt programs, it is too early in the program to evaluate either short- or long-term affects on population productivity or success of the hatchery component. Population productivity will be monitored over time.

Diversity – The program is designed and managed to select broodstock representative of the source population, increase the effective breeding population size, and avoid selection. Increasing the abundance of the native stock is expected to reduce demographic effects related to the very small natural population size. Phasing out the out-of-basin Carson and Rapid River stocks is believed to have reduced a significant risk factor to this population.

Distribution – The program is designed to supplement the local, Lostine River Chinook salmon population and is sized appropriately for the capacity of the basin. Naturally spawning fish are widely distributed in the Lostine River. As numbers of returning adults increase, spawning and rearing salmon are expected to utilize the entire available, suitable habitat in the basin. However, at this time the effects on distribution are unknown and will be monitored.

Catherine Creek Spring Chinook Salmon Propagation Program

The broodstock objectives of Catherine Creek Chinook Salmon Propagation Program are to collect adults throughout the run and be representative of the natural population. The hatchery and natural components of this program are believed to be very similar given the recent development of this program from natural fish. The program is designed to increase the number of adults on the spawning grounds leading to natural production. Additional objectives are to provide state and tribal harvest opportunities in the Grande Ronde subbasin. Best management practices are applied to program implementation. All hatchery fish are marked with adipose fin clips. No captive-propagation adults are used in the conventional broodstock.

Abundance – The program has successfully increased the number of individual fish in this population short-term, with combined captive and conventional smolt releases averaging 150,000 in recent years and increasing the number of adults released for natural spawning escapement.

Productivity – With only a few years of completed brood years of limited adult returns from the captive and conventional smolt programs, it is too early in the program to evaluate either short- or long-term affects on population productivity or success of the hatchery component. Population productivity will be monitored over time.

Diversity – The program may have helped preserve the remaining diversity in this population in the mid-1990s when the population was at very low abundance. The propagation program is designed and managed to select broodstock representative of the source population, increase the effective breeding population size, and avoid selection. Increasing the abundance of the native stock is expected to reduce demographic effects related to very small natural population size. Phasing out the out-of-basin Carson and Rapid River stocks is believed to have reduced a significant risk to the native fish.

Distribution – The program is designed to supplement the local, Catherine Creek Chinook salmon population and is sized appropriately for the capacity of the basin. Naturally spawning fish are widely distributed in Catherine Creek. As numbers of returning adults increase, spawning and rearing salmon are expected to utilize the entire available, suitable habitat in the basin. However, at this time the impacts on distribution are unknown and will be monitored.

Upper Gande Ronde River Chinook Salmon Propagation Program

The program was initiated from locally derived fish and the program fish are no more than one generation removed from the natural parents. The broodstock objectives of Grande Ronde River Chinook Salmon Propagation Program are to collect adults throughout the run and be representative of the natural population. The hatchery and natural components of this program are believed to be very similar given the recent development of this program from natural fish. The program is designed to increase the number of adults on the spawning grounds leading to natural production. Additional objectives are to provide state and tribal harvest opportunities in the Grande Ronde subbasin. Best management practices are applied to program implementation. All hatchery fish are marked with adipose fin clips. No captive-propagation adults are used in the conventional broodstock.

Abundance – The program has been less successful than the Lostine and Catherine Creek programs in terms of increasing the number of individual fish in the population, but smolt releases have increased. The program, however, is believed to have improved the abundance of this stock compared to what might have persisted without artificial propagation.

Productivity – With only a few years of limited adult returns from the captive smolt program, it is too early in the program to evaluate either short- or long-term impacts on population productivity or success of the hatchery component. Population productivity will be monitored over time.

Diversity – The program may have helped preserve the remaining diversity in this population in the mid-1990s when the population was at very low abundance. The propagation program is carefully designed and managed to select broodstock representative of the source population, increase the effective breeding population size, and avoid selection. Increasing the abundance of the native stock is expected to reduce demographic effects related to very small natural population size. Phasing out the out-of-basin Carson and Rapid River stocks is believed to have reduced a significant risk to the native fish.

Distribution – The program is designed to supplement the local, upper Grande Ronde River Chinook salmon population and is sized appropriately for the capacity of the basin. As numbers of returning adults increase, spawning and rearing salmon are expected to utilize the entire available, suitable habitat in the basin. However, at this time the impacts on distribution are unknown and will be monitored.

Lookingglass Creek Spring Chinook Salmon Propagation Program

The indigenous Lookingglass stock was extirpated by the early 1990s. Catherine Creek Stock has been selected as the geographically most proximate Grande Ronde subbasin tributary stock that has a life history similar to the extirpated stock and sufficient abundance to support the reintroduction effort. The captive-broodstock smolts released into Lookingglass Creek are no more than one generation removed from natural fish. The program is designed to reestablish a run of natural and artificially propagated spring Chinook salmon derived from Chinook native to the Grande Ronde subbasin back into Lookingglass Creek. The program is also designed to provide state and tribal harvest opportunities once adults return in sufficient numbers. Annual releases of up to 150,000 smolts from Catherine Creek captive or anadromous returns are planned with the program transitioning to a conventional smolt program once sufficient adults return to Lookingglass Creek. The eventual goal is to reintroduce native salmon back into Lookingglass Creek and develop a localized hatchery stock.

Abundance – The Lookgglass Creek propagation program began releases with brood-year 2000 parr released in 2001 and brood-year 2002 smolts released in 2004. It is too early in the program to determine if adults will be successfully produced from this initial release.

Productivity – It is too early in the program to evaluate either the short- or long-term impacts on population productivity or success of the hatchery component at natural reproduction.

Diversity – The program is designed to develop a localized broodstock representative of a population believed to be similar and geographically proximate to the extirpated native Lookingglass Creek stock. Development of a localized broodstock based on the listed, in-ESU stock while phasing out the out-of-basin Carson and Rapid River stocks is believed to have reduced a significant risk to native fish within the Grande Ronde Basin. A successful reintroduction should increase the diversity of spring Chinook salmon in the Grande Ronde Basin as fish adapt to Lookingglass Creek over time.

Distribution – Restoring a natural spawning population to Lookingglass Creek will increase the distribution of listed salmon within the ESU.

Snake River Basin Steelhead

The evaluation by NOAA Fisheries focused on the Lower Grande Ronde, Joseph Creek, Wallowa River, and Upper Grande Ronde populations (NOAA Fisheries 2004). The artificial propagation programs evaluated included the Cottonwood Pond, Wallowa Hatchery, and Big Canyon Satellite Pond facilities. These artificial propagation programs are derived from non-local stocks and are genetically distinct from local natural populations within the ESU. The program is managed as an isolated program and is not intended to be similar to any natural population in the Grande Ronde subbasin. The overall contribution of the hatchery programs in increasing natural population abundance is minimal. The contribution to productivity and diversity is uncertain. The Grande Ronde programs have no impact on distribution. Most returning hatchery steelhead are collected at hatchery weirs or have access to unproductive mainstem habitats, limiting potential contributions to the productivity the entire ESU. Overall within the Snake River ESU, the artificial propagation programs affect only a small portion of the ESU's spatial distribution, and confer only slight benefits to the ESU's spatial structure.

The benefits of the artificial propagation program, however, do not alter the ESA risk assessment: The naturally spawned component of the Snake River Basin steelhead trout, including the Grande Ronde subbasin population, is likely to become endangered within the foreseeable future. NOAA Fisheries has concluded that there are serious in-basin and out-of-basin non-hatchery issues that continue to impact the ESU. Within the Grande Ronde subbasin, habitat loss and instream flow issues continue to limit recovery efforts and affect natural origin fish survival.

The following is a summary of the impacts of the Grande Ronde subbasin steelhead artificial propagation programs on the VSP criteria (NOAA Fisheries 2004):

Cottonwood Pond Steelhead Propagation Program

The Wallowa stock was originally derived in 1976 and 1978 by steelhead adult trapping at Ice Harbor and Little Goose Dams during the spring and by importing Pahsimeroi hatchery stock in 1979. The stock is considered to be a composite of "A" and "B" run steelhead from the Snake River basin and is not part of the ESU. The program is managed as an isolated harvest program and is not intended to be similar to any natural population in the subbasin. A small run of natural-origin steelhead has developed in Cottonwood Creek, apparently originating from hatchery fish. These natural fish pass above the Cottonwood wier to spawn naturally. Adult returns are successfully homing back to Cottonwood Pond and the hatchery program appears to be isolated from important natural spawning areas.

<u>Abundance</u> – This program rears a hatchery stock that is not part of the ESU and does not contribute to its abundance.

<u>Productivity</u> – It is unknown if this program has any affect on productivity of Grande Ronde subbasin steelhead.

<u>Diversity</u> – It is unknown if this program has had any affect on diversity. Hatchery steelhead have not been reported in Joseph Creek, an important steelhead production area.

<u>Distribution</u> – This program is believed to have no effect on distribution.

Wallowa River Steelhead Propagation Program

The Wallowa Stock originated from collections of steelhead adults during the spring at Ice Harbor Dam (1976), Little Goose Dam (1977, 1978), and embryos from Pahsimeroi Fish Hatchery in Idaho (1979). Since 1979, Wallowa stock adults returning to Wallowa Hatchery, Big Canyon satellite facility, and Cottonwood Pond have been utilized as broodstock. The Wallowa program utilizes a hatchery stock which is not part of the ESU. The program is managed as an isolated harvest program and is not intended to be similar to any natural population in the Grande Ronde subbasin. The program is at least partially successful in isolating the hatchery-origin returns from important natural production areas. There is evidence that there is minimal straying of the hatchery fish into other Grande Ronde subbasin natural production areas. Very few marked hatchery fish have been found by counts at Lookingglass Hatchery, Catherine Creek, and upper Grande Ronde River traps. There is less information concerning hatchery fish returning to the Wallowa River. It appears, however, that fish released at the two acclimation sites (Wallowa Hatchery and Big Canyon) do not appear to stray between these facilities. Wallowa hatchery steelhead are known to stray into the Deschutes River (Middle Columbia steelhead ESU) in fairly large numbers.

<u>Abundance</u> – This program rears a hatchery stock that is not part of the ESU and does not contribute to its abundance.

Productivity – It is unknown if this program has had any effect on productivity of Grande Ronde steelhead.

Diversity – It is unknown if this program is having any effect on diversity.

Distribution – This program is believed to have no effect on distribution.

3.2.3.5 Environmental conditions for Aquatic Focal Species

For the purposes of this assessment "current" conditions were defined as the condition of the aquatic environment as it exists today. "Template" conditions were defined as what a given reach would be like if the system were restored to the fullest extent possible short of disrupting infrastructure that is vital to modern society and that is likely to remain in place for the foreseeable future. In those reaches with little cultural modification this reference condition might equate to "historic" conditions (i.e., conditions that were in place prior to European settlement).

Due to the large numbers of EDT variables (45) that needed to be rated for each reach (509 reaches) this was a large task. The final documentation and a summary of ratings for current and template conditions are included as **Appendix A** to this supplement.

3.2.4. Terrestrial Focal Species Population Delineation and Characterization

3.2.5 Plant Focal Species

3.3. OUT-OF SUBBASIN EFFECTS

3.4 ENVIRONMENT/POPULATION RELATIONSHIPS

3.5. IDENTIFICATION AND ANALYSIS OF LIMITING FACTORS/CONDITIONS

3.5.1. Description of Historic Factors Leading to Decline of Focal Species/Ecological Function-Process – Aquatic

3.5.1.2 Identified Habitat Limiting Factors

Part of the output from the EDT model is relative protection and restoration ratings for each reach that a given focal species currently uses, or historically used. These results are presented in section 3.2.3. The output from EDT provides a first approximation of where and in what order restoration and protection might proceed within the subbasin. It is important to consider the results from EDT in the Grande Ronde subbasin were difficult to interpret due to several technical factors. First of all, a separate output page was developed for each of the ten focal species populations. It was difficult to compare among these separate tables and graphics, particularly since there were different numbers of reaches assessed for different focal species. Secondly, the volume of output when considered at the subbasin scale was just too much to meaningfully interpret. However, some trends are apparent and the following sections summarize key points.

The EDT modeling approach provides a gauge of 16 “survival” or “limiting” factors for spring Chinook and steelhead:

- Flow
- Channel stability
- Habitat diversity
- Key habitat quantity
- Obstructions
- Withdrawals
- Sediment load
- Oxygen
- Chemicals
- Temperature
- Food
- Competition with hatchery fish
- Competition with other species
- Predation
- Pathogens
- Harassment/Poaching

As an output of the EDT analysis, these limiting factors are ranked in a qualitative way as having *high* (or large), *medium*, *low*, or no impact on the focal species’ survival. The most pervasive limiting factors with *high* or *medium* impacts for both species were channel habitat conditions (key habitat quantity and habitat diversity), high water temperatures, sediment loads, and flow modification. Culverts and other fish passage barriers were not adequately addressed through the EDT analysis. Evaluation of fish passage issues will be addressed through the management plan. The other limiting factors had minimal impacts on the survival ratings or are largely dependent on the primary factors.

Figures 3-1 and 3-2 show the limiting factors that had a *high* impact on spring Chinook and steelhead survival and the proportion of Geographic Areas in which the factor is limiting. Figures 3-3 and 3-4 show the limiting factors that had a *medium* impact on spring Chinook and steelhead survival and the proportion of Geographic Areas in which the factor is limiting.

Key habitat quantity and sediment loads highly impacted survival in the greatest proportion of steelhead and spring Chinook Geographic Areas. Key habitat quantity and habitat diversity are the most pervasive limiting factors for spring Chinook (with high and medium impact), impacting more than 50% of all the Geographic Areas. Channel habitat characteristics also have a disproportionate impact on steelhead survival. High water temperatures impacted a large proportion of the steelhead and spring Chinook Geographic Areas. Low flows resulting from water withdrawals are also limiting for both populations. While low flows received lower EDT ratings, there is a large cumulative impact from reduced stream flows. Flow and water withdrawals impacted most of the basins. Low summer flows is a key limiting factor, since flows effect the available habitat quantity and can help create higher water temperatures.

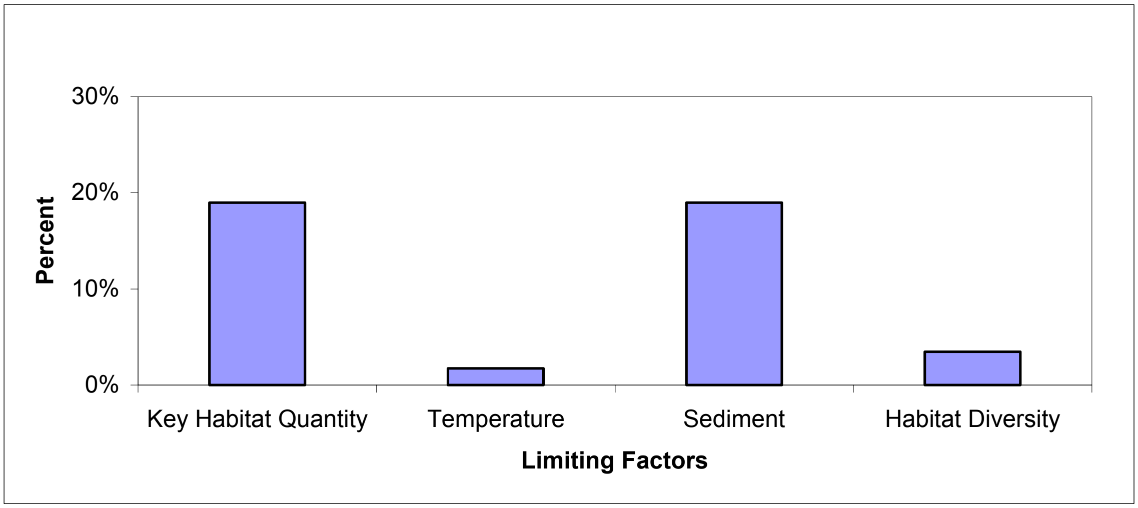

Figure 3-1. The percentage of all geographic areas in which the EDT graphed limiting factors have a large impact on the survival of spring Chinook salmon.

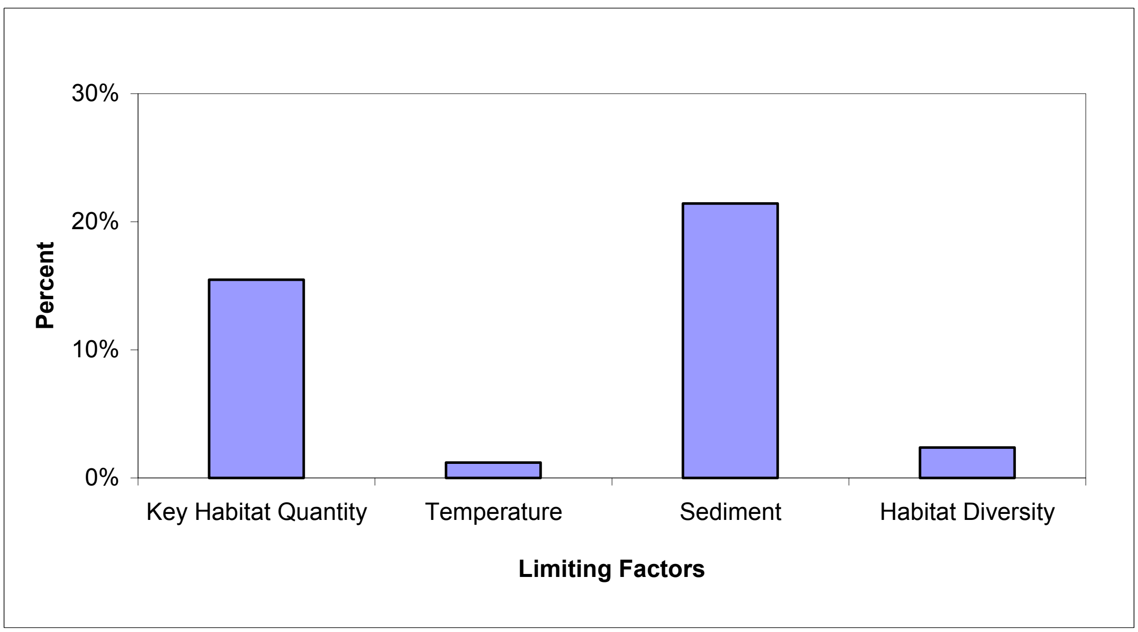

Figure 3-2. The percentage of all geographic areas in which the EDT graphed limiting factors have a large impact on the survival of steelhead.

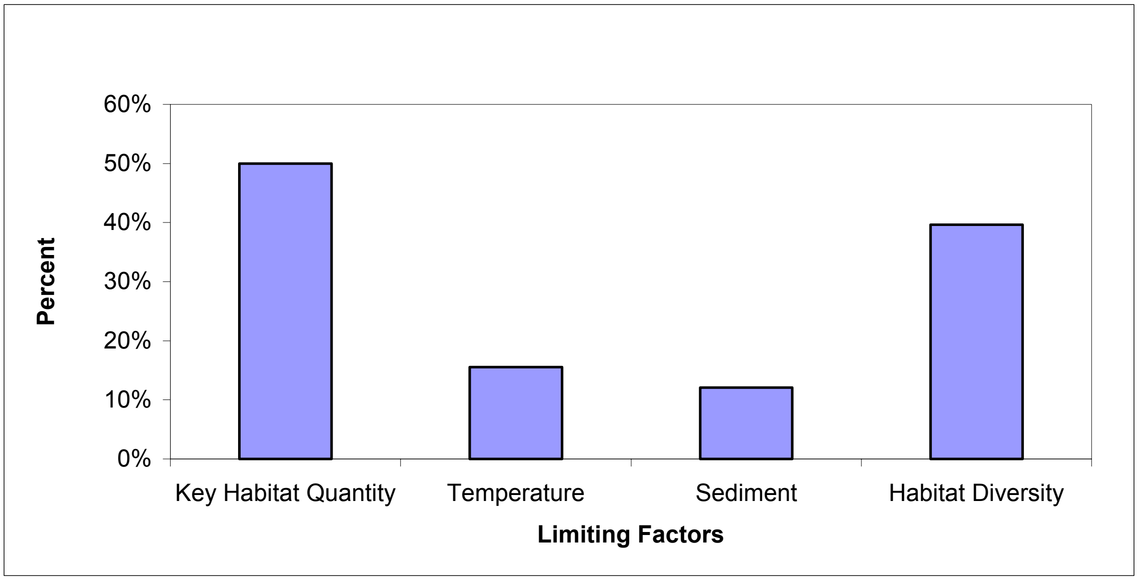

Figure 3-3. The percentage of all geographic areas in which the EDT graphed limiting factors have a medium impact on the survival of spring Chinook salmon.

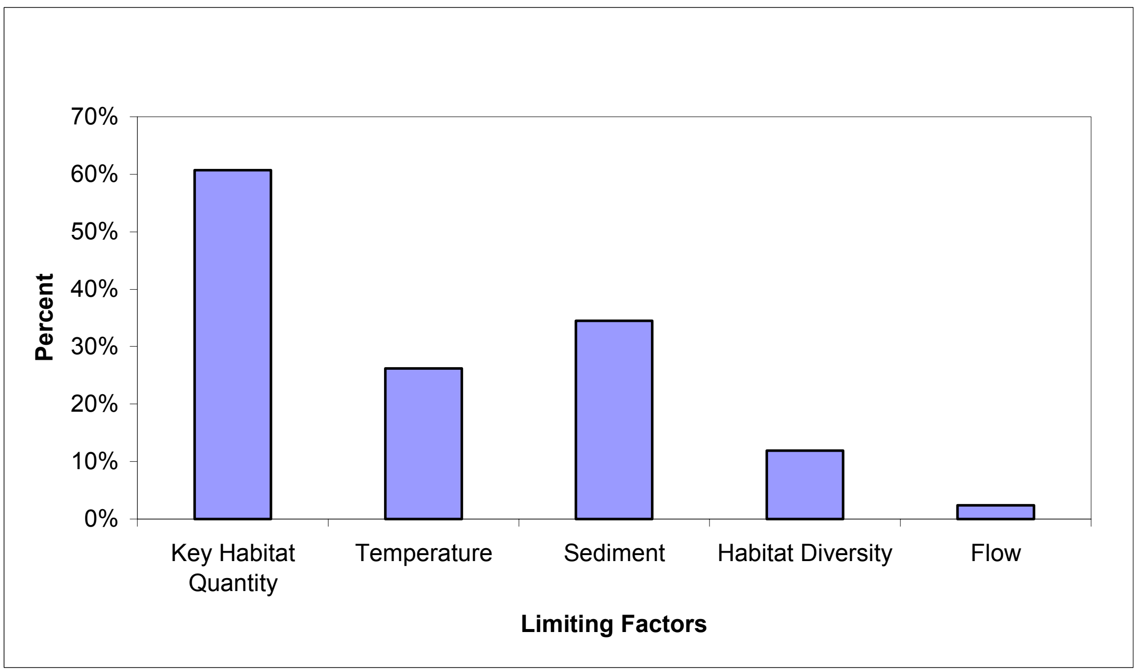

Figure 3-4. The percentage of all geographic areas in which the EDT graphed limiting factors have a medium impact on the survival of steelhead.

3.5.2 Identification of High Priority Areas for Restoration

The EDT model output provides a tool for estimating the effectiveness of habitat restoration efforts on steelhead and spring Chinook survival. All of the Geographic Areas in the subbasin were ranked for the relative benefits of habitat restoration and protection on the target populations. This information helps determine habitat restoration implementation priorities since actions will have a disproportionate effect in some of the Geographic Areas. Tables 3-1 and 3-2 show the highest priority Geographic Areas for restoration of the subbasin's spring Chinook and steelhead populations. The Wenaha and Minam watersheds, which have a large proportion of their area within wilderness designation, have very limited restoration potential. On the other hand, watersheds such as the Wallowa-Lostine, Upper Grande Ronde, and Catherine Creek have widespread management impacts and there is a very large benefit from habitat restoration. Tables 1 and 2 also show the key factors limiting steelhead and spring Chinook survival in the high priority Geographic Areas. A high restoration benefit ranking indicates that on-the-ground projects that result in improved aquatic/riparian habitat, reduced sediment delivery to the streams, and improved flow and water temperature regimes will provide a relatively large increase in abundance, productivity and diversity of the species.

Table 3-1. The EDT identified the five highest priority Geographic Areas for restoration and key factors limiting survival for each Grande Ronde subbasin spring Chinook population.

Population and Geographic Area Restoration Ranking	Key Limiting Factors (*High* and *Medium* impacts)
Wenaha*	
(1) Lower Grande Ronde R. 1	Habitat Diversity, Key Habitat Quantity
Minam*	
(1) Lower Wallowa River	Habitat Diversity, Key Habitat Quantity
(2) Lower Minam River	Key Habitat Quantity
Wallowa-Lostine	
(1) Upper Wallowa River	Habitat Diversity, Key Habitat Quantity, Sediment
(2) Lower Lostine River	Habitat Diversity, Key Habitat Quantity, Temperature
(3) Mid Wallowa River	Habitat Diversity, Key Habitat Quantity
(4) Hurricane Creek	Habitat Diversity, Key Habitat Quantity, Sediment, Temperature
(5) Prairie Creek	Habitat Diversity, Key Habitat Quantity, Sediment, Temperature
Lookingglass	
(1) Lower Grande Ronde R. 2	Key Habitat Quantity
(2) Lower Lookingglass Creek	Habitat Diversity, Key Habitat Quantity
(3) Upper Lookingglass Creek	Key Habitat Quantity
(4) Little Lookingglass Creek	Habitat Diversity, Key Habitat Quantity
(5) Lower Grande Ronde R. 1	Habitat Diversity, Key Habitat Quantity
Catherine Creek	
(1) Mid Catherine Creek	Habitat Diversity, Key Habitat Quantity, Temperature
(2) Lower Indian Creek	Habitat Diversity, Key Habitat Quantity, Temperature
(3) SF Catherine Creek	Sediment
(4) NF Catherine Creek	Habitat Diversity, Key Habitat Quantity, Sediment
(5) Lower Grande Ronde R. 2	Key Habitat Quantity
Upper Grande Ronde	
(1) Upper Gande Ronde R. 1	Habitat Diversity, Key Habitat Quantity, Sediment
(2) Mid Grande Ronde R. 4	Habitat Diversity, Key Habitat Quantity, Temperature
(3) Fly Creek	Sediment
(4) Sheep Creek, Lower Meadow Creek, Upper Grande Ronde R. 2**	Key Habitat Quantity, Sediment
(5) Mid Grande Ronde Tribs 4	Key Habitat Quantity, Sediment, Temperature

* Due to the large area of wilderness, the Wenaha and Minam watersheds have a limited restoration potential.
**The three geographic areas tied for the rank

Table 3-2. The EDT identified five highest priority Geographic Areas for restoration and key factors limiting survival for each Grande Ronde subbasin steelhead population.

Population and Geographic Area Restoration Ranking	Key Limiting Factors (*High* and *Medium* impacts)
Lower Grande Ronde	
(1) Lower Grande Ronde R. 1	Habitat Diversity, Key Habitat Quantity
(2) Lower Grande Ronde Tribs. 1	Key Habitat Quantity, Sediment
(3) Wildcat Creek	Key Habitat Quantity, Sediment
(4) Upper & Lower Mud Creek*	Key Habitat Quantity, Sediment, Temperature
(5) Courtney Creek	Key Habitat Quantity, Sediment
Joseph Creek	
(1) Lower Chesnimnus Creek	Key Habitat Quantity, Sediment, Temperature
(2) Lower Joseph Creek	Key Habitat Quantity, Sediment
(3) Upper Joseph Creek	Key Habitat Quantity, Sediment, Temperature
(4) Swamp Creek	Key Habitat Quantity, Sediment, Temperature
(5) Crow Creek	Key Habitat Quantity, Sediment, Temperature
Wallowa	
(1) Prairie Creek	Sediment, Temperature
(2) Upper Wallowa River	Key Habitat Quantity, Sediment
(3) Hurricane Creek & Lower Lostine*	Habitat Diversity, Key Habitat Quantity, Sediment, Temperature, Flow
(4) Lower Wallowa & Whiskey*	Habitat Diversity, Key Habitat Quantity, Sediment
(5) Mid Wallowa River	Key Habitat Quantity
Upper Grande Ronde	
(1) Mid Grande Ronde R. 4	Habitat Diversity, Key Habitat Quantity, Sediment, Temperature
(2) Mid Grande Ronde Tribs. 4	Key Habitat Quantity, Sediment
(3) Phillips Creek	Key Habitat Quantity, Sediment, Temperature
(4) Mid Catherine Creek	Habitat Diversity, Key Habitat Quantity, Sediment, Temperature
(5) Upper Grande Ronde R. 1	Key Habitat Quantity, Sediment, Temperature

* The two geographic Areas tied for the rank

In an effort to synthesize the results, the EDT output has been summarized at the watershed scale to display the results for each focal species together in the same table. We felt that given the overall size of the subbasin, as well as the regional focus of the primary agencies involved, that the watershed was an appropriate scale for synthesis. Eight key watersheds were identified based on population groupings. Steelhead populations generally covered larger areas than Chinook salmon or bull trout, so in some cases the same steelhead population is contained in several watersheds. This information is summarized in Table 3-3 and discussed for each watershed below.

Table 3-3. Grande Ronde subbasin restoration priorities by watershed and focal fish populations.

Watershed	Population(s)	EDT Priority Geographic Area(s) highlighted areas are priorities for multiple pops.	Restoration impacts on population abundance, productivity, diversity (EDT Analysis)	Considerations	Recommendations
Wenaha	Wenaha Spring Chinook Lower GR Steelhead Wenaha Bull Trout	Lower GR 1** loss in steelhead & Chinook productivity with impacts Wenaha conditions.	Chinook: Abundance: Moderate; Productivity: Low; Diversity: Minimal. Steelhead: Abundance: Minimal; Productivity: Minimal; Diversity: Minimal	Good quality unimpacted Habitat in the wilderness reaches.	Maintain Protection
Lower Grande Ronde	Lower GR Steelhead Possibly bull trout in tributary headwaters	Lower GR(1-12) – Wenaha Chin Lower Grande Ronde Tribs Wildcat Creek , Mud Creek	Steelhead: Abundance: Moderate; Productivity: Minimal; Diversity: Moderate	No one reach an overwhelming priority. Improving conditions in tributaries will help establish broader life history diversity.	Identify largest tributary sediment sources. Protect riparian & remove roads from riparian.
Joseph Creek	Joseph Creek Steelhead	Lower Chesnimius Lower Joseph Creek Upper Joseph Swamp Creek, Crow Creek	Steelhead: Abundance: **Large**; Productivity: **Large**; Diversity: Moderate	Tributary reaches are likely the source of the identified sediment impacts. Restoration main Joseph Cr. depends sediment delivery from upstream areas.	Upstream tributaries should be given priority Almost all streams have roads. Protect Riparian & remove roads from riparian.
Wallowa River	Wallowa Steelhead Wallowa-Lostine Chinook Lostine/ Bear Ck Bull Trout	**Steelhead Priorities** Prairie Creek Upper Wallowa River – Wallowa Chin. Hurricane Ck , Whiskey Ck Lower Wallowa (1-3) - Minam Sthd **Chinook Priorities** Lower Lostine – Wallowa Steelhead Mid-Wallowa – Wallowa Steelhead	Chinook: Abundance**: Large**; Productivity: **Large**; Diversity: Minimal Steelhead: Abundance: Moderate; Productivity: Moderate; Diversity: Moderate	No one reach an overwhelming priority (steelhead) Presence of primary pools, hydromodifications, riparian function and wood (Chinook)	Identify largest tributary sediment sources. Protect riparian & remove roads from riparian. Mid-Upper Wallowa address sediment load from decreased flows. Prairie – address sediment from increased flows Lower Lostine – address functions to increase pools, pool quality. Address water withdrawals.
Minam River	Wallowa Steelhead Minam Chinook Minam/ Deer Ck Bull Trout Little Minam Bull Trout	Lower Minam Lower Wallowa (1-3) Lower Grande Ronde 2 (13-25) (Chin.)	Chinook: Abundance: Moderate; Productivity: Moderate; Diversity: Minimal Steelhead: Abundance: Minimal; Productivity: Minimal; Diversity: Minimal	presence of primary pools, hydromodifications, riparian function and wood ** loss in steelhead & Chinook productivity with impacts Wenaha conditions.	Maintain Protection in Wilderness area Mainstem impacts difficult to address and related to trib conditions. Identify process affecting key habitat quality in mainstem. Lower Minam – address road impacts
Lookingglass Creek	Upper GR Steelhead Lookingglass Chinook Lookingglass Bull Trout	Lower GR 2 (GR 13 – 25) - Chinook No priority areas for steelhead	Chinook: Abundance**: Large**; Productivity: Moderate; Diversity: Minimal	Tributary reaches are likely the source of the identified sediment impacts.	Restoration options limited in lower main Grande Ronde. Continue efforts to establish endemic Chinook pop.

Table 3-3. Grande Ronde subbasin restoration priorities by watershed and focal fish populations.

Watershed	Population(s)	EDT Priority Geographic Area(s) highlighted areas are priorities for multiple pops.	Restoration impacts on population abundance, productivity, diversity (EDT Analysis)	Considerations	Recommendations
Catherine Creek/ Middle Grande Ronde	Upper GR Steelhead Catherine Ck Chinook Catherine Ck Bull Trout Indian Ck Bull Trout	Mid Cattherine Creek (2-9) – UGR Sthd SF, NF Catherine Creek Lower Grande Ronde R. 2	Chinook: Abundance**: Very Large**; Productivity: Minimal; Diversity: Minimal Steelhead: Abundance: **Large**; Productivity: Moderate; Diversity: Minimal	EDT found this area to have a huge Impact on Chinook abundance (5000%). Local ODFW bio's not sure they agree (J..Zakel pers comm.)	Important for Chinook & steelhead. Address sediment & waterwithdrawal impacts. Improve riparian.
Upper Grande Ronde	Upper GR Steelhead Upper GR Chinook Upper GR Complex Bull Trout	Mid GR 4 (GR 37 - 44) - chin Mid GR Tribs 4 (Whiskey, Spring, Jordan, Bear, Beaver, Hoodoo…) Phillips Creek Upper GR Ronde 1 (45-48) - chin Mid GR 3 (GR – 34-36) Valley Sheep Ck, Fly Ck, Lower Meadow Ck - Chinook	Chinook: Abundance**: Very Large**; Productivity: **Large**; Diversity: Minimal Steelhead: Abundance: **Large**; Productivity: Moderate; Diversity: Moderate	No one reach an overwhelming priority. Sediment & temperature consistent impacts	Find opportunities to restore functions. Reduce sediment delivery, improve riparian (decrease temps, increase wood inputs).

This analysis focused on habitat factors and altered watershed processes (e.g., sediment delivery to the aquatic system) that limit Grande Ronde steelhead and Chinook populations. Other factors including hatcheries and out-of-basin effects also impact the populations. As stated in the section on hatchery impacts, according to NOAA Fisheries recent analysis, the benefits of artificial propagation do not alter the ESA risk assessments for the Grande Ronde populations. The Snake River spring/summer-run Chinook salmon and steelhead trout ESUs in total, and within the Grande Ronde subbasin, are likely to become endangered in the foreseeable future (NOAA Fisheries 2004). NOAA Fisheries has concluded that there are serious in-basin and out-of-basin non-hatchery issues that continue to impact the subbasin. These factors will be considered in the management plan.

3.5.1.3 Wenaha

3.5.1.4 Lower Grande Ronde

3.5.1.5 Joseph Creek

3.5.1.6 Wallowa River

3.5.1.7 Minam

3.5.1.8 Lookingglass Creek

3.5.1.9 Catherine Creek/ Middle Grande Ronde

3.5.1.10 Upper Grande Ronde

3.5.2. Description of Historic Factors Leading to Decline of Focal Species/Ecological Function-Process – Terrestrial

3.6. SYNTHESIS/INTERPRETATION

3.6.1. Subbasin-wide Working Hypothesis – Aquatic

AQUATIC SUBBASIN-WIDE HYPOTHESES AND ASSUMPTIONS

The purpose of this section of the assessment is to bring together the primary assumptions and working hypotheses that, collectively, makeup the aquatic assessment. In the broadest sense the working hypotheses consist of all of the data, professional judgments, assumptions, model relationships, and analytical results that are contained in the preceding sections. However, for the purpose of this summary we have focused on the most important limiting factors and estimated population performance. These hypotheses and assumptions set the framework for evaluating the inventory (i.e., it provides a gap analysis of what has and is being done to address the limiting factors) and developing the management plan, which contains strategies to address the identified gaps. The primary assumptions and working hypotheses are:

- The aquatic technical team has adequately interpreted and synthesized the known data regarding current and reference habitat conditions within the subbasin. We are moderately confident in this assumption, given the presence on the team of individuals with long experience in the subbasin, and considering the breadth of agency involvement. However, the large size of the basin, large number of EDT reaches and limited time made it difficult to consistently assign attributes. In some cases interpretation of ratings varied among professionals and this was difficult to standardize.

- The Ecosystem Diagnosis and Treatment (EDT) model adequately represents the complex relationships between the focal species and their environments. The EDT is an expert system, and as such provides a structured and better-documented approach to evaluating limiting factors than expert opinion alone. In addition, the Ecosystem Diagnosis and Treatment (EDT) model, allowed us to evaluate the validity of the outcome (i.e., estimates of population size are generated).
- The species-specific hypotheses are correct and adequately represent how focal species use the subbasin. As part of the EDT model we capture the aquatic technical teams understanding of how the focal species use the various reaches within the subbasin, and what habitat attributes are most important to the focal species under both current and reference conditions. Given the aquatic technical team's expertise within the subbasin we feel that these hypotheses are reasonable.
- Of the 45 habitat attributes considered in this analysis the following four factors are the most limiting, and adequately illustrate the concerns with respect to the focal species:
    - Sediment
    - Temperature
    - Flows
    - Channel Condition (Key Habitat Quantity & Diversity)
- In the big picture the other limiting factors (in addition to the ones described previously) can be mostly ignored. Additional habitat attributes are either dependent on the "big" factors identified above, or are of relatively local and/or minor concern.
- Prioritization of restoration and protection can be first approximated using EDT, but must consider additional factors. The EDT methodology produces a prioritization approach for reach-scale restoration and protection. However, this first cut must be tempered with additional considerations, such as the additional factors described below.
- Additional factors are not adequately addressed in EDT, and must be dealt with in a more qualitative fashion. Consequently, these must be highlighted in the management plan as areas of special concern. This includes evaluation of passage problems from culverts and road crossings.
- Static, "one size fits all" biological objectives are inadequate for outlining a restoration strategy and management plan for the Grande Ronde subbasin. As noted by the ISAB, biological objectives must be developed with consideration given to inherent variability both in space (among the reaches in various parts of the watershed, and within the reaches themselves), and over time in response to natural disturbance and channel evolutionary response. The biological objectives, particularly for channel and riparian condition, have been outlined with this in mind.
- Many, if not most, of the likely strategies derived from these biological objectives are already being implemented within the subbasin. The products from the aquatic assessment do not implicate a change in direction for the various land management agencies, individuals, or other entities (e.g., watershed council) within the subbasin. Rather, the products here will (hopefully) help direct and prioritize ongoing activities at the watershed scale.

- Population performance is the ultimate arbiter of habitat protection/restoration activities, and must be incorporated into monitoring and evaluation plans. The underlying assumption of the work presented here is that it is appropriate to focus on habitat, and the focal species response will follow (i.e., "if you build it they will come"). However, this assumption must be borne out by thorough and systematic monitoring programs, which should be developed as part of this planning process.

3.6.2. Terrestrial Assessment Synthesis

3.6.3. Desired Future Conditions – Aquatic

3.6.3.1 EDT Analysis of Future Scenarios

The EDT model outputs of Grande Ronde Chinook salmon and steelhead populations under *Current without Harvest* and the *Historic Potential* provide the range for population performance. For the purpose of exploring the impact of restoration on the basin's spring Chinook and steelhead populations, this range (low to high) of population performance was compared to three restoration action scenarios: 1) Status quo; 2) status quo and restoration package; and 3) properly functioning conditions (PFC).

3.6.3.1.1 Status Quo Actions

The status quo actions assume that 1) implemented restoration projects are allowed to "mature" (e.g., riparian vegetation will grow over time), 2) there will be some ongoing habitat degradation from land use change and other management impacts, and 3) habitat conditions on federal lands within the subbasin will continue to improve (partial Properly Functioning Conditions). The Status Quo set of actions is divided into four distinct elements: a "restoration element", a "degradation element" a "partial Properly Functioning Condition ("partial PFC")" and an "obstruction removal element."

The "restoration element" of the status quo scenario was based on discussions with Lyle Kuchenbecker and Cecilia Noyes of the Grande Ronde Model Watershed Program. These individuals were asked to identify projects that had already been implemented but which will require a number of years to mature in terms of benefits to fish habitat and fish production. A perfect example of the type of project they were asked to identify was a riparian fencing project. Obviously, some decades are necessary before a fenced-off riparian corridor can be expected to regenerate itself. Other types of long-maturing restoration projects were incorporated in the restoration element, including campground closures, road obliterations and closures, floodplain restoration, wet meadow restoration, addition of large woody debris to stream channels, and, as mentioned, various types of riparian restoration actions.

The "partial PFC" element consisted of applying PFC conditions to all reaches under federal management (U.S. Forest Service and Bureau of Land Management) except for those already included in a Wilderness Area. Wilderness Areas were excluded because environmental conditions there are already better than are projected under a PFC scenario. Although the PFC scenario is defined in detail in **Appendix B**, it is appropriate to briefly define this scenario here. In very general terms, PFC conditions are established for each environmental attribute individually, and the values set represent conditions "just good enough" to pose no threat to the long-term viability of a salmonid population. This scenario is termed a "partial PFC" because normally PFC conditions are applied throughout a watershed. In this case, however, they were applied only to non-Wilderness reaches under federal management. This restriction of PFC effects is justified by the fact numerous federal land and water management policies already in effect should, over 25 years, result in the attainment of PFC status for federally managed areas.

Because conversations with Union and Wallowa County Planners indicated no meaningful changes in agricultural, industrial or logging-related activities were expected over the next 25 years, the degradation element was assumed to be caused exclusively by urban growth. The population increase expected over the next 25 years was based on information gleaned from the U.S. Census Bureau Quick Facts Internet site (http://quickfacts.census.gov/qfd/) for Union and Wallowa Counties. Adverse urbanization impacts were restricted to stream reaches flowing through cities and towns with a current population of 1,000 or more, and to one or two reaches upstream and downstream of such cities and towns.

Obstructions were not assumed to be made fully passable throughout the subbasin under the Status Quo scenario. Rather, obstructions to fish passage were modeled as being eliminated only for reaches under federal management. This restriction was made because the Grande Ronde Model Watershed staff did not expect all obstructions to be eliminated, but the elimination of obstructions *is* a standard provision of the PFC scenario, which applies to all federally managed waters. **Appendix C** provides a detailed description of the background information used to develop the *Status Quo Actions*, including reach-specific information.

3.6.3.1.2 STATUS QUO AND RESTORATION PACKAGE

To provide an EDT scenario of future Grande Ronde subbasin steelhead and spring Chinook salmon population performance under improved habitat conditions, a comprehensive package of habitat restoration actions was developed. Restoration actions were developed for all of the reaches within the subbasin at a workshop. The workshop included representatives from the Grande Ronde Model Watershed Program, the Oregon Department of Fish and Wildlife, Mobrand Biometrics, Inc. (MBI), and Watershed Professionals Network (WPN). The restoration actions were designed to address limiting factors identified through the EDT analysis. The comprehensive restoration package is intended to function as a "best case" restoration scenario, with implementation across the basin and without regard to social or other factors that might limit implementation. The restoration actions were grouped into five categories: 1) Placing large wood and other structures in the stream to improve habitat complexity; 2) restoring water in the stream during low flow conditions; 3) improving riparian vegetation through livestock management and fencing; 4) restoring meanders and backwater areas to some straightened channel segments to improve habitat complexity; and 5) reducing sediment inputs to the stream channel through improved road design and maintenance, and reducing grazing impacts. The EDT analysis assumes that the restoration package is built upon the status quo conditions (for example, current restoration projects are allowed to impact habitat). **Appendix C** provides a description of the aquatic / riparian impacts for the restoration actions used in the *Status Quo and Restoration Package* EDT analysis.

3.6.3.1.3 PROPERLY FUNCTIONING CONDITIONS (PFC) ACTIONS

Properly functioning conditions (PFC) were applied to all reaches (private and government ownerships) across the subbasin. PFC is a concept created originally by the Bureau of Land Management (BLM) to assess the natural habitat-forming processes of riparian and wetland areas. When these processes are working properly, it can be assumed that environmental conditions are suitable to support productive populations of native anadromous and resident fish species. The notion of Properly Functioning Conditions for salmonid systems has also been advanced by the National Marine Fisheries Service (1996) in connection with recovery of species listed under the Endangered Species Act.

The PFC concept has been translated into a set of EDT Level 2 attribute ratings—ratings that define a PFC environmental condition relevant to anadromous salmonids within Pacific Northwest streams.

PFC does not imply pristine or template conditions. There are many examples of healthy populations occupying degraded habitat (Hanford Reach Chinook, for example). With this in mind, PFC ratings were applied to all reaches regardless of current habitat rating (e.g., if riparian function is 100% for the current condition, the PFC condition would still apply the 70% functional rating). For this reason, it is possible for a pristine area (e.g., the Wenaha and Minam watersheds) to have PFC ratings below the current status. Also, PFC is not intended to imply a standard against which all streams are compared. PFC cannot be "better" than historic conditions for a stream reach (e.g., if percent fine sediment in historic reconstruction was 15%, the PFC rating for sediment must be greater than or equal to 15%).

Properly Functioning habitat conditions outlined by the National Marine Fisheries Service (1996) were used to help define the EDT PFC Level 2 ratings. The NMFS document includes a Matrix of Pathways and Indicators (MPI) that relates closely to EDT attributes. An inter-agency team organized by the Washington Department of Fish and Wildlife and the Northwest Intertribal Fish Commission and facilitated by MBI was responsible for translating the NMFS definitions into EDT Level 2 attributes. EDT attribute ratings and their relationship to the NMFS definition of PFC are presented in Table 3-4. The MPI addressed only a subset of the attributes used in EDT.

Table 3-4 also includes those attributes that were not defined by NMFS but were assigned a PFC rating by the inter-agency technical team. Guidance for these attributes was an understanding of the intent of the NMFS definition of properly functioning, gleaned largely from attributes described in the MPI.

Table3-4. Correspondence of Properly Functioning Condition as designated by NMFS (1996) and fully functional as used in the recovery target analysis (EDT).

Attribute	NMFS (1996) Properly Functioning	Representation of PFC in EDT Level 2 Environmental Attribute
Hydrologic Characteristics		
1) Annual Variation in High Flow	a) Change in Peak/Base Flow: Watershed hydrograph indicates peak flow, base flow, and flow timing characteristics comparable to an undisturbed watershed of similar size, geology, and geography	Consistent with undisturbed watershed of similar size, geology, and geography (Rating 2).
2) Annual Variation in Low Flow		Consistent with undisturbed watershed of similar size, geology, and geography (Rating 2).
3) Diel Variation in Flow		Consistent with natural runoff pattern or hydro project following WDFW ramping rate criteria (Rating 1).
4) Intra-Annual Variation in High Flow	b) Increase in Drainage Network: Zero or minimum increases in drainage network density due to roads.	Consistent with undisturbed watershed of similar size, geology, and geography (Rating 2).
5) Natural Hydrologic Regime	Not described	Attribute describes basic geomorphology and hydrology of basin
6) Regulated Hydrologic Regime	Not described	Flow not modified by hydro project (Rating 0)
Stream Corridor Structure		
7) Channel Length	Not described	EDT analysis assumed historic (template) channel length, gradient and widths; this assumption consistent with assumptions for channel hydromodifications (none)
8) Gradient		
9) Channel Minimum Width		
10) Channel Maximum Width		
11) Hydromodifications	Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	Stream channel is fully connected to the floodplain although very minor structures may exist that do not result in flow restriction or constriction (Rating 0).
12) Natural Channel Confinement	Not described; attribute describes basic geomorphology of reach	No difference historic and current ratings in EDT
13) Habitat Types	a) Pool Frequency: Width 5' 184 pools/mile Width 10' 96 pools/mile Width 15' 70 pools/mile Width 20' 56 pools/mile Width 50' 26 pools/mile Width 75' 23 pools/mile Width 100' 18 pools/mile b) Pool Quality: Pools > 1 meter depth (holding pools) with good cover and cool water, minor reduction of pool volume by fine sediment	Assumed to be consistent with 80% of historic (template) pool frequency; EDT criteria developed to acknowledge reach-specific differences in pool frequency.
14) Habitat Type – Off Channel	Backwaters with cover, and low-energy off-channel areas (ponds, oxbows, etc.)	Assumed full connection of historic (template) off-channel habitats.
15) Migration Obstructions	Any man-made barriers present in watershed allow upstream and downstream fish passage at all flows	Obstructions removed or designed to allow full passage of juveniles and adults (Rating 0)

Table3-4. Correspondence of Properly Functioning Condition as designated by NMFS (1996) and fully functional as used in the recovery target analysis (EDT).

Attribute	NMFS (1996) Properly Functioning	Representation of PFC in EDT Level 2 Environmental Attribute
16) Water withdrawals	Not described	Very minor withdrawals (entrainment probability considered to be very low) (Rating 0)
17) Bed Scour	Although not described, bank stability - >90% of banks not actively eroding -implies a stable stream bed.	Average depth of scour >2 cm and < 10 cm (Rating 1)
18) Icing	Not described	Riparian function is high, assumed no degradation of channel stability due to icing – assume historic (template) condition
19) Riparian Function	The riparian reserve system provides adequate shade, large woody debris recruitment, and habitat protection and connectivity in all subwatersheds, and buffers include known refugia for sensitive aquatic species (>80% intact); and/or grazing impacts; percent similarity of riparian vegetation to the potential natural community composition > 50%.	> 70%-90% of functional attributes present (overbank flows, vegetated streambanks, groundwater interactions typically present) (modeled 70% - Rating 1.6).
20) Wood Debris	>80 pieces/mile (diameter > 2"; length > 50') and adequate sources of woody debris recruitment in riparian areas.	Complex array of large wood pieces but fewer cross channel bars and fewer pieces of sound large wood due to reduced recruitment; influences of large wood and jams are a prevalent influence on channel morphology where channel gradient and flow allow such influences. (Rating 1).
21) Embeddedness	Dominant substrate is cobble or gravel, or embeddedness < 20%	>10% and <25% covered by fine sediment (Rating 1)
22) Fine Sediment (< 0.85 mm) and Turbidity	Fines: < 12%, turbidity low	Fines: 6%-11% (modeled 11% fines - Rating 1.5). Turbidity low, infrequent episodes, short duration, low concentrations (<50 mg/l) (Rating 0.5)
Water Quality		
23) Alkalinity and Dissolved Oxygen	Not described	Assumed historic (template) conditions
24) Pollutants (Metals, misc. pollutants)	Low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches	No toxicity expected due to dissolved heavy metals to salmonids under prolonged exposure (1 month exposure assumed) (Rating 0.5).
25) Nutrient enrichment		Very small amount suspected through land use activities (Rating 1.5)
26) Temperature – Daily Maximum	10-14 C	10-16 C on warmest day (Rating 1)
27) Temperature – Daily Minimum	Not described	Assumed historic (template) conditions
28) Temperature – Spatial Variation	Not described	Assumed historic (template) conditions
Biological Community		
29) Biological community (benthic community richness, introduced species, predator risk, and fish community richness)	Not Described	Assumed historic (template) conditions
30) Fish Pathogens	Not Described	a) No fish stocking within last decade; or b) no sockeye population in basin; or c) no viral epizootics in kokanee populations at the subbasin level (Rating 1).
31) Salmon Carcasses	Not Described	Very abundant -- an average number of carcasses per total miles of main channel habitat >400 and < 800 (Rating 1.5).
32) Hatchery Outplants	Not Described	No more than two instances of fish releases in the past decade in the drainage (Rating 1.5).

The composition of habitat types (pool, riffle, glide, etc) was not clearly defined in the MPI for PFC. The MPI provided pool frequency by channel width (number of pools per mile). However, this description did not adequately consider differences in gradient and channel confinement between stream reaches. Furthermore, the pristine composition of habitat types is not consistent with the overall PFC definition. Simply applying the template assumptions to PFC is not appropriate.

The EDT definition of habitat types under PFC assumes 80% of the template or 80% of current (whatever is greater) pool type habitat (primary pools, backwater pools and pool tailouts, and beaver ponds) within the reach. The composition of non-pool habitat (riffles and glides) is calculated, using the template composition of these habitat types for the reach. This assumes that the template characterization for riffle and glide habitat (largely based on an assessment of channel gradient and confinement for the reach) would correctly represent the natural composition (i.e., derived through natural habitat-forming processes) for these habitat types.

3.6.3.1.4 COMPARISON OF THE STATUS QUO AND FUTURE RESTORATION SCENARIOS

Population performance for the subbasin's spring Chinook and steelhead populations was estimated under the three scenarios: 1) Status quo; 2) status quo and implemented habitat restoration; and 3) properly functioning conditions (PFC) applied throughout the subbasin. Figures 3-5 to 3-8 show these scenarios in comparison with current conditions and the populations' historic potential for steelhead and spring Chinook spawner abundance and productivity. These scenarios provide a framework for examining the scale and direction of population change under various restoration options, but it is not a tool for predicting actual returns.

It appears that currently implemented restoration projects and ongoing improvements in land management will positively effect spring Chinook spawner abundance and productivity. All of the subbasin's spring Chinook populations increase over time under the status quo scenario. Additional implementation of habitat projects over the status quo has mixed impacts on the individual populations. Implementing the comprehensive habitat restoration package results in negligible estimated spawner population increase over the status quo for the Wenaha (336 to 337) and Lookingglass Creek (105 to 107) populations and a moderate increase for the Minam population (150 vs. 239). There is a dramatic increase under comprehensive restoration for estimated spring Chinook spawner populations in the Wallowa-Lostine (150 to 239), Catherine Creek (150 to 239) and Upper Grande Ronde (294 to 441) populations.

Applying PFC to the entire subbasin results in substantial spring Chinook population increases over the status quo. Under PFC there is some increase in the populations with most of the reaches under wilderness designations, with a slight increase in the Wenaha population (336 to 394) and a moderate improvement in the Minam (505 to 659) population. The other highly impacted populations are estimated to have dramatic increases from the status quo in the spawner population with PFC fully implemented across the basin. The increases from the status quo in estimated spawner abundance under PFC is large in the Lookingglass Creek (105 to 167) population and dramatic in the Wallowa-Lostine (150 to 802), Catherine Creek (48 to 488), and Upper Grande Ronde (294 to 916) populations.

Steelhead spawner abundance and productivity across all of the populations will be positively impacted over time with the currently implemented restoration projects and improvements in land management (the status quo). Going beyond the status quo and implementing the comprehensive habitat restoration package results in mixed steelhead population responses across the basin. There is no detectible increase in the estimated spawner population over the status quo for the Upper Grande Ronde population (2,633 to 2,633). There are moderate increases due to comprehensive restoration over the status quo for the Joseph Creek (1,512 to 1,658), Lower Grande Ronde (1,554 to 1,681) and Wallowa (1,206 to 1,947) populations.

Applying PFC to the entire subbasin results in substantial steelhead population increases over the status quo. Under PFC all of the populations increase over the status quo. Under PFC, there are moderate improvements in the Joseph Creek (1,512 to 2,209), Lower Grande Ronde (1,554 to 1,897), and Wallowa (1,206 to 1,992) populations, and a dramatic increase in the Upper Grande Ronde population (2,633 to 4,334).

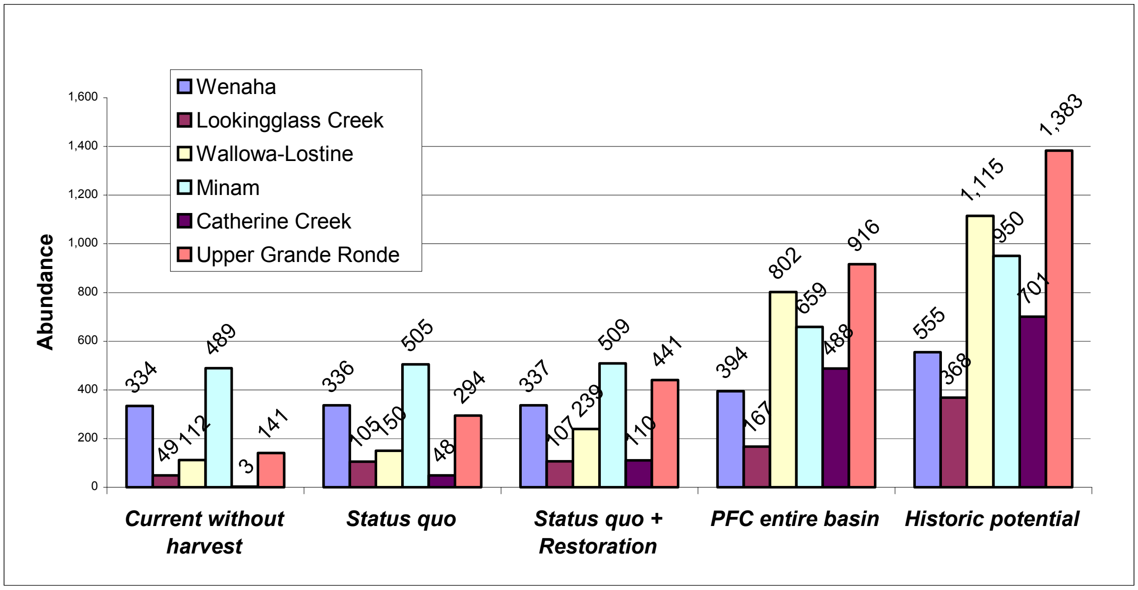

Figure 3-5. Population performance for the six spring Chinook populations measured by spawner abundance.

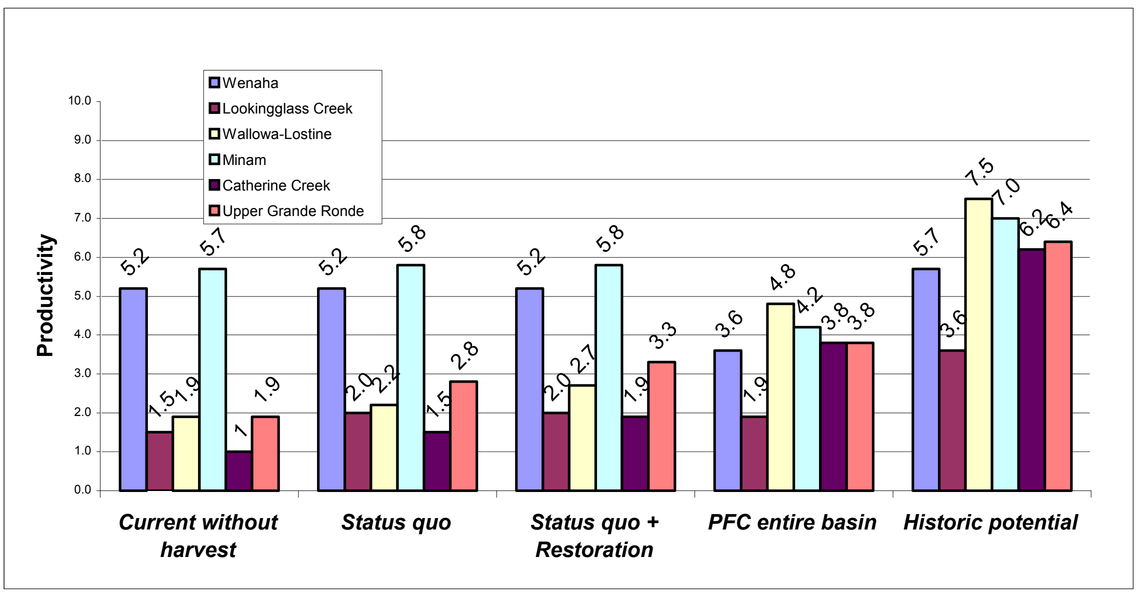

Figure 3-6. Population performance for the subbasin's six spring Chinook populations measured by spawner productivity.

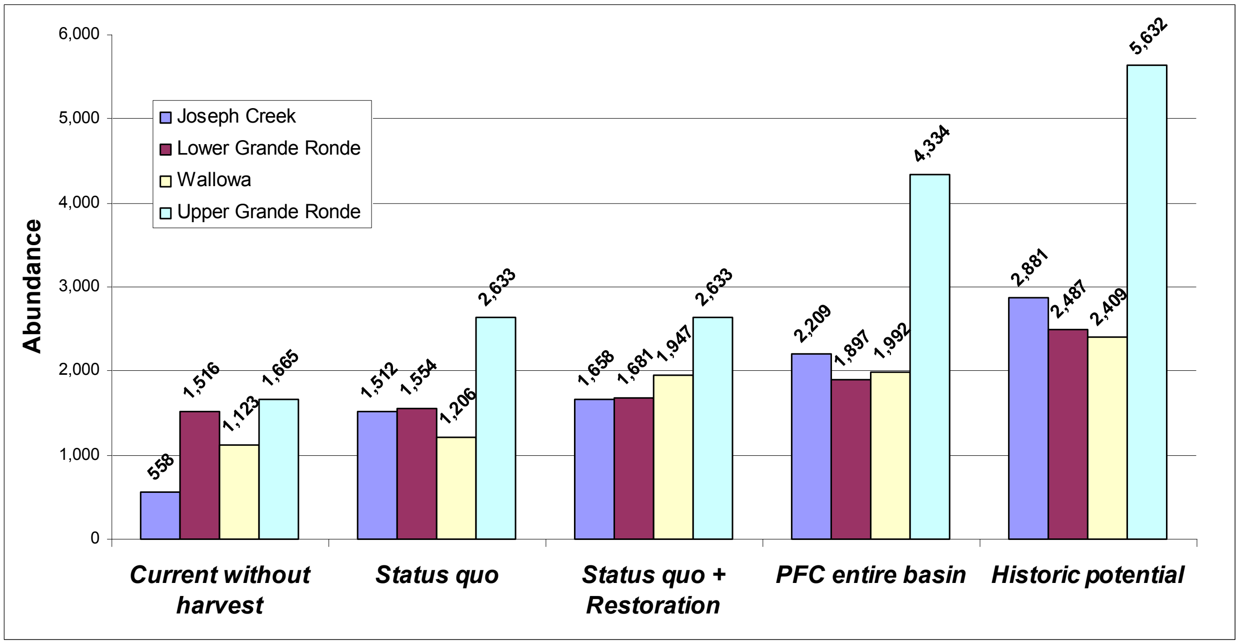

Figure 3-7. Population performance for the subbasin's four steelhead populations measured by spawner abundance.

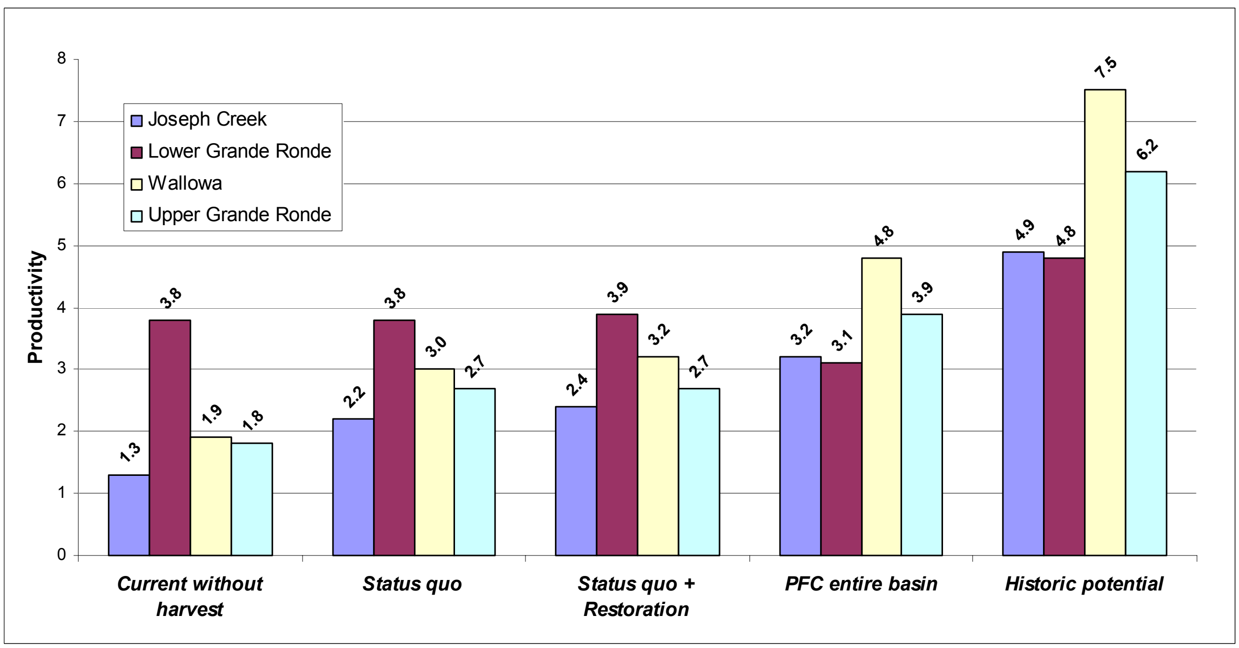

Figure 3-8. Population performance for the subbasin's four steelhead populations measured by spawner productivity.

3.6.3.1.5 SUMMARY OF EDT SCENARIO ANALYSIS FINDINGS – FOCAL SPECIES POPULATIONS WITH THE HIGHEST PRODUCTION POTENTIAL AFTER RESTORATION

From the perspective of the entire subbasin, it appears that currently implemented restoration projects and ongoing improvements in land management will positively effect spring Chinook and steelhead spawner abundance and productivity. In areas that are tracking toward PFC (e.g., large proportion of land within the watershed under federal land management) there is less need for focusing on restoration actions.

The EDT analysis of restoration scenarios provides a framework for focusing actions in the Geographic Areas where there is the greatest likelihood of a positive response:

Steelhead

- ♦ Restoration will have moderate change in abundance in the Joesph Creek, Lower Grande Ronde, and Wallowa populations.
- ♦ Joseph Creek & Upper Grande Ronde populations are predicted to experience the largest increases in abundance with status quo.
- ♦ Under the PFC scenario, all of the populations increase over the status quo, with moderate improvements in the Joseph Creek, Lower Grande Ronde, and Wallowa populations, and a dramatic increase in the Upper Grande Ronde population.
- ♦ The Upper Grande Ronde population has the highest potential population increases through restoration.

Spring Chinook

- ♦ Catherine Creek and Upper Grande Ronde are predicted to experience the largest increases in abundance with status quo.
- ♦ Implementing the comprehensive habitat restoration package results in a moderate increase for the Minam population and dramatic increases the Wallowa-Lostine, Catherine Creek, and Upper Grande Ronde populations.
- ♦ Applying PFC to the entire subbasin results in substantial spring Chinook population increases over the status quo, with dramatic predicted increases in the Wallowa-Lostine, Catherine Creek, and Upper Grande Ronde populations.
- ♦ The Wallowa Lostine and Upper Grande Ronde populations will be producing about 20% of historic potential even with restoration.

3.6.4. Desired Future Conditions – Terrestrial

3.6.5. Opportunities

5.0 MANAGEMENT PLAN

The Grande Ronde subbasin Planning vision describes the desired future condition in terms of a common goal for the subbasin. The subbasin-level vision is qualitative and reflects the **policies, legal requirements, local conditions, values and priorities of the subbasin** in a manner consistent with the Northwest Power and Conservation Council's overall fish and wildlife program vision which is:

- Sustain an abundant, productive and diverse community of fish and wildlife;
- Mitigate across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydro-system;
- Provide the benefits from fish and wildlife valued by the people of the region;
- Recognize the abundant opportunities in the ecosystem for tribal trust and treaty right harvest and for non-tribal harvest and the conditions that allow for the recovery of the fish and wildlife affected by the operation of the hydro-system and listed under the Endangered Species Act;
- Protect and restore the natural ecological functions, habitats, and biological diversity of the Columbia River Basin, wherever feasible. Where not feasible, other methods that are compatible with naturally reproducing fish and wildlife populations will be used;
- Where impacts have irrevocably changed the ecosystem, the program will protect and enhance the habitat and species assemblages compatible with an altered ecosystem;
- Actions taken under this program must be cost-effective and consistent with an adequate, efficient, economical and reliable electric power supply.

5.1 VISION FOR THE SUBBASIN

Vision Statement

Create a healthy ecosystem with abundant, productive, and diverse populations of aquatic and terrestrial species, which will support sustainable resource-based activities that contribute to the social, cultural, and economic well-being of the communities within the subbasin and the Pacific Northwest.

5.2 AQUATIC SPECIES AND HABITATS PROBLEM STATEMENT, OBJECTIVES AND STRATEGIES

The following list of component problem statements, objectives, and strategies is derived from the assessment. The problem statements address limiting factors which fall into several categories: 1) habitat based limiting factors which are identified are prioritized through the EDT analysis, 2) fish production limiting factors which are discussed in the assessment and, 3) out-of-basin limiting factors which need to be addressed outside of the subbasin. Biological objectives describe the physical and biological changes needed to achieve the vision, consistent with the scientific principles. Strategies provide specific steps necessary to accomplish the biological objectives. The biological objectives and strategies were developed to address the factors limiting focal species and habitats in the subbasin and that inhibit natural ecological processes, as described in the subbasin assessment.

Recommendations for further data collection or prioritization were noted where data gaps limit the development of sound biological objectives and strategies.

Table 5-1. Problems and objectives addressing factors limiting fish habitats and species.

Problem	Objective
Out of Sub-Bain Impacts and Issues Related to Suppressed Populations	
Problem 1: Out-of-subbasin factors are primary in limiting anadromous adult recruitment in the subbasin.	**Objective** 1A: Achieve escapement objectives shown in Table 2 within 24 years (represents 4-5 generations; the timeline is consistent with the NPCC's Fish and Wildlife Program).
Problem 2: Small population size of anadromous and resident species leads to an increased risk of extinction.	**Objective** 2A. By fifth code HUC, carry out focused activities designed to improve our understanding and definition of small populations, while protecting the genetic integrity of wild populations that are below historical levels. **Objective** 2B: Increase anadromous fish productivity and production, as well as life stage-specific survival, through artificial production.
Habitat Based Problems & Objectives	
Problem 3: Anadromous fish production in the subbasin is affected by habitat quantity, quality, and connectivity. Human activities have been a primary influence on habitat factors in some areas of the subbasin.	**Objective** 3A: Increase anadromous fish productivity and production, as well as life stage-specific survival, through habitat improvement.
Problem 4: Excessive amounts of fine sediment in various portions of the subbasin are negatively affecting incubation success, juvenile survival, invertebrate production, and habitat availability.	**Objective** 4A: Establish a subbasin-wide database to facilitate monitoring and evaluation of sedimentation trends and provide information relative to its effect on salmonid production. **Objective** 4B: In known problem areas, reduce sedimentation impacts to aquatic focal species.
Problem 5. Excessive summer stream temperatures currently represent the dominant limiting environmental factor in identified watersheds and are likely limiting seasonal salmonid distribution, which in turn is likely influencing production potential.	**Objective** 5A: Using ODEQs guidelines, reduce stream temperatures in listed segments so cold water biota beneficial uses are restored.
Problem 6: Low flow problems occur in specific stream reaches. Species affected are bull trout, steelhead spawning and rearing success and spring Chinook.	**Objective** 6A: Improve efficiency of irrigation withdrawal delivery and application to reduce volume of water needed for consumptive purposes. **Objective** 6B: Restore flows in limited reaches to support resident and anadromous fish needs.
Problem 7: Population connectivity is reduced as a result of structural barriers within specific watersheds. This reduction has resulted in a loss of genetic interchange, population carrying capacity, and habitat availability.	**Objective** 7A: Identify and prioritize for modification, structural barriers that limit connectivity.
Problem 8: There is a need for coordinated research and monitoring to evaluate the effectiveness of artificial propagation programs and habitat restoration efforts.	**Objective** 8A: Conduct coordinated spring Chinook salmon population monitoring as outlined in the Monitoring and Evaluation Plan for the Northeast Oregon Hatchery. **Objective** 8B: Develop and implement a coordinated monitoring and evaluation plan to evaluate the effectiveness of steelhead artificial propagation measures in the subbasin. **Objective** 8C: Develop and implement a coordinated monitoring and evaluation plan to assess the effectiveness of habitat restoration measures throughout the subbasin.
Bull Trout – Problem Statements & Objectives	
Problem 9: Long-term persistence and abundance of bull trout within the subbasin are threatened by genetic introgression and by loss of fluvial population components, genetic interchange, and population connectivity.	**Objective** 9A: To achieve bull trout distribution criteria, as defined in USFWS (2002), maintain or expand current distribution of bull trout throughout the Grande Ronde River Recovery Unit until bull trout are distributed among at least nine local populations. **Objective** 9b: Increase the abundance of bull trout among all local populations to 6,000 adults.

Problem	Objective
Problem 10: Research and monitoring, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks, is needed to implement and evaluate bull trout recovery activities.	**Objective** 10A: Design and implement a standardized monitoring program to assess the effectiveness of recovery efforts affecting bull trout and their habitats. **Objective** 10B: Conduct research, evaluating relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks. **Objective** 10C: Evaluate effects of diseases and parasites on bull trout, and develop and implement strategies to minimize negative effects. **Objective** 10D: Develop and conduct research and monitoring to improve information concerning the distribution and status of bull trout. **Objective** 10E: Identify evaluations needed to improve understanding of relationships among genetic characteristics, phenotypic traits, and local populations of bull trout.

5.2.1 Fish Production/Population Objectives

Identifying specific population objectives that will restore and maintain in-basin anadromous fish escapement for natural production, broodstock needs, treaty-reserved tribal harvest, and recreational fisheries was a challenge. In an effort to understand existing objectives for anadromous fish populations in the Grande Ronde subbasin Table 5-2 was developed to summarize the ranges of objectives that have been proposed within various fish management plans developed for the Grande Ronde subbasin. In some cases there is a wide range of what has been considered as attainable anadromous fish population objectives. For example the NMFS 2002 Interim abundance goals determined 2000 naturally spawning spring Chinook were needed as the minimum abundance for delisting while the 1990 Subbasin Plan set a long term objective of 16000 returning adults. The objectives from the 1990 Subbasin Plan were generally the highest numbers proposed as objectives.

The subbasin co-managers all agree the Grande Ronde anadromous fish populations are severely depressed from historic levels and population levels can be increased from current levels. Selection of the range using numbers from the 1990 Subbasin Plan and LSRP in this table does not imply consensus by all management agencies. ODFW biologists in the basin feel that a single, static number for spring chinook and steelhead escapement goals has a limited utility. They believe that management can be more successfully implemented if the goals recognize that variability is a normal part of both populations and the environment (J. Zakel ODFW pers. comm.) The TRT is developing criteria for populations that include, besides escapement: spatial structure, life history diversity, and productivity (recruits/spawner). When TRT completes its task for the Grande Ronde basin the mangers will review the results and incorporate any criteria that are appropriate. By taking a look at multiple attributes, and recognizing their range and variability we can be more successful at adaptive management of the populations. For the purpose of meeting the subbasin planning requirements a range of objectives bound by the 1990 Subbasin Plan and recommendations of ODFW biologist (B. Knox 12/2004 e-mail) are presented. These objectives are summarized in Table 5-3.

This information was developed to provide direction to managers who must work on the restoration and recovery of each species and population over time through implementation of the plan and is subject to change as better information becomes available. The escapement objectives shown in Table 5-3 are anticipated to be reached within 24 years (represents 4-5 generations; a timeline consistent with the NPCC's Fish and Wildlife Program).

In evaluating the validity of proposed goals and objectives it is important to consider out-of-subbasin factors (including estuarine and ocean conditions, hydropower impacts such as water quality and fish passage, mainstem Snake/Columbia river water quality and quantity conditions, and downriver and oceanic fisheries) are the primary factors limiting recruitment of anadromous spawners to the Grande Ronde subbasin. **Addressing out-of-subbasin issues combined within subbasin restoration and strategic artificial propagation is needed to achieve goals in Table 5-3**. Increases in both anadromous adult escapement and habitat carrying capacity will be required to achieve anadromous fish objectives set forth in Table 5-3. Habitat carrying capacity and fish survival have been reduced within the subbasin by land management activities that impact hydrology, sedimentation, habitat distribution and complexity, and water quality. Minimizing the impact of out-of-subbasin effects on subbasin restoration efforts will require coordination and cooperation in province- and basinwide efforts to address problems impacting subbasin fish stocks.

The BPA has invested significant funding in protecting and restoring aquatic and terrestrial species and habitat within the Grande Ronde subbasin. Enforcement of existing conservation practices, laws, and regulations is necessary to protect this investment and to strengthen the overall protection and restoration effort in the subbasin.

Table 5-2. Comparison of anadromous fish objectives from various plans pertaining to the Grande Ronde subbasin

Species	Long-term Objective	Natural Spawning	Hatchery Spawning	Total Spawning	Harvest Component	Notes
Spring Chinook						
CRITFC	16,000	----	----	----	----	
1990 Subbasin Plan	16,000	----	----	12,000	4,000	Parkhurst 1950
NMFS 2002		2,000	----	----	----	Interim delisting Abundance
LSRCP	12,200	----	-----	----	----	Snake R. above L. Granite
Fall Chinook						
CRITFC	10,000	----	----	----	----	
1990 Subbasin Plan	10,000	----	----	----	2,500	
Summer Steelhead						
CRITFC	27,500	----	----	----	----	
1990 Subbasin Plan	27,500	----	----	18,450	9,050	Thompson et al. 1958
NMFS 2002	10,000	----	----	----	----	Interim Abundance Goal
LSRCP	15,900	----	-----	----	----	Snake R. above L. Granite
Sockeye						
CRITFC	2,500	----	-----	----	----	
1990 Subbasin Plan	2,500			-	625	
NMFS 2002						
Coho						
CRITFC	3,500					
1990 Subbasin Plan	3,500	1,000	2,200	3,200	300	

CRITFC=Spirit of the Salmon; 1990 Plan= 1990 Snake Subbasin Salmon and Steelhead Production Plan; NMFS 2002=NMFS Draft Interim Abundance Goals; CRFMP=Columbia River Fish Management Plan; LSRCP - 1975 Lower Snake River Fish and Wildlife Compensation Plan

[1] CRFMP, which has expired (US v. Oregon), establishes interim mgmt goals for fish passing over the Lower Granite Dam; Snake River specific goals are not defined.

[2] Represents interim abundance goal for Snake River ESU

[3] CRFMP, which has expired (US v. Oregon), establishes interim management goals for fish

Table 5-3. Anadromous adult return objectives for the Grande Ronde Subbasin.

Species		Total Adult Returns	Natural Spawning Component	Hatchery Component (Broodstock Need)	Harvest Component
Spring/ Summer Chinook	Historic Condition	5,000 -12,200[1]	5,000 -12,000	0	200 - 800[2]
	Existing Condition	250 - 3,000[3]	250 - 3,000	up to 720	0
	Future Objective	*>5000 - 16,000*[6]	*>5000 - 12,400*	*Up to 720*	*>500 - ~ 4,000*
Fall Chinook	Historic Condition	unknown	unknown	unknown	unknown
	Existing Condition	up to 500	up to 500	0	0
	Future Objective	*10,000*[8]	*7,500*[8]	*0*	*2,500*[8]
Wild Summer Steelhead	Historic Condition	3,500 -16,000 [1]	3,500 -16,000	0	1,100 - 3,000 [2]
	Existing Condition	1,100 - 8,500[7]	1,100 - 8,500	0	0
	Future Objective	*>5,000 - 27,500*	*>5000 - ~18,450*[6]	*0*	*>1,000 - 9,050*[8]
Hatchery Summer Steelhead	Historic Condition	0	0	0	0
	Existing Condition	1,000-10,000	0	500	200 - 7,000
	Future Objective	0	0	0	0
Sockeye	Historic Condition	up to 15,000[4]	up to 15,000	0	up to 15,000
	Existing Condition	extirpated	extirpated	extirpated	extirpated
	Future Objective	*2500* [5]	*undetermined*	*undetermined*	*625*[5]
Coho	Historic Condition	up to 5,000 or more	up to 5,000 or more	0	0
	Existing Condition	extirpated	extirpated	extirpated	extirpated
	Future Objective	*3,500* [5]	*1,000*[5]	*2,200*[5]	*300*[5]

[1] Historic escapement for spring/summer Chinook and summer steelhead based on LSRCP method of partitioning run over McNary Dam 1954-1963 (first ten years of McNary data).
[2] Punch card estimates for 1959 (first year of data) through 1963.
[3] Estimate based on expanding total redd count by three fish per redd for most recent 10 years (1994-2003).
[4] Cramer, S.P. and K.L. Witty. 1997. The feasibility of reintroducing sockeye and coho salmon in the Grande Ronde basin. S.P. Cramer and Associates, Gresham, OR, USA.
[5] NPT proposed reintroduction goal.
[6] Selection and inclusion of a range for production objectives from the 1990 Subbasin Plan and ODFW recommendations does not imply consensus by all management agencies. This information was developed to provide direction to managers and may be subject to change as better information comes available.
[7] Estimate using 14.9% of Lower Granite Dam wild count from 1993-93 through 2002-03 run years (LSRP method).
[8] Selection and inclusion of a range for production objectives from the 1990 Subbasin Plan does not imply consensus by all management agencies. This information was developed to provide direction to managers and may be subject to change as better information comes available.

5.2.2 Fish Passage/ Habitat Connectivity

5.2.2.1 Goals

- Provide connectivity between functioning habitats.
- Utilize priority list of passage barriers developed by NPT for Wallowa county.
- Compile list and evaluate passage priorities for Union county.

5.2.2.2 Fish Passage/ Habitat Connectivity Objectives and Strategies

Good information on fish passage and migration barriers was not available in time for the analysis. The Nez Perce Tribe has been conducting a survey of barriers in the subbasin which has found over 90 fish passage barriers in Wallowa County (Rick Christian, NPT, Personal Comm. December 17, 2004). In general, irrigation diversions, hatchery facilities and culverts are the biggest passage barrier issues. Once the passage analysis is completed the NPT will have a priority list which will account for the amount of habitat blocked, life history stages impacted and long term management objectives. Table 5-4 is a preliminary list of identified passage barriers in the Grande Ronde subbasin.

The EDT analysis of restoration scenarios showed that that largest potential increase in both steelhead and spring Chinook production occurs in the Wallowa River Watershed. Based on this finding, priority should be given to improving fish passage in the Wallowa River Watershed.

Table 5-4: Summary of identified passage barriers in the Grande Ronde subbasin.

Watershed	EDT ReachName	Obstruction Description	Source	Notes
Lower GR Trib	Cottonwood Cr-2 (GR)	Rearing Pond Diversion Dam	EDT	
Lower GR Trib	Grouse Cr- 2	Culvert - 1st Road	EDT	
Lower GR Trib	Grouse Cr- 4	Culvert- Secone Rd	EDT	
Lower GR Trib	Grouse Cr- 6	Culvert- 3rd Road	EDT	
Lower GR Trib	Rattlesnake Cr-2	Culvert	EDT	
Lower GR Trib	Wildcat Creek	Culverts at road	NPT	More than one
Lower GR Trib	Wallupa	Culverts at road	NPT	More than one
Minam	Little Minam Cr-2	Waterfall	EDT	
Minam	Minam N-2	Waterfall	EDT	
Wallowa	Bear Creek	Irrigation Diversion	NPT	
Wallowa	Deer Cr-1 (Wallowa)	Picket Weir	EDT	
Wallowa	Dry Cr-2 (Wallowa)	Irrigation Diversion	EDT	Fish bypass ladder
Wallowa	Hurricane Cr-3	Flow Diversion	EDT	
Wallowa	Hurricane Cr-5	Waterfall	EDT	
Wallowa	Little Bear Cr-3	Irrigation Diversion	EDT	
Wallowa	Lostine-2	Irrigation Diversion	NPT	
Wallowa	Lostine-2	Picket Weir	EDT	Nez P. tribal operation
Wallowa	Sage Cr-1	High fill culvert 100' long	EDT	
Wallowa	Spring Cr-2 (Wallowa)	Hatchery Picket Weir	EDT	

Wallowa	Wallowa-18	Irrigation Diversion	EDT	
Wallowa	Wallowa - 18 o 20	Irrigation Diversion	NPT	There are at least 6 diversions between Enterprise and Wallowa Lake dam.
Wallowa	Wallowa-20	Dam	EDT	
Wallowa	EFK Wallowa	Waterfall	NPT	
Wallowa	WFK Wallowa	Waterfall	NPT	
Wallowa	Prairie Ck (Wallowa)	Culverts at road	NPT	At least 21
Wallowa	Prairie Ck (Wallowa)	Bridge	NPT	SW 2nd St
Wallowa	Deer Cr-1 (Wallowa)	Hatchery Water Intake	NPT	

5.2.3 Habitat

5.2.3.1 Goals

- Protect high quality habitat and restore degraded habitats between functioning habitats.
- Manage for healthy ecosystems to support aquatic resources and native species.

5.2.4.2 Habitat Objectives and Strategies

The aquatic assessment sets the stage for development of the aquatic biological objectives. The summary of limiting factors identifies primary habitat attributes that limit the abundance of the three focal species in the subbasin, and also identifies the primary management related activities that result in these limitations. The attributes are listed by watershed in Table 5-5. The table is prioritized by watersheds based on the EDT analysis of the potential for significant steelhead and spring Chinook population improvements through restoration actions. The purpose of this current section is to outline the overall biological objectives for each of these limiting factors.

There are some clear patterns that emerge in the subbasin. Sediment levels are elevated above template conditions and reducing productivity everywhere but in wilderness area watersheds. There has been a reduction in Key Habitat Quantity basin-wide. Temperature levels are elevated in all but Lookingglass, Minam and Wenaha Watersheds.

One of the difficulties in interpreting EDT results are that the attributes of Key Habitat Quantity and Habitat Diversity. These are defined differently for different species and life history stages and multiple factors play into the definition. For example, the habitat diversity for steelhead and Chinook at the Age 0 inactive life history stage is defined by a combination of factors including; gradient, confinement, hydro modification, riparian function and wood levels. Flow can also be complicated – the primary environmental correlate can be either changes in low flow or high flow depending on life history stage. In addition, if there is no change in the primary correlate EDT may still identify flow as a priority attribute if enough of the modifying correlates change – hence in some cases there were changes in hydromodification, riparian function and habitat types but no changes in flow and EDT still identified flow as a priority attribute.

Table 5-5. Summary of priority attributes identified by EDT for each watershed in the Grande Ronde subbasin.

Watershed	Priority Attributes
Wallowa – Lostine River	• Key Habitat Quantity (reduced wetted widths) • Habitat Diversity (reduced wood, riparian function) • Sediment • Temperature • Flows
Upper Grande Ronde	• Sediment • Flow • Temperature • Key Habitat Quantity (reduced wetted widths)
Catherine Creek	• Key Habitat Quantity (reduced wetted widths) • Habitat Diversity (reduced wood, riparian function) • Sediment • Flow • Temperature
Joseph Creek	• Sediment • Temperature • Key Habitat Quantity (reduced wetted widths)
Lower Grande Ronde	• Habitat Diversity (primary pools, glides, spawning gravels) • Key Habitat Quantity (wood, hydromodifications to channel) • Sediment
Minam	• Key Habitat Quantity (reduced wetted widths) • Habitat Diversity (reduced wood, riparian function) • Sediment
Lookingglass Creek	• Key Habitat Quantity (reduced wetted widths) • Habitat Diversity (reduced wood, riparian function) • Sediment
Wenaha	• None

In order to focus our objective development on key measurable factors we have made the following generalizations:

- The habitat quantity and habitat diversity attributes are a function of channel condition, and,
- Temperature is largely a function of riparian condition and/or low flows.

Therefore, we recommend setting objectives for the following attributes (in order of priority);

1- Low Flows/ Irrigation Diversions

2- Sediment Reduction

3- Channel Condition

4- Riparian Function

In assembling these biological objectives we have been mindful of the need to steer clear of the pitfall of developing static habitat target values, or "one size fits all" solutions. The Independent Science Advisory Board (ISAB, Bilby et al. 2003) recognizes the need to take a spatially variable and temporally dynamic approach to setting biological objectives by noting that:

"In many cases the application of environmental standards and performance thresholds will divert attention from the real issue – managing watersheds in such a way that ecological processes supporting aquatic productivity and diversity are restored and conserved. Habitat standards have often failed….because they are taken as fixed and do not focus on dynamic processes that create and maintain ecologically complex and resilient watersheds…"

The ISAB goes on to note that:

"This approach [of setting fixed standards] *is inappropriate because the general trend is to homogenize habitat rather than maintain the complexity of conditions that support biological diversity at multiple scales"*

In outlining our biological objectives for the Grande Ronde subbasin we have tried to incorporate these guidelines. The result is a road map of how to arrive at the dynamically stable future condition that will support the full spectrum of aquatic species. The detailed and spatially explicit information needed to implement these objectives (e.g., the current and potential distribution of channel types, and the appropriate range of channel conditions that should be represented within those channel types) constitute an important data gap that should be a high priority for evaluation.

Low Flow Conditions

Unlike the previous two biological objectives, which can (in our opinion) be achieved while sustaining the economic concerns of the human community, the limiting factors that result from low-flow related impacts is a much less tractable problem. Human use of water in the arid west comes at the direct cost to aquatic species, and any attempt to retain more water instream will come at the expense of existing water-dependent practices (i.e., irrigated farming). However, this reality not withstanding, there are activities that can occur that soften the blow to either the human or the aquatic communities. These include things such as the more efficient use of water, or the voluntary (and fully compensated) transfer of water rights to instream uses, such as is done under the auspices of the Oregon Water Trust (http://www.owt.org).

Fortunately, from the perspective of restoring the health of the focal species in the Grande Ronde subbasin, low flows are the primary limiting factor among only a few of the assessment reaches. Consequently, moderate improvements in the existing low flow situation (through technological advances as well as voluntary reductions in use), coupled with improvements in channel and riparian conditions, will result in substantial benefits to the aquatic community. In light of this we propose the following biological objective with respect to low flows in the Grande Ronde subbasin:

To enhance low flow conditions such that they mimic the natural hydrograph to the extent possible, given the limitations posed by agriculturally dependent water use in the region.

The practical implication of this objective is that we will seek to reduce irrigation impacts to the extent possible, through both technological innovation and voluntary reductions in water use, however, our focus will be on the non-consumptive factors that also affect low flows such as 1) lower effective summertime flows due to poor channel conditions that result in flow going sub-surface, 2) dam operations and irrigation infrastructure changes that can keep more water in the stream at the times and in the places that it is needed, and 3) restoration of natural storage pathways within the subbasin such as beaver dam/meadow complexes, and channel/floodplain connectivity.

Strategies (not prioritized):

- Identify flow deficient stream reaches caused by irrigation withdrawals.
- Improve riparian function and water storage where feasible by reconnecting floodplains through removal of confinement structures (roads, dikes), enhancing riparian vegetation, reestablishing beaver populations.
- Re-establish historic wet meadow complexes where feasible.
- Improve hydrologic function of forested watersheds through manipulation of tree species and density toward historic conditions.
- Explore feasibility of water storage facilities (above or below ground) to enhance late season stream flow.
- Reduce irrigation withdrawals through an integrated program of irrigation efficiency improvements, diversion point consolidations, water right leasing and water right purchase, where applicable with willing landowners.
- Promote education and technical training in the efficient use of irrigation water.
- Facilitate research and development of less water-intensive agricultural crops.
- Reduce water withdrawals through measurement to valid water rights quantities

Sediment Conditions

The biological objective for future stream channel sediment conditions follows a similar line of reasoning as for channel conditions:

> To have a distribution of sediment type and size structure that is appropriate for the channel type, geology and ecoregion, recognizing that the distribution will also vary in time in response to natural disturbance factors.

The recognition that channel sediment conditions vary with varying channel conditions ties this biological objective to the previous. For example, particle size in a low gradient meandering meadow will be different from a moderate gradient channel.

The recognition that natural disturbance factors (e.g., wildfire, flooding, etc.) will influence the potential channel condition (different portions of the subbasin will be more or less susceptible to these disturbances) and time (disturbance has a probability and distribution associated with it) requires us to think of restoration not in terms of fixed target conditions, but as an improving trend in conditions, a trend that may at times experience set backs, across a broader landscape.

Strategies (not prioritized):

- Identify sediment sources
- Close, obliterate or relocate sediment producing roads.

- Improve drainage, install culverts, surface, on open sediment producing roads.
- Manage grazing in riparian areas following grazing plans designed to improve riparian condition; could include exclusion, partial season use, development of off-site water, herding.
- Reestablish riparian vegetation by planting trees, shrubs, sedges (native species preferred)
- Stabilize active erosion sites, where appropriate, through integrated use of wood structures (limited use of rock if necessary) and vegetation reestablishment.
- Where appropriate and feasible, relocate channelized stream reaches to historic locations.
- Promote interaction of stream channels and floodplains by removing, where feasible and appropriate) channel confinement structures (roads, dikes).
- Encourage landowner participation in riparian management incentive programs, e.g. CREP, WRP, EQIP.
- Promote/implement minimum tillage practices.
- Promote/implement development of grazing plans to improve upland vegetative condition.
- Implement an integrated noxious weed management program including survey, prevention practices, education, treatment and revegetation.
- Create/construct wetlands and filter strips for livestock feedlots and irrigation return flows.

Channel Conditions

Simply stated, the biological objective for future channel condition is:

> To have both a 1) distribution of channel types (e.g., Rosgen (1996) channel types1), as well as 2) a distribution of habitat conditions within those channel types, that are as close as possible to the historic distribution of these two variables within the subbasin.

By “as close as possible” we are recognizing that there are human institutions and infrastructure that supports those institutions that may result in a difference between the historic and potential future condition.

In the EDT model we assigned gradient and confinement categories to describe the current and historic channel types based on a simple channel gradient and valley confinement approach. This channel classification is too coarse to provide the resolution required at the reach or finer scales to implement these objectives. Consequently, a more detailed analysis (e.g., OWEB, 1999) will be needed to identify the current, historic, and potential future distribution of channel types. This approach must also incorporate the concepts of the evolutionary stages of channel adjustment outlined by Rosgen (1996) that channels will proceed through as they adjust to natural disturbances (e.g., wildfire and flooding).

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1 The Rosgen classification system is used in this discussion, given it’s ubiquity and usefulness in the interior west, however, other classification systems may be equally appropriate

Once the distribution of channel types is known we can then evaluate the appropriate habitat characteristics (e.g., width/depth ratios, entrenchment, pool frequency, etc.) within these channel types. Again, it is important not to think of these as static values within a given channel type, but also to consider the range of values and how that would be distributed across the landscape. Generic reference values (and ranges of values) could be used (e.g., those found in Rosgen 1996), however, it would be more appropriate to use information from the local management agencies (BLM, USFS, etc.) in developing a set of conditions appropriate to the local area.

Strategies (not prioritized):

- Improve the density, condition and species composition of riparian vegetation through planting, seeding, grazing management and improved forest management practices.
- Reconstruct channelized stream reaches to historic or near-historic form and location where appropriate and feasible.
- Remove or relocate channel confinement structures such as draw-bottom roads and dikes where appropriate and feasible.
- Maintain existing LWD by promoting BMP's for forestry practices.
- Add LWD where deficient and appropriate to meet identified short term deficiencies.
- Reconnect channels with floodplain or historic channels where appropriate and feasible.
- Remove or relocate channel confinement structures such as draw-bottom roads and dikes where appropriate and feasible.
- Install in-channel structures (LWD, bolders, rock structures) as appropriate to improve habitat complexity in the short term.

Riparian Conditions

The biological objective for future riparian conditions follows a similar line of reasoning as for channel conditions:

> To have a distribution of riparian communities having 1) a species composition, 2) size, and 3) structure that is appropriate for the channel type and ecoregion, recognizing that the distribution will also vary in time in response to natural disturbance factors.

The recognition that the potential riparian communities will vary with varying channel conditions ties this biological objective to the previous. For example, restoration of a stream that presently flows through a channelized former-wet meadow will require not only restoration of the plant community, but restoration of the channel to restore the hydrology and soil conditions under which the potential plant community can develop.

The recognition that certain human institutions, and infrastructure that supports those institutions, exists that may result in a difference between the historic and potential future riparian condition is implicit, given the between the potential riparian community and the potential channel type.

The recognition that natural disturbance factors (e.g., wildfire, flooding, etc.) will influence the potential community both in space (different portions of the subbasin will be more or less susceptible to these disturbances) and time (disturbance has a probability and distribution

associated with it) requires us to think of restoration not in terms of fixed target conditions, but as an improving trend in conditions, a trend that may at times experience set backs, across a broader landscape.
Strategies (not prioritized):

- Improve the density, condition and species composition of riparian vegetation through planting, seeding, improved grazing and forest management practices.
- Reconnect channels with floodplain or historic channels where appropriate and feasible.
- Remove or relocate channel confinement structures such as draw-bottom roads and dikes where appropriate and feasible.
- Encourage/promote participation in agriculture and farm programs to enhance riparian vegetative condition and function (CREP, WRP, EQIP)
- Relocate developed recreational facilities, where appropriate, from riparian areas to upland sites.

Other Attributes

As discussed above, the primary limiting factors among the streams in the Grande Ronde subbasin are the habitat attributes described above. Furthermore, the additional habitat attributes can be considered as being either dependent on these "big four" factors, and therefore remedied by the objectives discussed above, or of relatively local and/or minor concern. However, for the sake of completeness, we will explicitly state the biological objectives for these other attributes here:

- Habitat diversity shall be restored as near as possible to historic conditions, as a result of restoring channel conditions and riparian conditions,

- High and low water temperatures and dissolved oxygen conditions shall be restored as near as possible to historic conditions, as a result of restoring channel conditions, reducing sediment loads, improving riparian conditions, and improving low flow conditions,

- Localized impacts due to Pollutants are expected to be reduced as ongoing Best Management Practices are implemented that will reduce inputs of pollutants across the landscape.

5.2.4 Bull Trout

Long-term persistence and abundance of bull trout within the subbasin are threatened by genetic introgression and by loss of fluvial population components, genetic interchange, and population connectivity. There are two bull trout recovery areas in the Grande Ronde subbasin, the Grande Ronde and Little Minam Rivers. Local populations of bull trout have also been identified within each of these recovery areas. Key issues impacting bull trout populations are increasing stream temperatures from water withdrawals and changes in riparian function; fish passage barriers; and competition with non-native species.

5.2.4.1 Goals

- Ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the species native range so that the species can be delisted.

5.2.4.2 Bull Trout Objectives and Strategies

Restoring aquatic habitat, water quality and connectivity between local populations are the key components of recovering bull trout populations. Recovery for bull trout will require reducing threats to the long-term persistence of their populations and habitats, ensuring the security of multiple interacting groups of bull trout, and providing habitat and water quality conditions and access that allow the expression of various life-history forms.

Objectives:

- To achieve bull trout distribution criteria, as defined in USFWS (2002), maintain or expand current distribution of bull trout throughout the Grande Ronde River Recovery Unit until bull trout are distributed among at least nine local populations.
- Increase the abundance of bull trout among all local populations to 6,000 adults.

Strategies:

- Address fish passage barriers to ensure connectivity between local populations.
- Continue to restore riparian function and low stream flows to address water temperature issues.

Research and monitoring, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks, is needed to implement and evaluate bull trout recovery activities. Ongoing research and monitoring is required to 1) understand the genetic structure of local populations, quantify spawning site fidelity, and straying rates; and 2) gauge productivity trends over time within and between the local populations, and migratory and resident life histories; 3) improve the understanding of distribution and movement; and 4) evaluate the impacts on diseases and parasites.

Objectives:

- Design and implement a standardized monitoring program to assess the effectiveness of recovery efforts affecting bull trout and their habitats.
- Conduct research, evaluating relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks.
- Evaluate effects of diseases and parasites on bull trout, and develop and implement strategies to minimize negative effects.
- Develop and conduct research and monitoring to improve information concerning the distribution and status of bull trout.
- Identify evaluations needed to improve understanding of relationships among genetic characteristics, phenotypic traits, and local populations of bull trout.

Strategies:

- Continue to build upon current monitoring efforts to develop an integrated and coordinated bull trout monitoring, research and evaluation program.
- Track bull trout population trends over time and relate the information to restoration efforts. Based on an evaluation, use this information to modify bull trout recovery measures.

5.2.5 Prioritization of Aquatic Strategies "Prioritization Framework"

There is no single cause for many of the limiting factors identified in the plan; rather, multiple causes and a long history of activities have acted in concert to disrupt the ecosystem processes. Therefore, the Subbasin Plan does not attempt to isolate, elevate, or pre-select a single, most important limiting factor, strategy or sequence of ranked strategies. There are no simple priorities.

However, there are straightforward objectives. The overall objective of this plan is to increase fish and wildlife population trajectories. To accomplish this effectively many things need to happen simultaneously over a long time period. The plan identifies a series of 10 aquatic objectives and strategies which could be implemented to meet the biological objectives. This means that all concerned parties in the subbasin need to be on the same page in terms of conservation outcomes, commitment of resources to efficiently produce those outcomes, and tracking whether these efforts are working.

Although there are no simple priorities, there are clear conservation themes that will deliver important benefits to the subbasin fish and wildlife habitat and populations in the next 10 to 15 years. These themes can be viewed as "funds" or "accounts" in a subbasin conservation investment portfolio. This plan recommends balanced investments in the following priority themes to ensure protection of life, property, and economy;

- *Fix passage barriers due to low flows, diversions and culverts to allow fish passage into additional habitat.*
- *Find opportunities to restore and increase low flow due to diversions*
- *Reduce upland erosion and fine sediment inputs to aquatic habitats*
- *Restore channel condition to appropriate habitat characteristics and channel form.*
- *Restore riparian function.*
- *Ensure that all priority themes above are taken up and supported in an organized way at the local level.*

The recommendation to ensure that all priority themes are taken up and supported in an organized way at the local level cannot be overemphasized. This plan cannot succeed unless local interests take ownership of it, agree with the identification of system-level needs, and identify how local contributions can help meet those needs.

Criteria to prioritize proposed actions

A list of all aquatic biologic objectives is presented in Table 5-1. Various potential strategies to accomplish these objectives are discussed in Section 5.2.4.2. The guidelines presented below in table 5-6 were developed based on the OWEB Habitat Restoration Priority Framework (OWEB 2004) and identified limiting factors in the Grande Ronde subbasin to present criteria that are intended to effectively screen and prioritize projects.

Table 5-6 : Framework for screening and identifying the priority of proposed projects in the Grande Ronde subbasin.

Restore watershed connectivity limiting key fish and wildlife populations	
Rationale	Restoring access to portions of the watershed with quality habitat is the appropriate initial strategy for the long-term improvement of watershed health. This approach provides access to suitable habitats for native aquatic species because it restores such connectivity. These types of projects are a priority because they have a high probability of success in a short time frame with relatively low cost and risk of failure
Strategy	♦ Restoring natural stream flows in dewatered streams through improved irrigation efficiency projects and instream flow protection ♦ Restoring fish passage to good habitats by restoring passage at road-crossing barriers
Build from strength	
Rationale	Work from the areas in the best condition outward. Protect habitat that supports existing populations that are relatively healthy and productive. Next, expand to adjacent habitats that have been historically productive or have a likelihood of sustaining healthy populations by reconnecting or improving habitat.
Strategy	♦ Work outward from high quality areas ♦ Larger contiguous patches are higher priority than smaller fragments. ♦ Address stream and population connectivity in all subbasins
Restore watershed *processes* impacting the aquatic system, water quality-limited streams, and wildlife habitat	
Rationale	In the long term it is important to address the causes of habitat degradation as a higher priority than restoring symptoms of disturbance. Restoring watershed processes that form, connect, and sustain habitats and water quality supports improving the long-term health of a watershed. Key watershed processes include the delivery and movement of sediment, wood, water, and nutrients to the aquatic system. **Restoring watershed processes often has a delayed response time. Costs of these projects can vary, however they have a high probability of success and low variability between projects.**
Potential Strategies	♦ Restoring hydrology to reestablish wetlands in the landscape ♦ Controlling sediment delivery to stream channels from roads and other sources ♦ Restoring native vegetation to lands with crop or exotic vegetation ♦ Removal of human structures that confine channels ♦ Removing roads or road related runoff
Importance of limiting factors to be addressed	
Rationale	***The priority in basin limiting factors are low flows, sediment reduction, channel condition, and, riparian function. High priority projects should address one or more of these limiting factors (see below).***
Low Flow/ Irrigation Diversions	
Objective	Reduce irrigation impacts to the extent possible, through technical innovation and voluntary reductions in water use. Address non-consumptive factors that also affect low flows such as 1) lower effective summertime flows due to poor channel conditions that result in flow going sub-surface, 2) dam operations and irrigation infrastructure changes that can keep more water in the stream at the times and in the places that it is needed, and 3) restoration of natural storage pathways within the subbasin such as beaver dam/meadow complexes, and channel/floodplain connectivity.
Strategies	♦ Identify flow deficient stream reaches caused by irrigation withdrawals. ♦ Improve riparian function and water storage where feasible by reconnecting floodplains through removal of confinement structures (roads, dikes), enhancing riparian vegetation, reestablishing beaver populations. ♦ Re-establish historic wet meadow complexes where feasible. ♦ Improve hydrologic function of forested watersheds through manipulation of tree species and density toward historic conditions.

- Explore feasibility of water storage facilities (above or below ground) to enhance late season stream flow.
- Reduce irrigation withdrawals through an integrated program of irrigation efficiency improvements, diversion point consolidations, water right leasing and water right purchase, where applicable with willing landowners.
- Promote education and technical training in the efficient use of irrigation water.
- Facilitate research and development of less water-intensive agricultural crops.
- Reduce water withdrawals through measurement to valid water rights quantities

Sediment Reduction

Goal

To have a distribution of sediment type and size structure that is appropriate for the channel type, geology and ecoregion, recognizing that the distribution will also vary in time in response to natural disturbance factors.

Strategy

- Identify sediment sources
- Close, obliterate or relocate sediment producing roads.
- Improve drainage, install culverts, surface, on open sediment producing roads.
- Manage grazing in riparian areas following grazing plans designed to improve riparian condition; could include exclusion, partial season use, development of off-site water, herding.
- Reestablish riparian vegetation by planting trees, shrubs, sedges (native species preferred)
- Stabilize active erosion sites, where appropriate, through integrated use of wood structures (limited use of rock if necessary) and vegetation reestablishment.
- Where appropriate and feasible, relocate channelized stream reaches to historic locations.
- Promote interaction of stream channels and floodplains by removing, where feasible and appropriate) channel confinement structures (roads, dikes).
- Encourage landowner participation in riparian management incentive programs, e.g. CREP, WRP, EQIP.
- Promote/implement minimum tillage practices.
- Promote/implement development of grazing plans to improve upland vegetative condition.
- Implement an integrated noxious weed management program including survey, prevention practices, education, treatment and revegetation.
- Create/construct wetlands and filter strips for livestock feedlots and irrigation return flows.

Channel Condition

Objective

To have both a 1) distribution of channel types , as well as 2) a distribution of habitat conditions within those channel types, that are as close as possible to the historic distribution of these two variables within the subbasin.

Strategy

- Improve the density, condition and species composition of riparian vegetation through planting, seeding, grazing management and improved forest management practices.
- Reconstruct channelized stream reaches to historic or near-historic form and location where appropriate and feasible.
- Remove or relocate channel confinement structures such as draw-bottom roads and dikes where appropriate and feasible.
- Maintain existing LWD by promoting BMP’s for forestry practices.
- Add LWD where deficient and appropriate to meet identified short term deficiencies.
- Reconnect channels with floodplain or historic channels where appropriate and feasible.
- Remove or relocate channel confinement structures such as draw-bottom roads and dikes where appropriate and feasible.
- Install in-channel structures (LWD, boulders, rock structures) as appropriate to improve habitat complexity in the short term.

Riparian Function

Objective

To have a distribution of riparian communities having 1) a species composition, 2) size, and 3) structure that is appropriate for the channel type and ecoregion, recognizing that the distribution will also vary in time in response to natural disturbance factors.

Strategy

- Improve the density, condition and species composition of riparian vegetation through planting, seeding, improved grazing and forest management practices.
- Reconnect channels with floodplain or historic channels where appropriate and feasible.
- Remove or relocate channel confinement structures such as draw-bottom roads and dikes where appropriate and feasible.
- Encourage/promote participation in agriculture and farm programs to enhance riparian vegetative condition

and function (CREP, WRP, EQIP)
Relocate developed recreational facilities, where appropriate, from riparian areas to upland sites.

Address ESA recovery goals and species conservation agreements

Rationale

Improving habitats for ESA-listed species addresses both political and ecological priorities, since many ESA-listed species are indicators for the broader ecological health of a watershed. Restoring these fish populations should focus on addressing watershed connectivity and the habitat-forming processes that sustain all of parts of their life cycle: adult and juvenile migration, spawning, and juvenile rearing. It is important, for example, to restore juvenile rearing habitat in concert with providing access (connectivity) throughout the watershed for migration and spawning. These actions, while focused on areas with current and historical populations of ESA-listed fish, will benefit other fish and wildlife populations.

Key Areas

- Improving fish passage barriers to allow access to high-quality spawning habitat
- Reconnecting historic river side channels provides winter juvenile rearing habitat for spring chinook.
- Improving in-stream flows to improve water temperatures for bull trout.
- Reducing road-related sedimentation that impacts spawning gravels.
- Providing proper fish screens at points of water diversion to improve juvenile fish survival.

Address the symptoms of disturbance that impact fish and wildlife populations and water quality-limited streams

Rationale

Addressing the symptoms of human-related disturbance can help provide important habitats while key watershed processes are recovering. Many functions that create habitat operate at very long time scales. Many decades may be needed, for example, before large wood delivery to stream channels can be restored to appropriate levels to provide quality aquatic habitats. In the short-term, habitat quality can be improved by placing wood in stream channels to improve pool complexity and accelerate other processes such as capturing and retaining spawning gravels.

Symptoms of human-related disturbance, for example, can include elevated levels of fine sediments, the lack of large wood in the stream from poor riparian conditions, altered peak flows, and confined stream channels from bank alteration. **These types of projects often have a short response time, but the costs can vary widely (potentially HIGH), and they are most effective when linked to watershed process improvement projects**

Potential Strategies

- Placing large wood in streams
- Creating natural channel and bank structure in an altered section of stream
- Installing water / sediment control basins to protect the riparian area

GEOGRAPHIC PRIORITIES FOR AQUATIC RESTORATION

The framework outlined in Table 5-6 provides a foundation for prioritizing and sequencing habitat restoration actions. In addition, the EDT analysis provides clear geographic priorities for applying spring Chinook and steelhead restoration actions. Based on the impact on steelhead and spring Chinook populations, some watersheds within the Grande Ronde subbasin display a disproportionate response to restoration actions. Table 5-7 outlines, in priority order, the watersheds that have the greatest population response (as measured by productivity and abundance) to restoration. These geographic priorities are not meant to imply that restoration must focus only on the highest priority watersheds. Rather than a rigid structure, the geographic framework is meant to provide a subbasin-wide perspective on spring Chinook and steelhead populations, while retaining the flexibility to respond opportunistically to restoration actions based on land owner needs, other fish populations such as bull trout, and other issues at the local and watershed scales.

Table 5-7. Grande Ronde subbasin watersheds listed in order of potential impact to steelhead and spring Chinook populations (abundance and productivity) from comprehensive habitat restoration.

Watershed
Wallowa – Lostine River
Upper Grande Ronde
Catherine Creek
Joseph Creek
Lower Grande Ronde
Minam
Lookingglass Creek
Wenaha

5.3. TERRESTRIAL SPECIES AND HABITATS

5.4 CONSISTENCY WITH ESA/CWA REQUIREMENTS

The Endangered Species Act (ESA) and the Clean Water Act (CWA) potentially impact the Grande Ronde subbasin by improving protection and restoration of the aquatic-riparian system, terrestrial habitats, and ecosystem processes. The acts function through two major mechanisms: Species listings under the ESA and designations of waters as water quality limited under the CWA. Species listings result in recovery plans and consultations on projects where there is a federal interest; water quality limited waters are addressed through the development and implementation of Total Maximum Daily Load (TMDL) allocations.

The Interior Columbia Basin Ecosystem Management Project (ICBMP) brought together current information on landscape dynamics and aquatic-riparian ecosystem function. In January 2003 the Regional Executives for the USDA Forest Service, Forest Service Research, USDI Bureau of Land Management, US Fish and Wildlife Service, the National Marine Fisheries Service and the Environmental Protection Agency signed a Memorandum of Understanding completing the Project. The agencies signing the MOU agree to cooperatively implement The Interior Columbia Basin Strategy. Recently, the agencies developed an aquatic/riparian habitat framework that clarifies the Interior Columbia Basin Strategy relative to the aquatic and riparian habitat components: "Conservation of fish, wildlife, plants, and habitats at risk should be considered with the full array of broad-scale ecosystem components addressed by the strategy (i.e., landscape dynamics, terrestrial source habitats, aquatic species and riparian and hydrologic processes…)." (USFS and BLM 2004, p. 1).

The Wallowa-Whitman National Forest completed its Forest Plan in 1990. The Forest Plan sets guidelines and land base allocations for resource resources, including fish and wildlife habitats. Because the Forest Plan was established before the ESA listings of salmon, steelhead, and bull trout populations, the Federal agencies established guidance for the management of anadromous (PACFISH, USDA 1995a) and resident (INFISH, USDA 1995b) fish populations. ESA consultation on the Forest Plan was completed in 1996 for salmon species and in 1998 for steelhead and bull trout. These Forest Plan-level consultations set the stage for project specific

ESA consultations. In addition to more stringent management standards as a result of ESA-listings, riparian management areas have been established.

The Wallow-Whitman National Forest is revising the 1990 Forest Plan. Key components of the Interior Columbia Basin Strategy will be included in the planning process, including riparian conservation areas and protection of population strongholds for listed or proposed species. The Forest Plan will be consistent with the CWA and ESA; NOAA Fisheries, US Fish and Wildlife Service, and the Environmental Protection Agency are involved in the planning process (USFS 2004a). The Forest Planning process will also incorporate management policies and objectives from the Grande Ronde Subbasin Plan and other subbasin plans (USFS 2004a). The Wallowa-Whitman Forest Plan revision is scheduled for completion in 2007.

In the Grande Ronde Basin, water quality is regulated by the states of Oregon and Washington. The Oregon Department of Environmental Quality has completed a TMDL assessment for the upper Grande Ronde Basin and an implementation plan is in place to improve water quality for this portion of the basin. The upper Grande Ronde TMDL, which has been approved by the Environmental Protection Agency, addresses water temperature, sediment, nitrogen, and phosphorous. The TMDL for the lower Grande Ronde Basin is scheduled for completion 2005 (Mitch Wolgamott, DEQ, personal communication, 2004).

Another important integration effort is the Oregon Plan for Salmon and Watersheds. The Oregon Plan is designed to protect and restore watershed health, including addressing at-risk fish and wildlife species and water quality. The Oregon Plan rests on a foundation of laws and executive orders, state agency actions, and voluntary efforts. A key component of the voluntary effort is the habitat restoration planning and implementation actions undertaken by the Grande Ronde Model Watershed Program. The GRMWP serves as a framework for voluntary restoration efforts by landowners and agencies and provides integration between the ESA and CWA. The GRMWP was a participant in the development of the upper Grande Ronde TMDL and implements projects designed to address identified water quality issues. ESA integration occurs at two levels in the GRMWP planning and implementation process: habitat restoration projects are prioritized to address listed fish species; and ESA consultation and National Environmental Policy Act (NEPA) review takes place for all federally funded projects.

5.5 RESEARCH, MONITORING AND EVALUATION

Developing a comprehensive and coordinated aquatic and terrestrial research and monitoring program in the Grande Ronde subbasin is an extraordinarily complex undertaking. Through the subbasin planning process, there was not the time or resources to devote to the development of a coordinated, integrated RM&E plan. With the development of the subbasin plan, key entities can pursue the development of a comprehensive RM&E plan. The final RM&E plan will provide detailed descriptions of data collection protocols, coordinated monitoring at various scales (subwatershed, watershed, subbasin), and mechanisms for information sharing and reporting. At this time, a number of organizations involved in the subbasin plan (e.g., ODFW, the Model Watershed Program, federal land management agencies) will continue to maintain ongoing monitoring and evaluation efforts until a more comprehensive and coordinated monitoring and evaluation framework and plan is developed and approved.

REFERENCES

This list only includes references new to the supplement. A full reference list in included in the original subbasin plan.

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