riparian trees. The yellow warbler represents species that utilize riparian scrub-shrub or riparian understory shrub habitats. The American beaver, like the great blue heron, represents species that require both aquatic and terrestrial elements of the ecosystem to satisfy all their life history needs. Further, beavers shape the environment by creating wetlands that often progress through successional stages of siltation and vegetation growth to become meadows and/or riparian areas.

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**Management Strategies:**

- Protect extant habitat in good condition through easements and acquisitions; protect poor quality habitat and/or lands with habitat potential adjacent to existing protected lands (avoid isolated parcels/wildlife population sinks).
- Fund and coordinate weed control efforts on both public and private lands.
- Work with Conservation Districts, NRCS, Forest Service, landowners et al., to implement best management practices in wetland and riparian areas in conjunction with CRP, CREP, WHIP, WRP and other programs.
- Restore wetland function by providing vegetation structural elements through reestablishment of native plant communities where practical and cost effective.
- Restore riparian area function with enhancements, livestock exclusions, in-stream structures and bank modification if necessary, and stream channel restoration activities.
- Identify and protect wildlife habitat corridors/links.
- Develop a beaver management plan to promote the reestablishment/reintroduction of beaver into headwater and mid-elevation habitats.

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**Data Gaps and M&E Needs:**

- Habitat quality data. Assessment data bases do not address habitat quality.
- Higher resolution habitat maps which accurately show location and extent of wetland and riparian habitats.
- Refined habitat maps including CREP program/field delineations.
- GIS soils products including wetland delineations.
- Wetland/riparian obligate species data. Significant lack of local population/distribution data for Columbia spotted frog, yellow warbler and beaver

### 3.6.3. Desired Future Conditions – Aquatic

Included in Biological Objectives in Management Plan

### 3.6.4. Desired Future Conditions – Terrestrial

Included in Synthesis Section 3.6.2.

### 3.6.5. Opportunities

See Section 3.5.1 and Table 46.

# 4. Inventory of Existing Activities (Private, Local, State, Federal)

The inventory section describes existing legal protection, plans, management programs and restoration projects followed by a gap assessment of effectiveness of these elements in protecting and conserving species and habitats in the Grande Ronde Subbasin.

## 4.1. Existing Legal Protection

The Land Management Protection Class map (Figure 62) illustrates the protection status of lands within the subbasin. The same protection class map is also seen as an overlay on the habitat maps in section 3.4.2. The protection status working definitions for the GAP analysis are as follows:

- High (Status 1): An area having permanent protection form conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity and legacy) are allowed to proceed without interference or are mimicked through management.
- Medium (Status 2): An area having permanent protection form conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.
- Low (Status 3): An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low intensity type (e. g., logging) or localized intense type (e. g., mining). It also confers protection to federally listed endangered and threatened species throughout the area.
- None (Status 4): There are no known public or private institutional mandates or legally recognized easements or deed restrictions held by the managing entity to prevent conversion of natural habitat types to anthropogenic habitat types. The area generally allows conversion to unnatural land cover throughout.

*Protected Areas:* The following is a list, with brief descriptions, of the major protected areas within the subbasin.

*U.S. Forest Service*

- *Eagle Cap Wilderness Area.* The Eagle Cap Wilderness Area lies in the heart of the Wallowa Mountains on the Wallowa-Whitman National Forest and encompasses 361,446 acres. First established as a primitive area in 1930, the Eagle Cap Wilderness became a part of the National Wilderness Preservation System with the passage of the Wilderness Act of 1964. The Eagle Cap Wilderness Area includes most of the Minam, upper Wallowa and upper Lostine river drainages as well as Bear Creek and Hurricane Creek and a small portion of Catherine Creek.
- *Wenaha-Tucannon Wilderness Area.* The Wenaha-Tucannon Wilderness Area was created by the Endangered American Wilderness Act of 1978. Located in the northern Blue Mountains of southeastern Washington and northeastern Oregon, it encompasses 177,465 acres and includes most of the Wenaha River drainage.

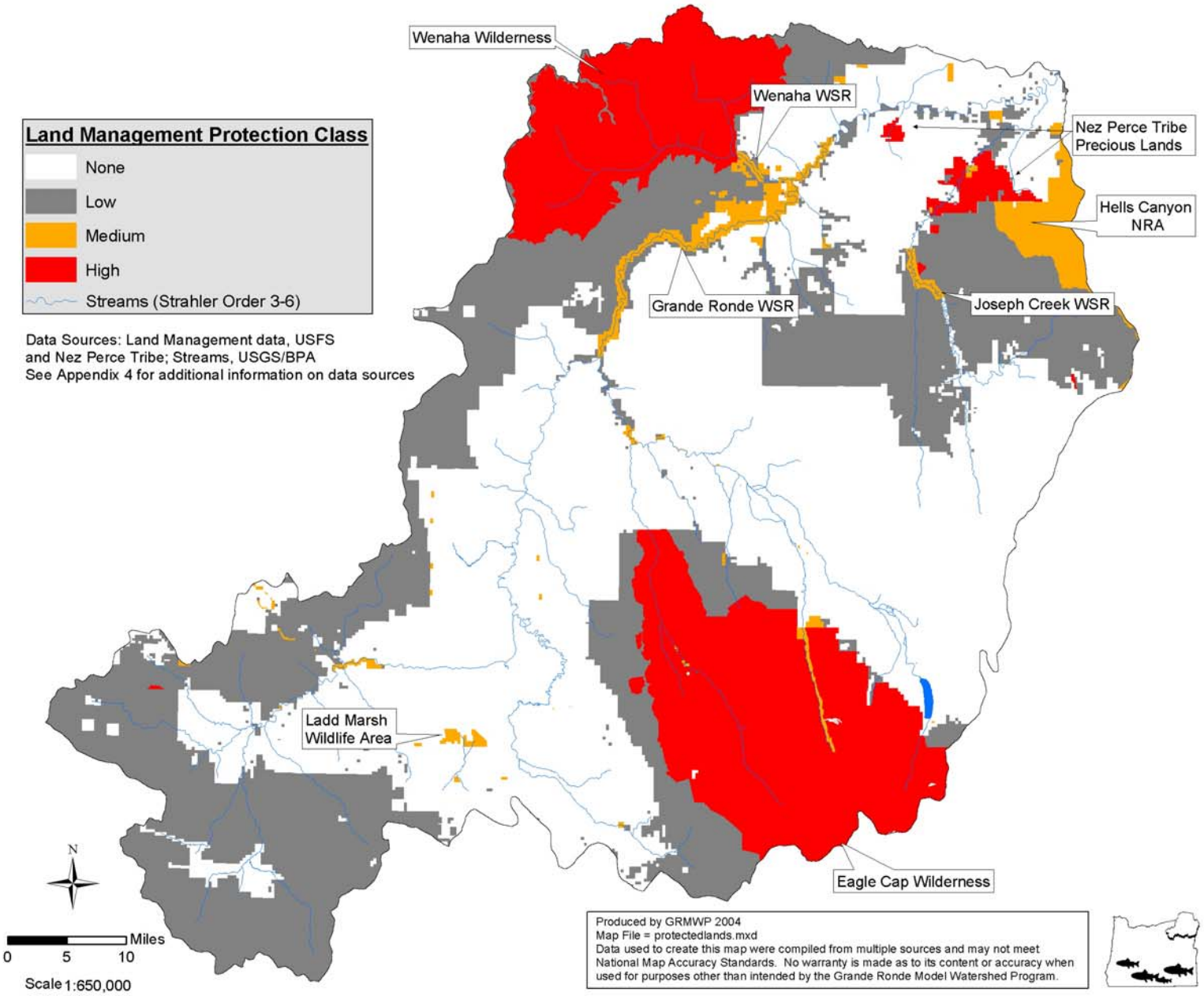


**Figure 62.** Land protection status and some protected areas in the Grande Ronde subbasin (NRA= National Recreation Area; WSR=Wild and Scenic River).

*Oregon Department of Fish and Wildlife*

- *Ladd Marsh Wildlife Area:* Ladd Marsh Wildlife Area is located about 5 miles southeast of La Grande, Oregon. It presently includes 4,051 acres of streams, ponds, wetlands and associated uplands, although negotiations to purchase neighboring tracts are ongoing. The Nature Conservancy and the Rocky Mountain Elk Foundation have purchased adjacent properties. These properties will be managed by ODFW as part of the Ladd Marsh Wildlife Area. Ladd Marsh is home to over 200 species of birds, 40 species of mammals and 10 species of reptiles and amphibians. Snake River spring Chinook salmon, Snake River summer steelhead and bull trout may all be found in Ladd Creek within the Wildlife Area at some times of the year.
- *Wenaha Wildlife Area:* The Wenaha Wildlife Area is located approximately 50 miles north of Enterprise, Oregon. The Wildlife Area encompasses 10,966 acres with an additional 1,370 acres currently managed as part of the Wildlife Area. The Wenaha Wildlife Area was established in 1953 to provide natural and subsistence food for mule deer, elk and bighorn sheep, to enhance habitat for native fish and wildlife species, and to provide wildlife-oriented recreational opportunities for the public. The Wenaha Wildlife Area is home to a variety of wildlife, both resident and migratory, including 29 species of mammals, 131 species of birds, and 7 species of reptiles and amphibians. Spring Chinook salmon, fall Chinook salmon, and summer steelhead may all be found in reaches of the Grande Ronde and Wenaha Rivers where they pass through the Wildlife Area.
- *Enterprise Wildlife Area:* Located in Wallowa County near Enterprise, Oregon, the Enterprise Wildlife Area consists of 32 acres of riparian and juniper habitat managed for a variety of wildlife species.
- *Lostine Wildlife Area:* The Lostine Wildlife Area is located in the Lostine River drainage of Wallowa County, Oregon about 6 mi. south of Lostine. The wildlife area encompasses 969 acres of grassland habitat managed primarily for Rocky Mountain bighorn sheep.
- *Rhinehart Wildlife Area:* This 1-acre tract adjacent to the Grande Ronde River near Elgin, Oregon is managed for its value as riparian habitat for passerine birds and other wildlife.
- *Saw-whet Wildlife Area:* This 7-acre wildlife area, in Union County, Oregon consists of pond and riparian habitat and is managed for a variety of wildlife associated with these habitats.
- *Wallowa Wildlife Area:* The Wallowa Wildlife Area is 22 acres of wetland and riparian areas. This area is managed to benefit wintering birds and a variety of other wildlife.
- *Minam River Public Access:* Located near the confluence of the Minam and Wallowa rivers, this public access area consists of 338 acres of mostly riparian habitat. The area is managed primarily for large mammals and other wildlife while offering an access point for recreation in the Minam River drainage.
- *Morgan Lake Public Access:* Morgan Lake is a 65-acre lake located southwest of La Grande, Oregon. The area serves as habitat for waterfowl and other wildlife as well as offering recreational opportunities for anglers, paddlers, birdwatchers, and others.

*Washington Department of Fish and Wildlife*

- *Chief Joseph Wildlife Area.* The Chief Joseph Wildlife Area complex consists of 3 parcels, with a total of 13,425 acres, located on the lower Grande Ronde River. The area is in Asotin County, Washington, approximately 30 miles south of the town of Asotin. The largest parcel in the complex, 9,735 acres, was purchased in 1974. The other two parcels, with a combined area of 3,680 acres, were added in the 1990's through Snake River dam mitigation for wildlife programs. The Chief Joseph Wildlife Area is managed for Rocky Mountain bighorn sheep, mule deer, upland birds and a variety of non-game wildlife. Over 115 species of birds have been identified in the Area. Peregrine falcons

have been reared in the wildlife area and it is a popular wintering area for bald eagles. Through its management of the wildlife area, WDFW owns or manages 11.5 miles of anadromous fish streams in, or bordering the area.

*Nez Perce Tribe*

- *Precious Lands*. The Precious Lands area, purchased with Snake River dam wildlife mitigation funds, lies approximately 40 miles north of Enterprise, Oregon and encompasses parts of Cottonwood, Broady, Tamarack, Joseph, and Buford Creeks. The area, with a total of 15,325 acres, contains primarily grassland plant communities dominated by bluebunch wheatgrass. North facing slopes also support dense shrub fields and/or mixed conifer stands of Douglas-fir and ponderosa pine. Riparian areas largely consist of a black cottonwood or white alder overstory with multi-layered shrub understory, or dense black hawthorn thickets with an occasional conifer. The area supports a wide range of wildlife species and is a critical big game wintering area for the Chesnimnus Unit elk herd. Survey work has identified 87 bird species, 29 mammals, and 11 reptiles and amphibians that inhabit the project area. Joseph and Cottonwood Creeks also support steelhead populations that benefit from the current management of the property.

*Wild and Scenic Rivers*

The lower Grande Ronde River in Oregon and all or portions of four tributaries are designated as federal Wild and Scenic under the Omnibus Oregon Wild and Scenic Rivers Act and are sub-classified as wild, scenic or recreational. These river segments are the Grande Ronde from its confluence with the Wallowa River (RM 82) to the Washington border, a distance of about 44 miles (wild, scenic, recreational); Joseph Creek from 6.5 miles below the Crow Creek/Chesnimnus Creek confluence to the Forest Service Boundary, about 9 miles (wild); The Lostine River from the headwaters to the Forest Service boundary, about 16 miles (wild, recreational); the Minam river from the headwaters to the Wilderness boundary, about 39 miles (wild); and the Wenaha River from the confluence of the North and South Forks (Wenaha Forks, RM 22) to the mouth, about 21 miles (wild, scenic, recreational). Outstandingly Remarkable Values (ORV) of the Wild and Scenic River designation include scenery, recreational opportunities and fisheries. Wild and Scenic rivers within the National Forests in the subbasin are managed by the Forest Service; those outside the National Forests are managed by the Bureau of Land Management.

Three river segments in the subbasin are also designated as Scenic Waterways under the Oregon State Scenic Waterways System. These are the entire Minam River; the Wallowa River from Minam to the confluence with the Grande Ronde; and the Grande Ronde from the Wallowa River to the Washington border. The criteria for state Scenic Waterways are similar to those for federal designation.

## 4.2. Existing Plans

➲ *US Forest Service and Bureau of Land Management*

The U.S. Forest Service is required to manage habitat to maintain viable populations of anadromous fish and other native and desirable non-native vertebrate species. **Land and Resource Management Plans (Forest Plans)** were developed for the Wallowa-Whitman National Forest (USDA 1990), and the Umatilla National Forest (USDA 1990). These Forest Plans guide all natural resource management activities, establish forest-wide multiple-use goals and objectives, and establish management standards and guidelines for the National Forests.

The Bureau of Land Management, in accordance with the Federal Land Policy and Management Act of 1976, is required to manage public lands to protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and

archeological values. Both the USFS and BLM are required by the Clean Water Act to ensure that activities on administered lands comply with requirements concerning the discharge or run-off of pollutants.

In the Columbia River Basin, the Forest Service and the Bureau of Land Management manage salmonid habitat under the direction of **PACFISH** (USDA and USDI 1994) and **INFISH** (Inland Native Fish Strategy; USDA 1995). These interim management strategies aim to protect areas that contribute to salmonid recovery and improve riparian habitat and water quality throughout the Basin, including the Grande Ronde subbasin. These strategies have also facilitated the ability of the federal land managers to meet requirements of the ESA and avoid jeopardy. PACFISH guidelines are used in areas east of the Cascade Crest for anadromous fish. INFISH is for the protection of habitat and populations of resident fishes outside anadromous fish habitat.

The **Interior Columbia Basin Ecosystem Management Project** (ICBEMP) is a regional-scale land-use plan that covers 63 million acres of federal lands in Oregon, Washington, Idaho, and Montana http://www.icbemp.gov/.

The Bureau of Land Management is developing the **Northeastern Oregon Assembled Land Exchange (NOALE) and Resource Management Plan (RMP)** for the retention, exchange, and disposal of public land (USDI 1998). The goal of the exchange is to enable the BLM to more effectively meet ecosystem management objectives, to consolidate BLM managed lands for more effective and efficient resource protection, enhancement, and use; and to ensure that retained lands have sufficient public benefit to merit the costs of management (Land Exchange Act).

➲ *US Fish and Wildlife Service*

The U.S. Fish and Wildlife Service administers the Endangered Species Act (ESA) for resident fish and wildlife. This act provides for the development of **Recovery Plans** and directs enforcement of federal protection laws. Relevant recovery plans in the subbasin include:

- Bald Eagle Recovery Plan
- Canada Lynx Recovery Plan
- Bull Trout Draft Recovery Plan
- Howell's Spectacular Thelypody Recovery Plan
- MacFarlane's Four-O'Clock Recovery Plan
- Greenmann's Lomatium Conservation Agreement
- Spalding's Catchfly Conservation Strategy

The USFWS also administers the **Lower Snake River Fish and Wildlife Compensation Plan (LSRCP)** authorized by the Water Resources Development Act of 1976 (Public Law 94-587). The goal of the LSRCP is to mitigate and compensate for fish and wildlife resource losses caused by construction and operation of the four lower Snake River dams and navigation lock projects (FWS 1998).

➲ *NOAA Fisheries*

The National Oceanic and Atmospheric Administration administers the **ESA** as it pertains to anadromous fish only. NOAA Fisheries has jurisdiction over actions pertaining to Snake River spring and fall Chinook salmon and Snake River Basin Steelhead where they occur in the subbasin.

The ODFW has prepared **Hatchery and Genetics Management Plans (HGMP**) for artificial production programs in the subbasin at the direction of NOAA Fisheries.

➲ *Environmental Protection Agency*

The U.S. Environmental Protection Agency is responsible for implementing and administering the **Clean Water Act** (CWA). Accelerated and strengthened efforts to achieve clean water and aquatic habitats was the intent of the Clean Water Initiative (1998), the core of which is the **Clean Water Action Plan (CWAP)**, a federal partnership to promote and enhance locally based watershed improvements (the Unified Federal Policy for Ensuring a Watershed Approach to

Federal Land and Resource Management). Restoration strategies called **Total Maximum Daily Loads (TMDL)** are being developed for the Columbia River mainstem and tributaries (including the Grande Ronde subbasin), based on court orders and negotiated agreements through CWA litigation. EPA serves an oversight and advisory role in development of TMDLs.

➲ *Confederated Tribes of the Umatilla Indian Reservation*

The CTUIR is responsible for protecting and enhancing treaty fish and wildlife resources and habitats for present and future generations. Members of the CTUIR have federal reserved treaty fishing and hunting rights pursuant to the 1855 Treaty with the United States government. CTUIR co-manages fisheries resources with ODFW and individually and/or jointly implements restoration and mitigation activities throughout the areas of interest and influence in northeast Oregon and southeast Washington. CTUIR policies and plans applicable to subbasin management include the **CTUIR Columbia Basin Policy** (1996), **Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon** (CRITFC 1995).

➲ *Nez Perce Tribe*

The Nez Perce Tribe is responsible for managing, protecting, and enhancing treaty fish and wildlife resources and habitats for present and future generations in the Grande Ronde River subbasin. The Nez Perce Tribe individually and/or jointly implements restoration and mitigation activities throughout their areas of interest and influence. Nez Perce Tribal policies and plans applicable to subbasin management include **Nez Perce Tribal Executive Committee Resolutions**, the **Wallowa County/Nez Perce Tribe Salmon Habitat Recovery Plan and Multi-Species Strategy** (Wallow County and Nez Perce Tribe, 1993), the **Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon** (CRITFC 1995), the **Nez Perce Fish and Wildlife Code**, and Reports to General Council.

➲ *Blue Mountains Elk Initiative*

The **Blue Mountains Elk Initiative** is a federal, private, state and tribal Partnership to manage elk in the Blue Mountains of Oregon and Washington. The mission of the Initiative is to more effectively manage elk and elk habitat in the Blue Mountains with an emphasis on working closely with landowners to alleviate damage, using more than 90 percent of funding for on-the-ground projects and obtaining consensus on elk management from all partners and interested groups.

➲ *Senate Bill 1010*

Senate Bill 1010 allows the Oregon Department of Agriculture (ODA) to develop Water Quality Management plans for agricultural lands where such actions are required by state or federal law, such as TMDL requirements. The **Water Quality Management Plan** should be crafted in such a way that landowners in the local area can prevent and control water pollution resulting from agricultural activities.

➲ *Oregon Plan*

Passed into law in 1997 by Executive Order, the **Oregon Plan for Salmon and Watersheds** (http://www.oregon-plan.org/) and the **Steelhead Supplement to the Oregon Plan** outlines a statewide approach to ESA concerns based on watershed restoration and ecosystem management to protect and improve salmon and steelhead habitat in Oregon.

➲ *Oregon Department of Fish and Wildlife*

Oregon Department of Fish and Wildlife is responsible for protecting and enhancing Oregon fish and wildlife and their habitats for present and future generations. ODFW co-manages fishery resources with the NPT, CTUIR and Washington Department of Fish and Wildlife (WDFW). Management of the fish and wildlife and their habitats in and along the Grande Ronde Subbasin is guided by ODFW policies, collaborative efforts with affected tribes, and federal and state legislation. Direction for ODFW fish and wildlife management and habitat protection is based on the amendments and statutes passed by the Oregon Legislature. For example, **Oregon Administrative Rule (OAR) 635 Division 07 – Fish Management and Hatchery Operation** sets forth policies on general fish management goals, the **Natural Production Policy**, the **Wild**

**Fish Management Policy**, and other fish management policies and **OAR 635 Division 008 – Department of Wildlife Lands** sets forth management goals for each State Wildlife Area. Another pertinent ODFW policy is the **Oregon Guidelines for Timing of In-Water Work** to **Protect Fish and Wildlife Resources** (ODFW 1997b). In addition to the OAR's, ODFW has developed a variety of species-specific management plans. http://www.dfw.state.or.us/

- Mule Deer Management Plan (2003)
- Elk Management Plan (2003)
- Bighorn Sheep and Rocky Mountain Goat Management Plan (2003)
- Cougar Management Plan (1993)
- Black Bear Management Plan (1987)
- Migratory Game Bird Program Strategic Management Plan (1993)
- Oregon Wildlife Diversity Plan (1999)
- Oregon's Trout Plan
- Warmwater Fish Plan
- Comprehensive Plan for Production and Management of Oregon's Anadromous Salmon and Trout, Part III: Steelhead Plan
- Native Fish Conservation Policy

➲ *Oregon Department of Agriculture*

The Department of Agriculture oversees several programs in the Natural Resource Division that address soil, water, and plant conservation in the Grande Ronde subbasin. Soil and Water Conservation Districts, Watershed Councils, the Environmental Quality Incentives Program (EQIP), and Coordinated Resource Management Planning (CRMP) are under the jurisdiction of the Department of Agriculture as is the **Oregon Noxious Weed Strategic Plan**.

➲ *Oregon Department of Forestry*

The Oregon Department of Forestry enforces the **Oregon Forest Practices Act** (OAR 629-Division 600 to 680 and ORS 527) regulating commercial timber production and harvest on state and private lands. The OFPA contains guidelines to protect fish bearing streams during logging and other forest management activities, which address stream buffers, riparian management, and road maintenance.

➲ *Washington Department of Fish and Wildlife*

The WDFW is responsible for preserving, protecting, and perpetuating populations of fish and wildlife. Washington State laws, policies or guidance that WDFW uses to carry out its responsibilities include:

**Hydraulic Code** (RCW 75.20.100-160): This law requires that any person, organization, or government agency that conducts any construction activity in or near state waters must comply with the terms of a Hydraulic Project Approval permit issued by WDFW.

**Strategy to Recover Salmon** (part of *Extinction is not an Option*): The strategy is intended to be a guide, and it articulates the mission, goals, and objectives for salmon recovery.

The **Bull Trout and Dolly Varden Management Plan**: Describes the goal, objectives, and strategies to restore and maintain the health and diversity of self-sustaining bull trout and Dolly Varden stock and their habitats.

The **Wild Salmonid Policy for Washington**: Describes the direction the WDFW will take to protect and enhance native salmonid fish. The document includes proposed changes in hatchery management, general fish management, habitat management, and regulation/enforcement.

The **Draft Steelhead Management Plan:** Describes the goals, objectives, policies, and guidelines to be used to manage the steelhead resource.

**Washington Priority Habitats and Species** (PHS): A guide to management of fish and wildlife "critical areas" habitat on all State and private lands as they relate to the Growth

Management Act of 1990. The recommendations address upland as well as riparian habitat and place emphasis on managing for the most critical species and its habitat.

Specific wildlife species management or recovery plans, (e.g., **Blue Mt. Elk Herd Management Plan 2000, Statewide Elk Management Plan, Bighorn Sheep Herd and Statewide Management Plan, Black Bear, State Ferruginous Hawk Recovery Plan, Bald Eagle Recovery Plan**).

The **Draft Snake River Wild Steelhead Recovery Plan**: This plan is an assessment of problems associated with the continuing decline in natural steelhead populations within the Snake River basin and includes recommendations to reverse the decline.

The WDFW **Snake River Fishery Management and Evaluation Plan (FMEP)**: A plan required by NOAA Fisheries for all fisheries in the Snake River and its tributaries in Washington. The plan is an assessment of fisheries effects on listed anadromous salmonids.

➲ *County Governments*

County Commissioners have established **Comprehensive Plans** for land use within each county in Oregon.

**Asotin County Shorelines Master Program** (1994) is responsible for protecting the classified Shorelines of Statewide Significance.

➲ *Grande Ronde Water Quality Committee*

The Grande Ronde Water Quality Committee is a group of representatives from interest groups affected by water quality issues and regulations. They developed the **Upper Grande Ronde Water Quality Management Plan** (ODEQ 1999). Similar plans for the lower Grande Ronde and Wallowa watersheds are in development. These WQMPs provide a framework for achieving the load allocations in the TMDL

➲ *Asotin County Conservation District*

The ACCD is Asotin County's designated lead agency for watershed planning and implementation. The ACCD is responsible for the implementation of the **Asotin Creek Model Watershed Plan** and the Washington State Salmon Recovery Act within Asotin County.

➲ *Columbia River Basin Forum*

Formerly called The Three Sovereigns, the Columbia River Basin Forum is designed to improve management of fish and wildlife resources in the Columbia River Basin. The Forum is included as a vehicle for implementation of the **Coordinated Federal Strategy for the Recovery of the Columbia-Snake River Basin Salmon**.

## 4.3. Existing Management Programs

➲ *Bonneville Power Administration*

The Bonneville Power Administration has mitigation responsibility for fish and wildlife restoration under the **Fish and Wildlife Program** of the Northwest Power and Conservation Council as related to hydropower development. It is also accountable and responsible for mitigation related to federal Biological Opinions and Assessments for recovery of threatened, endangered, and sensitive species. The recently released FCRPS Biological Opinion calls for the BPA to expand habitat protection measures on non-federal lands. BPA plans to rely on the Council's program as its primary implementation tool for the FCRPS BiOp off-site mitigation requirements.

➲ *U.S.D.A. Natural Resources Conservation Service*

Within the U.S. Department of Agriculture (USDA), the **Natural Resources Conservation Service (NRCS)** oversees the implementation of conservation programs to help solve natural resource concerns. The **Environmental Quality Incentives Program (EQIP)**, established in the 1996 Farm Bill, provides a voluntary conservation program for farmers and ranchers who face serious threats to soil, water, and related natural resources. The **Conservation**

**Reserve Program (CRP)** puts sensitive croplands under permanent vegetative cover. The **Conservation Reserve Enhancement Program (CREP)** helps to establish forested riparian buffers. The NRCS assists landowners to develop farm conservation plans and provides engineering and other support for habitat protection and restoration (PL 566). Other NRCS programs include river **Basin Studies**, **Forestry Incentive Program**, **Wildlife Habitat Improvement Program** and **Wetlands Reserve Program (WRP).**

➲ *Oregon State Police*

The Fish and Wildlife Division of the Oregon State Police (OSP) is responsible for enforcement of fish and wildlife regulations in the State of Oregon. **The Coordinated Enforcement Program (CEP)** ensures effective enforcement by coordinating enforcement priorities and plans by and between OSP officers and ODFW biologists.

➲ *Grande Ronde Model Watershed Program*

The **Grande Ronde Model Watershed Program (GRMWP**) was selected in 1992 by the Northwest Power Planning Council as the model watershed project in Oregon. The GRMWP has a Board of Directors, composed of local representatives, tribes and natural resource management agencies, to coordinate policy of the program. For the last twelve years the GRMWP has served as an example of a watershed management partnership among local residents, agency staffs and public interest groups. The Program coordinates the implementation, maintenance and monitoring of habitat restoration projects. To date the Program has facilitated the implementation of nearly 300 restoration projects. Activities are guided by the Grande Ronde Model Watershed Operations Action Plan (1994).

➲ *Asotin County Noxious Weed Board*

The primary function of the **Asotin County Noxious Weed Control Program** is to provide technical assistance to the citizens of the county in developing effective control strategy's in dealing with their noxious weed problems and encourage people to be good land stewards.

## 4.4. Existing Restoration and Conservation Projects

This section and Appendices will summarize restoration project activities and accomplishments in the Grande Ronde Subbasin. The accomplishments are mostly aquatics related although there are certainly projects such as wetlands restoration that benefit many wildlife species. Summary narrative and tables are included in the body of the document, complete project listings are found in the appendix. Accomplishments are listed by geographic areas corresponding to unique steelhead and Chinook population units identified by the Interior Columbia Technical Team (TRT 2003). Figure 63 shows the TRT defined population units. Table 59 displays ownership acreages by population units. Figure 64 is a map of project points for work done between 1994 and present.

The Grande Ronde Model Watershed Program has been using BPA fish and wildlife mitigation funds to implement watershed restoration projects since 1994. GRMWP staff, in response to BPA, agency and stakeholder requests about restoration accomplishments, began development of a database in 1996 to track restoration activities. The database currently contains approximately 610 projects, 400 of which are listed in Appendix 4, Grande Ronde Subbasin Project Inventory by Salmonid Population Units. Projects located in the Imnaha subbasin, those that occurred prior to 1994, and those that are not on-the-ground restoration activities were excluded from the list.

The database includes most aquatic habitat and restoration work by agencies, tribes, and private landowners. Emphasis was placed on obtaining data on riparian/stream/fish habitat improvement projects. However upland projects intended to improve watershed condition or fish

habitat were also included. Projects conducted under the FSA/NRCS programs such as CCRP, CRP, EQIP, and WHIP programs; and completed before 2001, were also included in the database. In 2001 access to FSA/NRCS project information was restricted so only FSA/NRCS projects funded through BPA/GRMWP are included after2001. All ODFW/BPA stream/riparian projects and some wildlife projects are also included.

A short narrative and project accomplishment summary table is included below for each population. Information in the table is listed by restoration category and tasks. Where applicable, work is reported by: # of task items, miles accomplished, stream miles affected, acres treated, acres benefited and stream miles made accessible to anadromous fish. Appendix 5, listing projects by name for each of the population units, includes the lead organization, work description, tasks, funding sources, project objectives and monitoring.

Restoration work in the Grande Ronde Subbasin has been the cooperative effort of many agencies, two tribes, schools, two county governments and many individual landowners. Funding partners are shown in the project listing in Appendix 5. Table 47 summarizes total funding contributions for projects accomplished from 1994 to present.

Table 47. Sources of funding for restoration projects located in the Grande Ronde subbasin from 1994 to present.*

| **Funding Source** | **Funding**** |
|---|---|
| Bonneville Power Administration | $8,216,270 |
| Bureau of Land Management | $25,925 |
| Bureau of Reclamation | $970,159 |
| Environmental Protection Agency | $92,225 |
| Farm Services Administration | $1,221,322 |
| Federal Emergency Management Agency | $44,750 |
| Federal Hwy Administration | $62,148 |
| National Marine Fisheries Service | $97,200 |
| Natural Resource Conservation Service | $930,828 |
| Northwest Power Planning Council | $5,000 |
| U.S. Army Corps of Engineers | $217,000 |
| US Fish & Wildlife Service | $107,700 |
| US Forest Service | $5,342,324 |
| Oregon Dept. of Agriculture | $76,164 |
| Oregon Dept. of Environmental Quality | $254,687 |
| Oregon Dept. of Fish and Wildlife | $977,828 |
| Oregon Dept. of Forestry | $120,351 |
| Oregon Dept. of Geology and Mineral Industries | $54,146 |
| Oregon Dept. of Transportation | $104,562 |
| Oregon Parks & Recreation Department | $52,337 |
| Oregon Water Resources Dept. | $55,820 |

| | |
|---|---|
| Oregon Watershed Enhancement Board (includes OWHP & GWEB) | $6,306,604 |
| Soil and Water Conservation Districts | $117,926 |
| County/City/Schools | $1,329,904 |
| Misc. State Agencies/Universities | $120,154 |
| Tribes | $679,017 |
| Private Landowners | $4,389,084 |
| Other/Unknown | $288,765 |
| **Total** | **$32,260,199** |

*This summary was derived from the GRMWP project database and corresponds with the projects listed in Appendix X and tables CC through CCC.
**includes inkind services and materials

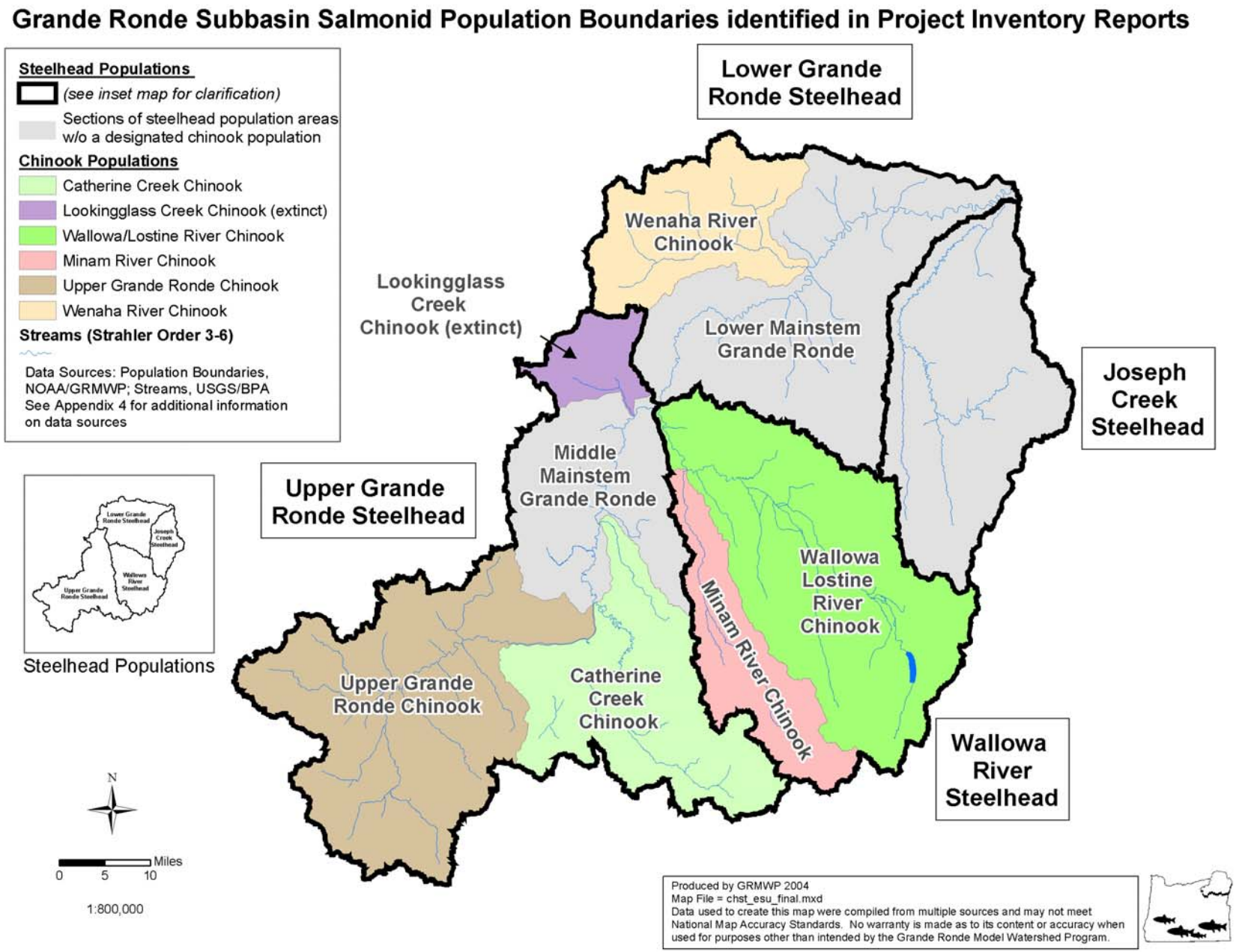


**Figure 63.** Grande Ronde Subbasin Salmonid Population areas identified in the EDT analysis and in project inventory tables.

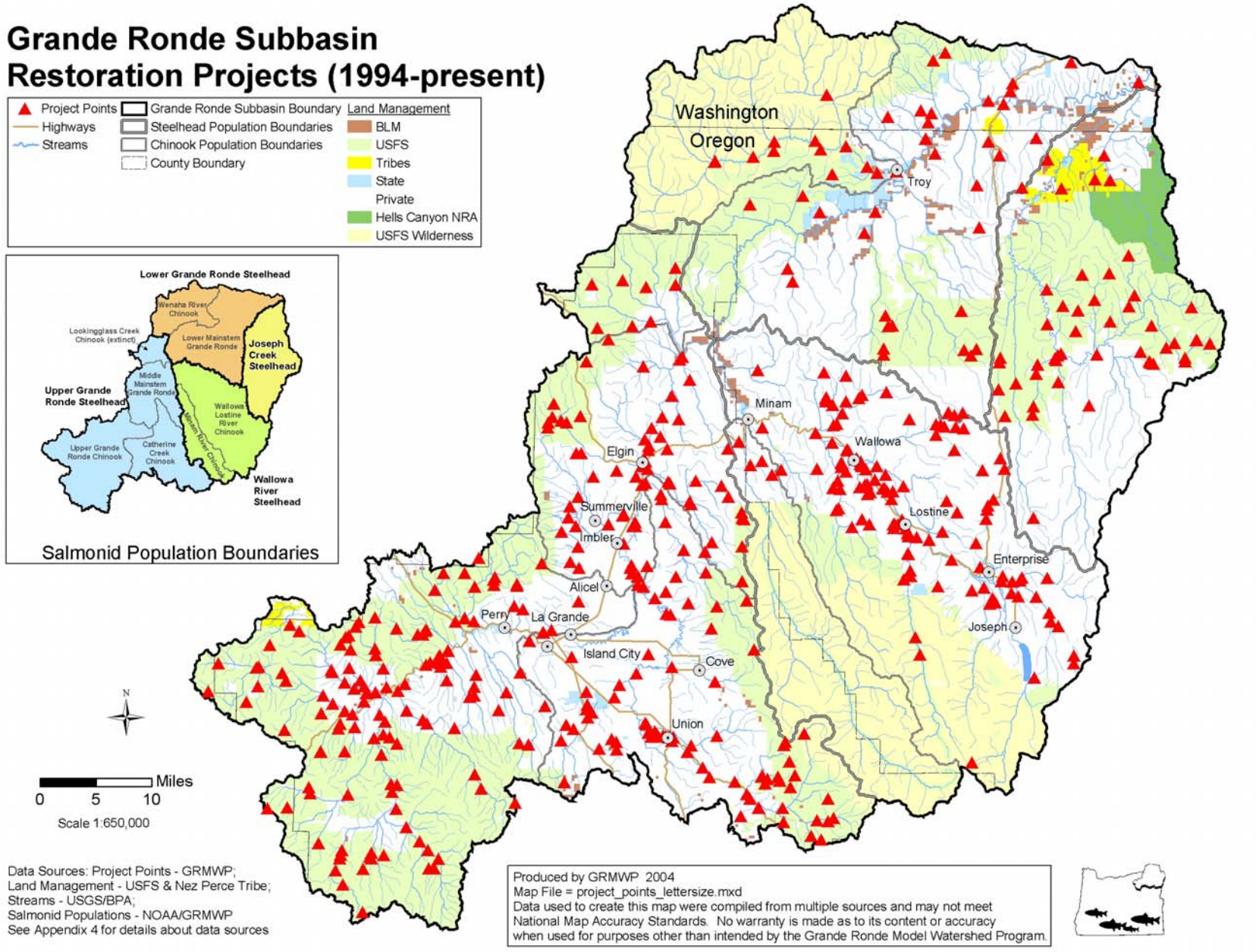


**Figure 64.** Restoration Projects 1994-present. Points represent central location of project activities.

**Table 48.** Restoration Inventory Project Task Objectives, Benefits, Descriptions.

| Restoration Category | Task | # Projects* | Objectives**; benefits; description of specific techniques | BPA WMP EIS Management Technique Codes*** |
|---|---|---|---|---|
| In Stream Enhancements | placement of boulders | 13 | ISD, WQS; Provide localized scour pools and resting areas, can provide additional cover or direct streamflow to preferred channel areas, enhances existing habitat, encourages upstream migration through higher velocity reaches | 1.7 |
| | placement of large woody material | 62 | ISD, SBS, WQS; Provides hydraulic and structural diversity, mimics natural processes, provides additional cover, slow, long-term decay of wood can provide transitional return to natural conditions; e.g. wood pieces, whole logs, logs with rootwads, can be hand/machine/helicopter placed, in a few cases used to keep livestock out of stream | 1.6 |
| | restore historic channel | 8 | ISD, SBS, WQS; Restores naturally operating processes necessary to sustaining channel structure and fish habitat, maintains a greater quality and quantity of fish and riparian habitat | 1.3 |
| | concrete structure(s) | 1 | WHI, WQN, WQT; in this one case designed as water control structures for ground water recharge for wetland | 2.3 |
| | log structure(s) | 11 | FPA, ISD, SBS, WQN, WQS; see benefits for placement of boulders and large woody material, directs flow to minimize bank erosion and/or improve fish passage, creates pool habitat, captures sediment, and cools water, when constructed as control structures an additional objective is to raise the water table; e.g. log weirs, water control structures, drop structures | 1.6, 1.7, 2.3 |
| | rock structure(s) | 22 | FPA, ISD, SBS, WQN, WQS; see benefits for placement of boulders, directs flow to minimize bank erosion and/or improve fish passage, creates pool habitat, captures sediment, and cools water, when constructed as control structures an additional objective is to raise the water table, objectives similar to log structures but used even more so to modify flow and protect banks and to help stabilize diversion sites; e.g. rock weir, grade control, check dam, drop structure, | 1.7, 2.3 |
| | misc. channel work | 14 | See objectives and benefits described for restoring historic channel; e.g. pool excavation, gravel bar removal, create meanders, reconfigure channel, | 1.3 |
| Dam-Diversion | fish passage ladder(s) @ diversion | 5 | FPA; Facilitates increased fish migration, provides access to unused or under utilized habitat | 1.15 |
| | fish passage weir(s) @ diversion | 2 | FPA, SBS, WQS; See benefits for fish passage ladder(s) @ diversion, also used to direct flow to minimize streambank erosion and collect sediment | 1.15 |
| | irrigation diversion(s) | 12 | FPA, SBS, WQN, WQS; Improves conditions for fish passage and eliminates pushup dams or replaces poorly designed or failing diversion to minimize streambank erosion and sediment, when headgate installed water use and rate applied can be controlled and monitored | 4.2, 4.22, 4.25 |
| | irrigation diversion(s) modified | 7 | See objectives and benefits for irrigation diversion(s); e.g. majority of projects involved installing/replacing headgates | 4.2, 4.22, 4.25 |
| | fish passage ladder(s) @ dam | 1 | See objectives and benefits for fish passage ladder(s) @ diversion | 4.2, 4.22, 4.25 |
| Side Channel-Pool Habitat | construction of side channel(s)/pool(s) | 3 | ISD, increase or improve available rearing habitat, potential to increase rearing success | 1.17 |
| | place large woody material in side channel(s)/pool(s) | 3 | See objectives and benefits for instream placement of large woody material | 1.6, 1.17 |
| | misc. modifications to side channel(s)/pool(s) | 2 | See objectives and benefits for construction of side channel(s)/pool(s); e.g. excavate pool to increase size, passage structure to provide access | |

*Number of projects in the Grande Ronde Subbasin



**Objectives and benefits listed may not apply to all applications of the associated task; Objective Code Definitions: EDU – Education; FPA – Fish Passage Improvement; ISD – Improve Instream Habitat Diversity; RIC – Improve Overall Riparian Condition; SBS – Stabilize Streambanks; SHP – Protect Spawning Habitat; UHI - Improve Upland Habitat; WHI – Wildlife Habitat Improvement; WQC – Improve Water Chemistry; WQN – Improve Water Quantity; WQS – Reduce Water Sediment; WQT – Improve Water Temperature

*** IDs are from BPA Watershed Management Program - Final EIS – 0265 Appendix A Available Management Techniques

| Restoration Category | Task | # Projects* | Objectives**; benefits; description of specific techniques | BPA WMP EIS Management Technique Codes*** |
|---|---|---|---|---|
| Streambank Enhancements | streambank rock treatment | 11 | SBS, WQS; protect streambanks from erosion, useful in highly disturbed areas or where high quality habitat and high value property require immediate protection; e.g. rip rap, | 1.10 |
| | streambank log structure(s) | 13 | ISD, SBS, WQS; absorb or redirect flow to reduce streambank erosion, mimics natural process of large woody debris recruitment , gradual decay provides transition to naturally stable banks, provides bank cover and scour pools for fish; e.g. revetment, jetty | 1.9 & 1.10 |
| | streambank rock structure(s) | 36 | ISD, SBS, WQS; absorb or redirect flow to reduce streambank erosion, provides bank cover and scour pools for fish; e.g. Barbs, jetties, j-vanes often with wood tied into structure | 1.9 & 1.10 |
| | streambank planting | 29 | SBS, WQS, WQT; Stabilizes banks, promotes natural processes, shades stream to maintain cool water temperatures, reduces sediments reaching streams nutrients taken up by vegetation; e.g. often includes bioengineering, planting in or between rock/wood streambank structures | 1.8, 2.1, 2.4 |
| | streambank seeding | 4 | SBS, WQS; Stabilizes banks, promotes natural processes, reduces sediments reaching streams nutrients taken up by vegetation; e.g. often used following project completion to protect disturbed ground, majority of USFS projects use native seed mixes | 1.8, 2.4 |
| | log/rootwad streambank treatment(s) | 3 | SBS, WQS; see benefits for streambank log structure(s); e.g. Juniper rip rap | 1.9 & 1.10 |
| | misc. streambank treatment(s) | 7 | SBS, WQS, WQT; Stabilizes banks, promotes natural processes, provides bank cover and scour pools for fish; shades stream to maintain cool water temperatures, reduces sediments reaching streams nutrients taken up by vegetation; e.g. bioengineering | 1.8 – 1.10 |
| Riparian Zone Habitat Enhancement | floodplain restoration | 13 | ISD, SBS, WQN, WQS, WQT, Restores naturally operating processes necessary to the sustaining of channel structure and fish habitat, maintains a greater quality and quantity of fish and riparian habitat, water slowly replenishes ground water and helps to sustain low flows later in summer; e.g. remove or relocate man made structures (dikes, railroad grade) that restricted interaction of river with floodplain | 1.3 2.3 |
| | place large woody material in riparian zone | 5 | SBS, WQS, WQT; reduces livestock access to riparian zone and streams, reduces erosion of streambank and sediment input, improved growth of riparian vegetation should provide shade and cool stream; e.g. used to restrict livestock access to streambanks and stream | 2.1 |
| | riparian planting | 89 | ISD, SBS, WQC, WQS, WQT; shades steam to maintain cool water temperatures, filters sediment, nutrients and other pollutants from upland sources, retains sediment, nutrients and other pollutants deposited from overbank flow events, preserves off-channel habitats, provides recruitment of large woody debris, provides detritus and primary food production, if conifers are planted provides thermal cover to sensitive stream reaches prone to ice development, moderates riparian temperatures which can reduce freezing of fish eggs and overwintering fry and juvenile fish, reduced bank and riparian damage from ice floes | 2.1, 2.2, 2.14, 3.15, 4.12 |
| | riparian seeding | 15 | See objectives and benefits for streambank seeding | 1.8, 2.4 |
| | noxious weed control | 6 | SBS, WQS, WQT; e.g. herbicide and/or hand pulling | 2.7, 2.11 |
| | thin riparian vegetation | 2 | RIC; benefits understory vegetation, primary aquatic food production, larger trees for large woody debris recruitment, wildlife habitat, reduces soil erosion due to increased understory | 2.14, 8.13 |
| | misc, riparian enhancement(s) | 3 | RIC | 2.1 |

*Number of projects in the Grande Ronde Subbasin



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*** IDs are from BPA Watershed Management Program - Final EIS – 0265 Appendix A Available Management Techniques

| Restoration Category | Task | # Projects* | Objectives**; benefits; description of specific techniques | BPA WMP EIS Management Technique Codes*** |
|---|---|---|---|---|
| Wet Meadow Habitat Enhancement | restore wet meadow | 4 | WQN, WQS, WQT; improves water quantity by storing ground water for release in late season (ground water recharge), captures/stores sediment; e.g. use structures to raise water table, close access to protect | 2.3 |
| | wet meadow prescribed burn | 1 | RIC; maintain early seral stage, increase vegetative diversity and wildlife communities; e.g. burn to prevent conifer encroachment | 2.12 |
| | wet meadow planting | 1 | WQS, WQT; Stabilizes soils, promotes natural processes, shade to maintain cool water temperatures, filters sediment, nutrients and other pollutants from upland sources | 1.8, 2.1 |
| | wet meadow seeding | 1 | WQS; Stabilizes soils, promotes natural processes, filters sediment, nutrients and other pollutants from upland sources | 1.8 |
| Wetland Habitat Enhancement | restore wetland | 1 | WQN, WQT late season ground water recharge | 2.3 |
| | wetland planting | 3 | See objectives and benefits for wet meadow planting | 1.8, 2.1 |
| Road Work | road(s) closed | 17 | WQS; removal of potential (and often active) sediment sources to reduce sediment yields to streams and fish habitat; e.g. berms or gates to prevent access | 7.18 |
| | road(s) built | 6 | WQS; avoid unstable slopes, provide adequate drainage, reduce sediment input to streams; e.g. roads built in less detrimental location to replace closed or obliterated roads | 7.1 |
| | road(s) improved | 52 | SHP, WQS; removal of potential (and often active) sediment sources to reduce sediment yields to streams and fish habitat; e.g. drainage structures (culverts, ditches, water bars, rolling dips, sediment traps), re-surface or seal, re-align or reposition grade, stabilize slopes | 7.6, 7.7, 7.8, 7.10, 7.13, 7.14, 7.16, 7.19 |
| | road(s) obliterated | 26 | SHP, WQS; removal of potential (and often active) sediment sources to reduce sediment yields to streams and fish habitat, return land to natural production; e.g. remove road, re-contour and plant slope, close access | 7.6, 7.7, 7.8, 7.10, 7.13, 7.14, 7.16, 7.19 |
| | road(s) relocated | 7 | See objectives and benefits for road improvement; road relocated away from stream or to a location that reduces sediment runoff | 7.21 |
| Stream Crossings | stream crossing structure(s) | 37 | FPA, SBS, WQSS; restore fish migration, reduces in-channel erosion and sedimentation, reduces pool filling; e.g. culvert, bridge, occasionally hardened ford, replace structures that produce sediment or impede fish passage | 1.12 & 5.11, 1.13, 1.14 |
| | stream crossing structure(s) modified | 6 | See objectives and benefits for stream crossing structure(s) | 1.12 & 5.11, 1.13, 1.14 |
| | stream crossing structure(s) obliterated | 3 | See objectives and benefits for stream crossing structure(s) | 1.12 & 5.11, 1.13, 1.14 |
| Agric. Practices-Erosion Control | modify irrigation methods | 14 | EDU, WQC, WQN, WQS; conserve water, minimize soil and nutrient runoff; e.g., convert from flood to sprinkler, gated pipe, demonstrate use of method | 4.1, 4.6, 4.7 |
| | misc. upland treatment(s) | 4 | WQS, reduces wind shear on soil surface thus reducing soil removed by wind and deposition of sediment to surface waters; e.g. windbreaks | 2.5 |
| | modify agriculture practice(s) | 4 | EDU, WQC, WQS; reduce erosion, reduced pollutant runoff, demonstrate use of method; e.g. terracing, direct seeding, convert to perennial crop/pasture | 3.1,3.3, 3.12 |
| | control erosion | 4 | WQS; remove sediment and debris; e.g. sediment traps/ponds | 3.17 |
| Irrigation Modification | ditch/canal work | 6 | WQN, WQS, reduce water loss and erosion; e.g. line ditch, convert from ditch to pipe conveyance | 4.9, 4.10, 4.22 |

*Number of projects in the Grande Ronde Subbasin



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*** IDs are from BPA Watershed Management Program - Final EIS – 0265 Appendix A Available Management Techniques

| Restoration Category | Task | # Projects* | Objectives**; benefits; description of specific techniques | BPA WMP EIS Management Technique Codes*** |
|---|---|---|---|---|
| Livestock Mgmt & Animal Facilities | CREP | 10 | ISD, SBS, WQC, WQS, WQT; see benefits from riparian exclosure fencing and planting; FSA/NRCS program to protect (fence) and plant riparian zone | 2.1, 2.2, 2.14, 3.15, 4.12, 6.10 |
| | relocate feedlot | 4 | WQC, WQS; reduced erosion and runoff of soluble nutrients; e.g. relocate away from riparian zone, redirect runoff away from riparian zone | 6.18 |
| | improve feedlot | 4 | WQC, WQS; reduced erosion and runoff of soluble nutrients; e.g. redirect runoff away from riparian zone | 5.1 & 6.18 |
| | grazing system modification | 2 | RIC, UHI; increase or sustain quantity and quality of vegetation, reduce sediment and nutrient in runoff; e.g. rotation grazing | 6.1, 6.2, 6.3 |
| | misc. modifications to livestock management | 1 | RIC; e.g. Construct livestock trail to aid moving cattle away from riparian area | 2.1, 6.3 |
| Water Developments | pond water development(s) | 21 | SBS, WQC, WQN, WQS, WQT; reduce sediment and direct contact of animal waste, when used to replace or supplement livestock access to stream for water helps protect streambank and riparian conditions, better distribution of livestock grazing improves habitat and reduces erosion, can be used to store water for late season flows, some provide wildlife habitat; e.g. most are fenced and piped to troughs to protect the water source | 5.13, 6.5, 6.6 & 6.7 |
| | spring water development(s) | 21 | SBS, WQC, WQN, WQS, WQT; reduce sediment and direct contact of animal waste, when used to replace or supplement livestock access to stream for water helps protect streambank and riparian conditions, better distribution of livestock grazing improves habitat and reduces erosion; e.g. most are fenced and piped to troughs to protect the water source | 5.13, 6.5, 6.7 & 6.9 |
| | well water development(s) | 23 | See objectives and benefits for spring water developments; e.g. typically wells already exist and the project work involves improvements and installation of piping and troughs | 5.13, 6.5, 6.7 & 6.8 |
| | water development(s) with ditch or stream as source | 6 | See objectives and benefits for spring water developments | 5.13, 6.5, 6.7 |

*Number of projects in the Grande Ronde Subbasin



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*** IDs are from BPA Watershed Management Program - Final EIS – 0265 Appendix A Available Management Techniques

| Restoration Category | Task | # Projects* | Objectives**; benefits; description of specific techniques | BPA WMP EIS Management Technique Codes*** |
|---|---|---|---|---|
| Fencing | riparian cross fence | 9 | SBS ,WQS, WQT; increase or sustain quantity and quality of vegetation, reduce sediment and nutrient in runoff , used to reduce livestock access or modify timing of access to riparian zone and streams, better distribution of livestock grazing improves habitat and reduces erosion; usually part of a rotational grazing plan | 2.1, 6.1, 6.2, 6.10 |
| | riparian exclusion fence | 107 | ISD, SBS, SHP, WQC, WQN, WQS, WQT; reduce sediment and direct contact of animal waste, protect streambank, increase or sustain quantity and quality of vegetation, improve/increase spawning habitat; eliminates livestock access to riparian zone and streams or springs, reduces erosion of streambank and sediment input, improved growth of riparian vegetation should provide shade and cool stream temperatures and in some cases provide woody material input | 1.16, 2.1, 6.10 |
| | riparian/upland cross fence | 12 | See objectives and benefits for riparian cross fence | 2.1, 6.1, 6.2, 6.10 |
| | upland cross fence | 35 | SBS, SHP, WQS, WQT; reduce sediment and direct contact of animal waste, protect streambank , increase or sustain quantity and quality of vegetation, improve/increase spawning habitat; reduces livestock access to riparian zone and streams or springs, reduces erosion of streambank and sediment input, improved growth of riparian vegetation should provide shade and cool stream temperatures and in some cases provide woody material input; e.g. used as part of rotational grazing plan to control when and how long livestock have access to the riparian zone, USFS has used to protect spawning habitat, also used to improve distribution in the uplands. | 2.1, 6.1, 6.2, 6.10 |
| | ditch cross fence | 1 | WQS; reduce sediment and direct contact of animal waste; e.g. used as part of rotational grazing plan to control when and how long livestock have access to ditch | 6.10 |
| | ditch exclusion fence | 9 | WQC, WQS, WQT; eliminates livestock access to ditch, reduces sediment input and direct contact of animal waste, improved growth of riparian vegetation should provide shade and cool water temperatures. | 6.10 |
| | pond exclusion fence | 2 | WHI; reduce sediment and direct contact of animal waste, increase or sustain quantity and quality of vegetation; e.g. this is fencing that is not associated with a water development | 6.10 |
| | riparian/upland exclusion fence | 10 | ISD, SBS, SHP, WQS, WQT; reduce sediment and direct contact of animal waste, protect streambank, increase or sustain quantity and quality of vegetation, improve/increase spawning habitat; eliminates livestock access to riparian and upland, reduces erosion of streambank and sediment input, improved growth of riparian vegetation should provide shade and cool stream temperatures and in some cases provide woody material input, eliminates livestock access to upland, riparian zone and streams | 1.16 5.13, 6.10 |
| | spring exclosure fence | 1 | WQS; reduce sediment and direct contact of animal waste; e.g. this is fencing that is not associated with a water development | 6.10 |
| | upland exclosure fence | 2 | RIC; e.g. one project is a watershed division fence, the other is an exclosure below feedlot to filter runoff | 5.2 |
| | wet meadow cross fence | 1 | WQT; e.g. low fence to prevent livestock while permitting wildlife access | 6.1, 6.2, 6.3, 6.10 |
| | wet meadow exclosure fence | 2 | RIC | 6.1, 6.2, 6.3, 6.10 |
| | wetland exclosure fence | 4 | RIC | 6.1, 6.2, 6.3, 6.10 |
| Upland Vegetation Management & Erosion Control | upland noxious weed control | 5 | WQS, UHI; e.g. spray, hand pull, plant perennial plants | 2.7. 2.11 |
| | upland planting | 9 | SHP, UHI, WQN, WQS; stabilize soils and reduce sediment runoff, increased ground water to support summer base flows; e.g. reforestation | 8.14, 8.15 |
| | upland seeding | 8 | SHP, UHI, WQS; stabilize soils and reduce sediment runoff | 8.24 |
| | thinning | 4 | UHI, WQN, WQS; increase understory vegetation, fire control, primary aquatic food production, size of trees available for large woody debris recruitment, reduce erosion, increased ground water to support summer base flows | 8.13, 8.15, 8.26 |

*Number of projects in the Grande Ronde Subbasin



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| Restoration Category | Task | # Projects* | Objectives**; benefits; description of specific techniques | BPA WMP EIS Management Technique Codes*** |
|---|---|---|---|---|
| | misc upland vegetation management | 1 | UHI, WHI; increased quantity and quality of vegetative cover ; e.g. fence Aspen stands to protect from browsing | 8.22 |
| Combined Riparian/Upland Vegetation Management | riparian/upland thinning | 5 | RIC, WQN, WQS, WQT; increase understory vegetation, primary aquatic food production, size of trees available for large woody debris recruitment, reduce erosion, increased ground water to support summer base flows | 8.13, 8.15, 8.26 2.14 |
| | riparian/upland planting | 3 | See riparian and upland planting | 2.1, 2.2, 2.14, 3.15, 4.12, 8.24 |
| | riparian/upland seeding | 1 | See riparian and upland seeding | 1.8, 2.4, 8.24 |
| Recreation | close campground(s)/park | 2 | EDU, SBS, SHP, WQS, WQT; e.g. close access, usually rehabilitate area (subsoil, plant), some include placing interpretive signs to explain the reason for the closure (habitat protection) | 10.1, 10.5, 10.9 |
| | obliterate campground(s)/park | 2 | EDU, SBS, SHP, WQC, WQS, WQT; e.g. close access, remove all campground improvements (toilets, tables, fences, fire rings, fences, etc), rehabilitate area (subsoil, plant), some include placing interpretive signs to explain the reason for the campground/park removal (habitat protection) | 10.1, 10.5, 10.7 |
| | improve trails | 6 | WQS, SBS move trails away from streams and/or improve drainage to reduce runoff | 10.1, 7.13, 7.19 |
| | improve campground(s)/park | 3 | EDU, SHP SBS, WQS, WQT, relocate sites or modify to reduce impact on riparian zone and streams; e.g. (1 case protects spawning habitat), close or modify access routes to direct use away from riparian areas, some include planting and placing interpretive signs to explain the reason for the modifications (habitat protection) | 10.3, 10.4, 10.5 |
| Mining | mine/dredge work | 2 | SHP, WQS; e.g. recontour, improve drainage and stabilize slope of abandoned mine to minimize runoff to salmonid spawning stream | 11.2 |
| Misc. Habitat | construct/improve pond (not water development) | 1 | WHI, WQC; e.g. construct settling pond below feedlot to collect runoff and filter pollutants also developed for wildlife habitat | |
| Facilities | wastewater facility | 1 | WQC, WHI replaced old system to improve treatment and use of municipal wastewater effluent for irrigation and use for wildlife habitat and wetlands. | 9.4 |

*Number of projects in the Grande Ronde Subbasin

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**Table 49.** Summary of Restoration/Conservation Projects located in the Grande Ronde Subbasin, from 1994 to present. See **Table 48** for information about each task.

| Restoration Category | Task | # task Items | mi. of task | stream mi. treated | stream mi. benefited | ac. treated | ac. benefited | stream mi. made accessible to fish |
|---|---|---|---|---|---|---|---|---|
| In Stream Enhancements | placement of boulders | | | 12.75 | | | | |
| | placement of large woody material | | | 208.16 | | | | |
| | restore historic channel | | | 4.44 | | | | |
| | concrete structure(s) | 5 | | 3.70 | | | | |
| | log structure(s) | 236 | | 15.73 | | | | |
| | rock structure(s) | 163 | | 18.58 | | | | |
| | misc. channel work | | | 9.26 | | | | |
| Dam-Diversion | fish passage ladder(s) @ diversion | 7 | | | | | | 1.50 |
| | fish passage weir(s) @ diversion | 4 | | | | | | |
| | irrigation diversion(s) | 14 | | | | | | |
| | irrigation diversion(s) modified | 8 | | | | | | 1.50 |
| | fish passage ladder(s) @ dam | 1 | | | | | | 14.00 |
| Side Channel-Pool Habitat | construction of side channel(s)/pool(s) | | | 0.10 | | | | |
| | place large woody material in side channel(s)/pool(s) | | | 0.01 | | | | |
| | misc. modifications to side channel(s)/pool(s) | | | 0.01 | | 3.00 | | |
| Streambank Enhancements | streambank rock treatment | | | 0.75 | | | | |
| | streambank log structure(s) | 96 | | 3.67 | | | | |
| | streambank rock structure(s) | 230 | | 11.45 | | | | |
| | streambank planting | | | 8.33 | | 11.00 | | |
| | streambank seeding | | | 0.08 | | | | |
| | log/rootwad streambank treatment(s) | | | 0.14 | | | | |
| | misc. streambank treatment(s) | | | 4.33 | | | | |
| Riparian Zone Habitat Enhancement | floodplain restoration | | 1.05 | 4.80 | | 159.04 | | |
| | place large woody material in riparian zone | | | 2.37 | | 3.00 | | |
| | riparian planting | | | 89.91 | | 1,230.81 | | |
| | riparian seeding | | | 20.39 | | 159.16 | | |
| | noxious weed control | | | 15.15 | | 246.00 | | |
| | thin riparian vegetation | | | 1.25 | | 25.00 | | |
| | misc. riparian enhancement(s) | | | | | 20.00 | | |
| Wet Meadow Habitat Enhancement | restore wet meadow | | | 2.50 | | 152.00 | | |
| | wet meadow prescribed burn | | | | | 60.00 | | |
| | wet meadow planting | | | 1.50 | | 50.00 | | |
| | wet meadow seeding | | | | | 45.00 | | |
| Wetland Habitat Enhancement | restore wetland | | | | | 300.00 | | |
| | wetland planting | | | 0.30 | | 12.50 | | |
| Road Work | road(s) closed | | 171.12 | | | | | |
| | road(s) built | | 5.72 | | | | | |
| | road(s) improved | | 214.74 | | | | | |
| | road(s) obliterated | | 267.59 | | | | | |
| | road(s) relocated | | 2.10 | | | | | |
| Stream Crossings | stream crossing structure(s) | 65 | | | | | | 38.25 |
| | stream crossing structure(s) modified | 6 | | | | | | |
| | stream crossing structure(s) obliterated | 5 | | | | | | |
| Agriculture Practices-Erosion Control | modify irrigation methods | | | | 1.10 | | 643.80 | |
| | misc. upland treatment(s) | | | | 2.63 | 4.75 | | |
| | modify agriculture practice(s) | | | | 4.40 | 2,512.70 | | |
| | control erosion | | | | 0.10 | | 100.00 | |
| Irrigation Modification | ditch/canal work | | 1.09 | | | | | |

| Restoration Category | Task | # task Items | mi. of task | stream mi. treated | stream mi. benefited | ac. treated | ac. benefited | stream mi. made accessible to fish |
|---|---|---|---|---|---|---|---|---|
| Livestock Management & Animal Facilities | CREP | | | 18.32 | | 663.20 | | |
| | relocate feedlot | 4 | | 0.01 | | 0.10 | | |
| | improve feedlot | 1 | | | | 12.00 | | |
| | grazing system modification | | | | 2.00 | | 4,390.00 | |
| | misc. modifications to livestock management | | | | 1.00 | | 12.00 | |
| Water Developments | pond water development(s) | 241 | | | | | | |
| | spring water development(s) | 248 | | | | | | |
| | well water development(s) | 25 | | | | | | |
| | water development(s) with ditch or stream as source | 9 | | | | | | |
| Fencing | riparian cross fence | | 24.49 | | 18.12 | | 11,341.50 | |
| | riparian exclusion fence | | 177.46 | 109.25 | | 2,369.06 | | |
| | riparian/upland cross fence | | 24.54 | | 26.35 | | 8,147.00 | |
| | upland cross fence | | 171.09 | | 265.44 | | 219,008.00 | |
| | ditch cross fence | | 0.50 | | | | | |
| | ditch exclusion fence | | 4.61 | | | 9.59 | | |
| | pond exclusion fence | | 2.26 | | | 8.25 | | |
| | riparian/upland exclusion fence | | 24.90 | 30.17 | | 16,202.00 | | |
| | spring exclosure fence | | 0.30 | | | 3.00 | | |
| | upland exclosure fence | | 3.60 | | 14.20 | | | |
| | wet meadow cross fence | | 3.50 | | 1.50 | | 100.00 | |
| | wet meadow exclosure fence | | 0.50 | 3.25 | | 303.00 | | |
| | wetland exclosure fence | | 1.86 | | | 40.50 | | |
| Upland Vegetation Management & Erosion Control | upland noxious weed control | | | | 4.75 | 8,637.00 | | |
| | upland planting | | | | 22.30 | 2,979.00 | | |
| | upland seeding | | | | 11.50 | 2,973.00 | | |
| | thinning | | | | 2.15 | 441.00 | | |
| | misc upland vegetation management | | | | | 2.00 | | |
| Combined Riparian/Upland Vegetation Management | riparian/upland thinning | | | 22.87 | | 2,192.00 | | |
| | riparian/upland planting | | | 0.50 | | 76.00 | | |
| | riparian/upland seeding | | | 3.00 | | 34.00 | | |
| Facilities | wastewater facility | 1 | | | | | | |
| Recreation | close campground(s)/park | | | | | 7.90 | | |
| | obliterate campground(s)/park | 18 | | | | 20.00 | | |
| | improve trails | | 38.71 | | | | | |
| | improve campground(s)/park | | | | | 7.10 | | |
| Mining | mine/dredge work | | | | | 10.00 | | |
| Miscellaneous Habitat Treatments | construct/improve pond (not water development) | 1 | | | | | | |

Steelhead – Upper Grande Ronde Population

Includes: Upper Grande Ronde Chinook Population
Catherine Creek Chinook Population
Lookingglass Chinook Population (extinct)
Middle Mainstem Grande Ronde area (not a Chinook population)

Upper Grande Ronde Chinook Population

This area has been a high priority restoration area for the GRMWP for some time as a result of prior assessments. National Forest lands comprise 64% of the land area. The La Grande Ranger District has completed over 50 individual restoration projects since 1995. Additionally there have been more than 40 projects done on private lands.

Restoration activities in the Upper Grande Ronde that have been emphasized large wood placement, riparian planting, road closure and obliteration, and riparian livestock exclusion fencing. Table 50 summarizes accomplishments by restoration categories and tasks.

**Table 50.** Summary of Restoration/Conservation Projects located in the Upper Grande Ronde River Chinook Population Area, from 1994 to present. See Table 48 for information about each task.

| Restoration Category | Task | # Task Items | mi. of Task | stream mi. treated | stream mi. benefited | ac. Treated | ac. Benefited | stream mi. made accessible to fish |
|---|---|---|---|---|---|---|---|---|
| In Stream Enhancements | placement of boulders | | | 9.07 | | | | |
| | placement of large woody material | | | 61.13 | | | | |
| | restore historic channel | | | 3.09 | | | | |
| | log structure(s) | 110 | | 6.40 | | | | |
| | rock structure(s) | 30 | | 7.23 | | | | |
| | misc. channel work | | | 3.50 | | | | |
| Dam-Diversion | irrigation diversion(s) | 2 | | | | | | |
| | fish passage ladder(s) @ dam | 1 | | | | | | 14.00 |
| Streambank Enhancements | streambank rock treatment | | | 0.02 | | | | |
| | streambank log structure(s) | 68 | | 2.15 | | | | |
| | streambank rock structure(s) | 54 | | 3.20 | | | | |
| | streambank planting | | | 3.43 | | 3.00 | | |
| | misc. streambank treatment(s) | | | 3.73 | | | | |
| Riparian Zone Habitat Enhancement | floodplain restoration | | | 0.78 | | 2.04 | | |
| | place large woody material in riparian zone | | | 1.92 | | | | |
| | riparian planting | | | 22.51 | | 363.15 | | |
| | riparian seeding | | | 12.02 | | 132.00 | | |
| | noxious weed control | | | 5.90 | | 193.00 | | |
| | thin riparian vegetation | | | 1.25 | | 25.00 | | |
| Wet Meadow Habitat Enhancement | restore wet meadow | | | 2.00 | | 52.00 | | |
| Road Work | road(s) closed | | 56.85 | | | | | |
| | road(s) built | | 0.85 | | | | | |
| | road(s) improved | | 15.28 | | | | | |
| | road(s) obliterated | | 67.24 | | | | | |
| | road(s) relocated | | 1.11 | | | | | |
| Stream Crossings | stream crossing structure(s) | 11 | | | | | | 24.50 |
| | stream crossing structure(s) modified | 4 | | | | | | |
| Irrigation Modification | ditch/canal work | | 0.06 | | | | | |
| Livestock Management & Animal Facilities | CREP | | | 3.21 | | 216.00 | | |
| | grazing system modification | | | | | | 2,290.00 | |
| | misc. modifications to livestock management | | | | 1.00 | | 12.00 | |
| Water Developments | pond water development(s) | 33 | | | | | | |
| | spring water development(s) | 60 | | | | | | |
| | well water development(s) | 1 | | | | | | |
| Fencing | riparian cross fence | | 7.00 | | 3.50 | | 6,080.00 | |
| | riparian exclusion fence | | 68.47 | 44.68 | | 1,243.10 | | |
| | riparian/upland cross fence | | 8.13 | | 8.97 | | 2,757.00 | |
| | upland cross fence | | 13.44 | | 21.10 | | 9,102.00 | |
| | ditch cross fence | | 0.50 | | | | | |
| | riparian/upland exclusion fence | | 21.08 | 21.92 | | 12,942.00 | | |
| | upland exclosure fence | | 3.00 | | 14.00 | | | |
| | wet meadow exclosure fence | | | 3.00 | | 300.00 | | |
| Upland Vegetation Management & Erosion Control | upland noxious weed control | | | | 0.25 | 10.00 | | |
| | upland planting | | | | 7.25 | 188.00 | | |
| | upland seeding | | | | 6.00 | 5.00 | | |
| | thinning | | | | 1.60 | 156.00 | | |
| Combined Riparian/Upland Vegetation Management | riparian/upland thinning | | | 14.87 | | 1,455.00 | | |
| | riparian/upland planting | | | | | 71.00 | | |
| | riparian/upland seeding | | | 3.00 | | 34.00 | | |
| Recreation | obliterate campground(s)/park | | | | | 20.00 | | |
| Mining | mine/dredge work | | | | | 10.00 | | |

Catherine Creek Chinook Population

Catherine Creek has been another emphasis restoration area for both public and private land managers. National forest lands comprise 26% of the land area with most of this being in the headwater stream reaches. Private forest lands comprise the mid elevation areas with the Grande Ronde Valley agricultural lands occurring at the lowest elevations. Forty projects have been accomplished on private lands with another twenty on national forest lands.

Projects of note in Catherine Creek include several hundred acres of wetland restoration in the Ladd Marsh Wildlife Management Area using treated municipal effluent and several dike setback/wetland restoration projects on private lands along the lower reaches of Catherine Creek. The Ladd Marsh projects have restored historic wetlands at the south end of the Grande Ronde Valley. Additionally, 140 miles of sediment-producing roads have been closed or obliterated, mostly in headwater areas adjacent to Chinook or steelhead spawning stream reaches. Table 51 summarizes accomplishments by restoration categories and tasks.

**Table 51.** Summary of Restoration/Conservation Projects located in the Catherine Creek Chinook Population Area, from 1994 to present. See **Table 48** for information about each task.

| Restoration Category | Task | # Task Items | mi. of Task | stream mi. treated | stream mi. benefited | ac. Treated | ac. Benefited | stream mi. made accessible to fish |
|---|---|---|---|---|---|---|---|---|
| In Stream Enhancements | placement of boulders | | | 3.43 | | | | |
| | placement of large woody material | | | 11.16 | | | | |
| | restore historic channel | | | 1.12 | | | | |
| | concrete structure(s) | 5 | | 3.70 | | | | |
| | log structure(s) | 45 | | 2.75 | | | | |
| | rock structure(s) | 5 | | 0.54 | | | | |
| | misc. channel work | | | 3.71 | | | | |
| Dam-Diversion | fish passage ladder(s) @ diversion | 6 | | | | | | 1.50 |
| | fish passage weir(s) @ diversion | 4 | | | | | | |
| | irrigation diversion(s) | 5 | | | | | | |
| | irrigation diversion(s) modified | 5 | | | | | | 1.50 |
| Side Channel-Pool Habitat | construction of side channel(s)/pool(s) | | | 0.04 | | | | |
| Streambank Enhancements | streambank rock treatment | | | 0.04 | | | | |
| | streambank log structure(s) | 1 | | 0.09 | | | | |
| | streambank rock structure(s) | 42 | | 0.43 | | | | |
| | streambank planting | | | 1.32 | | 1.50 | | |
| | streambank seeding | | | 0.02 | | | | |
| Riparian Zone Habitat Enhancement | floodplain restoration | | | 0.58 | | 18.00 | | |
| | place large woody material in riparian zone | | | 0.20 | | 3.00 | | |
| | riparian planting | | | 13.55 | | 99.56 | | |
| | riparian seeding | | | 4.53 | | 11.66 | | |
| Wet Meadow Habitat Enhancement | restore wet meadow | | | 0.50 | | | | |
| Wetland Habitat Enhancement | restore wetland | | | | | 300.00 | | |
| | wetland planting | | | 0.30 | | 2.00 | | |
| Road Work | road(s) closed | | 86.25 | | | | | |
| | road(s) built | | 3.23 | | | | | |
| | road(s) improved | | 39.95 | | | | | |
| | road(s) obliterated | | 53.25 | | | | | |
| | road(s) relocated | | 0.55 | | | | | |
| Stream Crossings | stream crossing structure(s) | 16 | | | | | | 3.00 |
| Agriculture Practices-Erosion Control | modify irrigation methods | | | | | | 21.00 | |
| | misc. upland treatment(s) | | | | 0.13 | 0.75 | | |
| Irrigation Modification | ditch/canal work | | 0.63 | | | | | |

| Restoration Category | Task | # Task Items | mi. of Task | stream mi. treated | stream mi. benefited | ac. Treated | ac. Benefited | stream mi. made accessible to fish |
|---|---|---|---|---|---|---|---|---|
| Livestock Management & Animal Facilities | CREP | | | 0.28 | | 3.00 | | |
| Water Developments | pond water development(s) | 14 | | | | | | |
| | spring water development(s) | 50 | | | | | | |
| | well water development(s) | 3 | | | | | | |
| Fencing | riparian cross fence | | 1.13 | | 1.00 | | | |
| | riparian exclusion fence | | 16.09 | 10.48 | | 138.91 | | |
| | riparian/upland cross fence | | 6.01 | | 7.63 | | 2,470.00 | |
| | upland cross fence | | 43.30 | | 112.59 | | 82,926.00 | |
| Upland Vegetation Management & Erosion Control | upland noxious weed control | | | | 4.00 | 8,587.00 | | |
| | upland planting | | | | 13.55 | 2,654.00 | | |
| | upland seeding | | | | 4.50 | 1,398.00 | | |
| Combined Riparian/Upland Vegetation Management | riparian/upland thinning | | | 8.00 | | 737.00 | | |
| Facilities | wastewater facility | 1 | | | | | | |

Lookingglass Chinook Population (extinct)

Lookingglass is a small, but distinct Chinook population extirpated during the early years of Lookingglass Hatchery operations as a result of adult fish collection. The drainage is about 80% National Forest lands. Overall current habitat and water quality is quite good. Little restoration work has been done. About 40 miles of forest roads have been closed or obliterated, and 60 acres of wetlands have been enhanced. Table 52 summarizes accomplishments by restoration categories and tasks.

**Table 52.** Summary of Restoration/Conservation Projects located in the Lookingglass Creek Chinook Extinct Population Area, from 1994 to present. See **Table 48** for information about each task.

| Restoration Category | Task | # Task Items | mi. of Task | stream mi. treated | ac. Treated |
|---|---|---|---|---|---|
| In Stream Enhancements | log structure(s) | 1 | | 0.01 | |
| | misc. channel work | | | 0.01 | |
| Streambank Enhancements | streambank rock structure(s) | 6 | | 0.20 | |
| Wet Meadow Habitat Enhancement | wet meadow prescribed burn | | | | 60.00 |
| Road Work | road(s) closed | | 4.40 | | |
| | road(s) improved | | 5.22 | | |
| | road(s) obliterated | | 34.20 | | |
| Stream Crossings | stream crossing structure(s) obliterated | 3 | | | |
| Upland Vegetation Management & Erosion Control | misc upland vegetation management | | | | 2.00 |

Middle Mainstem Grande Ronde (not a Chinook population)

The Middle Mainstem Grande Ronde is the Grande Ronde River portion of the Upper Grande Ronde Steelhead Population area that is not in a Chinook population area. It is 78% private lands. The south approximate one third of the area is the north end of the Grande Ronde Valley. Over 40 individual farm and ranch projects have been accomplished with only about 10 projects on public lands. Riparian planting and streambank stabilization work in both the Grande Ronde Valley and forested streams zones, along with road closures, improvement or obliteration has been done in many areas to reduce sediment input to streams. Riparian exclusion fencing and noxious weed treatments were also done on several projects. Table XX summarizes accomplishments by restoration categories and tasks.

**Table 53.** Summary of Restoration/Conservation Projects located in the Middle Mainstem Grande Ronde Sub Area, from 1994 to present. See Table 48 for information about each task.

| Restoration Category | Task | # Task Items | mi. of Task | stream mi. treated | stream mi. benefited | ac. Treated | ac. Benefited | stream mi. made accessible to fish |
|---|---|---|---|---|---|---|---|---|
| In Stream Enhancements | placement of large woody material | | | 6.63 | | | | |
| | restore historic channel | | | 0.23 | | | | |
| | misc. channel work | | | 1.75 | | | | |
| Dam-Diversion | fish passage ladder(s) @ diversion | 1 | | | | | | |
| | irrigation diversion(s) | 1 | | | | | | |
| | irrigation diversion(s) modified | 2 | | | | | | |
| Streambank Enhancements | streambank rock treatment | | | 0.38 | | | | |
| | streambank log structure(s) | 13 | | 0.10 | | | | |
| | streambank rock structure(s) | 65 | | 3.51 | | | | |
| | streambank planting | | | 0.52 | | 1.50 | | |
| | streambank seeding | | | 0.05 | | | | |
| | misc. streambank treatment(s) | | | 0.10 | | | | |
| Riparian Zone Habitat Enhancement | floodplain restoration | | 1.05 | 3.44 | | 139.00 | | |
| | place large woody material in riparian zone | | | 0.25 | | | | |
| | riparian planting | | | 10.44 | | 150.65 | | |
| | riparian seeding | | | 1.55 | | 14.50 | | |
| Wetland Habitat Enhancement | wetland planting | | | | | 10.00 | | |
| Road Work | road(s) closed | | 9.00 | | | | | |
| | road(s) improved | | 19.64 | | | | | |
| | road(s) obliterated | | 58.50 | | | | | |
| | road(s) relocated | | 0.41 | | | | | |
| Stream Crossings | stream crossing structure(s) | 11 | | | | | | 3.25 |
| | stream crossing structure(s) modified | 1 | | | | | | |
| | stream crossing structure(s) obliterated | 1 | | | | | | |
| Agriculture Practices-Erosion Control | misc. upland treatment(s) | | | | 1.50 | | | |
| | modify agriculture practice(s) | | | | 0.40 | 200.00 | | |
| | control erosion | | | | 0.10 | | 100.00 | |
| Livestock Management & Animal Facilities | CREP | | | 3.41 | | 36.00 | | |
| | relocate feedlot | 2 | | 0.01 | | 0.10 | | |
| | grazing system modification | | | | 2.00 | | 2,100.00 | |
| Water Developments | spring water development(s) | 13 | | | | | | |
| | well water development(s) | 1 | | | | | | |
| | water development(s) with ditch or stream as source | 2 | | | | | | |
| Fencing | riparian exclusion fence | | 12.22 | 8.46 | | 84.15 | | |
| | upland cross fence | | 7.79 | | 27.00 | | 26,080.00 | |
| | upland exclosure fence | | 0.60 | | 0.20 | | | |
| | wet meadow exclosure fence | | 0.50 | 0.25 | | 3.00 | | |
| | wetland exclosure fence | | 0.50 | | | 10.00 | | |
| Upland | upland noxious weed control | | | | | 6,500.00 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Vegetation Management & Erosion Control | upland planting | | | | 0.50 | 25.00 | | |
| | upland seeding | | | | | 750.00 | | |
| | thinning | | | | 0.55 | 55.00 | | |
| Miscellaneous Habitat Treatments | construct/improve pond (not water development) | 1 | | | | | | |

Steelhead – Wallowa River

Includes: Wallowa - Lostine Chinook Population
Minam Creek Chinook Population

Wallowa - Lostine Chinook Population

This unit is one of the largest population areas and naturally productive Chinook populations. Geography is very diverse ranging from the Wallowa Mountains in the Eagle Cap Wilderness, to Wallowa Valley agricultural lands, to rolling grasslands. Just over 30% is National Forest Lands, most of which is in the Eagle Cap Wilderness.

Over 100 projects have been accomplished in this unit, with all but a handful occurring on private lands. Most of the projects were accomplished through cooperative efforts of the Wallowa Soil and Water Conservation District, the Natural Resource Conservation District and the Bureau of Reclamation working with individual landowners and irrigation districts. Emphasis areas were irrigation diversion replacement or upgrades to address fish passage, livestock management activities to improve riparian condition, irrigation efficiency projects to address stream flow and streambank stabilization work to address sediment. Table 54 summarizes accomplishments by restoration categories and tasks.

**Table 54.** Summary of Restoration/Conservation Projects located in the Wallowa/Lostine River Chinook Population Area, from 1994 to present. See Table 48 for information about each task.

| Restoration Category | Task | # Task Items | mi. of Task | stream mi. treated | stream mi. benefited | ac. Treated | ac. Benefited | stream mi. made accessible to fish |
|---|---|---|---|---|---|---|---|---|
| In Stream Enhancements | placement of boulders | | | 0.25 | | | | |
| | placement of large woody material | | | 1.18 | | | | |
| | log structure(s) | | | 0.57 | | | | |
| | rock structure(s) | 108 | | 9.27 | | | | |
| | misc. channel work | | | 0.20 | | | | |
| Dam-Diversion | irrigation diversion(s) | 6 | | | | | | |
| | irrigation diversion(s) modified | 1 | | | | | | |
| Side Channel-Pool Habitat | construction of side channel(s)/pool(s) | | | 0.06 | | | | |
| | place large woody material in side channel(s)/pool(s) | | | 0.01 | | | | |
| | misc. modifications to side channel(s)/pool(s) | | | 0.01 | | 3.00 | | |
| Streambank Enhancements | streambank rock treatment | | | 0.09 | | | | |
| | streambank log structure(s) | 10 | | 1.30 | | | | |
| | streambank rock structure(s) | 45 | | 1.01 | | | | |
| | streambank planting | | | 2.68 | | 4.00 | | |
| | log/rootwad streambank treatment(s) | | | 0.14 | | | | |
| | misc. streambank treatment(s) | | | 0.50 | | | | |
| Riparian Zone Habitat Enhancement | riparian planting | | | 17.33 | | 223.25 | | |
| | noxious weed control | | | 2.25 | | 13.00 | | |
| | misc. riparian enhancement(s) | | | | | 20.00 | | |
| Wet Meadow Habitat Enhancement | wet meadow seeding | | | | | 45.00 | | |
| Wetland Habitat Enhancement | wetland planting | | | | | 0.50 | | |

| Restoration Category | Task | # Task Items | mi. of Task | stream mi. treated | stream mi. benefited | ac. Treated | ac. Benefited | stream mi. made accessible to fish |
|---|---|---|---|---|---|---|---|---|
| Road Work | road(s) closed | | 6.42 | | | | | |
| | road(s) built | | 1.64 | | | | | |
| | road(s) improved | | 84.36 | | | | | |
| | road(s) relocated | | 0.03 | | | | | |
| Stream Crossings | stream crossing structure(s) | 21 | | | | | | 1.00 |
| Agriculture Practices-Erosion Control | modify irrigation methods | | | | 1.10 | | 622.80 | |
| | misc. upland treatment(s) | | | | 1.00 | 4.00 | | |
| | modify agriculture practice(s) | | | | | 1,410.00 | | |
| Irrigation Modification | ditch/canal work | | 0.40 | | | | | |
| Livestock Management & Animal Facilities | CREP | | | 5.26 | | 138.80 | | |
| | relocate feedlot | 2 | | | | | | |
| | improve feedlot | 1 | | | | 12.00 | | |
| Water Developments | pond water development(s) | 118 | | | | | | |
| | spring water development(s) | 62 | | | | | | |
| | well water development(s) | 20 | | | | | | |
| | water development(s) with ditch or stream as source | 7 | | | | | | |
| Fencing | riparian cross fence | | 1.41 | | 1.22 | | 11.50 | |
| | riparian exclusion fence | | 36.81 | 23.87 | | 436.50 | | |
| | riparian/upland cross fence | | 7.40 | | 5.00 | | 820.00 | |
| | upland cross fence | | 87.75 | | 86.75 | | 90,140.00 | |
| | ditch exclusion fence | | 4.61 | | | 9.59 | | |
| | pond exclusion fence | | 2.26 | | | 8.25 | | |
| | riparian/upland exclusion fence | | 0.44 | 1.00 | | 200.00 | | |
| | wetland exclosure fence | | 1.36 | | | 30.50 | | |
| Upland Vegetation Management & Erosion Control | upland planting | | | | | 13.00 | | |
| | thinning | | | | | 135.00 | | |
| Combined Riparian/Upland Vegetation Management | riparian/upland planting | | | 0.50 | | 5.00 | | |
| Recreation | close campground(s)/park | | | | | 7.90 | | |
| | obliterate campground(s)/park | 18 | | | | | | |
| | improve trails | | 3.75 | | | | | |
| | improve campground(s)/park | | | | | 7.10 | | |

Minam River Chinook Population

The Minam population unit is a relatively small area compared to other Chinook populations but is important to the overall Grande Ronde Chinook population because of the current quality of the habitat and numbers of returning fish. Ninety percent of the unit is national forest land with all of that being in the Eagle Cap Wilderness area. The wilderness habitat is near pristine except for the lower fifteen miles which were splash-dam logged in the early 1900's.

There have been a few projects on private lands consisting of livestock management activities to reduce grazing impacts in riparian areas and some road work to reduce sediment input to streams. Table XX summarizes accomplishments by restoration categories and tasks.

**Table 55.** Summary of Restoration/Conservation Projects located in the Minam River Population Area, from 1994 to present. See Table 48for information about each task.

| Restoration Category | Task | # Task Items | mi. of Task | stream mi. benefited | ac. Benefited |
|---|---|---|---|---|---|
| Road Work | road(s) closed | | 5.50 | | |
| | road(s) improved | | 58.00 | | |

| | | | | | |
|---|---|---|---|---|---|
| Water Developments | pond water development(s) | 21 | | | |
| | spring water development(s) | 6 | | | |
| Fencing | upland cross fence | | 8.40 | 24.00 | 15,000.00 |

Steelhead – Lower Grande Ronde

Includes: Wenaha River Chinook Population
Lower Mainstem Grande Ronde area (not a Chinook population)

Wenaha River Chinook Population

The Wenaha Chinook population is similar to the Minam population in terms of size and condition. The area is 97 percent national forest land with most of that being in the Wenaha-Tucannon Wilderness Area. This unit however has not had splash-dam logging. There is a small portion of the watershed that is outside of the wilderness area where forest management activities and grazing occur.

Habitat condition is nearly pristine, little restoration work has been necessary. The Forest Service has closed several miles of forest roads outside of the wilderness. Within the wilderness the most notable project has been noxious weed control work on the lower reach of the Wenaha River. Table 56 summarizes accomplishments by restoration categories and tasks.

**Table 56.** Summary of Restoration/Conservation Projects located in the Wenaha River Population Area, from 1994 to present. See **Table 48** for information about each task.

| Restoration Category | Task | mi. of Task | stream mi. treated | ac. Treated |
|---|---|---|---|---|
| Riparian Zone Habitat Enhancement | riparian planting | | 2.00 | |
| | riparian seeding | | 2.00 | |
| | noxious weed control | | 7.00 | 40.00 |
| Road Work | road(s) improved | 3.00 | | |
| | road(s) obliterated | 12.00 | | |
| Upland Vegetation Management & Erosion Control | upland seeding | | | 550.00 |
| Recreation | improve trails | 23.27 | | |

Lower Mainstem Grande Ronde area (not a Chinook population)

The Lower Mainstem Grande Ronde is the Grande Ronde River portion of the Lower Grande Ronde Steelhead Population area that is not in a Chinook population area. There are numerous small steelhead producing tributaries. Chinook production/use is mostly limited to rearing and migration in the Grande Ronde mainstem. The Grande Ronde River through this reach is a Wild and Scenic river managed by the Bureau of Land Management. Over 60 percent is in private ownership with the remainder National Forest and Bureau of Land Management lands.

About 30 projects have been accomplished in this unit. A mix of activities has occurred with emphasis on livestock control fencing to improve riparian zone condition, in-channel large wood placement, and road work to reduce sediment. Table 57 summarizes accomplishments by restoration categories and tasks.

**Table 57.** Summary of Restoration/Conservation Projects located in the Lower Mainstem Grande Ronde Sub Area, from 1994 to present. See Table 48 for information about each task.

| Restoration Category | Task | # Task Items | mi. of Task | stream mi. treated | stream mi. benefited | ac. Treated | ac. Benefited | stream mi. made accessible to fish |
|---|---|---|---|---|---|---|---|---|
| In Stream Enhancements | placement of large woody material | | | 31.75 | | | | |
| | rock structure(s) | 20 | | 1.54 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Riparian Zone Habitat Enhancement | riparian planting | | | 10.24 | | 242.90 | | |
| | riparian seeding | | | 0.29 | | 1.00 | | |
| Wet Meadow Habitat Enhancement | restore wet meadow | | | | | 100.00 | | |
| | wet meadow planting | | | 1.50 | | 50.00 | | |
| Road Work | road(s) closed | | 2.70 | | | | | |
| | road(s) improved | | 30.18 | | | | | |
| | road(s) obliterated | | 40.80 | | | | | |
| Stream Crossings | stream crossing structure(s) | 5 | | | | | | 6.50 |
| Agriculture Practices-Erosion Control | modify agriculture practice(s) | | | | 4.00 | 902.70 | | |
| Livestock Management & Animal Facilities | CREP | | | 4.97 | | 204.60 | | |
| Water Developments | pond water development(s) | 55 | | | | | | |
| | spring water development(s) | 33 | | | | | | |
| Fencing | riparian cross fence | | 3.50 | | 5.00 | | 5,000.00 | |
| | riparian exclusion fence | | 17.08 | 10.38 | | 249.90 | | |
| | riparian/upland cross fence | | 1.75 | | 1.75 | | 100.00 | |
| | upland cross fence | | 21.81 | | 36.00 | | 33,800.00 | |
| | spring exclosure fence | | 0.30 | | | 3.00 | | |
| | wet meadow cross fence | | 3.50 | | 1.50 | | 100.00 | |
| Upland Vegetation Management & Erosion Control | upland planting | | | | 1.00 | 99.00 | | |
| | upland seeding | | | | 1.00 | 710.00 | | |
| | thinning | | | | | 95.00 | | |
| Recreation | improve trails | | 11.69 | | | | | |

Steelhead – Joseph Creek

The Joseph Creek watershed is not a Chinook population unit. Joseph Creek is a lower elevation, canyon-land type watershed not suited to Chinook salmon production. Ownership is nearly evenly split between national forest and private lands. Joseph Creek has not been a particularly high priority for habitat restoration work mostly due to the absence of Chinook. Approximately 20 projects have been done on National Forest lands. Only a handful have been done on private lands. Restoration emphasis has been the placement of large woody material, riparian planting and livestock management activities, e.g. riparian fencing and off-channel water developments. Table XX summarizes accomplishments by restoration categories and tasks.

**Table 58.** Summary of Restoration/Conservation Projects located in the Joseph Creek Steelhead Population Area, from 1994 to present. See **Table 48** for information about each task.

| Restoration Category | Task | # task items | mi. of task | stream mi. treated | stream mi. benefited | ac. treated | ac. benefited |
|---|---|---|---|---|---|---|---|
| In Stream Enhancements | placement of large woody material | | | 96.31 | | | |
| | log structure(s) | 80 | | 6.00 | | | |
| | misc. channel work | | | 0.09 | | | |
| Streambank Enhancements | streambank rock treatment | | | 0.22 | | | |
| | streambank log structure(s) | 4 | | 0.03 | | | |
| | streambank rock structure(s) | 18 | | 3.10 | | | |
| | streambank planting | | | 0.38 | | 1.00 | |
| | streambank seeding | | | 0.01 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Riparian Zone Habitat Enhancement | riparian planting | | | 13.84 | | 151.30 | |
| Road Work | road(s) improved | | 1.61 | | | | |
| | road(s) obliterated | | 1.60 | | | | |
| Stream Crossings | stream crossing structure(s) | 1 | | | | | |
| | stream crossing structure(s) modified | 1 | | | | | |
| | stream crossing structure(s) obliterated | 1 | | | | | |
| Livestock Management & Animal Facilities | CREP | | | 1.19 | | 64.80 | |
| Water Developments | pond water development(s) | 5 | | | | | |
| | spring water development(s) | 24 | | | | | |
| Fencing | riparian cross fence | | 11.45 | | 7.40 | | 250.00 |
| | riparian exclusion fence | | 26.79 | 11.38 | | 216.50 | |
| | riparian/upland cross fence | | 1.25 | | 3.00 | | 2,000.00 |
| | riparian/upland exclusion fence | | 3.38 | 7.25 | | 3,060.00 | |
| Upland Vegetation Management & Erosion Control | upland noxious weed control | | | | 0.50 | 40.00 | |
| | upland seeding | | | | | 750.00 | |

Miscellaneous Existing Projects

There are a number of entities accomplishing program-level surveys and work, or relatively small-scale projects for which we had difficulty obtaining accurate accomplishment information. The most significant ones are listed here.

**Noxious weeds** - there have been several noxious weed projects that are included in the inventory database. In addition to those projects there are several program-level work activities. Both Wallowa and Union Counties, the U. S. Forest Service and Wallowa Resources (non-profit organization) have noxious weed programs. Work includes landowner educational programs, survey and inventory, and control activities as funding allows.

**Wildlife** - The Oregon Department of Fish and Wildlife manages four wildlife habitat enhancement programs that have been utilized in the Grande Ronde Subbasin. These programs are aimed at improving habitats or deterring big game damage.

The Green Forage (G.F.) program helps fund weed control, seeding, prescribed burning, fertilization and water development projects. The goal of these projects is to draw big game away from areas where they damage agricultural crops.

The Deer Enhancement and Rehabilitation (DEAR) program supports the same type of projects as those associated the G.F. program, but is directed at improving mule deer habitat. Over the past decade both the G.F. and DEAR programs have implemented 10 to 30 projects per year in Union County. Annual treated area varies from 500 to several thousand acres.

The Upland Bird program has funded tree and shrub distributions, seeding, fertilization, access and other projects primarily aimed at improving upland bird habitat. Our tree and shrub distributions in the past have amounted to about 3000 plants annually on several hundred acres. These plants were used primarily on upland projects, with some going to riparian areas.

Wildlife damage funds are used to implement projects similar to those under the G.F. and DEAR program. Most of that budget pays for fencing supplies and personnel or supplies associated with hazing/detouring big game from areas where damage is occurring.

The La Grande Ranger District implements several activities each year at a program level. The District uses prescribed fire for big game forage enhancement on 500 to 1,000 acres per year. The District is working on over 100 acres of mountain mahogany restoration and three aspen regeneration sites. Maintenance is done most years. The District manages over 60,000 acres as limited vehicle access to reduce big game disturbance.

Riparian easements - the Farm Services Administration and Natural Resource Conservation Service has been very active promoting the Conservation Reserve Enhancement Program (CREP) and Continuous Conservation Reserve

Program in the Grande Ronde Subbasin. In addition to individual projects listed in the project inventory prior to 2001, since 2001 there have been approximately 2800 acres put into riparian buffers.

**Table 59.** Grande Ronde Subbasin Fish Population Areas, Acreage and Ownership.

| Steelhead Population | Chinook Population/Sub area | Total Acres | Private | | USFS | | State | | BLM | | Tribal Lands | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upper Grande Ronde Steelhead | | 1,046,784 | 557,078 | 53% | 476,703 | 46% | 5,268 | 1% | 4,331 | 0% | 3,404 | 0% |
| | Upper Grande Ronde Chinook | 469,064 | 159,829 | 34% | 302,448 | 64% | 2,201 | 0% | 1,183 | 0% | 3,404 | 1% |
| | Catherine Creek Chinook | 296,748 | 213,815 | 72% | 78,124 | 26% | 2,759 | 1% | 2,050 | 1% | | |
| | Middle Mainstem Grande Ronde | 220,199 | 170,672 | 78% | 48,119 | 22% | 308 | 0% | 1,099 | 0% | | |
| | Lookingglass Creek Chinook (extinct) | 60,773 | 12,761 | 21% | 48,012 | 79% | | | | | | |
| Wallowa River Steelhead | | 609,955 | 323,121 | 53% | 282,307 | 46% | 1,878 | 0% | 2,649 | 0% | | |
| | Wallowa/Lostine River Chinook | 457,238 | 307,326 | 67% | 145,484 | 32% | 1,818 | 0% | 2,610 | 1% | | |
| | Minam River Chinook | 152,717 | 15,795 | 10% | 136,822 | 90% | 60 | 0% | 40 | 0% | | |
| Lower Grande Ronde Steelhead | | 618,271 | 274,761 | 44% | 313,134 | 51% | 13,205 | 2% | 15,556 | 3% | 1,614 | 0% |
| | Lower Mainstem Grande Ronde | 429,176 | 272,244 | 63% | 130,385 | 30% | 9,965 | 2% | 14,967 | 3% | 1,614 | 0% |
| | Wenaha River Chinook | 189,095 | 2,517 | 1% | 182,749 | 97% | 3,241 | 2% | 589 | 0% | | |
| Joseph Creek Steelhead | | 352,497 | 170,136 | 48% | 173,387 | 49% | 1,460 | 0% | 7,514 | 2% | | |

## 4.5. Gap Assessment of Existing Protections, Plans, Programs and Projects

The gap assessment will briefly address some of the more pertinent plans or policies but will primarily focus on existing programs, projects and strategies.

Protection and Plans

There are many plans, policies and regulations governing management actions on both public and private lands in the Grande Ronde Subbasin. There are also many, federal and state laws regulating land use, ESA species and water quality. There are land use designations that offer various levels of protective status such as wilderness, wild and scenic rivers and wildlife management areas. Additionally there are a multitude of fish and wildlife management plans, hatchery and genetics plans, and water quality plans. These are listed in sections 4.1 and 4.2., and in Appendix 5, GRSBP Planning Source Documents. It appears there are ample laws, regulations, plans and policies to provide the structure and incentive for both public and private land managers to protect or restore fish and wildlife populations and their habitat in the Grande Ronde Subbasin.

National forest and BLM lands are managed under Land and Resource Management Plans (LRMP). The Wallowa-Whitman and Umatilla National Forest Plans were approved in 1990. The BLM Baker Resource Area Resource Management Plan was approved in 1989. Public land management plans go through an extensive public involvement process when they are developed and are intended to provide a balanced approach to the management of natural resources.

Amendments to the LRMP's in the mid-1990's provided additional protection for riparian areas and wildlife habitat on federal lands. These were PACFISH, INFISH and the Regional Forester's Eastside Forest Plan Amendment #2 (known as "SCREENS"). PACFISH AND INFISH applied to all federal lands, SCREENS applied only to national forest lands.

PACFISH (anadromous fish habitat) and INFISH (non-anadromous) established riparian goals, Riparian Management Objectives (RMO's) and Riparian Habitat Conservation Areas (RHCA's) adjacent to all stream courses. RHCA widths range from 50 feet on intermittent streams to 300 feet on fish bearing streams. Standards and Guidelines were developed for the RHCA's modifying timber harvest, grazing, recreation and other activities.

The Regional Forester's Eastside Forest Plan Amendment #2 (known as "SCREENS") established ecosystem standards (SCREEN 2) and wildlife standards (SCREEN 3) to manage forest stands toward the Historic Range of Variability (HRV). SCREENS required HRV analysis before most timber harvest to begin processes to reestablish historic species composition and older structural stages. SCREEN #3 required the maintenance of specific levels of snags, snag replacements and down logs.

PACFISH, INFISH and SCREENS provided increased protection for fish and wildlife resources on federal lands. They are management direction until LRMP's are revised. The revision process is currently underway for the national forest plans and is scheduled to be completed in four years. The BLM revision is scheduled to begin in 2006.

Fish production and hatchery management plans (see Section 4.2 and Appendix 5) developed by the subbasin's co-managers are in place. These plans are periodically revised as knowledge of the species and management techniques change.

Programs

The GRMWP was designated in 1992 by the NPPC to be the model watershed for Oregon to coordinate restoration work in the Grande Ronde Subbasin. The GRMWP was entrusted by BPA to oversee the planning and implementation of new projects using BPA funds. GRMWP oversight has provided consistency in project implementation in the Grande Ronde Subbasin.

FSA and NRCS administer many farm programs which have been used extensively in the subbasin to reduce agricultural impacts to riparian areas and water quality. CRP, Continuous CRP, CREP and WRP are the programs most used.

Projects

Over 400 on-the-ground restoration projects were accomplished in the Grande Ronde Subbasin in the last decade. Many of these were implemented through the GRMWP using BPA fish and wildlife mitigation funds. Others were done by agencies without the assistance of BPA. Table 49 summarizes work accomplishment for the entire Grande Ronde Subbasin from 1994 to present.

Examination of Section 4.4 (page 231) reveals several emphasis work areas. There have been over 200 stream miles of large wood placement in response to prior assessments identifying wood deficiencies. Over 30 projects have addressed fish passage at irrigation diversions, a common problem at many older diversion structures or at gravel push-up dams (Clearwater Biostudies 1993). Over 2000 acres of riparian zone enhancement activities, including planting, seeding and weed control have been implemented to address degraded riparian conditions. Approximately 650 miles of road work; closures, obliteration and improvement have been accomplished to address sediment issues, another limiting factor reinforced by the current EDT assessment. Livestock management activities, primarily fencing and water developments, have been done on several thousand acres to address riparian degradation.

The previously established "focus" areas, and corresponding limiting factors, are not substantially different than limiting factors identified by the current EDT analysis. Both are based on available data, prior assessments and professional expertise. Prior assessments have identified in-channel habitat diversity, large wood, sediment, temperature and riparian condition as being problems to varying degrees in most of the subbasin's watersheds. The difference, providing the EDT can be calibrated to correctly reflect actual conditions, is that the EDT can now more precisely identify habitat impacts by stream reach to fish life stages.

Strategies

Project selection and implementation in the Grande Ronde Subbasin for the last ten years, using BPA funds, has been coordinated through the GRMWP. The process followed a protocol established by the GRMWP Board of Directors. The GRMWP appointed a Technical Committee, composed of agency and tribal biologists and others, to annually review and prioritize prospective projects for BPA funding. Early in this process the Technical Committee established "focus" areas based on various habitat assessments and the initial prototype EDT Assessment (Mobrand 1996). Limiting factors were identified for the focus areas along with "candidate restoration actions". The Technical Committee established project review criteria that considered the location of proposed work, technical merit, degree of benefit, species benefited, educational value and cost.

Each year the GRMWP solicited project applications from agencies, SWCD's and tribes. The Technical Committee reviewed, prioritized and made recommendations to the Board of Directors for funding.

This process resulted in the accomplishment of many beneficial projects, responding to identified habitat needs. Project prioritization was the result of the Technical Committee's comparison of the proposed activities, the evaluation criteria and how well the committee felt the project addressed the location's limiting factors. The process relied on the Technical

Committee's subjective assessment of the project in terms of benefits to habitat. Most biologists felt this process adequately screened and prioritized prospective projects. However there was no methodology to quantitatively compare fish production benefits from project to project.

Project accomplishment on private land has been "opportunistic", meaning when we have had willing landowners we have tried to take advantage of the opportunity. Private landowners have participated in habitat restoration for a variety of reasons; a desire to improve habitat, fear of future regulation, testimonials from other participating landowners, cost share opportunity, etc. All have played a part in an individual's decision to implement a project. The GRMWP has had a long standing policy of considering all proposals from willing landowners, provided the proposed work addressed identified habitat needs. Although there may have been higher priority actions, or higher priority reaches in which to pursue conservation and/or restoration, this has not always been possible due to the absence of willing landowners. This process may not have resulted in the highest priority work being done in terms of fish benefits, but it has resulted in accomplishing many beneficial projects.

Project applications from public lands have generally reflected the agency's priorities for work on a particular area, e.g. USFS Ranger District. These are often more total resource oriented as opposed to strictly fish production. As with private lands, the GRMWP process considered these projects in terms of benefits to watersheds and fish habitat.

Summary

We believe there are sufficient protective mechanisms, laws, management plans and programs to provide the framework for habitat protection and restoration in the Grande Ronde Subbasin. Additionally projects over the last decade have been targeting the same limiting factors as have been identified in this assessment. The EDT model, if calibrated, refined and validated; may assist subbasin planners to more precisely target restoration work to stream reaches, watersheds and fish populations where the work will be the most beneficial to fish recovery.

# 5. 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

### 5.2.1 Habitats

#### *5.2.1.1 Goals*

- Protect high quality habitat, restore degraded habitats, and provide connectivity between functioning habitats.

- Manage for healthy ecosystems to support aquatic resources and native species.

#### *5.2.1.2 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 60. The purpose of this current section is to outline the overall biological objectives for each of these limiting factors.

**Table 60. Summary of priority attributes identified by EDT for each watershed in the Grande Ronde Subbasin.**

| Watershed | Priority Attributes |
|---|---|
| Wenaha | none |
| Lower Grande Ronde | Habitat Diversity (primary pools, glides, spawning gravels)<br>Key Habitat Quantity (wood, hydromodifications to channel)<br>Sediment |
| Joseph Creek | Sediment<br>Temperature<br>Key Habitat Quantity (reduced wetted widths) |
| Wallowa River | Key Habitat Quantity (reduced wetted widths)<br>Habitat Diversity (reduced wood, riparian function)<br>Sediment<br>Temperature<br>Flows |
| Minam | Key Habitat Quantity (reduced wetted widths)<br>Habitat Diversity (reduced wood, riparian function)<br>Sediment |
| Lookingglass Creek | Key Habitat Quantity (reduced wetted widths)<br>Habitat Diversity (reduced wood, riparian function) |

| | |
|---|---|
| | Sediment |
| Catherine Creek | Key Habitat Quantity (reduced wetted widths)<br>Habitat Diversity (reduced wood, riparian function)<br>Sediment<br>Flow<br>Temperature |
| Upper Grande Ronde | Sediment<br>Flow<br>Temperature<br>Key Habitat Quantity (reduced wetted widths) |

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.

One of the difficulties in interpreting EDT results are 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.

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 a largely function of riparian condition and/or low flows.

Therefore we recommend setting objectives for the following attributes;

1- Channel Condition

2- Sediment Reduction

3- Riparian Function

4- Low Flows

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 objective 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 and important data gap that should be a high priority for evaluation.

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 types[1]), 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 that 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).

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.

[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

- 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.

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.

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.

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

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.

### 5.2.2 Fish Production/Population Strategies

Fish production goals are discussed in Section 3.2.3.4.2 (page 86).

Some additional population objectives are included below:

Achieve escapement objectives shown in Table X within 24 years (represents 4-5 generations; timeline is consistent with the NPCC's Fish and Wildlife Program). Criteria will involve both a time element (persistence) and an abundance element, both of which are currently under review. Achieving these objectives would restore and maintain in-basin escapement for natural production, broodstock needs, treaty-reserved tribal harvest, and recreational fisheries (Table X).

**Table 61.** Anadromous adult return objectives for the Grande Ronde Subbasin.

| Species | | Adult Escapement | Natural Spawning Component | Hatchery Component (Broodstock Need) | Harvest Component |
|---|---|---|---|---|---|
| Spring/ Summer Chinook | Future Goal | ?[8] | ? | ? | ? |
| | Historic Condition | 5,000-12,200[2] | 5,000-12,000 | 0 | 200-800[3] |
| | Existing Condition | 250-3,000[4] | 250-3,000 | up to 720 | 0 |
| Fall Chinook | Future | ?[8] | ? | ? | ? |
| | Historic Condition | ? | ? | ? | ? |
| | Existing Condition | up to 500 | up to 500 | ? | ? |
| Wild Summer Steelhead | Future | >5,000 | >5,000 | 0 | >1,000 |
| | Historic Condition | 3,500-16,000[1] | 3,500-16,000 | 0 | 1,100-3,000[2] |
| | Existing Condition | 1,100-8,500[5] | 1,100-8,500 | 0 | 0 |
| Hatchery Summer Steelhead | Future | ? | ? | ? | ? |
| | Historic Condition | 0 | 0 | 0 | 0 |
| | Existing Condition | 1,000-10,000 | 0[6] | 500 | 200-7,000 |

[2] 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).

[3] Punch card estimates for 1959 (first year of data) through 1963.

[4] Estimate based on expanding total redd count by three fish per redd for most recent 10 years (1994-2003).

[5] Estimate using 14.9% of Lower Granite Dam wild count from 1993-94 through 2002-2003 run years (LSRCP method).

[6] No intentional release of hatchery summer steelhead for natural spawning in recent years.

| | | | | | |
|---|---|---|---|---|---|
| Sockeye | Future | ?[7] | ? | ? | ? |
| | Historic Condition | up to 15,000[7] | up to 15,000 | 0 | up to 15,000 |
| | Existing Condition | extirpated | - | - | - |
| Coho | Future | ?[7] | ? | ? | ? |
| | Historic Condition | up to 5,000 or more[6] | up to 5,000 or more | 0 | ? |
| | Existing Condition | extirpated | - | - | - |

[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] Estimate using 14.9% of Lower Granite Dam wild count from 1993-94 through 2002-2003 run years (LSRCP method).
[5] No intentional release of hatchery summer steelhead for natural spawning in recent years.
[6] 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.
[7] NPT proposed reintroduction, numbers not agreed to by co-managers.
[8] Numbers not agreed to by co-managers.

[7] 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.

[7] NPT proposed reintroduction, numbers not agreed to by co-managers.

[8] Numbers not agreed to by co-managers.

**Table 62.** Comparison of anadromous fish objectives from various plans pertaining to the Grande Ronde Subbasin

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

| Species | Long-term Objective | Natural Spawning | Hatchery Spawning | Total Spawning | Harvest Component | Overall Goal/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 |
| US v. Or | | | | | | |
| **Fall Chinook** | | | | | | |
| CRITFC | 10,000 | ---- | ---- | ---- | ---- | |
| 1990 Subbasin Plan | 10,000 | ---- | ---- | ---- | 2,500 | |
| US v.Or | | ---- | ---- | ---- | ---- | |
| **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 |
| US v. Or | | | | | | |
| **Sockeye** | | | | | | |
| CRITFC | 2,500 | **----** | **-----** | **----** | **----** | |
| 1990 Subbasin Plan | 2,500 | | | **-** | **625** | |
| NMFS 2002 | | | | | | |
| US v. Or. | | | | | | |
| **Coho** | | | | | | |
| CRITFC | 3,500 | | | | | |
| 1990 Subbasin Plan | 3,500 | **1,000** | **2,200** | **3,200** | **300** | |
| US v. OR | | | | | | |

[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 passing over the Lower Granite Dam; Snake River specific goals are not defined.

## 5.3. Terrestrial Species and Habitats

The following terrestrial goals were established by the terrestrial technical group and approved by the management and policy group.

- Maintain the subbasin's wildlife diversity by protecting and enhancing populations and habitats of native wildlife at self-sustaining levels throughout their natural geographic ranges.
- Restore and maintain self-sustaining populations of non-game species extirpated from the state or regions within the state, consistent with habitat availability, public acceptance, and other uses of the lands and waters of the state.

Objectives

The terrestrial team did not establish quantifiable habitat objectives because accurate acreage for both current and historic habitat types is not available. The terrestrial wildlife team spent considerable time reviewing IBIS and ONHIC data and determined that there were significant inaccuracies in both. Better data needs to be developed before future analysis. The team however does feel that the available data does adequately portray trend and approximate magnitude of change from historic to present.

Ponderosa Pine Forest and Woodlands

Acreage in this his habitat type has been reduced approximately one third from historic primarily due to selective timber harvest, fire suppression and agricultural development. Timber harvest has also significantly reduced tree size and snags habitat. Reversing this trend will be a very long term process.

Objective: Establish an increasing trend in acreage and tree size for the type.

Strategies (not prioritized:

- Protect extant habitat in good condition through easements and acquisitions.
- Identify ponderosa pine types that have converted to mixed conifer stands and promote the conversion back to ponderosa pine.
- Coordinate with public and private land managers on the use of prescribed fire and stand management practices.
- Restore forest function through the use of prescribed fire and silvicultural treatments.
- Fund and coordinate weed control efforts on both public and private land.
- Identify and protect wildlife habitat corridors/links.

Quaking Aspen and Curleaf Mountain Mahogany

The data showed an increase in acreage from historic to current. However the terrestrial team doubted this is the case based on professional experience and personal communications. Indications are overall acreage is somewhat less, but the extent of the decline is unknown. Browsing by both domestic and wild ungulates, fire suppression and invasion of exotic plants have combined to reduce the occurrence of these habitats.

Objective: Increase size and vigor of aspen and mahogany stands.

Strategies (not prioritized):

- Conduct inventories to locate and map existing, isolated aspen and mahogany stands.
- Protect extant stands of aspen and mountain mahogany through fencing to exclude both big game and livestock.
- Remove conifers from stands of aspen and mountain mahogany to allow recruitment of young trees to size classes beyond the reach of browsing wildlife.
- Promote use of low-intensity ground fires to regenerate aspen.

Eastside Grasslands

Eastside grasslands have been substantially reduced by conversion to cropland and pasture, and shrub invasion in the absence of frequent low intensity fires. Additionally the quality of existing grasslands has been degraded by overgrazing and invasion of exotic plants.

Objective: Increase the occurrence and condition of native grasslands.

Strategies (not prioritized):

- Fund and coordinate weed control efforts on both public and private lands.
- Restore grassland function through reestablishment of native plant communities where practical and cost effective.
- Identify and protect wildlife habitat corridors/links.
- Promote research and development of bio-control agents for noxious weeds.
- Promote landowner education in identification and management of noxious weeds

Wetlands

Extensive stream channelization and ditching, dike construction, road construction, overgrazing, beaver elimination and invasion of exotic species have substantially reduced wetland acreage throughout the subbasin. The terrestrial team felt that the acreage reduction may be even more pronounced than indicated due to the scale of mapping. Small wet meadow complexes likely were under represented historically.

Objective: Protect existing wetlands and reestablish wetland and wet meadow complexes where feasible.

Strategies (not prioritized):

- Protect extant habitat in good condition through easements and acquisitions.
- Fund and coordinate weed control efforts on both public and private lands.
- Work with soil and water conservation districts, NRCS, FSA, landowners et al., to implement best management practices in wetland and riparian areas.
- Promote and fund CRP, CREP, WHIP, WRP and other programs.
- Restore wetland function through reestablishment of native plant communities where practical and cost effective.
- Restore riparian area function through livestock management, in-channel improvements, vegetative enhancement and removal of channel confinement structures.
- Identify and protect wildlife habitat corridors/links.

- Develop a beaver management plan to promote the reestablishment/reintroduction of beaver into suitable habitats.
- Restore historic or near-historic stream channels where feasible.

Mid- to High-Elevation Conifer Forest

Overall, the quantity of this habitat type has changed little although the quality has deteriorated. Structural and seral diversity has changed due primarily to selective timber harvest, fire suppression and wildfires. Heavy fuel conditions have predisposed vast acreages to high intensity stand replacement wildfire.

Objective: Increase acreage occupied by vigorous stands, reduce acreage of heavy fuel loading.

Strategies (not prioritized):

- Restore forest function and improve stand vigor through the use of prescribed fire and silvicultural practices.
- Identify and protect wildlife habitat corridors/links.

Agriculture, Pasture and Mixed Environs

This habitat type has been created by conversion of native grasslands, wetlands, shrub-steppe and ponderosa pine habitat type to crop land and pasture. The focal species representing this type is the Rocky Mountain elk. Elk were designated a focal species due to the social and economic importance of the species to the local area, and due to conflicts with agriculture as a result of loss of winter range.

Objective: Reduce elk/agriculture conflicts.

Strategies (not prioritized):

- Protect unconverted winter range in good condition through easements and acquisitions.
- Implement winter range forage improvement activities.
- Take actions necessary to prevent the establishment of year-around resident valley elk herds.

## 5.4 Consistency with ESA/CWA Requirements

As discussed throughout the document, the Grande Ronde Subbasin Plan is consistent with the Endangered Species Act, the Clean Water Act and other relevant laws and regulations.

## 5.5 Research, Monitoring and Evaluation

### 5.5.1 Aquatic Research, Monitoring, and Evaluation

Aquatic research, monitoring and evaluation (RM&E) needs have been identified for the Grande Ronde subbasin through input from the EDT results and from a wide range of stakeholders and professionals who are most familiar with the logistical needs in their areas.

The information provided in the aquatics RM&E section considers taking both a 'bottom-up' and 'top-down' approach. The bottom-up approach is in accordance with the initiative provided two years ago in the *Technical Guidance for Subbasin Planners* (NPPC 2001), and specifically treats M&E at the project scale, for example, in support of individual habitat projects. The top-down approach is recognized to be a critical component of RM&E efforts at the regional or programmatic level, as it examines monitoring questions now being asked at large-scale landscape and ecosystem levels and has been called for in the Federal Salmon Recovery Strategy and the Implementation Plan of the Action Agencies addressing the NOAA-Fisheries Biological Opinion (Biological Opinion) on the Federal Columbia River Power System (FCRPS). (Note: the Action Agencies are Bonneville Power Administration, the Army Corps of Engineers, and the Bureau of Reclamation).

The aquatics RM&E section follows guidelines provided in the Pacific Northwest Aquatic Monitoring Partnership (PNAMP 2004). The PNAMP represents a group whose mission is to coordinate between project-specific and regional RM&E efforts to establish the most effective system design and application needed to accomplish objectives at both levels. Several assumptions are built into the guidance document, which are also applicable to the Grande Ronde RM&E section (PNAMP 2004)

1. Monitoring and evaluation coordination and implementation will be an ongoing activity at the reach, subbasin, and regional levels.

2. Monitoring that is proposed will be more effective if it fits within a broader programmatic network of status monitoring programs and intensively monitored watersheds.

3. It is assumed that local, bottom-up approaches developed within the Grande Ronde will have higher likelihood for successful funding and meaningful results if they reflect the approaches being developed within the comprehensive state, tribal initiatives, and federal pilot projects (Wenatchee, John Day, and Upper Salmon), and the top-down framework and considerations being developed by PNAMP.

Using a checklist developed for the Council's Independent Scientific Advisory Board (ISAB) and the Independent Scientific Review Panel (ISRP) review of subbasin plans, the PNAMP (2004) suggests planners consider the inclusion of 1) Monitoring Objectives, 2) Monitoring Indicators, 3) Data and Information Archive, 4) Coordination and Implementation, and 5) Evaluation and Adaptive Management in the RM&E component.

## Monitoring and Evaluation Objectives and Indicators

The Grande Ronde subbasin planning team used the subbasin assessment, information provided in Section 5.1.2 of this document for guidance. But largely structured the following section using information provided in the Monitoring and Evaluation Plan For Northeast Oregon Hatchery Imnaha and Grande Ronde Subbasin Spring Chinook Salmon (Hesse et al. 2004), and information provided in Monitoring and Evaluation Framework for Northeast Oregon Hatchery Grande Ronde and Grande Ronde Subbasin Steelhead (Hesse et al. 2004 *in review*) to develop a list of measurable objectives and indicators to address subbasin-level questions about factors defining the condition of the watersheds and associated salmon and steelhead populations.

Hesse et al. (2004) and Hesse et al. (*in review*) was used extensively in the development of the Grande Ronde aquatic M&E objectives and indicators since the work provides a format that (1) is specific to the Grande Ronde, (2) coordinates an array of monitoring and evaluation activities, (3) fits within a regional framework, and (4) results in information with broad applicability. Hesse et al. (2004) and Hesse et al. (*in review*) also draws from federal, state, tribal, academic and independent sources for monitoring and evaluation recommendations and statistical council.

Limitations of structuring the M&E section by using Hesse et al. (2004) and Hesse et al. (*in review*) include the omission of RM&E specific to other focal species. Also, because Hesse et al. (2004) and Hesse et al. (*in review*) were developed as a part of The Northeast Oregon Hatchery (NEOH) program, their primary intent is to guide evaluation of the NEOH program, give empirical evidence of effects and fill knowledge gaps regarding supplementation and its uncertainty as an enhancement tool.

Despite their focus on only two of the aquatic focal species, the spring/summer chinook and steelhead M&E plans developed by Hesse et al. (2004) and Hesse et al. (*in review*) provide a solid, statistically-based foundation from which additional M&E plans can be derived, and represent an M&E effort that is regionally applicable.

The information presented below represents only a portion of that which is provided in the NEOH M&E plans, but includes that which is pertinent to all five focal species (i.e. fall chinook, bull trout, and Pacific lamprey) and to M&E needs identified in the assessment and Section 5.1.2 of this document.

Monitoring Questions:

As suggested in the PNAMP (2004) guidance document, management goals and the measurable monitoring objectives are based on a series of monitoring questions that define specific M&E problems. The monitoring questions address six key variables, including 1) Abundance, 2) Survival/Productivity, 3) Distribution, 4) Genetics, 5) Life History, and 6) Habitat.

1. How is the annual abundance and distribution of Grande Ronde spring chinook summer and bull trout populations and associated life history stages changing over time within the subbasin?

2. How is freshwater productivity (e.g., smolt/female) and survival (e.g., SAR) of focal fish populations affected by hatchery practices?

3. What is the fraction of potential natural spawners that are of hatchery origin?

4. What is the age-structure of chinook salmon, steelhead bull trout populations?

5. How does habitat condition affect productivity of various life history stages of focal populations?

6. What are the overall impacts of human related activities on freshwater habitat and landscape processes within the subbasin?

Management Objectives and Assumptions:

The following management objectives/assumptions are based on the previous questions, and address the same key variables. For each Management Objective determining whether the assumptions are met (valid) requires expression of the assumption in quantifiable terms.

**MANAGEMENT OBJECTIVE 1: UNDERSTAND THE CURRENT STATUS, TRENDS, AND DISTRIBUTION OF FOCAL SPECIES IN THE GRANDE RONDE**

**Assumptions:**

A. In-basin habitat is stable and suitable for focal species production
B. We can describe juvenile production in relationship to available habitat in each population and throughout the subbasin.
C. We can describe annual (and 8-year geometric mean) abundance of natural-origin adults relative to management thresholds (minimum spawner abundance and ESA delisting criteria) within prescribed precision targets.
D. Adults utilize all available spawning habitat in each population and throughout the subbasin.
E. The relationships between life history diversity, life stage survival, abundance and habitat are understood.

**MANAGEMENT OBJECTIVE 2: ASSESS, MAINTAIN, AND ENHANCE NATURAL PRODUCTION AND SURVIVAL OF FOCAL SALMONID POPULATIONS IN SUPPLEMENTED STREAMS WITHIN THE GRANDE RONDE**

**Assumptions:**

A. Progeny-to-parent ratios for hatchery-produced fish significantly exceeds those of natural-origin fish.
B. Natural reproductive success of endemic hatchery-origin fish must be similar to that of natural-origin fish.
C. Spatial distribution of endemic hatchery-origin spawners in nature is similar to that of natural-origin fish.
D. Abundance and spatial distribution of non-endemic hatchery-origin spawners in nature is limited.
E. Productivity of supplemented populations is similar to productivity of populations if they had not been supplemented.
F. Life stage-specific survival is similar between hatchery and natural-origin population components.

**MANAGEMENT OBJECTIVE 3: ASSESS LIFE HISTORY CHARACTERISTICS AND MAINTAIN GENETIC DIVERSITY IN SUPPLEMENTED AND UNSUPPLEMENTED FOCAL POPULATIONS IN THE GRANDE RONDE**

**Assumptions:**

A. Adult life history characteristics in supplemented populations remains similar to pre-supplementation population characteristics.
B. Temporal variability of life history characteristics in supplemented populations remains similar to unsupplemented populations (assumes robust wild population dynamics).
C. Juvenile life history characteristics in supplemented populations remains similar to pre-supplemented population characteristics.
D. Genetic characteristics of the supplemented population remain similar (or improved) to the unsupplemented populations.

**MANAGEMENT OBJECTIVE 4: UNDERSTAND THE CURRENT STATUS AND TRENDS OF HABITAT CONDITIONS AS THEY RELATE TO FOCAL SPECIES STATUS IN THE GRANDE RONDE**

**Assumptions:**

A. The relationships between focal species use and habitat are understood
B. In-basin habitat is stable and suitable for focal species production
C. We can describe juvenile production in relationship to available habitat in each population and throughout the subbasin

**MANAGEMENT OBJECTIVE 5. ASSESS THE EFFECTIVENESS OF RESTORATION ACTIVITIES AND OTHER HUMAN RELATED ACTIVITIES ON FOCAL SPECIES HABITAT CONDITION**

**Assumptions:**

A. Habitat conditions in wilderness reaches (*e.g.,* Eagle Cap) are representative of an unmanaged system and can be used comparatively between streams sharing similar physical characteristics
B. Determination of restoration activity effectiveness and/or human-related disturbance on aquatic habitats are indicative of biological production potential of a given focal species

**Monitoring and Evaluation Objectives:**

The management assumptions form the basis of the Monitoring and Evaluation Objectives. Testable hypotheses or descriptive measures are then identified. Key and associated performance measure(s) to be quantified are then described. The KPMs and associated spatial scale, required/desired precision, and sampling frequency/duration are presented in Table 63. To maximize incorporation of the five subbasin focal species, verbiage presented in Hesse et al. (2004) and Hesse et al. (*in review*) has been selectively incorporated, and/or revised.

**Table 63. Summary of key performance measures in relation to spatial scale, required precision, frequency of sampling, and linkage to monitoring objectives and objectives/strategies defined in Section 5.2.1.**

| | Performance Measure | Spatial Scale | Required Precision[1] (CV) | Desired Precision[1] (+/- 95% CI) | Frequency/ Duration | Monitoring Objective Link |
|---|---|---|---|---|---|---|
| Abundance | Adult Escapement to Snake Basin | Subbasin-wide | | | Annual | |
| | Fish per Redd | Primary Aggregates | | | Annual – ongoing | 1b, 2a, 2b |
| | Adult Spawner Abundance | Primary Aggregates | | | Annual – ongoing | 2a |
| | Index of Spawner Abundance (redd counts) | Subbasin-wide and Primary Aggregates | | | Annual – ongoing | 1b, 2a |
| | Hatchery Fraction | Primary Aggregates | | | Annual – ongoing | 2a, 2b |
| | Harvest | Key Areas | | | Annual | 2a |

| | Performance Measure | Spatial Scale | Required Precision[1] (CV) | Desired Precision[1] (+/- 95% CI) | Frequency/ Duration | Monitoring Objective Link |
|---|---|---|---|---|---|---|
| | Index of Juvenile Abundance (Density) | Subbasin-wide | | | Annual | 1a |
| | Juvenile Emigrant Abundance | Primary Aggregates | | | Annual | 1a, 2c |
| | Hatchery Production Abundance | Key Areas | | | Annual | 2a |
| | Smolt Equivalents | Primary Aggregates | | | Annual | 2a, 2c |
| | Run Prediction | Key Areas | | | Annual, ongoing | |
| Survival-Productivity | Smolt-to-Adult Return Rate | Subbasin-wide and Key Areas | | | Annual | 2c |
| | Parent Progeny Ratio (lambda, adult-to-adult) | Subbasin-wide and Key Areas | | | Annual for at least 10 years intervals | 2a |
| | Recruit/spawner (smolt per female or redd) | Primary Aggregates | | | Annual | 2a |
| | Pre-spawn Mortality | Key Areas | | | Annual | 2a |
| | Juvenile Survival to Lower Granite Dam | Primary Aggregates | | | Annual | 2c |
| | Juvenile Survival to Mainstem (McNary and Bonneville) Dams | Subbasin-wide | | | Annual | |
| | In-hatchery Life Stage Survival | Key Areas | | | Annual | |
| | Post-release Survival | Key Areas | | | Annual | 2c |
| Distribution | Adult Spawner Spatial Distribution | Subbasin-wide | | | 3-5 year cycle | 1c |
| | Stray Rate | Key Areas | | | Annual | |
| | Juvenile Rearing Distribution | Subbasin-wide | | | Annual (5 year cycle) | 1a |
| | Disease Frequency | Primary Aggregates | | | Annual, Event Triggered | |
| Genetic | Genetic Diversity | Subbasin-wide and Key Areas | | | Small-scale Study (5 years) | 3a |
| | Reproductive Success (Parentage) | Key Area | | | Small-scale Study (5 years) | 2c |
| | Gene Conservation (Cryopreservation) | Primary Aggregates | | | Annual (5 + year cycle) | |
| Life | Age–at–Return | Primary Aggregates | | | Annual - ongoing | 2a, 3b |
| | Age–at-Emigration | Primary Aggregates | | | Annual | 3c |

| | Performance Measure | Spatial Scale | Required Precision[1] (CV) | Desired Precision[1] (+/- 95% CI) | Frequency/ Duration | Monitoring Objective Link |
|---|---|---|---|---|---|---|
| | Size-at-Return | Primary Aggregates | | | Annual | 3b |
| | Size-at-Emigration | Primary Aggregates | | | Annual | 3c |
| | Condition of Juveniles at Emigration | Primary Aggregates | | | Annual – ongoing | 3c |
| | Adult Spawner Sex Ratio | Primary Aggregates | | | Annual - ongoing | 2a, 2b, 3b |
| | Fecundity | Key Areas | | | Annual | 2b, 3b |
| | Adult Run-timing | Key Areas | | | Annual | 3b |
| | Spawn-timing | Key Areas | | | Annual | 2b |
| | Juvenile Emigration Timing | Primary Aggregates | | | Annual | 3c |
| | Mainstem Arrival Timing (Lower Granite) | Subbasin-wide | | | Annual | 3c |
| Habitat | Physical Habitat | Subbasin-wide and Key Areas | | | Every three years | 4a |
| | Stream Network | Subbasin-wide | | | 10yrs | |
| | Passage Barriers/Diversions | Subbasin-wide | | | 5 yrs | |
| | Instream Flow | Subbasin-wide and Key Areas | | | Continual (5 plus year cycle) | 4a |
| | Water Temperature | Subbasin-wide and Key Areas | | | Continual (5 year cycles), Event Triggered | 4a |
| | Chemical Water Quality | Subbasin-wide | | | Continual, 3 years | |
| | Macroinvertebrate Assemblage | Subbasin-wide | | | 5 years | |
| | Fish and Amphibian Assemblage | Subbasin-wide | | | 5 year | |

[1] Prescription of the required/desired precision is being developed as part of the final M&E plan Step 3 submittal based on observed annual variability, five year evaluation cycles, and number of replicates associated with each performance measure needed to detect biologically/management significant change. Currently used recommendations generally identify CV's of 15 and 25% (Jordan et al. 2002). However these have been established through EMAP type projects on the bases of the number feasible sample size/replication (i.e. 50 sample site). Required precision is related to ability to detect change, whereas desired precision compares population status with management thresholds.

The following section is structured as follows:

Monitoring Question
MANAGEMENT OBJECTIVE
Monitoring and Evaluation Objective
    Hypotheses or Descriptive Monitoring Attributes
        *Performance Measures Required*
        Statistical Tests Applied
        Duration/frequency
        Spatial Scale of Application

**MANAGEMENT OBJECTIVE 1: UNDERSTAND THE CURRENT STATUS, TRENDS, AND DISTRIBUTION OF NATURAL FOCAL SPECIES POPULATIONS IN THE GRANDE RONDE.**

**Monitoring and Evaluation Objective 1a. Describe status and trends in juvenile abundance at the population and subbasin scales in the Grande Ronde Subbasin**

$H_1$ - Descriptive: Characterize parr densities over time for the Grande Ronde subbasin.

$H_2$ - Descriptive: Characterize smolt production over time in index production areas.

*Key performance measures*:

- parr densities
- juvenile emigrant abundance

Statistical Tests Applied: Data analysis will involve calculating the percentage of survey sites that contain at least one juvenile fish for each focal species and the percentage of pools per site that contain juvenile fish for each focal species to quantify changes in the relative distribution inter-annually. We will quantify the number of juveniles observed per square meter for use in population trend analysis within and among individual subbasins. Confidence limits for summary estimates will be developed based on quantifying the measurement error in the survey data and site-to-site variability based on a variance estimator developed by the EPA Environmental Monitoring and Assessment Program (EMAP) for this application (*refer to* http://www.epa.gov/nheerl/arm/).

Duration/Frequency: Monitoring of juvenile emigration will occur continually over time by emigrant trapping in key production streams.

Spatial Scale: Subbasin-wide

**Monitoring and Evaluation Objective 1b. Describe status and trends in adult abundance and productivity for all focal populations in the Grande Ronde subbasin**

$H_1$ - Descriptive: Trend in adult abundance over time.

$H_2$ - Descriptive: Monitor survival rates and abundance relative to management and conservation thresholds.

*Key performance measures:*

- adult abundance (weir, mark- recapture, and redd count combinations)
- derived measures of productivity (Lamda; based on annual and 8-year geometric means of minimum spawner escapement thresholds and ESA recovery criteria)

Statistical Tests Applied: We will apply data of time series abundance to the Diffusion Approximation Model (also called a Wiener-Drift process model) to evaluate population viability. The DA model has been recommended for use when analyzing time series data regarding abundance (Dennis et al. 1991, Holmes 2001, Holmes and Fagan 2002).

Frequency/Duration: Annually – ongoing

Spatial Scale: Subbasin-wide and primary aggregates

**Monitoring and Evaluation Objective 1c. Monitor focal species spawning distributions in the Grande Ronde subbasin**

$H_1$ - Descriptive: Spatial distribution of adult spawners over time.

*Key performance measure:*

- redd distribution

Statistical Tests Applied: The development of an EMAP- type probabilistic sampling scheme for redd counts will complement current survey efforts. Twenty-five random sites outside the traditional survey areas will be selected. Each site will be 1 km in length. Survey style will be based on protocols and methods used during traditional surveys employed in the subbasin.

Frequency/Duration: 3-5 year cycle

Spatial Scale: Subbasin-wide

**MANAGEMENT OBJECTIVE 2: ASSESS, MAINTAIN, AND ENHANCE NATURAL PRODUCTION AND SURVIVAL OF FOCAL SALMONID POPULATIONS IN SUPPLEMENTED STREAMS WITHIN THE GRANDE RONDE**

**Monitoring and Evaluation Objective 2a: Determine and compare the productivity of hatchery-origin fish and natural-origin fish in Grande Ronde**

$Ho_1$: Progeny-per-parent ratio of hatchery-origin fish over time is equal to that of natural-origin fish for each stream.

$Ha_1$: Progeny-per-parent ratio of hatchery-origin fish over time is greater than that of natural-origin fish for each stream.

$Ho_2$: Progeny-per-parent ratio is equal between streams (or the levels of supplementation intensity) regardless of fish type (hatchery vs. natural-origin fish).

$Ha_2$: Progeny-per-parent ratio is significantly different between streams (or the levels of supplementation intensity) regardless of fish type (hatchery vs. natural-origin fish).

$Ho_3$: Progeny-per-parent ratio of hatchery-origin fish is the equal to that of natural-origin fish across streams (or the levels of supplementation intensity).

$Ha_3$: Progeny-per-parent ratio of hatchery-origin fish is significantly different from that of natural-origin fish across streams (or the levels of supplementation intensity).

*Key performance measures:*

- progeny-per-parent ratio (P:P). Calculation of P:P relies on annual run reconstructions and requires quantification of adult abundance to tributary (escapement), index of spawner of abundance (redd counts), spawner abundance (spawner), fish per redd, hatchery fraction, age class structure, age-at-return, adult spawner sex ratio, prespawning mortality, and in-tributary harvest. Progeny are quantified through run-reconstruction. Natural fish P:P use two variants of parents; estimated escapement and spawners. Hatchery P:P are generated from the number of parents collected for broodstock by brood year and resulting hatchery returns to the parent stream. P:P ratio will be calculated for total adult contribution (adult-to-adult) and by female contribution (female-to-female).

Statistical Tests Applied: Testing of results for significantly greater rate by hatchery-origin fish applies a pair-wise one-tail t-test comparison of hatchery P:P to natural P:P by brood year (cohort) within each tributary over time. Time (year) plays a role of 'pair'. Characterization of result variability over time within each stream utilizes replication over 5 years periods.

We also desire to test across streams (or the levels of supplementation intensity). In this case, we are interested in testing additional null hypotheses. In testing these hypotheses, we check the main effect of stream, whereas in testing the second hypotheses, we first check the interaction term between stream and fish type. Graphically, the second null hypothesis says that P:P ratio of hatchery fish over streams is parallel to that of naturally produced fish. Years are replicates. To test these hypotheses at the same time, two-factor analysis of variance (ANOVA) is appropriate, where two factors are fish type (hatchery fish vs. naturally produced fish), and stream (or the level of supplementation intensity).

We will test at 5% Type I error (i.e. $\alpha = 0.05$), and show the p-value of test statistic. If the p-value is less than the level of Type I error, we will reject null hypothesis.

Frequency/Duration: Annual – ongoing. Monitoring of P:P ratios is a long-term process which should continue until the program achieves equal or stable performance for two complete generations (assumption of consistent program operations). Changes in hatchery program operations must be accompanied by monitoring of P:P ratios.

Spatial Scale: Primary Aggregates

**Monitoring and Evaluation Objective 2b: Determine and compare relative reproductive success of hatchery and naturally produced focal species**

$Ho_1$: Reproductive success of naturally spawning hatchery fish is equal to that of naturally produced fish.
$Ha_1$: Reproductive success of naturally spawning hatchery fish is significantly different than that of naturally produced fish.

$Ho_2$: Mate choice is random with respect to parentage of individual fish (i.e., wild, conventional and captive brood stock).
$Ha_2$: Mate choice with respect to parentage of individual fish is selective and is significantly different.

$Ho_3$: Selection gradients are the same in the hatchery and the wild and do not differ between sexes nor between hatchery- and naturally-produced fish.
$Ha_3$: Selection gradients are significantly different for hatchery and natural origin fish between sexes.

$Ho_4$: Interfamily variance in reproductive success is so great that it is not possible to make meaningful conclusions about specific selective factors and the quantitative genetic interactions between hatchery and wild components of these supplemented populations. Preliminary results indicate that although variance is large, effect sizes can also be large.
$Ha_4$: Interfamily variance can be accounted for relative to effect size.

*Key performance measures:*

- The relative proportion of offspring produced per parent by origin.
- Supporting performance measures include adult abundance to tributary, hatchery fraction, age-at-return, adult spawner sex ratio, fecundity (by age and size), and spawn-timing (by origin).

Statistical Tests Applied: Probabilistic approaches that explore the likelihood of each possible parentage assignment and establish statistical criteria for accepting the true parent (*e.g.,* Cervus 2.0, Marshall et al. 1998).

Frequency/Duration: Annual – ongoing. Performance should be monitored for at least two complete generations and replicated annually three to five year.

Spatial Scale: Primary aggregates.

**Monitoring and Evaluation Objective 2c: Determine and compare life-stage specific survival rates for hatchery and natural fish in the Grande Ronde**

$Ho_1$: There is no difference in survival rate of smolts from the tributary to Lower Granite Dam between hatchery produced fish and naturally produced fish over time for each stream.

$Ha_1$: There is a significant difference in survival rate of smolts from the tributary to Lower Granite Dam between hatchery produced fish and naturally produced fish over time for each stream.

$Ho_2$: There is no difference in smolt-to-adult return rate between hatchery fish and naturally produced fish over time for each stream.

$Ha_2$: There is a significant difference in smolt-to-adult return rate between hatchery fish and naturally produced fish over time for each stream.

Descriptive: Base line monitoring of life stage specific survival for trends over time.

*Key performance measures:*

- juvenile emigrant survival to Lower Granite Dam
- smolt-to-adult return rate (SAR) for natural-origin fish and hatchery produced fish within each tributary.

Statistical Tests Applied: Testing of results for significant differences in survival rates between hatchery and natural production within streams/subbasin annually and over five year periods. Juvenile survival estimates generated by the SURPH.2 model include a point estimate and associated variance. SAR estimates will be point estimates with no associated variance descriptor. When we compare two samples by year, the paired t-test is appropriate.

A $\chi^2$ contingency table analysis is performed to test the null hypothesis that detection rates are the same for all populations (Zar 1984, equation 6.1). If detection rates differ, a Tukey-type multiple comparison on transformed proportions is used to determine which populations differ (Zar 1984, equation 22.13). Survival probabilities are compared between populations using the modeling and hypothesis testing capabilities of SURPH 2.1. Candidate models are compared by the likelihood ratio test, and Akaike's information Criterion (AIC).

We will test at 5% Type I error (i.e. $\alpha = 0.05$), and show p-value of test statistic. If the p-value is less than the level of Type I error, we will reject null hypothesis.

Frequency/Duration: Annual

Spatial Scale: Primary Aggregates

**MANAGEMENT OBJECTIVE 3: ASSESS LIFE HISTORY CHARACTERISTICS AND GENETIC DIVERSITY IN SUPPLEMENTED AND UNSUPPLEMENTED FOCAL POPULATIONS IN THE GRANDE RONDE**

**Monitoring and Evaluation Objective 3a. Determine and compare genetic characteristics of hatchery and natural fish in the Grande Ronde subbasin**

$Ho_1$: There are no genetic differences between hatchery populations and natural populations they were derived from.
$Ha_1$: Significant genetic differences exist between hatchery and natural population segments they were derived from.

$Ho_2$: Populations that have been supplemented show the same magnitude of genetic change over time as unsupplemented populations.

$Ha_2$: The magnitude of genetic change over time has been altered in supplemented populations.

$Ho_3$: The relationship between $N_e$ and $N$ is the same in hatchery and natural populations.
$Ha_3$: The relationship between $N_e$ and $N$ is significantly reduced for hatchery and natural populations.

$Ho_4$: Non-target wild populations have not been genetically affected by hatchery strays.
$Ha_4$: Non-target wild populations have been genetically altered by hatchery strays.

*Key performance measures:*

- Measure levels of genetic variability in each population: Genetic variability within populations will be evaluated in a number of different ways. Comparisons of variability in hatchery, natural, and wild populations will be made and changes in levels of variability will be evaluated through time. Observed variability will also be compared.
- Estimate effective population size ($N_e$) and the ratio $N_e/N$ for each population--Fixation indices and gametic disequilibrium will be used to estimate and evaluate the relationship between effective population size and census size ($N$) estimated from redd counts, spawner surveys, and population enumeration.
- Evaluate population genetic structure of natural and wild populations--Fixation indices and hierarchical gene diversity analyses will be used to partition genetic variation into spatial and temporal components. These relationships will be used to estimate levels of gene flow among populations.
- Document selective forces and genetic effects of supplementation on target and non-target populations--Indices of genetic differentiation will be calculated between hatchery and natural, and hatchery and wild populations. Patterns of genetic change will be examined through time in the three classes of populations.

Statistical Tests Applied: Electrophoretic phenotypes visualized on starch gels are interpreted as genotypes according to guidelines discussed by Utter et al. (1987). A chi-square test is used to compare genotypic frequencies at each variable locus in each population with frequencies expected under Hardy-Weinberg equilibrium. This test can be useful in detecting artifactual (nongenetic) variation. The method of Waples (1988) is used to evaluate genotypes and estimate allele frequencies at isoloci (duplicated gene loci). A variety of standard statistical analyses are routinely applied to the data (e.g., computing heterozygosity, gene diversity, number of alleles per locus, genetic distances, and *F*-statistics; testing for heterogeneity of allele frequencies among populations).

In addition to these analyses, a number of more specialized analyses are used to estimate effective population size. As the primary goal of this project is to study genetic changes over time in natural and wild populations resulting from supplementation, it is necessary to consider factors other than hatchery-wild genetic interactions that can lead to genetic change. Because supplementation is typically considered only when natural abundance is low, the effects of random genetic drift due to finite population size must be considered in evaluating

observed genetic changes. Our methods for estimating effective population size include the following:

Quantifying allele frequency change. The statistic used to measure the magnitude of genetic change is $\hat{F} = (P_1 - P_2)^2 / [(\overline{P}(1-\overline{P})]$, where $P_1$ and $P_2$ are allele frequencies in samples taken at two different times and is the mean of $P_1$ and $P_2$. $\hat{F}$ is computed for each gene locus surveyed, and a mean $\hat{F}$ over all loci in a comparison of temporally spaced samples is also computed.

Testing for selection. Although there is a body of evidence suggesting that the enzymatic gene loci sampled by electrophoresis in general are largely unaffected by natural selection, it is important to evaluate this assumption because strong selection would complicate the interpretation of changes within populations and interactions between populations. If the loci used are effectively neutral, they all should be affected by genetic drift to approximately the same degree. The method of Lewontin and Krakauer (1973) will be used to test the hypothesis that the variance of single locus values is no larger than expected from random sampling error. DNA sequence data will be subjected to additional tests of neutrality, including non-synonymous to synonymous substitution rates and others (reviewed by Ford 2002b).

Measuring gametic disequilibrium. The statistic $r^2$, the squared correlation of alleles at different gene loci, are computed for each pair of loci in each sample. The overall mean $r^2$ value is a measure of gametic disequilibrium, or non-random associations across loci.

Estimating $N_b$. After omitting any loci identified by the test for selection, the mean value (computed as in #1) is used to estimate $N_b$, the effective number of breeders each year. The procedure follows the "temporal method" for estimating effective population size (Krimbas and Tsakas 1971; Nei and Tajima 1981; Waples 1989), as modified specifically for Pacific salmon (Waples 1990).

Because $\hat{F}$ is known to be distributed approximately as chi-square, confidence limits can be placed on the estimate of $N_b$. The mean value of $r^2$ provides an independent method for estimating $N_b$, based on the method developed by Hill (1981), and confidence limits can also be placed on this estimate.

Frequency/Duration: Annual (5-year cycle)

Spatial Scale: Primary aggregates; Subbasin-wide; Key areas

**Monitoring and Evaluation Objective 3b. Determine and compare adult life history characteristics between hatchery and natural fish in the Grande Ronde subbasin**

$Ho_1$: There is no difference in adult age-at-return structure over time between hatchery and natural fish within each supplemented population.

$Ha_1$: There is a significant difference over time in adult age-at-return structure between hatchery and natural fish within each supplemented population.

$Ho_2$: There is no difference in adult size-at-age over time between hatchery and natural fish within each supplemented population.

$Ha_2$: There is a significant difference over time in adult size-at-return between hatchery and natural fish within each supplemented population.

$Ho_3$: There is no difference in adult spawner sex ratio over time between hatchery and natural fish within each supplemented population.

$Ha_3$: There is a significant difference over time in adult spawner sex ratio between hatchery and natural fish within each supplemented population.

$Ho_4$: There is no difference in adult run-timing over time between hatchery and natural fish within each supplemented population.

$Ha_4$: There is a significant difference over time in adult run-timing between hatchery and natural fish within each supplemented population.

$Ho_5$: There is no difference in fecundity over time between hatchery and natural fish within each supplemented population.

$Ha_5$: There is a significant difference over time fecundity between hatchery and natural fish within each supplemented population.

$Ho_6$: There is no difference in egg size over time between hatchery and natural fish within each supplemented population.

$Ha_6$: There is a significant difference over time in egg size between hatchery and natural fish within each supplemented population.

*Key performance measures:*

- age-at-return structure (with out jacks)
- size-at-return
- sex ratios
- fecundity
- adult run-timing

Statistical Tests Applied: A simple t-test is appropriate because we compare two population segments (hatchery origin and natural-origin) directly for each adult life history characteristics over time. Years are replicates.

We determine whether migration timing (frequency distributions) differs between populations using a Kruskal-Wallis one-way analysis of variance on ranked dates of detection, expressed as day of the year, of expanded fish numbers. When significant differences are found, we use

Dunn's pair-wise multiple-comparison procedure ($\alpha = 0.05$) to further analyze the data (SPSS Inc. 1992–1997).

ANOVA analysis can also be used to characterization of trends (population description) over time by considering time (year) as an explanatory variable not as replicates.

We will test at 5% Type I error (i.e. $\alpha = 0.05$), and show p-value of test statistic. If the p-value is less than the level of Type I error, we will reject null hypothesis.

Frequency/Duration: Annually. Monitoring of adult life history characteristics will occur annually for the duration of the program operations. Testing for change will occur in 5-year intervals.

Spatial Scale: Primary Aggregates and other key areas.

**Monitoring and Evaluation Objective 3c. Determine and compare smolt migration characteristics between natural and hatchery smolts in the Grande Ronde**

$Ho_1$: There is no difference in juvenile age-at-emigration over time between hatchery and natural fish within each supplemented population.

$Ha_1$: There is a significant difference over time in juvenile age-at-emigration between hatchery and natural fish within each supplemented population.

$Ho_2$: There is no difference in size-at-emigration over time between hatchery and natural fish within each supplemented population.

$Ha_2$: There is a significant difference over time in size-at-emigration between hatchery and natural fish within each supplemented population.

$Ho_3$: There is no difference in juvenile emigration-timing over time between hatchery and natural fish within each supplemented population.

$Ha_3$: There is a significant difference over time in juvenile emigration-timing between hatchery and natural fish within each supplemented population.

*Key performance measures:*

- age-at-emigration
- size-at-emigration
- emigration timing

Statistical Tests Applied: A simple t-test is appropriate because we compare two population segments (hatchery origin and natural-origin) directly for each juvenile life history characteristics over time. Years are replicates.

We determine whether migration timing (frequency distributions) differs between populations using a Kruskal-Wallis one-way analysis of variance on ranked dates of

detection, expressed as day of the year, of expanded fish numbers. When significant differences are found, we use Dunn's pair-wise multiple-comparison procedure ($\alpha$ = 0.05) to further analyze the data (SPSS Inc. 1992–1997).

ANOVA analysis can also be used to characterization of trends (population description) over time by considering time (year) as an explanatory variable not as replicates.

We will test at 5% Type I error (i.e. $\alpha = 0.05$), and show p-value of test statistic. If the p-value is less than the level of Type I error, we will reject null hypothesis.

Frequency/Duration: Annual. Monitoring of juvenile life history characteristics will occur annually for the duration of the program operations. Testing for change will occur in 5-year intervals.

Spatial Scale: Primary aggregates; subbasin-wide

**MANAGEMENT OBJECTIVE 4: UNDERSTAND THE CURRENT STATUS AND TRENDS OF HABITAT CONDITIONS AS THEY RELATE TO FOCAL SPECIES STATUS IN THE GRANDE RONDE**

**Monitoring and Evaluation Objective 4a. Determine status and trends of focal species habitat in the Grande Ronde**

$H_1$ - Descriptive: Characterization of physical habitat condition throughout each subbasin and trend over time.

$H_2$ - Descriptive: Characterization of water temperature profiles for each watershed and key areas within each treatment and reference stream (including in-hatchery temperatures).

$H_3$ - Descriptive: Characterization of stream flow profiles for each subbasin and key areas within each treatment and reference stream (including stream reaches impacted by hatchery facilities).

*Key performance measures:* N/A

Statistical Tests Applied: We will implement the Environmental Monitoring and Assessment Program (EMAP) sampling framework, a statistically based and spatially explicit sampling design to quantify status and trends in stream and riparian habitats.

Frequency/Duration: Annually (late June through September).

Spatial Scale: Fifty spatially balanced, randomly selected reaches will be sampled for juvenile salmonids and stream and riparian condition in the Grande Ronde subbasin.

**MANAGEMENT OBJECTIVE 5. ASSESS THE EFFECTIVENESS OF RESTORATION ACTIVITIES AND OTHER HUMAN RELATED ACTIVITIES ON FOCAL SPECIES HABITAT CONDITION**

Stock status and performance can be evaluated only with respect to the properties of the natural environment in which the population is found. We will characterize abiotic features of stream habitat and its use by focal species. Habitat features influence the distribution and productivity of

populations and sometimes serve as limiting factors. The sampling conducted under this objective will help quantifying the type and availability of habitat features that juvenile and adult salmonids use. Temperature, flow, and substrate are environmental variables that are known to influence aquatic organisms. They will be used in analyses of cause-effect relationships. Understanding habitat use and influence will allow co-managers to make recommendations regarding specific habitat protection and restoration measures.

**Monitoring and Evaluation Objective 5a. Determine status and trends of habitat in the Imnaha and Grande Ronde subbasins.**

Descriptive: Characterization of physical habitat condition throughout each subbasin and trend over time.

Descriptive: Characterization of water temperature profiles for each subbasin and key areas within each treatment and reference stream .

Descriptive: Characterization of stream flow profiles for each subbasin and key areas within each treatment and reference stream (including stream reaches impacted by hatchery facilities).

We will implement the Environmental Monitoring and Assessment Program (EMAP) sampling framework, a statistically based and spatially explicit sampling design to quantify status and trends in stream and riparian habitats. Fifty spatially balanced, randomly selected reaches will be sampled for juvenile salmonids and stream and riparian condition in the Imnaha and Grande Ronde subbasins from late June through September annually.

Sampling domains and site selection: In each subbasin, we will refine the sampling universe for habitat and juvenile surveys based on current distribution maps. The sampling domain will be defined at the upper ends of watersheds by perennial streams and at the lower end by the capability of field crews to snorkel the sample reach. Juvenile salmonids will be inventoried at all sites within the summer rearing distribution of juvenile *O. mykiss* and spring chinook in snorkelable streams below known barriers to upstream migration. Sample sites will be derived from the 1:100k EPA River Reach file. To balance the needs of status (more random sites) and trend (more repeat sites) monitoring, we will implement a rotating panel design in the Columbia Plateau based on recommendations from the EPA EMAP Design Group. The 50 sites drawn on an annual basis for each subbasin will be assigned to the rotating panel design as follows:

- 3 panels with different repeat intervals
- 17 of the sites will be sampled every year
- 16 sites will be allocated to a 4 year rotating panel (sites visited once every 4 years on a staggered basis)
- 17 sites will be new sites each year

With this sampling strategy, 50 sites will be drawn the first year and 33 new sites will be drawn in subsequent years because 17 of the originally drawn sites will be repeated each year. There is nothing "magical" about 50 as precision increases gradually with increase in sample size. For the most part, we want a good estimate of the variance of our target population. Small sample sizes give poor estimates of the variance, and with small

samples, random draws can be quite a bit off from the actual population's characteristics (mean, variance, median...). Fifty is a rule of thumb to get a reasonably good picture. Another reasonably good rule of thumb is that doubling precision requires a four-fold increase in sample size. So if you get a particular precision at 50 samples, you'd need 200 samples to double precision. Over the first 3 years of the study, co-managers will evaluate the influence of sample size on meeting/not-meeting/exceeding our target precision levels and make recommendations for adjusting the sample size accordingly. Without the data this survey will provide it is extremely difficult to conduct the appropriate power analysis. Our experience on coastal watersheds has demonstrated that a target sample size of 50 sites will meet out precision targets for habitat and juvenile sampling.

Once annual sample sites are drawn, the site is assigned to the river reach file based on site coordinates. A Geographic Information System (GIS) incorporating a 1:100,000 digital stream network is used to insure an unbiased and spatially balanced selection of sample sites across each subbasin. The GIS site selection process provides the geographic coordinates (i.e. latitude and longitude) of each of the candidate sites. We then produce topographic maps showing the location of each sample point. Field crews use a handheld Geographic Positioning System to find the approximate location of the EMAP selected sample point, and then establish 1 km long survey reaches that encompass the sample point.

**Methods**

Habitat and Riparian Survey Methodology: Channel habitat and riparian surveys will be conducted as described by Moore et al. (1997) with some modifications. Modifications include: survey lengths of 500-1000 m and measurement of all habitat unit lengths and widths (as opposed to estimation). Survey teams will collect field data based on stream, reach, and channel unit characteristics. Each field crew is comprised of two people with each member responsible for specific tasks. The "Estimator" will focus on the identification of channel unit characteristics. The "Numerator" will focus on the counts and relative distribution of several unit attributes and will verify the length and width estimates for a subset of units. The "Estimator" and "Numerator" share the responsibility for describing reach characteristics, riparian conditions, identifying habitat unit types, and for quantifying the amount of large woody debris.

To quantify within-season habitat variation and differences in estimates between survey crews, ten percent of the sites will be resampled with a separate two-person crew. Repeat surveys will be a randomly selected sub-sample from each subbasin and each survey crew. Variation in survey location was assumed minimal because survey starting and ending points were marked in the field. The precision of individual metrics will be calculated using the mean variance of the resurveyed streams “Noise” and the overall variance encountered in the habitat surveys “Signal”. Three measures of precision are calculated, the standard deviation of the repeat surveys SDrep, the coefficient of variation of the repeat surveys (CVrep), and the signal to noise ratio (S:N). S:N ratios of $< 2$ can lead to distorted estimates of distributions and limit regression and correlation analysis. S:N ratios $> 10$ have insignificant error caused by field measurements and short term habitat fluctuations (Kauffman et al. 1999).

Habitat conditions in each subbasin will be described using a series of cumulative distributions of frequency (CDF). The variables described are indicators of habitat structure, sediment supply and quality, riparian forest connectivity and health, and in-stream habitat complexity. The specific attributes include but are not constrained to:

Density of woody debris pieces (> 3 m length, >0.15 m diameter)
Density of woody debris volume (> 3 m length, >0.15 m diameter)
Density of key woody debris pieces (>10 m length, >0.6 m diameter)
Density of wood jams (groupings of more than 4 wood pieces)
Density of deep pools (pools >1 m in depth)
Percent pool area
Density of riparian conifers (>0.5 m DBH) within 30 m of the stream channel
Percent of channel shading (percent of 180 degrees)
Percent of substrate area with fine sediments (<2 mm) in riffle units
Percent of substrate area with gravel (2-64 mm) in riffle units

While these attributes do not describe all of the conditions necessary for high quality salmonid habitat, they do describe important attributes of habitat structure within and adjacent to the stream channel. The attributes are also indicative of streamside and upland processes. The median and first and third quartiles will be used to describe the range and central tendencies of the frequency distributions of the key habitat attributes used in the analysis of current habitat conditions (Zar 1984). Frequency distributions will be tested to determine if significant differences ($p<0.05$) exist between subbasins for each habitat attribute (Thom et al. 2000).

3. Data Information Archive

The ability for all resource managers to access monitoring and evaluation information is paramount in their ability to report recovery success. This depends upon consistent data management standards. The PNAMP data management goal is to: develop or adopt fish and habitat data collection protocols, sampling protocols, and analytical methods, and to ensure that data arising from these protocols can be managed, shared, and used.

To facilitate the PNAMP data management goal, data management systems will follow a consistent methodology that breaks the tasks into distinct steps (from PNAMP 2004):

1. Assessing needs and gathering requirements. Understanding the necessary data products, the people who are involved, and when products are needed.
2. Developing a detailed Data Management Coordination Project Plan following forthcoming guidance from PNAMP. Set out the time frame for deliverables, who will do what and when and cost and cost share.
3. Analyzing the requirements. The requirements need to be described in data management terms.
4. To the degree possible, utilize existing database projects and systems.
5. Designing, developing and testing solutions.
6. Transition and training.
7. Deployment.
8. Maintenance.
9. Independent validation and verification.

Coordination of data management will be most successful if standard RM&E protocols are adhered to by planners. Examples of data definitions (*e.g.,* definitions of KPMs) are provided in Appendix X.

4. Coordination and Implementation

As previously discussed, the mission of the PNAMP is to coordinate between project-specific and regional RM&E efforts to establish the most effective system design and application needed to accomplish objectives at both levels. The Grande Ronde subbasin planning team welcomes this assistance, as well as that provided through the Council in order to establish a meaningful and replicable M&E program.

5. RME Logic Path (Evaluation and Adaptive Management)

The Grande Ronde aquatics RM&E program is predicated upon achieving the desired future condition of the subbasin (Biological Vision Statement – Section 5.1 of this document). The vision statement provides guidance for implementing actions in the future and frames the biological objectives and strategies for the subbasin. Direct ties between the proposed RM&E program and the guiding principles used to implement the vision statement are illustrated in **Error! Reference source not found.**.

**Table 64. Ties between the proposed Grande Ronde RM&E program and the guiding principles of the Grande Ronde vision statement (linkage is shown with an 'X').**

| RM&E Program | Process Principles | Outcome Principles |
|---|---|---|
| | Respect, recognize, and honor the legal authority, jurisdiction, treaty-reserved rights, and legal rights of all parties | Provide ridgetop-to-ridgetop stewardship of natural resources, recognizing all components of the ecosystem, including the human component |
| **X** | Coordinate efforts to implement the Pacific Northwest Electric Power Planning and Conservation Act; the Endangered Species Act; the Clean Water Act; tribal treaties; and other local, state, federal, and tribal programs, obligations, and authorities | |
| **X** | Promote and enhance local participation in, and contribution to, natural resource problem solving and subbasinwide conservation efforts | Provide opportunities for natural resource-based economies to recover in concert with aquatic and terrestrial species |
| **X** | Develop a scientific foundation that incorporates local knowledge for prioritizing projects and for monitoring and evaluation | |
| **X** | Promote understanding and appreciation of the need to maintain, protect, enhance, and/or restore a healthy and properly functioning ecosystem | Maintain, enhance, and/or restore habitats to sustain and recover aquatic and terrestrial species diversity |

The Grande Ronde aquatics RM&E program is also designed to fit within 'top down' regional RM&E efforts, such as those currently being coordinated by the PNAMP and the CSMEP, both of which draw from the federal Action Agencies and NOAA Fisheries in their "Draft Research, Monitoring and Evaluation Plan for the NOAA-Fisheries 2000 Federal

Columbia River Power System Biological Opinion" (The Research, Monitoring and Evaluation Plan, http://www.efw.bpa.gov/cgi-bin/FW/welcome.cgi).

Because of the M&E efforts already underway in the Grande Ronde (e.g., NPT NEOH M&E program and CSMEP), a template for cataloging data, similar to that currently being used in the other federal pilot programs (e.g.,Wenatchee, John Day, and Upper Salmon), is available for application (Appendix 9). The template includes consideration of Tier 1, 2, and 3 variables, which are consistent with the FCRPS BiOp

### 5.5.2 Terrestrial Research Monitoring and Evaluation

The Grande Ronde Subbasin Terrestrial Team found preparation of the terrestrial assessment very challenging. Initial screening of IBIS and ONHIC data found both to be of questionable accuracy. Consequently the team spent much time analyzing the data for accuracy and validity. There is little if any local species population data for many of the selected focal species so changes in habitat from historic to current were the basis of the assessment. Data gaps and research needs are also addressed for each habitat type in the Synthesis section beginning on page 206.

Suggestions for monitoring and evaluation are:

- Determine population status in the Grande Ronde Subbasin of the American marten, olive-sided flycatcher, white-headed woodpecker, sage sparrow, Columbia spotted frog and yellow warbler. Data on these species is a prerequisite to meaningful discussions on the changes to habitats.
- Inventory and assess condition of aspen and mountain mahogany habitat types. Access USFS data, although these are limited, for baseline information.
- Conduct literature search and/or initiate studies to determine timing and type of use of these habitats by wildlife in the Grande Ronde Subbasin.
- Access USFS data and inventory priority habitats to determine habitat quality with reference to dependent focal species.
- Identify key wildlife habitat corridors/links.
- Identify and protect wildlife habitat corridors/links

Develop higher resolution habitat maps which accurately show location and extent of priority habitats (e.g., stringer wetlands).

# 6. Appendices

## 6.1 Appendix 1: References

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