GRANDE RONDE BASIN FISH HABITAT ENHANCEMENT PROJECT

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Cover Photograph. Diversion day on the Wallowa River/McDaniel project. The old channel (far right) is separated from the new channel (flowing right to left) with concrete highway blocks. A diversion structure consisting of root wad revetments and earthen fill was built shortly after, and spoils piles were pushed into the old channel after fish were removed from harms way. *Photograph courtesy of Brian Alfonse, ODFW.*

ABSTRACT

On July 1, 1984 the Bonneville Power Administration and the Oregon Department of Fish and Wildlife entered into an intergovernmental contract to initiate fish habitat enhancement work in the Joseph Creek subbasin of the Grande Ronde River Basin in northeast Oregon. In 1985 the Upper and Middle Grande Ronde River, and Catherine Creek subbasins were included in the contract, and in 1996 the Wallowa River subbasin was added. The primary goal of "***The Grande Ronde Basin Fish Habitat Enhancement Project***" is to create, protect, and restore riparian and instream habitat for anadromous salmonids, thereby maximizing opportunities for natural fish production within the basin. This project originally provided for implementation of Program Measure 703 (C)(1), Action Item 4.2 of the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program (NPPC, 1987), and continues to be implemented under revisions of the Fish and Wild Program as offsite mitigation for mainstem fishery losses caused by the Columbia River hydro-electric system.

All work conducted by the Oregon Department of Fish and Wildlife and partners is on private lands and therefore requires considerable time be spent developing rapport with landowners to gain acceptance, and continued cooperation with this program throughout 10-15 year lease periods. Both passive and active restoration treatment techniques are used. Passive regeneration of habitat, using riparian exclosure fencing and alternate water sources, is the primary method to restore degraded streams when restoration can be achieved primarily through changes in management. Active restoration techniques using plantings, bioengineering, site-specific instream structures, or whole stream channel alterations are utilized when streams are more severely degraded and not likely to recover in a reasonable timeframe. Individual projects contribute to and complement ecosystem and basin-wide watershed restoration efforts that are underway by state, federal, and tribal agencies, and coordinated by the Grande Ronde Model Watershed Program (Project. No. 199202601).

Work undertaken during 2008 included: (1) completing 1 new fencing project in the North Fork John Day subbasin that protects 1.82 miles of stream and 216.2 acres of habitat, and 1 fencing project in the Wallowa subbasin that protects an additional 0.59 miles of stream and 42.5 acres of habitat; (2) constructing 0.47 miles of new channel on the Wallowa River to enhance habitat, restore natural channel dimensions, pattern and profile and reconnect approximately 18 acres of floodplain and wetland habitat; (3) planting 10,084 plants along 0.5 miles of the Wallowa River project; (4) establishing 34 new photopoints on 5 projects and retaking 295 existing photopoint pictures; (5) monitoring stream temperatures at 10 locations on 5 streams and conducting other monitoring activities; (6) completing riparian fence, water gap and other maintenance on 116.8 miles of project fences; and (7) completed a comprehensive project summary report to the Independent Scientific Review panel (ISRP) that provided our conclusions regarding benefits to focal species, along with management recommendations for the future.

Since initiation of this program 57 individual projects have been implemented, monitored and maintained along 84.9 miles of anadromous fish bearing streams, that protect and enhance 3,564 acres of riparian and instream habitat.

INTRODUCTION

Background:

The Grande Ronde Basin Fish Habitat Enhancement Project was initiated in 1984 after it became widely recognized that wild and naturally spawning populations of salmon and steelhead were at low levels throughout the Columbia River Basin due to impaired mainstem fish passage, blocked habitat, habitat degradation, fishing, predation and other factors. Habitat degradation and its causes within the Grande Ronde Basin have been well documented (Anderson et al. 1992; CTUIR, 1984; Henjum et al. 1994; Huntington, 1993; McIntosh et al. 1994; Noll, et al. 1988; Sedell and Everest, 1991). Listings of Snake River salmonid populations through the Endangered Species Act led to increased efforts to implement and coordinate ecosystem or watershed based approaches to species recovery efforts within individual subbasins (Anderson et. al., 1992; Huntington, 1994; Mobrand and Lestelle, 1997; NPCC, 2004; NMFS, 1997; Wallowa Co.-Nez Perce, 1993). The intent of this project is to work within this framework by providing offsite mitigation for mainstem losses of habitat and fish productivity caused by the construction and operation of eight dams on the Columbia River. This is achieved through coordinated efforts to protect and improve spawning and rearing habitat, and improve fish passage.

Prior to implementation of this project, streams within the Grande Ronde River basin were examined as part of a study funded by Bonneville Power Administration (BPA), and undertaken by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and the Oregon Department of Fish and Wildlife (ODFW). The study compiled the basic information necessary to identify, evaluate, prioritize, and recommend site-specific solutions to major problems impacting the anadromous salmonid resources and fisheries, and prepared an integrated overall plan for the study area. This established an initial template from which to pursue fish habitat enhancement projects (CTUIR, 1984). In 1996 project areas on private lands were re-prioritized based on several factors, including: 1) review of work completed in the basin; 2) review of more recent watershed assessments such as those produced through the Grande Ronde Model Watershed Program or local watershed groups; 3) and continual input from local district fisheries and research biologists. Upon direction of the Northwest Power and Conservation Council, the Grande Ronde Subbasin Plan and supplements were written in 2004 to provide guidance for identifying and prioritizing future projects (NPCC, 2004; Appendix 1).

Fisheries Status:

Historically the Joseph Creek subbasin has been an excellent producer of summer steelhead, and continues to be managed as a wild fishery. Wild summer steelhead spawning ground counts on ODFW index streams began in the 1960's ("index" stream reaches represent the longest continuous data sets on record). Joseph Creek subbasin steelhead counts are illustrated because they consist solely of wild fish and might be considered to be representative of other wild runs in the Grande Ronde Basin. Redds/mile in this subbasin from 1970 through 1984 indicated severe reductions of returning spawning adults (Figure 1). This downward trend showed signs of improvement from 1985 to 1989 when counts ranged from 8-11 redds/mile. Counts have fluctuated at lower levels since then, averaging 3.9 redds/mile over the last 19 years.

Adult summer steelhead returns over Lower Granite Dam (which includes all wild and hatchery stocks entering Oregon and Idaho) have fluctuated a great deal but showed substantial

improvements after 1981 when fish passage improvements were initiated (Figure 1). Total returns over Lower Granite have remained in excess of 100,000 fish since 2000, with the 2001 counts being the highest on record. However, counts of the wild portion of the run, which began in 1994, remain relatively low, averaging only 18.4% of the total run in the last 15 years.

Figure 1. Snake River Summer Steelhead adult counts over Lower Snake River dams, and spawning ground counts in index Joseph subbasin streams, 1960-2008.

SOURCES: Columbia River Fish Runs and Fisheries, 1938-2000, Status Report; Fish Passage Center; ODFW Wallowa District Fisheries Biologists.

NOTES: The 1962-1974 dam counts are at Ice harbour and Little Goose, the 1975-2005 counts are at Lower Granite dam. Counting of wild steelhead separately from hatchery origin began in 1994. Joseph Creek subbasin index steelhead spawning ground counts include Butte, Chesnimnus, Crow, Devil's Run, Elk, McCarty Gulch, Peavine, Swamp, Summit and TNT Gulch Creeks.

The Wallowa River subbasin historically supported sockeye, coho, and fall chinook in addition to strong runs of steelhead and spring chinook. However, sockeye and coho are now extinct, and only small numbers of fall chinook remain, which generally spawn lower in the basin.

In the Upper Grande Ronde River drainage historical records also indicate excellent production of both summer steelhead and spring chinook. However, chinook redd counts from 1989-2000 indicate that returns to the Upper Grande Ronde River drainage remained well below those observed in the late 1960's and early 1970's (Figure 2). The streams illustrated represent a

mixture of wild and hatchery stocks. The 1994 and 1995 redd counts were the lowest on record since extensive surveys were initiated in 1986 (Carmichael, 1994). Some improvement has occurred beginning in 2001, and counts reached 8.9 redds/mile in 2002. The majority of redds were counted in unmanaged wilderness, in the Minam and Little Minam rivers (accounting for 70% of all redds in the last 13 years, in only 29% of the miles surveyed). One exception to this is in 2004, when there were 98 redds found in the Upper Grande Ronde River (UGR) as a result of a successful captive broodstock program (Carmichael, 2004). However, the UGR River counts have since declined, ranging from 0-18 redds in the same index reaches in 2006-2008.

Spring chinook returns over Lower Granite dam (which includes hatchery and wild fish) have averaged 31,800 fish/year since counting began. The 1995 returns were the lowest run counts on record at 1,478, but increased over several years to a record high of 175,093 adults and jacks in 2001. Returns over the last few years have fluctuated near average levels (Figure 2).

Figure 2. Snake River Spring Chinook adult and jack counts over Lower Snake River dams, and spawning ground counts in index Upper Grande Ronde subbasin streams, 1960-2008.

SOURCES: Columbia River Fish Runs and Fisheries, 1938-2000, Status Report; Fish Passage Center; ODFW La Grande District & Research Fisheries Biologists.

NOTES: Spring chinook dam counts include adults and jacks. Fish passage improvements and smolt transports began after 1981. Streams in this graph include ODFW index spawning ground counts of wild and hatchery fish in Catherine Creek, the Upper Grande Ronde River, and Sheep Creek, and wild fish in the Minam and the Little Minam rivers.

Causes and Consequences of Declines:

There are many reasons for declines of anadromous fish in the Grande Ronde River Basin, including: (1) problems with adult and juvenile passage that occurred following construction of 8 Columbia and Snake River dams between 1938-1975 (ODFW/WDF, 1997); (2) commercial, sport and Tribal demands for the fishery resource; and (3) degradation of spawning and rearing habitat throughout the basin.

Observations in the Grande Ronde River basin indicate optimum spawning and rearing areas for summer steelhead and spring chinook are limited in large portions of the drainage by degradation of riparian and instream habitats (Noll, et al. 1988; Anderson et al. 1992; Huntington, 1994). For example, approximately 70% of the large pool habitat in the mainstem Upper Grande Ronde River and 26% in Meadow Creek have been lost since 1941 (Sedell and Everest, 1991). The average percent shade cover over low gradient constrained, and low gradient unconstrained streams in the Grande Ronde Basin were 33% and 24%, respectively (Huntington, 1994).

Management practices that have contributed to habitat degradation within project areas include beaver trapping, livestock overgrazing, irrigation diversions and cropland agriculture, timber harvest, road construction, mining, stream channelization, and introduction of exotic species. Limiting factors that are most often associated with instream and riparian habitat degradation and that have led to reductions in natural production of salmonids in the Grande Ronde River Basin include:

- Loss of riparian vegetation
- Poor instream habitat diversity
- Unstable stream channels
- Increased sedimentation
- High summer water temperatures
- Low summer flows
- Loss of off channel habitat and floodplain connectivity
- Winter icing
- Obstructions and loss of fish passage

Considerable effort and money have been invested in trying to resolve mainstem dam passage problems. Tighter restrictions on ocean and river harvest of these stocks have also been implemented, and tribal salmon fishing in the basin ceased almost entirely since 1983. Despite these efforts, salmonid populations continued to decline. The National Marine Fisheries Service listed the Snake River portion of the Columbia River sockeye salmon run as an endangered species in December 1991. The Snake River wild portion of the summer and spring chinook runs were combined and listed as threatened in May 1992, along with the fall chinook. Bull trout and summer steelhead listings followed in 1997 and 1998. All of these species remain protected under the ESA.

Solutions:

The Grande Ronde Basin Fish Habitat Enhancement Project is a logical and integral part of the species recovery process by implementing projects that establish long term riparian and instream habitat enhancement, and tributary passage improvement on private lands. Project investments

are protected using riparian leases, easements or other formal agreements. Planning and implementation of these projects includes the participation and involvement of private landowners, state and federal agencies, tribes, and coordination through the Grande Ronde Model Watershed. Collectively, these individual projects contribute to ecosystem and basin-wide watershed restoration and management efforts that are underway by these groups.

Out of basin variables (such as mainstem passage and harvest) are beyond the scope of this project, but the in-basin limiting factors mentioned above can be adequately addressed if proper habitat enhancement techniques are utilized. Drake (1999) concluded that seasonal maximum temperatures and variables related to it explained the distribution and abundance of salmonids in Upper Grande Ronde streams, and that management and restoration activities should focus on reducing stream temperatures. Streams in the John Day basin with greater than 75% shade maintained acceptable stream temperatures for rainbow trout and chinook salmon, and the lowest temperatures were observed in streams from ungrazed watersheds (Maloney et al. 1999). This program primarily relies on restoring natural riparian vegetative recovery, floodplain connectivity and groundwater interactions, using riparian fencing in streams that have been impacted by livestock grazing. These passive methods have proven to be effective in protecting and restoring streams (Beschta et al. 1991; Chaney et al. 1993; Kaufman, et al. 2002; Owens et al. 1996; McGowan and Morton, 2008).

In more severely degraded areas, fencing, in combination with placement of instream structures and riparian plantings, can accelerate the natural recovery process (Chaney et al. 1993; ISG, 1996; Huntington, 1994; NMFS, 1997, Roper et al. 1998). In channelized or severely entrenched streams more aggressive action including whole channel alterations or relocations of streams back into a stable dimension, pattern and profile may be required (Rosgen, 1996; Federal Interagency Stream Restoration Group, 1998). The Grande Ronde Basin Fish Habitat Enhancement Project utilizes a variety of passive and active techniques to provide optimum habitats for returning adults and their progeny, and help achieve the overall goal of maximizing natural anadromous fish production in the Grande Ronde River basin.

DESCRIPTION OF PROJECT AREAS

Five of the ten subbasins within the Grande Ronde Basin are included in the project areas. Not included are the Minam, Lower Grande Ronde, Wenaha, Imnaha, and Inner Snake subbasins. Those subbasins are comprised mostly of Forest Service, National Recreation Area, or Wilderness lands (Figure 3).

JOSEPH CREEK SUBBASIN:

The Joseph Creek drainage constitutes a major watershed within the Lower Grande Ronde Subbasin (Federal Hydrologic Unit Number 17060106) of northeast Oregon. It drains approximately 635 square miles of the 5,299 square mile Grande Ronde Basin. It contains an estimated 225 miles of anadromous fish habitat, and is managed for wild summer steelhead. It empties into the Grande Ronde River 4.3 miles above the confluence of the Grande Ronde and Snake rivers (Figure 3). Approximately 75 percent of the Joseph Creek subbasin is within the project area. Not included in the project area are lower Joseph Creek in Washington State, and the Cottonwood Creek drainage, which enters Joseph Creek 4.4 miles above Joseph Creek's confluence with the Grande Ronde River (Figure 3).

Within the project area 120.5 miles of stream were originally identified as in need of habitat enhancement; 75 miles on private land and 45.5 miles on public lands (CTUIR, 1984).

WALLOWA RIVER SUBBASIN:

The Wallowa River Subbasin (Federal Hydrologic Unit Number 17060105) drains approximately 721 square miles and includes approximately 168 miles of streams used by spring chinook and summer steelhead. It starts at the confluence of the Grande Ronde and Wallowa rivers; 81.4 miles upstream from the confluence of the Grande Ronde and Snake rivers (Figure 3). A large portion of the drainage originates in the northern half of the Eagle Cap Wilderness.

Within the project area 43.0 miles of stream were identified as in need of habitat enhancement, all within private lands (CTUIR, 1984).

UPPER GRANDE RONDE RIVER SUBBASIN:

The Upper Grande Ronde River Subbasin (Federal Hydrologic Unit Number 17060104) includes the Upper Grande Ronde, Middle Grande Ronde and Catherine Creek watersheds. It drains approximately 1,650 square miles of the 5,299 square mile Grande Ronde Basin, and contains an estimated 660 miles of anadromous fish habitat. It starts at the confluence of the Grande Ronde and Wallowa rivers at Rondowa (Figure 3), draining the south western portion of the Eagle Cap Wilderness and the northern portion of the Elkhorn Mountain range.

Within the project area 211.8 miles of stream were identified as in need of habitat enhancement; 116.8 miles on private lands and 95.0 miles on public lands (CTUIR, 1984).

FIGURE 3. ODFW/BPA Fish Habitat Projects in the Grande Ronde Basin, 1985-2007

Legend

Project Stream Reaches

GRMWP Project Points and Labels

City

City Boundary

Subbasin Boundary

1 - Imnaha River

2 - Lower Grande Ronde

3 - Wallowa River

4 - Upper Grande Ronde

Basin Boundary

State Boundary

County Boundary

Highways

Ditches

Streams

Lakes

Land Management

Private

Tribes

BLM

State

Other Federal

USFS

USFS Wilderness

Hells Canyon NRA

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METHODS

The goal of this program is to optimize spring/summer chinook and summer steelhead smolt production and survival within the Grande Ronde River Basin using a variety of treatment measures. Biological objectives and strategies were developed to address the primary factors limiting anadromous species and their habitats in the basin (McGowan and Morton, 2008). Objectives were set forth with the intent of restoring natural ecological processes, while acknowledging the variety of conditions generated by natural disturbance and recovery. When identifying project treatments we strive to address the causes of habitat degradation rather than simply restoring symptoms of disturbance. To accomplish this goal, work will progress in the following phases:

1. PROJECT PLANNING
2. IMPLEMENTATION
3. OPERATIONS and MAINTENANCE
4. MONITORING and EVALUATION

PROJECT PLANNING:

This is one of the most time-consuming and important phases of the program, in which landowner relations and goals of the project are established and work activities are scheduled. Prior to project implementation the following activities are conducted:

Project Identification and Selection

Selection of individual projects on private lands is generally based on information provided in planning documents available at the time of implementation. The Grande Ronde Subbasin Plan (NPCC, 2004), along with oversight by the Grande Ronde Model Watershed technical committee provides current guidance on potential work areas and prioritization. Biological considerations include working outward from areas in best condition, larger contiguous patches are given priority over smaller fragments, and streams that provide spawning, rearing and over winter habitat for all life stages of salmonids are given higher priority. Other administrative or logistical factors that must be factored in include landowner cooperation, cost effectiveness, technical feasibility and timing with regard to fish instream work windows.

Project Coordination

This phase of planning includes initial contacts with landowners, identifying existing problems and what caused them, and selection of appropriate treatments. Project schedules are developed, and coordination with other partners, if applicable, is initiated.

Field Inventories

These may include pre-project stream/habitat surveys, GPS total station land surveys, and

photographic documentation to provide baseline information on habitat condition and potential for improvement prior to any onsite implementation.

Project Onsite Preparation

Prior to signing landowner agreements or initiation of construction contracts, all easement boundaries and work sites must be identified, staked out, or otherwise agreed upon by the landowner and/or contractor. Areas to consider include existing easements or right-of-ways, fences, livestock watering gaps, instream structures, offsite water developments, planting, and/or other construction related areas.

Riparian Leases, Easements, Cooperative Agreements

In order to ensure that investments in habitat restoration are protected, ODFW will negotiate and secure written agreements prior to completing any work. This process includes meeting with landowners and/or their legal representatives specifically for the purpose of developing an acceptable lease, easement or cooperative agreement. The type of agreement will depend on the cost and relative importance of the project. Generally, 10 years of habitat protection is considered a minimum requirement under any agreement. Leases or easements must be reviewed by ODFW Realty Section, signed and notarized, then filed in the county courthouse. In some cases, landowners may be allowed to substitute written agreements signed with other agencies, such as the Natural Resource Conservation Service (NRCS), if those agreements have long term habitat protection as their primary objective.

Developing Contracts and Technical Specifications

Construction jobs generally require development of contracts and technical specifications specific to the individual job. Contracts funded by this project are administered through ODFW Procurement Services following state guidelines. Pre-bid tours will be conducted to provide contractors the opportunity to review the job site and request clarification of work details.

Project Designs

For more complicated projects, formal designs may be required showing detailed mapping, layout, and drawings of all work to be done onsite. Formal designs are included in contract specifications, and may be required to fulfill permit requirements mentioned below.

Environmental Compliance and Permits

This work element includes obtaining Oregon Division of State Lands (DSL) and US Army Corps of Engineers (USACE) fill/removal permits, completing National Environmental Protection Act (NEPA) compliance documents, writing biological assessments and obtaining biological opinions from NOAA Fisheries and/or the US Fish and Wildlife Service if needed for Endangered Species Act (ESA) approval, and other local permits. On some projects cultural resources surveys (CRS) and approval through the State Historic Preservation Office (SHPO) may also be required.

IMPLEMENTATION:

Onsite implementation encompasses the actual on-the-ground work phases of the program. Figure 4 lists the types of treatments most commonly used by this program that are intended to

address both the causes and symptoms of habitat degradation. Passive treatments are generally defined as changes in management or eliminating sources of disturbance that cause habitat degradation, thus allowing systems to recover on their own. The most passive treatments (Treatment Types 1 and 2) generally involve total rest and are implemented via the written leases or easements mentioned earlier. Methods for Treatment Types 3-5 are discussed individually below, while Treatment Types 6-13 are more broadly described as Instream Work. Detailed discussion and the rationale for each treatment type are more fully described in a comprehensive project summary report (McGowan and Morton, 2008).

Figure 4. List of restoration treatments commonly used on individual projects. Treatments are generally listed from passive to more active.

Off-channel Water Developments (Treatment 3):

Development of off-site water for cattle use helps distribute livestock away from riparian zones, alleviating pressure on riparian exclosure fences and reduces the number of in-channel water gaps and associated maintenance. These are often critical components in negotiating lease agreements with landowners. In some cases they help reduce grazing pressure on riparian areas or off channel habitat outside the exclosures, and reduce local inputs of sediment. Off-channel water developments may directly or indirectly help address the limiting factors for riparian vegetation, sediment and off channel habitat.

Riparian Exclosure Fences (Treatment 4):

Degradation of streamside vegetation by domestic livestock has been a major problem within project areas. Fences are constructed along riparian zones to provide protection from livestock, and thereby promote rapid recovery of existing and planted vegetation. This may result in reduced streambank erosion and sediment, reduced stream temperatures, protection of off channel habitat, and reduced effects of winter icing. Unlike other programs, ODFW is not constrained by artificial boundaries or other restrictions (i.e. inability to fence property boundaries, or maximum/minimum fence widths). When negotiating fence locations with

landowners, preference will be given to projects where fences are located well outside the normal flood-prone area and include off-channel habitat. In many cases, ridge top to ridge top fencing is constructed, providing benefits to wildlife as well as aquatic organisms. On most projects a minimum of 15 years of exclusion is required, and leases are frequently renegotiated.

Plantings (Treatment 5):

Native sedges, rushes, shrub and/or tree species appropriate to the site may be planted within project areas if recovery through natural regeneration is not expected to occur in a reasonable time frame. Plantings may be focused in areas of poor bank stability and are the preferred alternative to the more costly rock or other bank stabilization structures. Since high summer water temperatures are a major limiting factor, trees and shrubs will be planted to provide stream shade in order to reduce summer water temperatures and increase salmonid distribution in streams. Vegetation encroachment and strengthening of banks through dense root masses along the channel margins can eventually result in reduced width/depth ratios, further reducing the amount of solar radiation on the wetted channel, improving channel stability and reduce sediment.

Plantings are done only after riparian fences have been installed to ensure their protection, and in some cases additional protection from wildlife using cages is necessary. During the fall, areas disturbed during implementation activities will be seeded to stabilize soils and discourage weed growth. For projects involving whole channel relocation a complete planting program is required that includes planting and seeding of new channels and adjacent uplands, reducing competition from noxious weeds and installing irrigation systems to increase survival.

Instream Work (Treatments 6-13):

Instream work may be prescribed to address factors limiting optimum stream channel morphology and fish production in specific stream reaches. These restoration treatments involve physical manipulations of the stream that will result in direct changes to variables such as width, depth, slope, velocity and sediment transport. All instream work is conducted during instream work windows, in late summer and early fall when stream flows are lowest. These treatments require some type of quantitative pre-project analysis that may range from relatively simple inventories of habitat features such as large wood to full scale watershed analysis. Work locations are selected by project staff and/or interdisciplinary teams during the project planning phase.

For less severely degraded stream reaches, instream habitat structures using natural materials such as large wood or boulders (Treatment 6) may be used to increase number and complexity of pools, provide hiding cover, and accelerate other natural processes such as storage of sediment (spawning gravels) and organic matter (food for invertebrates).

In more degraded reaches, structures that improve the lateral or vertical stability of the main channel may be necessary (Treatments 7-9). These might include various types of bank stability and grade control structures that require a somewhat more engineered approach. Bioengineered or other “soft” structures using large wood are the preferred method used to stabilize stream banks. Hard rock structures are generally avoided, but may be necessary under some circumstances.

In reaches where the stream has lost access to the floodplain, removal or replacement of roads, railroads, dikes, culverts or bridges may be necessary to restore natural hydrology (Treatment 10). Other treatments may include reconnecting side channels, backwaters or oxbows, and restoration or construction of wetlands, marshes or floodplain ponds (Treatment 11). Restoring these types of habitats serves a number of physical and biological functions, including subsurface-surface water interactions that increase the quantity and quality of cold water patches, flood energy dissipation and sediment storage, and providing winter juvenile rearing habitat and high water refuge.

In some cases, such as in artificially channelized reaches typically built in the 1960's to 1970's, more intensive work may be needed to restore rivers back into a channel functioning at full potential. Channel relocations (Treatment 12) are only undertaken if it is determined that the channel is incised, incapable of dealing with existing sediment loads, and/or unlikely to recover within a reasonable time period using more passive approaches. The decision to relocate a channel into a historic location or to reconstruct in its entirety is not done without conducting a thorough watershed analysis and design process. Work in these reaches will be conducted based on Rosgen (1996), or comparable natural channel design methods, to restore streams back into their natural dimension, pattern and profile.

Fish passage projects (Treatment 13) include removal of man-made obstructions not meeting ODFW fish passage criteria for juvenile salmonids, and eliminating unnatural barriers due to channel head cutting. Work areas tend to be very site-specific, but may restore access to miles of functional habitat. This treatment type occasionally includes working with landowners to identify irrigation ditches requiring screening to prevent fish access to poor or potentially lethal habitat.

OPERATIONS AND MAINTENANCE:

Operations and maintenance (O&M) activities will begin the year following implementation and are intended to protect the overall investment in projects and ensure that project objectives are being met. These activities include:

Landowner Coordination

Ongoing coordination and cooperation between the landowners and ODFW is a vital element to ensure long-term project success after the initial implementation is completed.

Fence Maintenance

Fence maintenance is usually included as part of our written agreements with landowners. Biannual inspections of all project areas will be made. Following these inspections all fence maintenance will be done. Stream cross fences and/or water gap cross fences may be installed or removed during these inspections, or at any time during the year to meet landowner needs and to ensure maximum recovery within the projects.

Revegetation

Replanting and/or seeding of project areas may be necessary to produce adequate stream shading, bank stability, or cover within the 15-year lease period. The decision to replant an area may be influenced by events such as severe flooding and bank erosion, or simply when recovery is unacceptably slow due to lack of parent stock.

Instream Maintenance

Annual inspections of all instream structures will be done, usually in combination with fence maintenance inspections. Instream structures are generally expected to provide long lasting benefits with low maintenance. Instream structure maintenance will be done on a case-by-case basis, depending on impact of the structure failure on riparian recovery, streambank stability and with consideration of landowner needs.

Other Maintenance Activities

These activities may include maintenance and repair of off-channel water developments, and efforts to control wildlife related damage. Other routine operations include maintenance of vehicles, ATV's, and other equipment or installing or replacing project signs.

MONITORING AND EVALUATION:

Whenever possible, monitoring will be established prior to project implementation, and will continue beyond the term of the lease agreement if the landowner is willing. We attempt to apply an appropriate level of monitoring based on the needs of an individual project, but also consider efficient use of staff time, expertise, and available funding. Project staff will monitor individual projects using one or more of the following methods:

Physical Monitoring:

Photopoints

Photopoints are a primary and inexpensive means of documenting physical and biological changes along streams. They are considered to be the minimum level of monitoring for any individual project. Several representative photopoints are taken of each project, and the number of photopoints established at a given site is based on size and complexity of the project. Photopoints are taken prior to or during the implementation of any project and generally repeated annually for the duration of the project. Photopoint establishment will include locating and placing permanent markers (T-posts with metal identification tags) at sites from which photographs can be taken at regular intervals. Photopoint notebooks are established for each project and contain maps or aerial photographs showing all photopoint locations, general protocol, and individual instructions on taking specific photopoints (location, camera used, time of year +/- 7 days, direction/angle taken, and focal length).

Printed copies of the original photopoints are taken into the field to ensure correct image duplication, while original slides, prints or digital images remain stored in the office. Slides and prints are stored in archive-safe photo material. Digital images are copied and backed up on separate computer systems.

Aerial Photography

Aerial photographs have been available from a variety of sources (BPA, USDA Aerial Photography Field Office, Oregon department of Forestry, privately flown contracts, the internet). Formats include color, black and white and color infrared and they are produced at various scales and resolution. More recently digital orthoquads are becoming more widely available. These are corrected to known coordinate systems, and have edge distortions removed.

Early on, aerial photographs were used primarily for planning purposes such as mapping stream reaches for use in lease maps of projects. They may also be used to quantify changes in vegetation or channel morphology over time, and related to management practices such as grazing, farming, stream channelization or restoration. Aerial photography can be incorporated with GPS total station data to monitor channel relocation projects. Pre-project and post-project land and channel GPS coordinate data are imported into Autodesk Civil 3D engineering software, along with time series of aerial photographs or digital orthoquads that are scaled to on the ground data. Increases in channel sinuosity, acres of floodplains and other off-channel habitat types, and vegetation coverage can all be measured in this manner. This method can provide both visual and quantitative data to monitor changes along the stream corridor.

Habitat Surveys

Prior to 1990, locally developed riparian habitat inventory methodologies were used to collect baseline data on project streams. These were used to establish an overall picture of instream and riparian conditions and to assist in project prioritization and design. However, these surveys were not statistically repeatable. Since then, the ODFW Aquatic Inventory Project was initiated and was designed to be compatible with other inventory and classification systems (e.g. Rosgen, 1985, Frissell et al. 1986, Cupp 1989, Ralph 1989, USFS Level II 1992, and Hawkins et al.

1993). The data collected is more detailed and includes geologic and geomorphic features, land uses, vegetation, flow, channel features, slope, shade, substrate, erosion, undercut banks, wood and other features. Field inventories and methodologies have been updated many times since then (ODFW, 2007). Baseline data are compared to post project treatments. Streamlined versions of these surveys are occasionally conducted by project staff on stream reaches suspected to be limited by particular habitat features, primarily complex pools or large wood.

Riparian Habitat Transects

Riparian habitat transects are a more intensive form of habitat inventory within specific stream reaches. Within selected project areas, 30-40 permanent habitat monitoring transects are established in randomized locations along homogeneous reaches. Control reaches are also set up when possible. Specific measurements are taken at 1-foot intervals along each transect, to record floodplain, bank and channel features, instream structural cover, channel substrate, ground cover classes, undercut banks, overhanging vegetation and solar radiation. Data collection is done the first year following completion of implementation activities and thereafter at approximately 3 to 5 year intervals. These measurements are compared with original measurements as a means of quantitatively measuring both physical and biological (vegetation) changes through time.

Thermograph Data Collection and Summarization

Thermographs are installed at representative locations throughout the project basin. They are installed at the upstream and downstream ends of treated stream reaches to monitor changes over time. The expected outcome is that summer temperatures will gradually decline as riparian canopy increases, stream width/depth ratios decrease and/or hyporheic interaction improves. Whenever possible, thermographs are installed prior to project implementation to collect 1-2 years of pre-project data. Thermistor probes are anchored to the stream bed with rebar to prevent dislodging in high flows or ice events. Probes are placed in well mixed riffle sections where vertical stratification is avoided.

Thermographs are deployed 365 days/year to record changes in both summer and winter temperatures. Instruments are set to record an entry every 5 seconds and an average value computed every hour. A second thermistor probe records ambient air temperature in the same manner. Data are downloaded onto laptop computers every 6 months in May and October of each year. Any maintenance required is done at this time, and probes are checked for accuracy ($\pm 0.2\text{ }^{\circ}\text{C}$) against National Institute of Standards and Technology (NIST) registered thermometers. Instruments and wiring are checked frequently during the summer months to ensure proper operation or that the probes are not dewatered during summer base flow.

Raw data are imported into an Excel summarization program that uses macros to calculate daily maximum, minimum and average temperatures, and automatically plots data in monthly increments. Data are checked for errors before further analysis, and then broken down into weekly, monthly, summer or winter averages to compare year to year results over time. Representative sites may also be established to measure solar radiation throughout the reach (measured as British thermal units) using a Solar Pathfinder, that will be correlated with changes in temperature over time.

Bank Stability, Overhanging Vegetation and Undercut Banks

This type of monitoring is chosen when pre-project reconnaissance indicates that channel stability is one of the primary limiting factors. These methods are also used to determine how quickly a newly constructed channel stabilizes. The methodology is described by EPA (1993), as modified from Platts et al., (1983). If riparian fencing is installed in the first year of sampling that year may be used as our pre-treatment control, thereby representing a Before After Control Impact (BACI) study design. Comparisons between post treatment years will be an Extended Post-Treatment (EPT) experimental design.

The bank stability portion of the survey defines the banks as stable or unstable and covered or uncovered based on specific visual indicators. The bank is then categorized as a combination of the two into one of four classes:

- CS = Mostly Covered and Stable (non-erosional)
- CU = Mostly Covered and Unstable (vulnerable)
- US = Mostly Uncovered and Stable (vulnerable)
- UU = Mostly Uncovered and Unstable (erosional)

Each cover/stability class is tallied as a distance, recording lengths in feet, and measured from a hip chain while walking the right or left stream banks. Undercut Banks (UC) are defined as having bank angles $\geq 10^\circ$ toward the bank, measured from the farthest protrusion from the tip of the bank toward the bed/bank, and recorded as a length per individual section. Overhanging Vegetation (OV) is defined as vegetation from trees or shrubs within 1 vertical ft. of the water surface, and excluded grasses/sedges/rushes. These are also tallied as lengths (minimum of 1 ft.) along the channel margin.

All surveys are conducted at low flows (summer or fall). Stream sections may be broken into reach segments based on geomorphic or other features noted within project areas. Individual lengths of all 6 classifications are totaled and calculated as percentages of total bank length measured.

Groundwater

Groundwater well studies will be established at sites where significant changes in water tables are expected to occur. Sites may include construction of new channels; the assumption being that relocating and filling incised channels and constructing new ones at higher elevations with active floodplains will result in higher groundwater tables and improved surface-subsurface interaction. The number of wells, spacing and depths within the study areas are based on project scope, soil profiles, ground topography, etc. All wells are surveyed with a GPS total station. Water depths are measured to the nearest 0.05 ft. using the top of pipe as the fixed reference point. Data are collected every 10-14 days on a year around basis. Additional data recorded include visual estimates of flow and basic weather patterns.

Channel Morphology, Sediment and Flows

Channel morphology, sediment and flow data are collected in selected reference reaches and on projects where channel relocation is the primary restoration treatment. Channel morphology data are collected to classify streams and their state of channel evolution (aggrading, stable,

degrading) within their geomorphic setting. Classification is based on specific measured features such as bankfull width, depth, cross sectional area, entrenchment, slope and sinuosity. The data may be collected in reference reaches, existing channels prior to restoration, and new channel alignments. Channel morphology measurements are collected using a variety of equipment and four general methods: (1) GPS Total Station Land Surveys; (2) Longitudinal Profiles; (3) Cross Sections; and (4) Bank Pins, Toe Pins and Scour Chains.

Collection of sediment and flow data are used to further refine stream classification, determine particle sizes moved at channel forming flows, determine conditions necessary to move sediment in new channel configurations, and analyze whether projects are meeting objectives for sediment. Data may be collected in reference reaches, existing channels or newly relocated sections using a variety of methods, including: (1) Pebble Counts; (2) Bar Samples; (3) Sediment Transport Calculations; and (4) Bankfull Flows and Hydraulics (field measured, calculated, or modeled).

Biological Monitoring:

Riparian Plants

A variety of methods may be used depending on objectives which range from monitoring survival of planted trees/shrubs to changes in composition of riparian plant communities over time. Lack of riparian vegetation was identified as a limiting factor on all projects. Plant survival monitoring may consist of revisiting sites and estimating percentage survival from subsamples, 1-2 years after planting. For more thorough studies on selected projects, all new plantings may be identified using the GPS total station. Point data are collected and coded by species in the first year, and in future years the stakeout mode of the GPS unit can pinpoint exact locations of plantings, even if they have disappeared. This method can provide both short-term and long-term survival results.

On some projects with low shrub/tree survival it may be necessary to separate the effects of wildlife browse from other factors. Plant cages or complete exclosures designed to exclude wildlife (primarily deer, elk and beaver) are constructed and plant height measured annually before and after caging for several years. Other riparian plant composition studies may be conducted on individual projects, but are done by partners such as Oregon State and Eastern Oregon universities.

Fish Monitoring

Several methods are used to monitor fish distribution and densities depending on objectives. Most of the monitoring done by project staff is characterized as baseline or trend monitoring. Methods include: (1) presence/absence surveys to identify salmonid presence in existing or proposed project areas; (2) snorkel surveys to determine fish use of installed habitat structures or fish presence to impaired reaches after barriers have been removed; (3) adult spawning ground surveys to document trends in specific project reaches; and (4) fish population estimates using multiple pass electrofishing in selected reaches to determine trends in fish abundance and species composition.

Additional fish monitoring is conducted by local ODFW Fish District and Fish Research staff, and several other entities such as OSU, ODEQ, CTUIR, PNWRS, and the USACE. However,

since fish populations are affected by both in-basin and out-of basin variables, attempts to directly tie habitat restoration efforts to changes in fish populations become very complex and have been beyond the scope of this project. There have been few research level attempts at this type of effective monitoring in the Grande Ronde Basin. In our project summary report (McGowan and Morton, 2008) we proposed a draft framework for improving effectiveness monitoring, particular with regard to fish population responses, using a collaborative approach and the combined strengths of the many partners in the basin. We expect to begin implementing this strategy in 2009.

RESULTS AND DISCUSSION

PROJECT PLANNING:

The following planning activities were completed in 2008:

Project Identification and Selection

Potential projects on lower Ladd, Willow, Pyles, Bear and Little Bear creeks were reviewed and prioritized.

Project Coordination

An onsite tour of the McCoy Creek/Tipperman project was conducted with NRCS & CTUIR staff to discuss the need for additional channel work. We all agreed the NRCS constructed channel was not performing to our expectations with regards to head cutting and lack of flood plain connection, and discussed conceptual plans for channel improvement.

The biologist met with engineers from Anderson Perry & Associates and Union County road department staff regarding the replacement of a culvert on the East, West and Middle forks of Ladd Creek/LMWA project. GPS survey data and AutoCAD files were sent to Anderson Perry for use in their designs to replace the 5-foot culvert with a 20-foot steel bridge.

The biologist and technician met with Jon Skovlin and Richard McDaniel on Bear and Little Bear creeks to discuss potential fencing of those streams. Although they do not do any grazing on their property, they have frequent cattle trespassing from adjacent RY Timber lands. Before deciding on the need or locations of any riparian fences, we agreed to check on previous GRMWP or NRCS funded agreements on RY Timber lands.

GRWMP, CTUIR, Ducks Unlimited and ODFW staff toured potential projects on Willow, Pyles and lower Ladd creeks.

Field Inventories

The three branches of Ladd Creek were inspected at various flood stages. Estimates of absolute and relative flows were made that will be incorporated into new channel designs.

Project Onsite Preparation

ODFW staff staked out the upper and lower ends of the Wallowa River/McDaniel Reach 2 project. Several tree limbs were cleared for equipment access. Old tires were removed from the old channel and recycled.

Riparian Leases, Easements, Cooperative Agreements

A copy of the Hidaway Creek lease was sent to ODFW Realty section in July 2008. The lease was reviewed for consistency with state requirements for easements.

A project map and a 10-year cooperative agreement for the Wallowa River Reach 2 project was developed and mailed to the landowner for signatures. The project will fence off 0.59 miles of the river, protecting 42.5 acres of habitat for 10 years.

Developing Contracts and Technical Specifications

The biologist assisted GRMWP staff with preparation of requests for quotes for the Wallowa River/McDaniel Reach 2, Phase 2 contract. A pre-bid tour conducted on June 19th, 2008. Partney Construction was awarded the contract which was started on August 4th and was completed by August 18th.

The contract for the Hidaway Creek fencing project was terminated on August 24th due to lack of performance by the contractor. ODFW Procurement withheld \$3,999 from the final payment pending estimated repairs which need to be done.

Project Designs

Mapping of the East, West and Middle forks of Ladd Creek/LMWA project was completed and conceptual designs were distributed to project partners. Some preliminary mapping was completed on the Willow Creek/McKenzie project.

Environmental Compliance and Permits

The biologist met with USACE, NOAA, DSL, CTUIR and GRMWP staff to review Ladd Creek permitting requirements on May 28, 2008. The intent was to improve permit turn around time and identify any wetland issues prior to submitting the permit. The permit was started on July 1 and submitted on July 17, 2008. The DSL received public input from several sources including: (1) local landowners concerned about effects on water rights; (2) Oregon Department of Agriculture regarding sensitive plants, and (3) notice from the State Historic Preservation Office (SHPO) regarding supposed portions of the project that had not been surveyed by archeologists. The first two issues were resolved by mid-October. The issue regarding the cultural resource surveys revolved around the fact that the state archeologist was not correctly reading the maps provided to him, and that he could not locate other information in the SHPO data base. This was finally resolved on October 30th and the DSL issued their permit on November 19, 2008. However, our plans for beginning construction of this project in 2008 had to be postponed until spring/summer 2009. The USACE had done nothing on this permit as of year end.

IMPLEMENTATION:

Onsite implementation encompasses the actual on-the-ground work phase of the program and in 2008 included the following:

Planting

In 2008 all of our planting efforts were focused on the Wallowa River/McDaniel Reach 2 project. Beginning in March, all large and many of the small whole tree transplants were installed by Partney Construction using tracked excavators via an equipment rental contract. Transplants were installed at a cost of \$28/tree, and included many large cottonwoods ranging in height up to 40 ft. (Figure 6).

ODFW and CTUIR staff completed the installation of all trench cuttings, and many of the small tree transplants. Volunteers from Wallowa Resources and Hells Canyon Preservation Council planted individual willow cuttings and 3-inch sedge/rush plugs (Figure 5). Partney Construction also transplanted sedge/rush mats during the August construction phase, while the ½ gallon container plants were installed in late fall by CTUIR staff who also caged them to protect from wildlife browsing. Plant cages from the Reach 1 project were recycled and used on this reach. A total of 10,084 plants were installed (Table 1). Twenty five pounds of riparian seed mix were used to touch up disturbed areas in April, and another 75 lbs. was seeded following the August final construction phase.

Figure 5. Wallowa Resources Explorations of Nature (WREN) students assisted with planting sedge/rush plugs on the Wallowa River. *Photo courtesy of Penny Arentsen.*

Figure 6. Wallowa River/McDaniel Reach 2 project, March 2008. Partney Construction operators install large whole cottonwood, alder, aspen and willows using a tracked excavator, while ODFW crews install small trenches with a tractor that are filled with coyote and booth willow cuttings.

Aluminum irrigation pipe was transferred to the site from the End Creek project and the irrigation system was reinstalled. The site was watered 1-2 times per week using 4-inch trash pumps with fish screens.

TABLE 1: Wallowa River/McDaniel Reach 2, 2008 Planting Summary

Species	Size/Type							Species Totals
	Mats (ft ²)	3 inch plugs	1/2 gallon container	Small (<8') transplants	Large (>8') transplants	Individual Cuttings	Trench Cuttings	
Alder			125	31	13			169
Booth Willow				115		175	2,790	3,080
Cottonwood			125	41	27			193
Coyote Willow				12			4,000	4,012
Dogwood			100					100
Peachleaf Willow					1			1
Quaking Aspen			50		30			80
Water Birch			50		9			59
Sedges/Rushes	2,240	150						2,390
Sub-totals:	2,240	150	450	199	80	175	6,790	10,084

Notes: Sedge/Rush Mats are live whole transplants placed along 200 ln. ft. of stream banks;
Riparian seed mix = 100 lbs. of seed on all disturbed sites and the reclaimed channel
Total Area planted = approximately 4.6 acres

Riparian Exclosure Fences

Hidaway Creek Fence

ODFW staff continued to haul in new materials, dispose of old wire and inspect the Hidaway Creek fence as the work progressed. The contractor, Bill Groce (BG Fencing), was warned several times about work that did not meet contract specifications. He claimed to be finished with the job in early August, but inspections by project staff revealed otherwise. We eventually terminated the contract on August 24th, and withheld \$3,999 from the final payment pending estimated repairs which needed to be done.

Because the contractor had threatened us with a lawsuit, we did a complete inventory of the entire job and documented all deficiencies with flagging, photographs, and written comments. In September, ODFW staff began working on needed repairs for several weeks and spent approximately \$8,000 in labor to complete about one third of the estimated work needed. Additional repair work had to be postponed until 2009. In November we were informed that BG Fencing intended to file a lawsuit that was to include tort claims against us. We spent a considerable amount of time reviewing all of his claims, preparing responses, and providing that information to the state attorney general's office. As of year's end, we had received no additional information from Bill Groce's attorney.

Despite these problems, the project was functioning by year's end, with 5.08 miles of fence built that now protects 1.82 miles of stream and 216.2 acres

Wallowa River Fence

Due to budget constraints and inability to contract out additional work this year, ODFW

personnel constructed fences along the west side of the Wallowa River/McDaniel Reach 2 project. A total of 0.39 miles of 4-strand barbed wire and 6 gates were built in the fall. The fence protects 0.59 miles of the Wallowa River and 42.5 acres of habitat.

Instream Work

Wallowa River/McDaniel Reach 2 Channel Relocation Project

Phase 2 of this project included connecting the upstream and downstream ends of the channel that was partially built in 2007. Work was started by Partney Construction on August 4th and completed on August 18th, 2008. Equipment used to complete the work included tracked excavators, D6H and D5H dozers and standard 10-12 yard dump trucks.

ODFW staff provided daily onsite inspections insuring that the project was built to design specifications. Laser levels were used to set channel grade at each station. Work highlights included:

- Construction of 423 feet of new channel connecting the upstream and downstream ends of the project.
- Constructing a diversion structure at the upstream end and reclaiming/filling the old channel with approximately 13,000 yards of topsoil.
- Installing 21 trees at 2 revetment sites for lateral channel stability and habitat.
- Constructing 1 cross vane for vertical channel stability and improved fish passage downstream of the Cross Country Canal intake structure.
- Placing approximately 160 boulders in various clusters.
- Installing 7 engineered log jams using 30 pieces of large wood for habitat complexity.
- Contouring and shaping 1 floodplain pond within the old channel footprint.
- Placing approximately 2,240 ft² of sedge/rush mats along outside meanders.
- Sorting of 820 yards of gravels which will be hauled off by South Fork Ready Mix.
- Seeding with 75 lbs. of riparian seed mix.

Figure 7. D-Day! on the Wallowa River. Partney Construction crews begin installing concrete highway blocks to gradually divert the river from the old channel to the new channel (flowing from right to left). After all the blocks were installed a diversion structure including root wad revetments and earth fill was constructed to permanently divert the entire channel.

Summaries of all Grande Ronde Basin Fish Habitat Enhancement Projects are listed in Table 2, showing a total of 117 miles of riparian fences constructed that protect 3,521 acres of habitat. Individual projects may be located on the project map (Figure 3) by cross-referencing with the Grande Ronde Model Watershed Project number.

TABLE 2. Summary of Projects Completed or in progress by the ODFW/BPA Grande Ronde Basin Fish Habitat Enhancement Project, 1985-2008.							
<u>UPPER GRANDE RONDE:</u>		GRMWP	Year	Stream	Acres	Fence	Spring
Stream	Landowner	Project #	Built	Miles	Protected	Miles	Devel.
Bear Creek.	Alta Cunha Ranches	1616	2002-03	1.03	48.0	CREP	0
Beaver Creek	Clark/Crown Pacific	1095,1120	1993-94	6.10	243.6	11.5	0
Catherine Creek (old GR River)	Smidtt*	1516	1999	0.50	6.0	0.2	0
Coon Creek Trib.	Warren*	1440	1998	0.25	2.1	0.5	0
Dobbin Creek	Rynearson*	1508	1999	0.40	4.4	0.4	0
Eaton Creek	Sunderman*	1515	1999	0.50	160.0	0.5	0
End Creek & springs	Davidson	1658	2006	0.41	108.6	WRP	0
End, SF Willow Creek and tributaries	Rice	1658	2006	1.46/1.64	569.0	WRP	0
Fir Creek	Wyland*	1528	1997	0.40	3.0	0.8	0
Fly Creek	Smith	1123	1987	1.20	14.8	1.7	0
Jordan Creek	Alta Cunha Ranches	1616	2003	1.26	56.5	2.5	1
Ladd Creek	ODFW/LMWA	1468	2002	3.70	309.0	WRP	0
Ladd Creek- East, Middle & West Fks.	ODFW/LMWA	1766	In progress				
Little Creek	Kerr*	1365	1998	0.25	5.0	0.41	0
McCoy Creek	Cunha/Warn	1553	2000-01	4.06			0
McCoy, McIntyre Creeks	Misener/Tipperman	1117,1551	1988	2.88	231.9	3.93	3
McDonald Creek	Dake	1658	2005-06	0.61	6.49	1.1	1
McDonald Creek	Dake	1658	2005-06	1.23	100.04	WRP	0
Meadow Creek	Alta Cunha/Warn	1406	1998-99	1.80	149.8	3.51	0
Meadow Creek	B.M.C.B.A.	1114	1990	0.40	6.6	1.1	0
Meadow Creek	Habberstad	1550	2000	1.13	48.0	CREP	0
Meadow Creek	Misener/Tipperman	1115, 1762	1988, 2006	2.70	256.5	5.25	3
Meadow Creek	Waite	1116	1989	1.20	19.7	2.58	1
Milk Creek	Hall Ranch*	1579	2000-01	0.23	4.18	0.25	0
N.F. Cabin Creek	Johnson	1748	2005	0.15	10.0	0.46	0
Sheep Creek	BLM	1112	1988/2004	0.70	80.0	1.25	0
Sheep Creek	Vey	1113	1987-88	5.20	54.7	6.0	4
U.G.R. River	Bowman/Hoeft	1118	1991	1.50	37.8	3.23	1
U.G.R. River	Crown Pacific	1321	1997	5.20	179.7	5.16	2
U.G.R. River	Delve	1119	1991	0.50	7.0	0.93	2
Whiskey, L. Whisk.	Courtney	1121	1991-92	3.30	35.0	5.62	3
Whiskey Creek	Hampton	1122	1990-91	1.50	15.2	2.97	1
Subtotals:				53.4	2,772.61	63.44	22
<u>JOSEPH CREEK SUBBASIN:</u>							
Butte Creek	McDaniel	1128	1990-91	2.70	29.2	5.3	1
Chesnimnus Creek	McDaniel	1130	1992	3.80	130.1	8.1	0
Chesnimnus Creek	Yost	1133	1986-87	3.00	41.8	5.6	0
Crow Creek	Buhler/Buckhorn Rchs	1125	1989	0.80	7.4	1.5	0

Crow Creek	Fleshman	1126	1988	1.20	10.5	2.4	2
Doe Creek	Mount	1815	2005-06	0.62	13.69	2.02	0
Elk Creek	Birkmaier	1134	1986	0.60	7.7	1.4	0
Pine Creek	McDaniel	1131	1991	1.50	43.5	3.2	0
Salmon Creek	McClaran	1127	1989	0.70	7.0	1.4	0
Salmon Creek	McDaniel	1129	1990	1.90	45.5	3.2	0
Swamp Creek	Boise Cascade	1124	1987	2.60	48.6	5.0	5
Swamp Creek	Olsen	1132	1985	2.40	16.2	4.4	0
Subtotals:				21.82	401.19	43.52	8
<u>WALLOWA SUBBASIN:</u>							
Stream	Landowner		Year Stream Built	Miles	Acres Protected	Fence Miles	Spring Devel.
Hurricane Creek	Irby	1443	1998	0.67	20.3	0.63	0
Hurricane & tribs.	Jones	1337	1997	0.83	9.0	1.3	2
Parsnip Creek	Scott	1641	2001	0.06	0.7	0.15	0
Wallowa River	Burrows*	1442	1998	0.06	0.3	0.06	0
Wallowa River	Cox, Allen	1442	1998	0.40	4.7	0.39	0
Wallowa River	Johnson	1442	1998	0.11	1.3	0.11	1
Wallowa River	McCrae	1442	1998	0.23	2.8	0.23	0
Wallowa River	McDaniel	1666	2005	0.48	31.1	CREP	1
Wallowa River	McDaniel		2007-08	0.59	42.5	0.39	
Wallowa River	Scott	1641	2001-02	0.89	22.2	1.8	2
Wallowa River	Wiseman, Douglas	1441	1998	0.68	8.1	0.68	2
Whiskey Creek	Cox	1517	1999	0.23	3.6	0.42	0
Subtotals:				5.23	146.6	6.16	8
<u>NORTH FORK JOHN DAY:</u>							
Camas Creek	Pendleton Ranches	N/A	1995	2.65	27.3	4.10	0
Hidaway Creek.	Cannady & Morrison	N/A	2007-08	1.82	216.2	5.08	0
Subtotals:				4.47	243.50	9.18	0
GRAND TOTALS:				84.90	3,563.9	122.28	38

* Indicates a 10-15 year cooperative agreement, landowner does project maintenance. WRP/CREP = easement through the Wetland Reserve Program or Conservation Reserve Enhancement Program. GRMWP Project Numbers are cross-referenced on project map (Figure 3).

OPERATIONS AND MAINTENANCE:

Landowner Coordination

Jim Martin was contacted to discuss how to deal with blow down trees on Hurricane Creek. Some fallen cottonwood trees had been cut up and removed from the exclosure fence. He recently purchased the property from the Irby's and requested a copy of the lease agreement. We included before/after photopoints of the project. In a letter back to us he indicated his appreciation and intent to cooperate fully with us. Leslie Leviner, the caretaker, was sent copies of all correspondence.

Other landowners were frequently contacted to discuss timing of cattle movements and maintenance needs.

Fence Maintenance

Routine maintenance and inspections of a total of 116.8 miles of project fences were completed in the spring, including: 63.4 miles in the Upper Grande Ronde River subbasin; 43.5 miles in the Joseph Creek subbasin; 5.8 miles in the Wallowa subbasin; and 4.1 miles in the NF John Day subbasin. A total of 345 stream cross fences and 152 watering gaps were inspected and maintained in the spring and fall. Inspections for trespass cattle in the summer months were conducted on a weekly basis.

Maintenance of stream cross fences included removal of these structures in the fall to prevent damage from icing and high flows, and reinstallation and repair in the spring after flows subside. Maintenance of water gaps consisted of ensuring that all entry gates, escape gates and fence structures were functioning properly. Routine maintenance of the main fence lines included removing fallen trees, repairing and tightening wires, and repairing structures.

Despite a very wet winter, no significant flooding occurred this year, so the time spent on spring maintenance was below average. ODFW personnel spent approximately several hundred hours on fence maintenance this year. Projects that required significant amounts of labor and materials in 2008 included:

Upper Grande Ronde Subbasin:

On Fly Creek we inventoried 45 structures that will need to be rebuilt in the near future, chased cattle out of the exclosures on 2 occasions, repaired one fence section and made a temporary repair to an H-brace, and restretched the fencelines at the USFS boundary where trespass cows were entering. On Jordan Creek 1 tree was removed from the fence line, on the Meadow Creek/Warn project one rock jack was repaired. Nine trees were sawed off the Sheep Creek/BLM project and 1 broken wire was repaired. The lower stream crossing on the Upper Grande Ronde River/BH project needed to be rebuilt, small numbers of cattle were chased out on 3 occasions, 1 broken wire was spliced, we added a strand of barbed wire on one section where calves had pushed under the fence, we replaced an electric charger on a water gap, and we rebuilt a boundary cross fence.

Joseph and Wallowa subbasins:

On the Butte Creek project 5 broken wires were repaired, we added 4 t-posts, removed one fallen tree, and chased out 22 head of cattle. Repairs were made to 2 water gaps and 2 cows chased out on Chesnimnus Creek. On Doe Creek 1 tree was cut off the fence line, and 3 broken wires were repaired. Two downed trees were removed on Hurricane Creek, 2 flood damaged water gaps were repaired and 6 broken wires were spliced. On Pine Creek 1 water gap was repaired. On Salmon Creek 1 cow was chased out, we repaired 1 broken wire, and fixed 1 section of fence that was damaged by elk. On the Swamp Creek fence 23 trees were cut off the fence line, all wires were retightened as needed, 5 wires were respliced, a broken deadman was repaired, cattle were chased out 4 different times. On the Wallowa River 1 tree was removed on the Douglas property, 6 wires were spliced on McCrae's, and on the Scott project 1 tree was removed and 8 cows were chased out. One tree was removed on the Whiskey/Cox project.

North Fork John Day Subbasin:

On Camas Creek 3 wires were repaired, we replaced 1 broken post, repaired a Double H-brace, reinforced the water gap cross fences, and chased out 1 lamb. On the Hidaway Creek project ODFW staff installed all the water gap panels on all new stream crossings, 3 cows were chased out, and 2 fallen trees were sawed off.

Instream Maintenance

During rising flows on the Wallowa River Reach 2 project, some high water was seeping into old ditch lines and being directed toward the Hunt residence. Four loads of 1 ft. minus rip rap were hauled in and placed along the downstream end of the blended terrace. Apparently during construction last year a small gap where the terrace met the existing road had been overlooked; adding the rock and reshaping the area solved the problem.

Other Maintenance Activities

Routine maintenance was completed on the tractor, backhoe, utility trailers, pickup trucks, water pumps, chainsaws and ATV's. Deck flooring was replaced on one of the utility trailers. New seals, bearings, springs, and bushings were installed on trailers as needed.

Off-channel solar pumps and irrigation system parts and hoses used on all projects were stored and winterized for future jobs. Weed spraying was completed on the Wallowa River/Scott and the NF Cabin Creek/Johnson projects by their respective landowners. Inventories of all fence materials, supplies and equipment were completed.

MONITORING AND EVALUATION:

Photopoints

Three additional photopoints were established on the Hidaway Creek project and photopoint specifications were written. Some additional photographs were taken of caged willows on Sheep Creek.

Two hundred and eighty three of a total of 404 active photopoint pictures were retaken in 2008. All photopoint pictures taken in 2008 were processed, labeled and filed in permanent notebooks. All digital images were backed up on a separate hard drive.

A project photopoint comparison template was developed and representative photopoints were selected from each project. Each comparison lists the project objectives and treatment types along with other general information. Judgments were made as to whether or not project objectives were being met based on visual evidence, or from the results of collected monitoring data. The entire set for 57 projects was included in the 1984-2007 summary report to the ISRP.

Habitat Surveys

ODFW Fish Research/Early Life History Project staff completed pre-project aquatic habitat inventories on portions of the Hidaway Creek project. Surveys started at the RM 0.0 and ended at approximately RM 1.66, and included areas outside the project reach to serve as controls.

Riparian Habitat Transects

Editing and analysis of previously collected habitat transect data (from 1988-2001) on McCoy,

Sheep, Chesnimnus and Elk creeks was completed during this report period. A total of 140 transects were established on 4 streams and data was repeated 3-4 times to measure changes in 12 major physical or biological (vegetation) habitat attributes. Due to time constraints the data had not been dealt with in the last several years. However, based upon the comments from the ISRP in August 2006, specifically asking for a summary of the results from this large data set, we made a concerted effort to compile and analyze the data.

About 6 weeks were spent checking data for errors. Two data sets had become corrupted and were completely re-entered into the databases. Onsite photopoint pictures of the sites were scanned from slides and before/after comparisons were illustrated. Aerial photograph comparisons were also compiled that showed changes in channel pattern and vegetation occurring between 1987 and 2005. All 140 channel cross sections for the four streams were plotted by year, showing changes in channel location and dimension over several years. A summary of our findings is shown in Table 3.

TABLE 3: Overview of changes in stream channel attributes following restoration treatments. Transect monitoring occurred over a 13-year period from 1988 – 2001.

Habitat Attributes	Chesnimnus Cr	Elk Cr	McCoy Cr A/B	Sheep Cr A/B
Location (river mile)	2.5	4.2	0.9/0.1	2.5/2.8
Drainage area (mi ²)	188.5	18.1	56.7	29.3
Elevation (ft)	3320	3590	3390/3350	4170/4163
Stream Type (Rosgen)	C	C	F/G	E
Constraintment	Hill slope constrained	Hill slope constrained	Channelized	Unconstrained
Gradient	0.5%	0.9%	1.0%	0.3%
Sinuosity	1.02	1.36	1.02	1.45
Summary of changes in channel and vegetation characteristics 1988 to 2001				
Channel Width	Decreased	No Change	Moderate Increase/Decrease	Decreased
Channel Depth	Increased	Slight Increase	Increased	Increased
Pool Depth	Increased	Decreased	Moderate increase	Increased
Number of Pools	Decreased	Moderate Decrease	Decreased	Moderate Increase
Percent Pools	Increased	Increased	Decreased	Increased
Percent Glide/Run	Decreased	Decreased	Decreased	Decreased
Percent Riffles	Increased	Increased	Increased	Increased
Boulders	Decreased	Moderate Decrease	Moderate Increase	Decreased
Cobbles	Decreased	Moderate Decrease	Moderate Increase	Decreased
Gravel	Increased	Increased	Increased	Decreased
Hardpan	No Change	Not significant	No Change/Slight Increase	No Change
Fines/Silt	Decreased	Decreased	Increased/Decreased	Increased
Woody Debris	Increased	Increased	Slight Increase/No Change	Increased
Forbs	Decreased	Increased	Decreased	Decreased
Grass	Increased	Decreased	Decreased/Increased	Increased
Rush/Sedge	Moderate Decrease	Increased	Increased	Increased/Decreased
Trees/Shrubs	Moderate Decrease	Increased	Increased	Moderate Increase
Bare Soil	Increased	Increased	Decreased	Decreased/Increased
Undercut Banks	Slight Decrease	Increased	Slight Decrease/Increase	Increased
Overhanging Veg.	Fluctuated	Increased	Slight Decrease	Decreased
Solar Radiation	Decreased	Decreased	Slight Decrease	Slight Decrease
Instream Cover	Increased	Increased	Decreased	Increase/Decrease

A total of 810 hours of staff time was involved in completing the summary report (Naylor and McGowan, 2008), which is available online at:
<http://pisces.bpa.gov/release/documents/DocumentViewer.aspx?doc=P110003&session=ccb3387b-ac62-4fb7-9268-d7b85fa957a1>

Thermograph Data Collection and Summarization

Long-term temperature data has been collected on 7 stream reaches and 14 sites. Descriptions of sites are summarized in Table 4. The thermographs on Sheep Creek were taken out of operation in 2002, and thermographs on Beaver Creek were removed in May 2004; final results were reported in a project summary report to the ISRP (McGowan and Morton, 2007). That report also includes results and discussion of winter temperatures at each site, while this report contains updated information and focuses on summer temperature data.

TABLE 4. Long-term Temperature Monitoring Site Descriptions.

Stream	GRMW P ID. No.	Year Installed	Site Elevation	Drainage Area (mi ²)	Bankful l Width	River Mile	Primary Treatment	Exper. Design
McCoy Creek	1117	1988- present	3,370	56.7	30	0.0-2.6	Fencing/New Channel	BA, EPT
Sheep Creek	1112, 1113	1988- 2002	4,270	29.3	25	2.2-8.1	Fencing	BA, EPT
Salmon Creek	1127, 1129	1991- present	3,770	23.7	12	0.1-2.7	Fencing	BACIP
Beaver Creek	1095, 1120	1994- 2004	3,470	59.4	45	0.0-6.1	Fencing	EPT
Camas Creek	N/A	1994- present	4,050	56.8	35	26.6-29.3	Fencing	BA, EPT
Meadow Creek	1406	1999- present	3,650	62.8	33	9.2-10.8	Fencing	EPT
End Creek	1658	2005- present	2,740	4.9	10	0.0-2.0	New Channel	BACI

The results and discussion of temperature monitoring at individual study areas are presented below. Data for the summer of 2008, along with historical averages are illustrated, and relationships to project management and restoration treatments are discussed. As we discuss the results, it is important to keep in mind how changes in stream temperatures affect survival and distribution of salmonids. For review purposes, the upper lethal limit for chinook salmon has been reported as 26.2°C, and the lower lethal limit at 0.8°C. Upper and lower lethal limits for steelhead are 23.9°C and 0.0°C (Meehan, 1991). The Independent Scientific Group (ISG, 1996) also reviewed available information and concluded that the thermal requirements for chinook salmon are approximately as follows (other salmonid species are not markedly different):

LIFE STAGE	TEMPERATURE			
	Optimum	Range	Stressful	Lethal*
Adult migration and spawning	50 °F (10 °C)	46.4 -55.4 °F (8 -13 °C)	>60 °F (>15.6 °C)	>70 °F (>21 °C)
Incubation	<50 °F (<10 °C)	46.4 -53.6 °F (8-12 °C)	>56 °F (>13.3 °C)	>60 °F (>15.6 °C)
Juvenile rearing	59 °F (15 °C)	53.6-62.6 °F (12-17 °C)	>65 °F (>18.3 °C)	>77 °F (>25 °C)

** Lethal is for 1-week exposures, higher temperatures may be tolerated for shorter exposure times.*

McCoy Creek Results-

Thermographs were installed in 1988 at the upper and lower boundaries of the Misener/Tipperman property; riparian fencing was constructed in the same year. Stream flow entering the upper site is from several miles of an untreated control reach on private lands that are constrained by hill slopes. The lower site registers exit temperatures through the treated section which lies within an unconstrained meadow system, but had been channelized in the late 1960's and early 1970's. The original landowner was only willing to allow construction of a narrow riparian fence and some limited instream work, while the current landowner (Tipperman) allowed relocation of the channel into historic locations and expanded exclosures. Channel relocation was completed in two phases. Phase I was completed in the upper meadow portion in 1997, which added 0.3 miles of channel length using historic channels located within McIntyre Creek, requiring minimal excavation. Diversion of flow was phased over 3 years. Phase II relocation occurred in 2002 in the lower part of the meadow and was a constructed channel (partially through historic remnants), and added 0.9 miles of channel length.

The upper thermograph site has remained in a fixed location, at the transition from a canyon to a meadow reach. River miles changed when the channel was lengthened in 1997, and again in 2002. The upper site originally was at RM 1.4, but is now at RM 2.6. The lower site was originally located at the mouth of McCoy Creek at RM 0.0. The physical location of the instrument changed twice; once when the lower part of the channel was relocated in the summer 2002 (to new RM 0.36, about 500 ft. NW). This was a temporary location because when flow was diverted during base flows the lower 0.3 miles did not have a well defined thalweg or outlet to Meadow Creek due to subsurface flow. It was relocated again in 2003, to new RM 0.0, after the thalweg and mouth of the new channel became fully defined (about 1,900 ft. NW of the original location).

During 2008, the upper McCoy Creek water probe was replaced and the entire unit moved closer to the stream so that the standard length probe could be installed. The air probe had been chewed off and was repaired during this time.

In 1988 during the first year of data collection, summer mean weekly maximum temperatures at the lower (downstream) site averaged 3.70°C warmer than the upper site. In 2008, following 21 years of treatment, summer mean weekly maximum temperatures averaged 2.34°C warmer at the lower site (Figure 8), however, the upper site excluded data for the period of June 10-July 21 due to a reprogramming error. An examination of all 22 years of summer plots indicate that preferred temperature ranges for juvenile salmonids (12-17°C) are generally exceeded throughout most of the summer months at both upper and lower sites (for consistent comparison summer includes May-October for all data presented in this report section). For the upper site preferred temperatures were exceeded an average of 15 weeks of the 26-week period, and 17 weeks at the lower site. Lethal temperatures (>25.0°C) were exceeded in July and/or August at the lower site in all years except 2003, but only 8 out of 22 years at the upper site.

Over the last 22 years of data collection (1988-2008), the plot of mean summer maximum temperatures show temperatures at the lower McCoy Creek site have exceeded those at the upper site in all years except 2003, averaging 2.0°C warmer than the upper site (Figure 9).

Figure 8. Mean weekly summer temperature data on McCoy Creek in 2008, at the upper (RM 2.6) and lower (RM 0.0) sites. Data for the upper site is missing for the period of June 10 to July 22, 2008 and excluded from the calculated difference.

Figure 9. Mean summer maximum temperatures on McCoy Creek, 1988-2008, at the upper (RM 2.6) and lower (RM 0.0) sites. Data sets for 1991 and 2008 (upper), and 2001-02 (lower) were partially or fully incomplete and excluded.

The first ten years of data collection (1988-1997) represent fence only treatments; the last 11 years represent fenced and relocated channels. In order to further analyze the data based on changes in treatment the data was further broken down as follows:

Years	Upper Max.	Lower Max.	Upper - Lower	Treatment
1988-1997	17.51 °C	19.88 °C	-2.37 °C	Fence only
1998-2002	17.43 °C	19.65 °C	-2.21 °C	Phase I (upper) channel
2003-2008	17.68 °C	18.45 °C	-0.77 °C	Phase II (lower) channel

Although there are some gaps in data collected at the lower site in 2001-2002, the data indicate that the upper, control site remained relatively constant, while the lower site showed declines in temperature over time that seem to correlate to phases in restoration. After deploying some additional Hobo Temp thermographs in the Phase I reach in 1997 we also showed some rapid cooling occurring that was 1-2 °C colder than the upper site (McGowan, 1997 Annual Report). However, we also found that the stream warmed back up rapidly by the time it reached the lower thermograph at the mouth. Therefore, we do not assume that stream temperatures are cooling throughout the entire 2.6 mile reach, but we are cautiously optimistic of the results.

Temperature fluctuations have also been tracked over time. From 1988-2008 fluctuation averaged 8.9 °C at the lower site compared to 7.0 °C at the upper site, indicating cooler, stable, and more favorable summer conditions in the upper reaches. However, comparing only the 2003-2008 period, the lower site averaged 6.3 °C and the upper averaged 6.7 °C, serving as another indicator that changes are occurring at least in the lower reaches, while little change occurred in the control reach.

Salmon Creek Results-

Thermographs were installed at upper and lower sites in 1991. The upper control site is located at the upstream end of the McDaniel property at RM 2.7. The lower site is near the mouth at RM 0.1, on the McClaran property. Riparian fencing at the upper site was completed in 1990; the lower site was fenced in 1989. Upstream of the project the reach had been heavily grazed for many years until the fall of 2005, when the property was enrolled in the federal CREP program and riparian fencing installed. The entire stream reach, including the 3 miles upstream of the upper site, consists of an unconstrained and terrace constrained, moderate gradient system.

Data from 1991 are excluded because thermographs were not installed until late July and one instrument failed. Salmon Creek has consistently shown cooling of stream temperatures as water travels downstream through the riparian corridor. In 1992, comparison of upper and lower summer mean weekly maximum temperatures showed an average cooling of 1.69°C at the lower (downstream) thermograph. In the summer of 2008 the average was 1.54°C cooler at the lower end (Figure 10). Analysis of all 17 years of summer plots indicate that preferred temperature ranges for juvenile salmonids (12-17 °C) are exceeded for 17.6 weeks of the 26-week summer period at the upper site and 13.6 weeks at the lower site. Lethal temperatures (>25.0 °C) were exceeded in July and/or August at the lower site in only 2 years, but were exceeded in 15 of 17 years at the upper site, with 2005 and 2007 being the only exceptions.

Figure 10. Mean weekly summer temperature data on Salmon Creek in 2008, at the upper (RM 2.7) and lower (RM 0.1) sites.

Figure 11. Mean summer maximum temperatures on Salmon Creek, 1992-2008, at the upper (RM 2.7) and lower (RM 0.1) sites. CREP fence above the upper site was installed in the fall of 2005. Data for 1995 (lower) was incomplete and excluded.

Based on trend lines over the last 17 years of data collection, mean summer maximum temperatures in the upper, untreated (grazed) site steadily increased until 2005, averaging 2.91°C warmer than the lower site (Figure 11). But after installation of riparian fencing upstream of the site in the fall of 2005 the average difference reduced to 1.86 °C. The lower Salmon Creek site through the treated reach has shown a consistent cooling trend of nearly 2 °C.

Temperature fluctuations from 1992-2008 averaged 5.9 °C at the lower site compared to 9.1 °C at the upper site, indicating cooler, stable, and more favorable conditions in the lower reaches. However, for the 2006-08 periods the averages are 5.6 °C and 8.1 °C for the lower and upper sites, again indicating that rapid changes are occurring at the upper site. Monitoring will continue for as long as possible to determine how temperatures at the upper site continue to be affected now that the reach upstream has been fenced.

Camas Creek Results-

Hobo Temp thermographs were placed at the upper and lower ends of the project area on August 2, 1994, and later replaced with Unidata Starloggers in May 1995, recording stream and ambient air temperatures. Riparian corridor fencing was completed in 1995. The upper control site is located about 0.3 miles downstream of Lehman Hot Springs Road at RM 29.3 and has been intensively grazed upstream prior to and throughout the study period. Stream flows entering the upper site flow mostly through private lands. The 0.5 mile section immediately upstream is mostly unconstrained, while further upstream the reaches are hillslope constrained with moderate gradients. The lower treated site is about 2.7 miles downstream at RM 26.6 at the Pendleton Ranches and U.S.F.S. property boundary. The lower reach consists of unconstrained and terrace constrained sections flowing through a wide grassy meadow, with gradients averaging about 0.5%. In 2008, the water probe on the lower site was recording faulty data or was dewatered from May 1st to May 29th. That data was excluded from comparative analysis. The air probe on the lower Camas Creek site was also replaced on June 10, 2008.

In 1995, the first full year of data collection, the upper site averaged 0.5 °C cooler than the lower site. In 2008 the mean weekly summer maximum temperatures at the lower site averaged 0.81°C cooler than the upper site (Figure 12), showing a reversal of pattern. Analysis of all 15 years of summer plots indicate that preferred temperature ranges for juvenile salmonids (12-17 °C) are generally exceeded throughout most of the summer months (about 15 weeks of the 26 week period) at both upper and lower sites. Lethal temperatures (>25.0 °C) were exceeded in July and/or August at both sites in nearly all years.

Figure 12. Mean weekly summer temperature data on Camas Creek in 2008, at the upper (RM 29.3) and lower (RM 26.6) sites.

Figure 13. Mean summer maximum temperatures on Camas Creek, 1994-2008, at the upper (RM 29.3) and lower (RM 26.6) sites. Data for 1994 is for both sites includes only August 2nd to October 27th, data for 1997 (lower site) was excluded (instrument failed).

Mean summer maximum temperatures at the lower site averaged slightly cooler (0.56°C) than

the upper site throughout the 15-year study period, with the majority of the cooling occurring in the last 4 years (Figure 13). Trendlines for the upper control site show a positive slope, while the slope for the lower treated reach is negative. The data suggests that on Camas Creek it took 10 years before restoration treatments began to affect downstream temperatures.

Daily fluctuations were similar to those previously observed on Sheep Creek (another higher elevation, open meadow system), and averaged 9.6°C at the upper site and 8.3°C at the lower site during the 15-year period.

Meadow Creek Results-

Permanent thermographs were installed at the upper and lower ends of Meadow Creek on the Alta Cunha Ranches (now Warn) property in May 1999; riparian fencing was started in the fall 1998 and completed in May 1999. The upper control site borders the USFS Starkey Experimental Forest at RM 10.85. Stream flows entering the upper site run through mostly hillslope constrained sections with moderate gradients, all through national forest managed lands. The lower treated site is located 1.65 miles downstream at RM 9.2. The treated reach consists mostly of hillslope constrained sections, but in some reaches valley widths exceed 500 feet with potential for groundwater storage. Stream slope averages 0.7%.

The plot for summer mean weekly maximum and minimum temperatures for 2008 shows that the lower treated site averaged 0.15°C cooler than the upper control site (Figure 14). This is similar to the 2000 data, which also indicated slightly cooler water (0.10°C) at the downstream end of the project. Analysis of all 10 years of summer plots indicate that preferred temperature ranges for juvenile salmonids (12-17 °C) are generally exceeded throughout the majority of the summer months (averaging 15 weeks of the 26 week summer period) at both upper and lower sites. Lethal temperatures (>25.0 °C) were exceeded in July and/or August at both sites in all years with the exception of the lower site in 2008.

The overall averages for mean summer maximum temperatures at the upper control and lower treated sites were nearly identical (averaging 18.32°C and 18.36 °C for upper and lower sites respectively) for the 10-year period from 1999-2008 (Figure 15). As we observed on McCoy and Camas creeks, it may take several more years of additional monitoring before noticeable cooling occurs. Daily temperature fluctuations at the lower site averaged 8.1 °C, versus 8.3 °C at the upper site.

Figure 14. Mean weekly summer temperature data on Meadow Creek in 2008, at the upper (RM 10.8) and lower (RM 9.2) sites.

Figure 15. Mean summer maximum temperatures on Meadow Creek, 1999-2008, at the upper (RM 10.8) and lower (RM 9.2) sites. Data sets for the lower site in 1999 and 2006 were incomplete and excluded, and the probe may have been dewatered in 2007.

End Creek Results-

Permanent thermographs were installed at the upper end of the Davidson property at RM 1.25, and at the mouth on the Rice property in May 2005. Stream flows entering the upper control reach run through private lands in terrace constrained reaches; channel slopes are 2-3%. The upper 0.15 miles of stream within the treated reach on the Davidson property has been protected from farming or grazing activity since 1993 and habitat is in relatively good condition.

The next 0.33 mile section on Davidson's had been grazed and was entrenched up to 10 feet from a series of head cuts that mostly occurred 8-10 years prior to treatment. It is likely the head cutting process on Davidson's was initiated by channelization done on the Rice property that migrated quickly upstream and was exacerbated by the large flood events (~25 yr. reoccurrence) in 1996 and 1997.

The third section that ran entirely through the Rice property was completely channelized and entrenched for 0.77 miles. The Rice property had been farmed to the stream's edges for several decades (pre-1930's). Riparian vegetation in the lower reaches was sparse. Lack of maintenance of the ditch was allowing the stream to erode the banks and redeposit materials, forming the beginnings of floodplains and associated vegetation establishment, but the channel was entrenched by 2-6 feet with no access to historic floodplains. Gradients started at 2% but gradually transitioned to the valley floor where they decreased to 0.1% at the confluence with the South Fork Willow Creek. Nearly two complete summers of pre-project data were collected.

Restoration treatments were conducted in June-October of 2006. All but the upper 0.15 miles of the reach were placed into new channels that included structural grade controls and were planted extensively. Water was diverted into the new channel in September 2006, at which time the lower thermograph was moved to the new mouth near the confluence of the SF Willow Creek (about 560 ft. NNW). The upper thermograph remained in the same physical location but the river miles increased to RM 1.88 due to increases in sinuosity. In 2008 we also set up solar pathfinder stations at 300 ft. intervals along the entire treated reach, including 9 stations on Davidson's and 19 on Rice's property. These were marked with 50 ft. offset stakes from the channel centerline offset stakes, using T-posts and metal identification tags.

Summer mean weekly maximum and minimum plots for 2008 data indicated substantial warming of the water at the downstream end of the project, and averaged 7.28°C warmer than the upper site (Figure 16). Analysis of the 4 years of summer plots indicate that preferred temperature ranges for juvenile salmonids (12-17 °C) are generally better at the upper site where they were exceeded for an average of 10 weeks of the 26-week period; the lower site averaged 16 weeks. Lethal temperatures (>25.0 °C) were exceeded in July and/or August at the lower site in all 4 years, but were never exceeded at the upper site.

The 4-year period showed mean summer maximum temperatures at the lower treated sites were considerably warmer, averaging 4.66°C higher than the upper control site (Figure 17). The trendline for the lower site is positive and indicative of the lack of vegetation in the newly constructed channel, while the trendline for the control site is negative. As would be expected, daily temperature fluctuations at the upper site are moderate, averaging 6.4°C for the 4 years, versus 10.9°C at the lower site.

Figure 16. Mean weekly summer temperature data on End Creek in 2008, at the upper (RM 1.88) and lower (RM 0.0) sites.

Figure 17. Mean summer maximum temperatures on End Creek, 2005-2008, at the upper (RM 1.88) and lower (RM 0.0) sites.

Bank Stability, Overhanging Vegetation and Undercut Banks

All data collected in 2000 and 2007 was summarized and plotted. The EBA completed statistical analysis on all sites, showing significant increases in the percentages of covered and stable banks over time, as well as differences between ungrazed and moderately grazed stream reaches. The complete analysis was included in the project summary report for 1984-2007 (McGowan and Morton, 2008).

Groundwater Wells

Bear Creek and End Creek/SF Willow Creek Groundwater Wells Methods

Groundwater well studies were established at two sites to monitor changes in water tables following construction of new channels. The assumption is that relocating and filling incised channels and constructing new ones at higher elevations with active floodplains will result in higher ground water tables and improved surface-subsurface interaction. Groundwater wells were set up in grid fashion to include both cross sectional and longitudinal (down valley) profiles of the study area (Figures 18 and 23). A total of 17 wells were installed on Bear creek on January 30, 2002, and 15 wells on End Creek on February 10, 2005. One year of pre-project data was collected on Bear Creek; 1.5 years on End Creek. Data was collected every 10-14 days for both sites throughout the year.

In 2008, we encountered problems with false bottoms on the Bear Creek wells due to hard crusts being formed during periods of drying. Corrections were made to the data and a method for cleaning out silt materials in the well bottoms was initiated. Benchmarks for measuring Grande Ronde River water elevations at the mouth of Bear Creek were also reset after high flows, changes in bedload and ice scour made them hard to identify.

Bear Creek Groundwater Results:

Bear Creek is a small mid-elevation stream (Wbkf = 12 ft.) that frequently goes dry by July. The objectives for groundwater monitoring were: 1) Collect pre-project data to aid in determining the thalweg elevations of the proposed new Bear Creek channel (i.e. avoid perching the new channel ending up with a dewatered stream during summer base flows); 2) Conduct post-project data to determine if an overall net increase in water tables occurred following new channel construction and restoring natural hydrology; and 3) Assess whether or not fish passage improved as a result of the new channel.

The January 31, 2002 to July 25, 2003 data represents pre-project conditions before new channel activation and filling of the old channel (on July 31, 2003). Many of the wells (wells 1-10) dried out by mid-summer in 2002, so it was not possible to determine the maximum loss of the water tables. Therefore, the pre-project averages and minimums for those wells in 2002-03 are skewed toward the high side. The August 1, 2003-December 31, 2008 data sets are continuous representation of groundwater elevations associated with the new channel. Data are summarized in Table 5, along with our original expectations of direction of change at individual wells.

Figure 18. Location of Bear Creek groundwater wells in relation to old and new channels. Color infrared photography was used to illustrate wetland meadow characteristics.

TABLE 5. Summary of Changes in Groundwater Elevations on Bear Creek, 2002-2008.										
WELL NO.	PRE-Project			POST-Project			Delta Maximum	Delta Minimum	Delta Average	Expected Change
	Annual Maximum	Annual Minimum	Annual Average	Annual Maximum	Annual Minimum	Annual Average				
1	3108.94	3105.44	3106.97	3110.64	3105.84	3107.99	1.70	0.40	1.02	Increase
2	3103.47	3098.22	3101.83	3104.27	3098.67	3100.37	0.80	0.45	-1.47	Decrease
3	3104.08	3099.73	3102.48	3104.38	3099.43	3100.74	0.30	-0.30	-1.74	Decrease
4	3103.87	3098.52	3102.27	3104.42	3099.57	3102.12	0.55	1.05	-0.15	No Change
5	3103.65	3098.30	3101.83	3104.40	3098.85	3102.06	0.75	0.55	0.23	Increase
6	3103.43	3098.93	3101.48	3105.38	3098.78	3102.21	1.95	-0.15	0.73	Increase
7	3103.01	3096.06	3101.04	3104.81	3098.31	3101.85	1.80	2.25	0.81	Increase
8	3101.12	3094.52	3099.36	3101.12	3096.57	3099.06	0.00	2.05	-0.30	Increase
9	3095.95	3092.50	3094.55	3097.20	3092.70	3093.74	1.25	0.20	-0.81	Decrease
10	3096.12	3091.87	3094.70	3097.57	3091.92	3093.84	1.45	0.05	-0.86	Decrease
11	3096.69	3094.44	3095.77	3097.54	3093.94	3095.82	0.85	-0.50	0.05	Decrease
12	3097.22	3094.62	3095.94	3097.52	3094.72	3095.94	0.30	0.10	0.01	No Change
13	3097.95	3094.50	3096.08	3097.60	3094.50	3095.85	-0.35	0.00	-0.23	Increase
14	3098.15	3094.70	3096.32	3099.10	3094.45	3096.27	0.95	-0.25	-0.06	Increase
15	3093.19	3091.09	3091.83	3092.89	3090.39	3091.15	-0.30	-0.70	-0.67	No Change
17	3088.98	3085.23	3087.24	3088.03	3084.73	3086.48	-0.95	-0.50	-0.76	Decrease
Averages	3099.74	3095.54	3098.11	3100.43	3095.84	3097.84	0.69	0.29	-0.26	Increase

Note: Well 16 was installed next to well 17 but not to full depth and was omitted.

Generally we expected wells placed to the west of the old channel and farthest away from the new channel (wells 2, 3, 9, 10) to decline, and those placed close to the new channel to increase (wells 1, 5-7, 8, 13, 14). We also expected decreases at well 17 due to deeper cuts of the new channel that were required in to drop elevation going into the Grande Ronde River. The majority of wells showed positive changes for maximums and minimums. However, only 6 of 16 wells did so for average values. We expect this is partially due to the fact that wells 1-10 bottomed out in 2002, skewing the data toward the high side. Also, several of the wells that were expected to decline did so to a larger degree than anticipated. Overall averages for maximums and minimums were positive, while the combined averages for all wells were slightly negative at -0.26 ft. (Table 5).

Representative examples of well data are shown in Figures 19-21. The plots show individual well elevations and trendlines during the pre and post-project periods in relation to channel diversion, existing ground surfaces, thalweg of the new and old channels, and well bottoms. Annual precipitation at the Starkey Experimental Station was plotted on the first graph to compare general weather patterns with the groundwater data. Low rainfall occurred in 2002 and 2005.

Figure 19. Bear Creek Well 1 illustrating overall increases in groundwater at the upstream end of the project. While the post-project trendline is slightly negative, the majority of data plots well above pre-projects levels, averaging 1.02 ft. higher. Channel dewatering still occurs, but not to the degree noted prior to construction.

Figure 20. Bear Creek Well 9 illustrating decreases in average groundwater but slight increases in minimum levels (0.2 ft.) for wells placed farthest away from the new channel. The large spike in March to June of 2004 was during the period of most precipitation and was observed in all the wells.

Figure 21. Bear Creek Well 14 illustrating slight decreases in average groundwater (-0.06 ft.) but large increases in maximum levels (0.95 ft.) for wells placed closer to the new channel but farther downstream where less overall changes occurred. Note how water surfaces generally remained well above the new channel invert and closer to existing ground surfaces.

General groundwater patterns observed included:

1. Increases in all 3 categories for maximums, minimums and averages of groundwater elevations only occurred for 4 wells (wells 1, 5, 7, 12) which were generally close to the new channel and toward the upstream end of the project. However, inability to measure groundwater in wells 1-10 in 2002 after they dried out has likely negatively skewed the data.
2. Maximum and minimum groundwater elevations increased in the majority of wells regardless of location.
3. Mean annual groundwater generally tracked annual precipitation in all of the wells, resulting in positive trendlines when we reported data in 2004, but became negative by 2007 possibly as a result of a very dry year in 2005. In 2008, another wet year, we began to see a reversal of pattern again.
4. Peak groundwater elevations generally occur in March for most of the wells. Minimum groundwater elevations generally occurred in October to November.

The first objective of the pre-project monitoring was to determine where to set the new channel thalweg elevation. We expected that if we built the new channel perched on top of the meadow it might have resulted in larger periods of complete dewatering. Analysis of that data confirmed our suspicions, and therefore the new channel was constructed approximately midway up from the former elevation to existing ground elevations, and incorporated constructed floodplain benches.

The second objective of raising the overall groundwater table in the meadow is still in question and additional monitoring will tell us more, but it appears that the stream is supply limited and highly subject to rainfall patterns. Unlike End Creek that has year around flow (see below), water tables are very local in nature, generally following the new channel and declining in locations farther away.

The third objective was to improve fish passage. Before the new channel was constructed the stream flowed through a channelized reach and an earlier restoration project by other agencies included adding 21 log weirs in an attempt to raise water tables. However, this resulted in the channel becoming a series of isolated pools in early summer that were impassible for fish and inhabitable for salmonids (Figure 22). Pre-project (2002 and earlier) observations showed that the old channel dried up in June through November. Flow data collected since then shows the channel remains wetted for an average 60 days/year longer, resulting in a much larger percentage of the channel length that remains passable for fish throughout the year. We will continue to monitor ground water and channel morphology at this site for several more years to determine if these observed habitat benefits continue as the new channel matures.

Figure 22. Old channelized section of Bear Creek, July 2002. Photograph illustrates pre-project limiting factors. Installation of log weirs by another agency resulted in impaired fish passage, warm and stagnant water and artificially altered water tables.

End Creek Groundwater Results:

Pre-project data is for the period of February 2005 to August 2006. End Creek was diverted into the new channel in 2 phases: the lower section on August 24th, 2006 and September 6th for the upper section. The SF Willow Creek was diverted on October 7th, 2006. In 2005 all wells show considerable fluctuation of 5.0-6.5 feet from peak elevations in May to lowest elevations in October-December (see 2005 Annual Report). In 2005, water tables for all 15 wells remained within 2 ft. of existing ground surfaces an average of 42 days/year. By 2007 water tables remained within 2 ft. of existing ground surfaces an average of 81 days longer, for a total of 123 days/year.

Although we are still in the early stages of monitoring, following diversion of water into the new stream channels groundwater elevations rose dramatically in nearly all of the wells. Examples are shown in Figures 24-26. Averages for all wells combined show increases in maximums, minimums and means (Figure 27). Improvements in restored floodplain connectivity are illustrated in Figure 28.

Figure 23. Location of End Creek groundwater wells in relation to old and new channels and associated wetland restoration (1997 Aerial).

Figure 24. Plot of Well 6 which showed the lowest response; an average increase of 1.20 ft. in groundwater elevations between 2005 and 2008.

Figure 25. Plot of Well 10 illustrating a typical well showing an average increase of 2.80 ft in groundwater elevations between 2005 and 2008.

Figure 26. Plot of Well 13 illustrating large increases in water table, averaging 4.15 ft higher groundwater elevations between 2005 and 2007. Wells 12, 14 and 15 showed similar response. The 2008 data shows water surfaces above existing ground elevations for over 6 months of the year.

Figure 27. Averages of all groundwater wells from 2005-2008, showing modest increases in maximum water elevations (0.98 ft.), and large increases in average (2.16 ft.) and minimum elevations (2.77 ft.).

Figure 28. Groundwater Well 13 in April 2008, looking northwest, illustrating restored floodplain connectivity, with water surfaces several inches above the ground surface for extended periods of time in the spring.

Channel Morphology, Sediment and Flows

Pebble counts were taken of the as-built channel on the Wallowa River Reach 2 project, prior to diversion of water. The counts will be repeated and compared following significant runoff events to monitor for channel stability and sediment transport. The End Creek channel was inspected on June 12 for signs of channel erosion, and generally appeared to be handling 2 years in a row of above average flows. Gravel recruitment and deposition was occurring in areas that were devoid in the newly excavated channel.

Spawning Surveys

Steelhead spawning surveys were completed on 22.3 miles of streams in April and May 2008. Water conditions for conducting spawning surveys were less than ideal this year with much higher than normal spring rains and poor water clarity. Redd counts overall have shown a downward trend beginning in 2003. The 2008 counts averaged 0.36 redds/mile (Table 6), with the Wallowa River being the only stream where redds were found. Redd counts on Whiskey and Little Whiskey creeks also dropped off considerably in 2003-08 (Figure 29).

TABLE 6. Steelhead Spawning Surveys in Selected Project Streams, 2008.

STREAM	RM start	RM end	Miles surveyed	Redds	Redds/mile	Live Fish
Bear Cr ¹	0.00	2.40	2.40	0	0.00	0
End Cr ²	0.47	2.01	1.54	0	0.00	0
Jordan Cr	0.00	1.66	1.66	0	0.00	0
McCoy Cr ³	0.00	9.20	9.20	0	0.00	0
McDonald Cr	0.71	1.63	0.92	0	0.00	0
Meadow Cr	7.92	10.85	2.93	0	0.00	0
Milk Cr	0.06	1.01	0.95	0	0.00	0
Wallowa R	33.63	33.83	1.20	8	6.67	5
Whiskey, Little	0.00	1.10	1.10	No survey	n/a	n/a
Whiskey, Main	0.00	1.50	3.70	0	0.00	0
Totals :			22.30	8	0.36	5

1. Includes 0.5 miles of additional new channel built and connected in 2002-03.

2. Includes 0.63 miles of new channel built and connected in 2006-07.

3. Includes 0.9 miles of additional channel built in 2001 and connected in July 2002, river miles upstream were adjusted accordingly.

Figure 29. Redd counts on 4.6 miles of Whiskey Creek and Little Whiskey Creek, 1993-2008.

Fish Population Estimates

ODFW Fish Research repeated mark recapture fish population estimates on 10 randomly selected 100 meter sections of the East, Middle and West forks of Ladd Creek. Work was completed on July 11-23, 2008. Carp were the most abundant species in 2008, which was a very high runoff year. Carp made up 83% of the total fish population, followed by much lower numbers of dace, shiner, Rb/std and pikeminnow. Carp were not found in any sample sites in 2007. Additional sampling will be conducted following the channel restorations to compare pre and post project fish abundance and species composition.

ODFW Fish Research and project staff coordinated the fish salvage efforts on the Wallowa River/McDaniel Reach 2 project on August 12-13th, 2008 (see news article in Appendix 2). Fish were isolated in a 1,193 ft. section using block nets and captured using 3 backpack electroshockers working in tandem. Three passes were completed on the first day, but work was stopped by mid-afternoon when temperatures reached 18°C. Two additional passes were completed on the second day. A total of 2,759 fish were captured and percent composition and densities are summarized in Table 7. Notable were the low numbers of warmer water and more pollution tolerant species such as redbside shiner and pikeminnow.

Approximately one third of all salmonids were measured and weighed. Length frequency data showed that Rb/Std ranged in size from 36-408 mm, with age-0 fish making up about 56% of the total. Chinook ranged in size from 81-128 mm, several of which were precocious males. This data may later be used to calculate fish population estimates and compared with post-project populations.

TABLE 7. Summary of fish population data from fish salvage efforts on the Wallowa River.								
Species	Number Captured	Percent Composition	Density (fish/m ²)	No. fish per pass				
				pass 1	pass 2	pass 3	pass 4	pass 5
Rb/std	627	22.73%	0.12	274	172	65	82	34
Chinook	156	5.65%	0.03	86	39	19	9	3
Mountain Whitefish	413	14.97%	0.08	273	94	31	8	7
Longnose Dace	1085	39.33%	0.21	253	346	213	197	76
Umatilla Dace	60	2.17%	0.01	18	7	1	18	16
Bridgelip Sucker	53	1.92%	0.01	20	11	10	4	8
Northern Pikeminnow	3	0.11%	0.00	2	1	0	0	0
Redside Shiner	1	0.04%	0.00	1	0	0	0	0
Sculpin	361	13.08%	0.07	114	84	36	94	33
Totals:	2759	100.00%	0.52	1041	754	375	412	177

PROGRAM ADMINISTRATION

Administrative activities during 2008 included preparation of reports and data summaries, budget preparation and purchases, program development, and personnel hiring and supervision.

Reports and Data Summaries

The 2007 Annual Report for the Grande Ronde Basin Fish Habitat Enhancement Project was written and submitted to BPA and others. The fish habitat project database was updated and PISCES quarterly status reports were completed. A summary of construction costs for the Wallowa River Reach 2, Phase II project was completed.

A total of 5 months were spent completing the “Grande Ronde Basin Fish Habitat Improvement Project Summary Report, 1984-2007” which was submitted in May, 2008 (see also Program Development below). The report was distributed to the ISRP, NPPC, BPA and many other interested parties.

Budgets and Purchases

Considerable time was spent obtaining quotes for construction materials, purchasing supplies, receiving material shipments, working on the Statement of Work and Budget, and tracking project expenditures from various sources of funds. Staff completed Work Elements and the FY 2009 Statement of Work and Budget, and all data was entered into PISCES.

Major purchases this year included: Fence materials for the Hidaway Creek project, survey and stakeout supplies, a new solar pathfinder, irrigation supplies, tailgate repairs on one of the pickup trucks, and Civil 3D software renewals.

Program Development

As part of the FY 2007-09 project solicitation processes, in August 2006 the Independent Scientific Review Panel had issued a final recommendation that this project should only be funded after we satisfied their requirement of submitting a report that includes analyzing the results and a summary of conclusions over the entire 24-year history of the project. March 2007 was originally set as the deadline for the report but an extension was granted. ODFW requested that additional funds be allocated to cover the costs associated with this effort, however, 2007-09 funds were flat-lined at 2006 levels. As a result, BPA and ODFW mutually agreed to delay implementation of some of the new projects scheduled for 2007-08.

Project staff worked nearly continuously on this report from December 2007 to May 2008. The ISRP reviewed the report in June 2008 and gave a final recommendation of “Meets Scientific Review Criteria”. In their memorandum to the Northwest Power and Planning Council (ISRP 2008-9) they stated:

“The report is excellent and is the sort of results reporting that the ISRP has been requesting to substantiate scientific merit. The report should be a good source for other sponsors in the Columbia Basin and perhaps could serve as a model for reporting and analyzing results. The ISRP appreciates the tremendous amount of work the sponsors did in preparing the report.”

They also provided general comments as well as 14 additional specific comments and recommendations that might improve future results reporting.

Position classification reviews were completed by the watershed manager and were reviewed by ODFW Human Resources for the existing NRS 2 and Senior Technician positions. They recommended both positions be upgraded, and reclassifications will go into effect pending review from the Department of Administrative Services.

Karen Toefte in ODFW/Realty was contacted to discuss current policies regarding leases and coop agreements.

Personnel

Jon Fritz continued duties as the ODFW NE Region safety officer until May, and also was assigned to work for the fish liberation program for the months of February and March.

Contract Administration

ODFW assisted with request for proposals, contract development and bid tours for channel construction on the Wallowa River/McDaniel Reach 2, Phase II channel relocation project. The GRMWP administered the contracts. The bid was originally awarded to Partney construction for a total price of \$42,000. Work was completed on August 4th-18th, 2008 for final price of \$47,215 for this phase, and was paid for using a combination of GRMWP/BPA, OWEB and USFWS dollars.

ODFW administered the Hidaway Creek fence contract that was awarded to BG Fencing for a total price \$34,972 for 5.08 miles of new fence and 1.5 miles of removal of old fence.

Miscellaneous Administrative Activities

Our BPA COTR, Joe DeHerrera toured recently completed projects and provided advice on securing additional funds through the Budget Oversight Group for 2009.

INTERAGENCY COORDINATION & EDUCATION

Communication, education, coordination and cost sharing of habitat enhancement activities were completed by actively pursuing opportunities to work with and learn from personnel involved with other agencies, organizations and programs.

INTERAGENCY COORDINATION:

Information, materials or assistance was provided to members of various agencies or programs, including:

- The biologist gave a power point presentation explaining the results of the project summary report required by the ISRP. ODFW Fish Division and NE Region fisheries staff attended the meeting. The head of Fish Division and other headquarters staff toured the End Creek project that afternoon.
- NOAA Fisheries staff contacted us to provide technical input on the designs for the Sixes

Ranch along the Wallowa River.

- The biologist participated in the NOAA fisheries workshop “ANALYSIS OF STREAM MANAGEMENT ACTIONS: Scientific Review, Decision Support and Project Evaluation”. The purpose was to introduce and comment on project evaluation tools that were under development and would be used by NOAA staff to review biological assessments. The CTUIR/ODFW Meadow Creek biological assessment was used as an example project.
- Coordination continued with ODOT staff regarding a new bridge they planned to install on the Middle Fork of Ladd creek.
- Landowner names and phone numbers were provided to Joe Ebersole with the EPA. He resurveyed coldwater patches and channel morphology along the Upper Grande Ronde River and tributaries in late July.
- The Nikon 5000 slide scanner was loaned to the John Day fish habitat program to convert 35 mm slides to digital format.

Meetings were attended to provide technical input on projects, including:

- The biologist provided technical comments to La Grande and Enterprise district fish staff regarding GRMWP and OWEB project proposals.
- ODFW, GRMWP and CTUIR staff met regularly to review schedules, budgets and organize content of new project proposals.
- The biologist attended a BPA/BOR FCRPS Biop meeting on November 13, 2008.
- The biologist attended the John Day basin habitat monitoring coordination meeting.

Other agencies, organizations, groups or individuals that worked cooperatively, or provided assistance or materials to this project, included:

- Wallowa Resources staff and volunteers, ODFW fish research, ODFW Enterprise fish district staff, CTUIR, GRMWP and Partney Construction staff all provided much needed assistance with fish trapping and relocation on the Wallowa River/McDaniel Reach 2 project.
- ODOT provided the highway blocks used to divert the Wallowa River into its new channel.
- Professor Karen Antell with Eastern Oregon University helped with solar pathfinder data collection on End Creek.
- The Grande Ronde Model Watershed provided \$3,968 worth of fence materials for the Wallowa River/McDaniel Reach 2 project.
- The ODFW screens shop loaned us their backhoe for placing rock on the Wallowa River.

EDUCATION:

The following educational activities were undertaken during 2008:

- The biologist and technician attended the 2008 River Restoration Northwest, Stream Restoration Design Symposium that included a workshop on designing pool/riffle stream channels.
- The technician attended the Rosgen “River Restoration and Natural Channel Design” course, number 4 in a series of four.

- Wallowa Resources organized school kids and parents for helping with the fish trapping and relocation effort on the Wallowa River/McDaniel Reach 2 project. They were given a talk on the reasons for the project and basic salmonid life history.
- The biologist met with the staff of Green Fire Productions on the Wallowa River project and participated in production of an instructional video on stream restoration techniques that was being funded by the GRMWP.
- On April 4, 2008 the technician gave a tour to twelve Wallowa Resources Explorations of Nature (WREN) 5th to 8th grade students on the Wallowa River Reach 2 project. They assisted with planting of sedge/rush plugs and were able to observe adult steelhead spawning (Figure 30).

Figure 30. Winston Morton and WREN's students spend a cool April afternoon on the Wallowa River, where they were able to observe a pair of adult steelhead spawning.

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APPENDIX 1. Grande Ronde Subbasin Plan Supplement, 2004

<http://www.nwcouncil.org/fw/subbasinplanning/granderonde/plan/AssessmentMgmtPlan010305.pdf>

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

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

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

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

APPENDIX 2. News Articles.

Ripples in the Grande Ronde, Fall 2008 article on the Wallowa River/McDaniel fish trap and haul effort, available at:
http://www.grmw.org/publications/publications_documents/Ripples/Ripples_2008/Ripples%20Fall08%20low%20res.pdf

The Wallowa River gets help from the bucket brigade

by Coby Menton, GRMW

Restoration of the Wallowa River on property owned by Doug and Gail McDaniel near Lostine has been ongoing for most of the last five years. The work of re-meandering the channelized and diked channel has been accomplished over two separate projects each consisting of two phases. On August 19 this past summer Phase 2 of Project 2 was completed, resulting in nearly one mile of restored channel over the two projects.

The idea of the restoration method at first glance may sound simple, but rebuilding naturally meandering channel, complete with habitat features as they are expected to naturally occur, is a tall order. Design, permitting, fundraising, and project implementation usually takes between two and three years per project. The effort is well worth the work as improved habitat for fish is nearly immediate upon completion. Given local, state and regional efforts to improve and restore resident and anadromous fish populations, this project will provide a multitude of benefits to those efforts.

Recognized stressors to fish populations include degraded or simplified instream habitat, compromised riparian (near stream) vegetation diversity, and simplified hydrologic function. This project has a variety of objectives addressing those stressors:

1. Improve instream habitat by constructing a channel complete with components much as they would occur in natural conditions. Components include

pools, riffles, runs and glides. The previous unrestored channel was a near continuous riffle – shallow, wide and with fast-moving water. Wood and rock structures will improve habitat diversity in the reconstructed channel.

2. Improved hydrologic function and water quality will result from improved channel conditions. A channel that can seasonally occupy its floodplain during high-flow times will deposit sediment above the streambank. Water will then be stored in this floodplain, allowing for the delayed release of cooler and cleaner water back into the river through the soil. Wetlands, once an important part of the riparian function along this river, will again exist.

3. Improved riparian condition and function will result from improved channel and hydrologic conditions. While the current riparian conditions are actually pretty good, water-tolerant plants are anticipated to become more prominent, and displace the current vegetation comprised largely of dryland grasses and shrubs. The post-construction planting plan will give this process a jump start.

Much like Project 1, Project 2 was completed with a diligent implementation team consisting of the Oregon Department of Fish and Wildlife, the Confederated Tribes of the Umatilla Indian Reservation, and the Grande Ronde Model Watershed. With the assistance of CTUIR, ODFW designed the new channel and managed project construction. The Model Watershed administered the project, and was in charge of all contracting and financial obligations. The best management team needs competent skilled help. LD Perry, Inc. of Enterprise started the construction effort in 2007 by

digging most of the new channel, installing many structural components, and staging excavated material for Phase 2 filling-in of the old channel. All of the work done by LD Perry, Inc. was “in the dry,” meaning out of flowing water. Phase 2, the connection phase, was completed by Partney Construction, Inc. of La Grande. This 2008 work consisted of installing several structural features, linking the new channel to the old, and backfilling the old channel with material excavated in 2007. Other contractors included Henderson Logging of Wallowa, who provided logs for rootwad habitat features; Jones Excavating of Lostine, who delivered boulders for

channel grade control structures; and Farm Supply of Enterprise, who was contracted for trucking services.

One of the more rewarding aspects of restoration is the amount of volunteer efforts realized. This was no more apparent than on the two fish salvage days. “Fish salvage” is a term that needs explanation. Before the old channel can be dewatered and filled in, all fish must be captured, counted, and released back to the river out of harm’s way. This is done by slowly dewatering the old channel to a very low, manageable flow. Dewatering is accomplished by slowly diverting water to the new channel. Many

of the fish will leave the old channel as flow recedes, either upstream or downstream, seeking normal flow conditions. Those fish that do not leave are captured with electro-shockers that temporarily stun the fish and dip nets. After capture, all fish are transported from the stream in buckets to water-filled coolers mounted on all-terrain vehicles and then driven to the processing area. All fish are then identified, counted, measured and released back to the live-flowing new channel. Each end of the area to be filled in is “block netted” to prevent fish from swimming back in. The process of removing fish from the part of the river that will be reclaimed is fish salvage, and on August 12 and 13 the following species and numbers were salvaged.

- Mountain whitefish, 413
- Juvenile steelhead/rainbow trout, 621. Distinguishing juvenile steelhead from rainbow trout is very difficult and beyond the scope of this salvage effort.
- Juvenile hatchery steelhead, 6. These fish are offspring from adult steelhead processed at the Wallowa Fish Hatchery in Enterprise and marked by a clipped adipose fin.
- Juvenile chinook, 156
- Longnose dace, 1,085
- Umatilla dace, 60
- Bridgelp sucker, 53
- Northern pikeminnow, 3
- Sculpin, 361

The capture, processing and release of 2,758 fish over five fishing passes of the old channel over two days required a lot of people. CTUIR personnel led the fishing effort by running the electro-shockers and coordinating fish transport. ODFW took care of all the species identification, counting and record keeping. In between capture and release is a lot of high-paced, bucket-brigade work taken care of by a small army of volunteers. A very energetic group of youngsters from Wallowa County led by Penny Arentsen of Wallowa Resources took care of the bucket work. These Wallowa Resources Outdoor School students meaningfully participated in an active restoration project, learned about fish in their county, and appeared to have a great time.

The Grande Ronde Model Watershed would like to take this opportunity to thank all of those organizations who have made the Wallowa River/McDaniel Habitat Restoration projects possible. Without the generous funding support of the Oregon Watershed Enhancement Board, the Bonneville Power Administration, and the U.S. Fish and Wildlife Service; the dedicated production team of ODFW and CTUIR; the willing landowners Doug and Gail McDaniel; and the diverse group of volunteers, this project would not have been possible. ■

Top: Joe Partney of Partney Construction, Inc. installs the diversion structure on the morning of August 12, 2008. The old channel to be filled in is on the left side of the photo and the new channel is on the right. Once the barriers are installed and sealed, more than 90 percent of the flow is down the new channel. A small amount of flow is necessary in the old channel until all fish have been salvaged. When all fish have been removed, the old channel is reclaimed. GRMW photo. Right: The bucket brigade! From left to right: Troy Nave (Outdoor School teacher), Ella Shoup, Maddie Hill, Siije Christofferson, Lars Skovlin (with bucket on head), Erich Roepke, Natalie Ziegler, Landra Skovlin, Kyle Roepke, and Paul Arentsen (Outdoor School teacher). Photo by Penny Arentsen.

Top: Upstream end of project where most of the flow has been diverted to the new channel on the right. The old channel was slowly dewatered over one day and then salvage efforts began. The Confederated Tribes of the Umatilla Indian Reservation crew is running fish shockers in old channel while the Oregon Department of Fish and Wildlife and volunteers are shuttling fish in buckets from the old channel to the transport cooler on the ATV.

Above left: Vance McGowan, ODFW habitat biologist and McDaniel project lead, discusses salvage techniques and habitat restoration with Outdoor School students. Above right: Members of the CTUIR salvage crew with Jeff Owsen (second from right), GRMW Executive Director. Photos by Penny Arentsen.