PROJECT COMPLETION REPORT

Document ID #P105072

End Creek-Dake Restoration Project, Phase 4

Grande Ronde Model Watershed/Bonneville Power Administration
Project PI 1992-026-01/Contract #00032501

Natural Resource Conservation Service
Dake -Wetland Reserve Program Project

December 2007

March 2007 Photo illustrating southern portion of the End Creek Restoration Project. The Phase 4 project component on the Dake parcel is located in the center foreground. Previous restoration work is shown in top of photograph.

Prepared by:
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CTUIR Grande Ronde Subbasin Restoration Project Leader
Fish and Wildlife Biologist

PROJECT PARTNERS & COOPERATORS

Ron & Nancy Dake (Landowner)
Natural Resource Conservation Service
Oregon Department of Fish and Wildlife
Grande Ronde Model Watershed
Confederated Tribes of the Umatilla Indian Reservation

Confederated Tribes of the Umatilla Indian Reservation
Administrative Summary

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION and BACKGROUND

During late summer 2007, Phase 4 of the End Creek Restoration Project complex on the Dake property was constructed. The project is located in the northwest Grande Ronde Valley within the Grande Ronde Subbasin of eastern Oregon and was jointly developed by the landowners (Ron and Nancy Dake), Natural Resource Conservation Service (NRCS), Oregon Department of Fish and Wildlife (ODFW), Grande Ronde Model Watershed (GRMW) and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). This report provides an overview of the project purpose, existing conditions and limiting factors, project goals and objectives, accomplishments, and expenditures for the project.

The project was funded by through the NRCS Wetland Reserve Program and the GRMW using Bonneville Power Administration (BPA) funds. The NRCS was the lead agency for administering the WRP with ODFW and CTUIR contributing to securing cost-share funding, planning and design, and permitting. The NRCS and landowner provided construction contract and field administration.

The End Creek Project complex encompasses approximately 776 acres within three contiguous private land parcels. Project construction on the Rice (568 acres) and Davidsion (108 acres) parcels was completed during 2006. Project construction the Dake parcel (100 acres) was completed during late summer 2007. Work included construction of spring channels, floodplain ponds, filling drainage ditches, removal of a concrete headgate on upper McDonald Creek, and native grass seeding. Project accomplishments included:

1. Construction of approximately 1.23 miles of spring-fed channels.
2. Reclamation of 2.18 miles of existing channelized stream reaches and ditches.
3. Construction and contouring 2 floodplain ponds (3.43 acres).
4. Instream placement of two rock grade control structures (cross vanes) in McDonald Creek to stabilize the stream following removal of a concrete headgate and to provide grade control at the entrance to an overflow channel constructed under the project.
5. Removal of an existing concrete headgate on McDonald Creek to improve fish passage.
6. Initiation of native plant community restoration, involving native seed installation on 86 acres.

Project construction was initiated in August and completed by late September 2007. Seeding was completed by the landowner by mid October. Planned activities for 2008 include installation of sedge/rush plugs and shrubs along new channels and floodplain ponds to facilitate vegetative recovery.

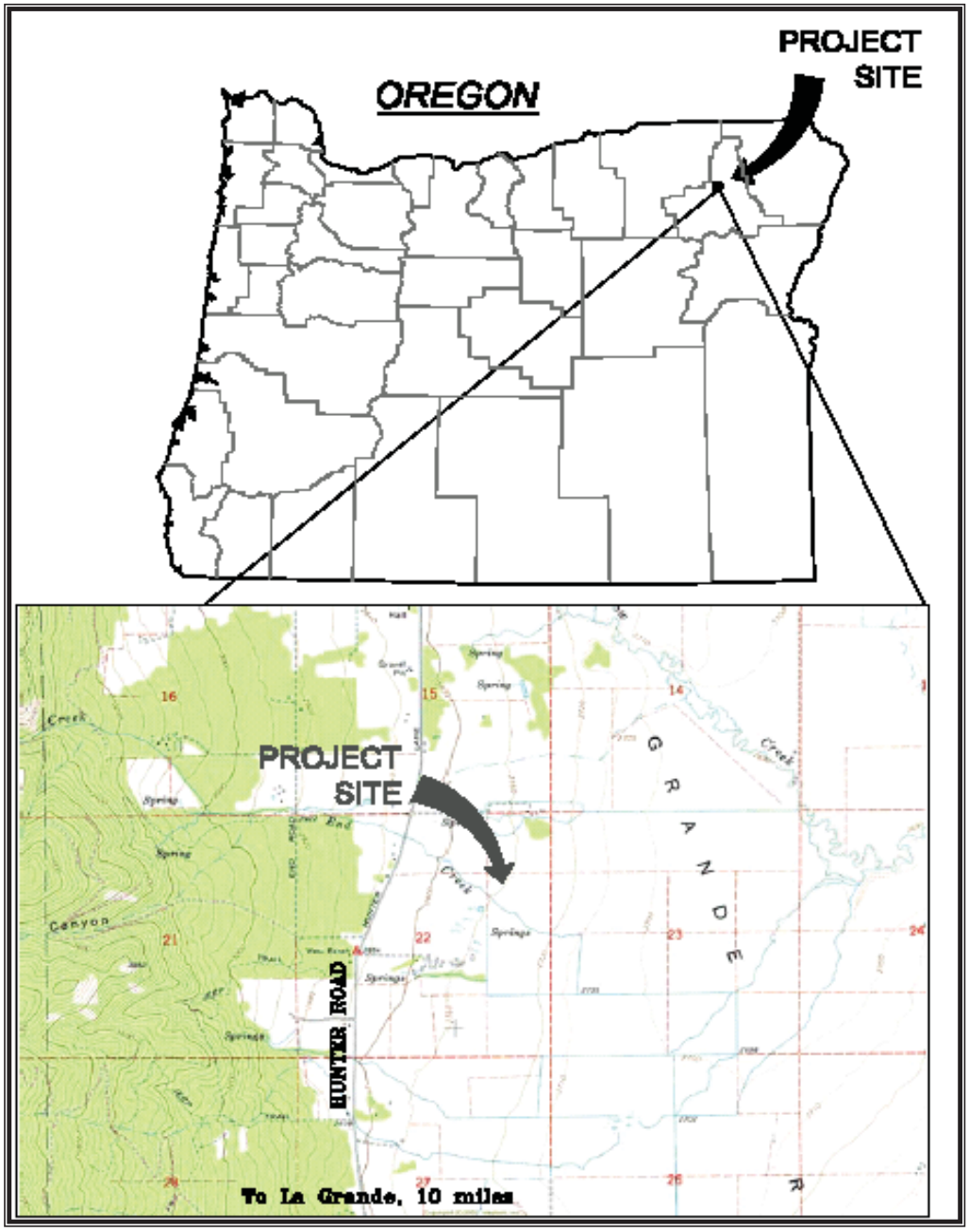
2. PROJECT DESCRIPTION & EXISTING RESOURCE CONDITIONS

Project Area Description

The End Creek Restoration Project is located in the upper Willow Creek watershed in the Upper Grande Ronde River Subbasin (6^{th} Field HUC 17060104803). The project is located in the northwest portion of the Grande Ronde Valley about 8 miles north of LaGrande, Oregon in Union County approximately 1 mile upstream from the confluence with Willow Creek in Township 1 South, Range 38 East, all or portions of Sections 22, 23, 26, and 27, Willamette Meridian. The project complex encompasses three contiguous private land parcels: Rice (568 acres); Davidson (108 acres); and Dake (100 acres). See Figure 1, Project Vicinity Map. In context of the Grande Ronde Subbasin Plan (NPCC, 2004), the project area is located in the Mid Grande Ronde Valley Geographic Priority Area (Lower Willow/mid Grande Ronde). Habitat limiting factors include sediment, flow, temperature, and key habitat quantity. Primary focal species include summer steelhead (spawning/rearing) and spring Chinook salmon (rearing habitat). Other species include resident trout and riparian/wetland dependent wildlife.

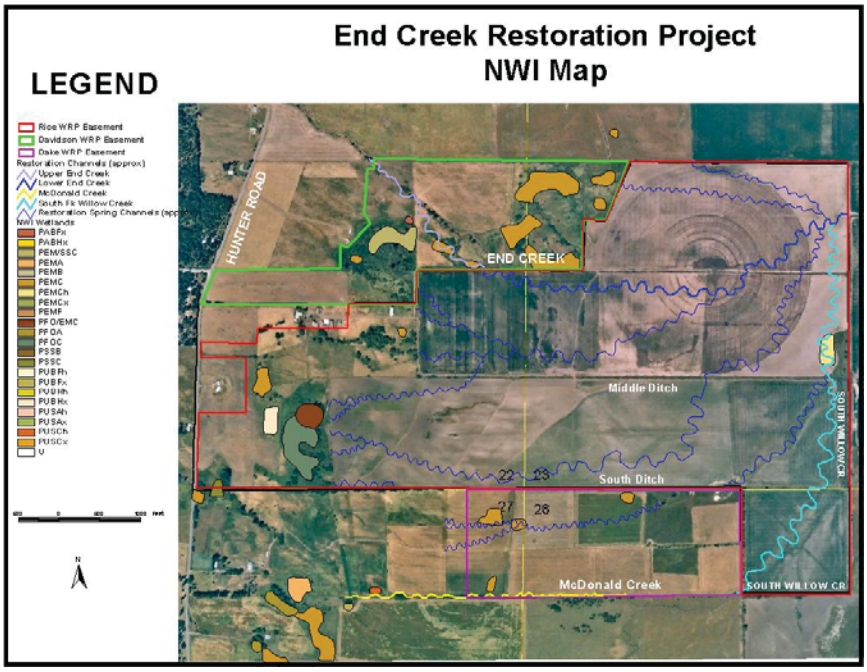
The End Creek watershed drains an area along the eastern foothills of the Blue Mountain Range, at the base of Mt. Emily. The drainage area includes approximately 4.9 square miles with a mean annual precipitation of 24 inches. Approximately 75 percent of the area is forested with 25 percent in agricultural production. End Creek is about 5 miles in length with headwaters originating at an elevation of 6,000 feet and a confluence elevation at the South Fork of Willow Creek of 2,700 feet. Based on USGS quadrangle maps, the forested headwater reaches are located on very steep slopes with an average gradient of 28 percent. The 1.5 mile middle transitional reach, consisting of a mixture of forest and agriculture use, has moderately steep terrain with an average 5.5 percent slope. The lower 1.5 miles, downstream of Hunter Road, are located along a relatively flat depositional and floodplain area with agricultural production being the primary activity. The reach averages 1.6 percent slope.

Figure 1 End Creek Project Vicinity



Existing Resource Conditions

Private lands in the project area have a long history of agricultural cultivation, channelization/ditching, and wetland conversion. Historic land use practices have altered the hydrologic cycle, including the storage, movement, and character of water resources throughout the Subbasin (NPCC, 2001). Changes in the hydrologic cycle are demonstrated by excessive runoff, altered peak flow regimes, lack of ground water recharge, reduction in soil moisture, reduced storage capacity, and low late-season flow. Historic and current land use, in combination with hydrologic changes, have resulted in stream channel instability (channel incision, increased width:depth ratios, vertical cut banks, sedimentation, and loss of hydrophytic vegetation). Improperly managed land uses act to destabilize natural hydrologic processes and amplify the impacts of natural events such as floods. In an effort to enhance drainage for agricultural production, End Creek, South Fork Willow, McDonald Creek and several spring-fed tributaries were channelized in the early 1900's, resulting in a series of linear ditches currently lacking instream habitat complexity, riparian/wetland vegetation, and extensive vertical, eroding stream banks. Anthropogenic practices were extensively successful in draining wetlands and lowering local water tables, which allowed farming on much of the project area. In the existing condition, approximately 90 acres of the Dake property are annually tilled and planted to various crops. The balance of the project area is in . The balance of the project area is in pasture and Idaho fescue seed production



National Wetland Inventory Map of End Creek Restoration Project Complex illustrating lack of emergent and shrub-scrub wetlands.

The Willow Creek Watershed, including End Creek, South Fork Willow, and McDonald Creek are known to provide habitat for Federally listed Snake River summer steelhead. Willow Creek may provide rearing habitat for spring Chinook salmon and may have historically provided spawning habitat. End Creek was identified in the Willow Creek Coordinated Resource Management Plan (CRMP) (Union SWCD, 2002) and in the Union County Soil and Water Conservation District's water quality monitoring program as a high contributor of sediment to Willow Creek due to aggressive headcuts and streambank erosion.

3. PROJECT GOALS AND OBJECTIVES

The primary goal of the project is to restore riparian, floodplain, and wetland habitat, promote natural, stable stream channels and accompanying instream habitat diversity, and improve water quality for anadromous and resident salmonids. The project includes protecting habitat through conservation easement under the Federal Wetland Reserve Program (WRP), restoration of channelized stream reaches, reconnecting floodplains, restoring wetlands and associated native plant communities. Habitat parameters addressed include high summer water temperatures, low summer flows, unstable streambanks and erosion/sedimentation, poor riparian/wetland conditions, and poor instream habitat diversity.

Project objectives include:

- Increase suitable spawning and rearing habitat for anadromous and resident salmonids
- Improve water quality (sediment, nutrient, water temperatures)
- Improve wetland habitats for riparian/wetland dependent species
- Increase groundwater recharge
- Achieve private landowner land management and conservation objectives

Regional Strategies/Objectives

This project is part of a region-wide effort to protect and restore anadromous fish habitat in the Grande Ronde Subbasin. The following reference documents and plans provide guidance for prioritizing habitat and watershed enhancement activities and provide context for the restoration project effort.

--Grande Ronde Subbasin Plan, NPCC. 2004
--Grande Ronde Subbasin Summary, NPCC 2001
--Willow Creek Watershed Assessment (GRMWP 2001)
--Willow Creek Coordinated Resource Management Plan (CRMP) (Union SWCD 2002)
--Grande Ronde River Subbasin- Salmon and Steelhead Production Plan, Columbia Basin System Planning, ODFW, CTUIR, NPT, WDF, WDW. 1990.
--CTUIR - Columbia Basin Salmon Policy, 1995.
--Stream and Riparian Conditions in the Grande Ronde Basin: A Report to the G.R. Model Watershed Board, Huntington, 1993.
--Upper Grande Ronde Subbasin Water Quality Management Plan (ODA 1990)
--Upper Grande Ronde TMDL (ODEQ 2000)
--Grande Ronde Model Watershed Action Plan (GRMWP 1994)

Watershed analysis through the EDT (NPCC, 2004a and Mobrand, 2003) and synthesis through the Management Plan development process, identified instream habitat condition, high water temperature, sediment loads, and flow modification as primary limiting factors for Chinook and steelhead (pg 11 NPCC 2004c, pg 3 NPCC 2004d). Primary habitat degradation includes:

Habitat Limiting Factors

- **Channel Habitat Conditions** – Channel instability associated with removal of streamside cover and channelization has resulted in channel incision/downcutting, increased gradient, reduced channel length, elevated erosion, increased width-to-depth ratios, and loss of channel complexity. The quality of instream habitat has correspondingly been altered throughout much of the Subbasin.
- **Sediment** – Loss of upland and streamside vegetative cover has increased the rates of erosion. Soils lost from upland areas has overwhelmed hydraulic processes resulting in decreased availability of large pool habitat, spawning areas, riffle food production, and hiding cover.

- **Riparian Function** – Riparian habitat degradation is the most serious habitat problem in the subbasin for fish (McIntosh 1994, ICBEMP 2000). Loss of flooplain connectivity by roads, dikes, and channel incision, and in many streams reduced habitat suitability for beaver has altered dynamically stable floodplain environments which has contributed to degradation and limited habitat recovery. This loss leads to secondary effects that are equally harmful and limiting, including increased water temperature, low summer flows, excessive winter runoff, and sedimentation.
- **Low Flow** – Water resources in many streams have been over over-appropriated resulting in limited summer and fall baseflow, development of fish passage barriers, and increased summer water temperatures.

The Willow Creek Watershed Assessment specifically identified lack of shade, large wood deficiencies, channelization, wetland drainage, high stream temperatures, and high nutrient levels as limiting factors in the Willow Creek watershed. Landowners identified a primary concern as lack of streamside vegetation. The Assessment identified the opportunity to restore channelized streams to natural, stable channels. The Willow Creek CRMP, developed by the GRMW, Union County SWCD, and participating landowners identified several goals for the watershed including: 1) make the stream more hospitable to fish (restore streamside vegetation, reestablish desirable cover, increase shade, reduce streambank erosion); and 2) improve fish habitat.

4. PROJECT ACCOMPLISHMENTS & ACTIVITIES

Table 1 illustrates project actions and metrics. Additional discussion follows the table to describe the various work related components involved in the development and implementation of the project.

Table 1 Summary of End Creek-Rice Restoration Project Accomplishments

PROJECT ACTION	PROJECT METRICS
Restoration Channel Construction --McDonald Creek	Planned channel construction on McDonald Creek delayed due to concerns regarding adjacent private lands and desire to develop a more comprehensive approach to channel design that will promote a more dynamically stable, function system.
Spring Channel Construction	6,440 feet 1.23 miles total
Rock Cross Vanes	2 structures (vertical grade control in restoration channel)
Woody Debris Additions	None
Channel/Ditch and Terrace Reclamation	11,500 feet 2.18 miles
Floodplain Ponds/Backwater Habitat	2 ponds (3.43 acres)
Blended Earthen Terraces	None
Revegetation and Planting	No planting completed during 2007 project construction. Shrub/tree and sedge/rush planting planned for spring 2008. Approximately 86 acres of native seed installation completed by landowner during fall 2006 and fall 2007 (1,300 pounds of native seed mix) 18,000 live willow whips purchased from CTUIR native plant nursery for outplanting during spring 2008.
Culvert Removal/Relocation	(1) headgate removed along McDonald Creek.

Figure 2 End Creek Restoration Project Overview (Dake project component highlighted in blue in lower center of map)

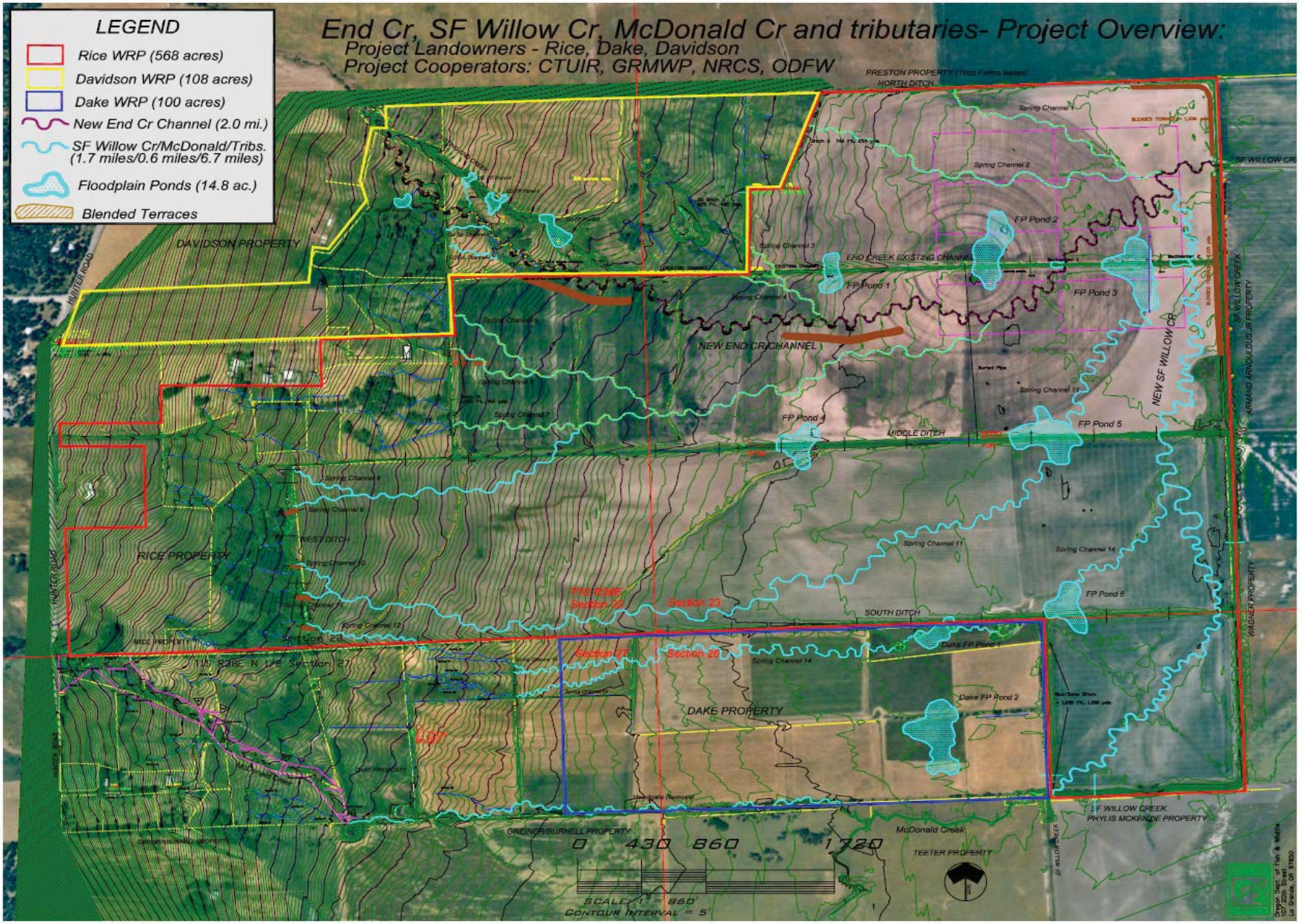
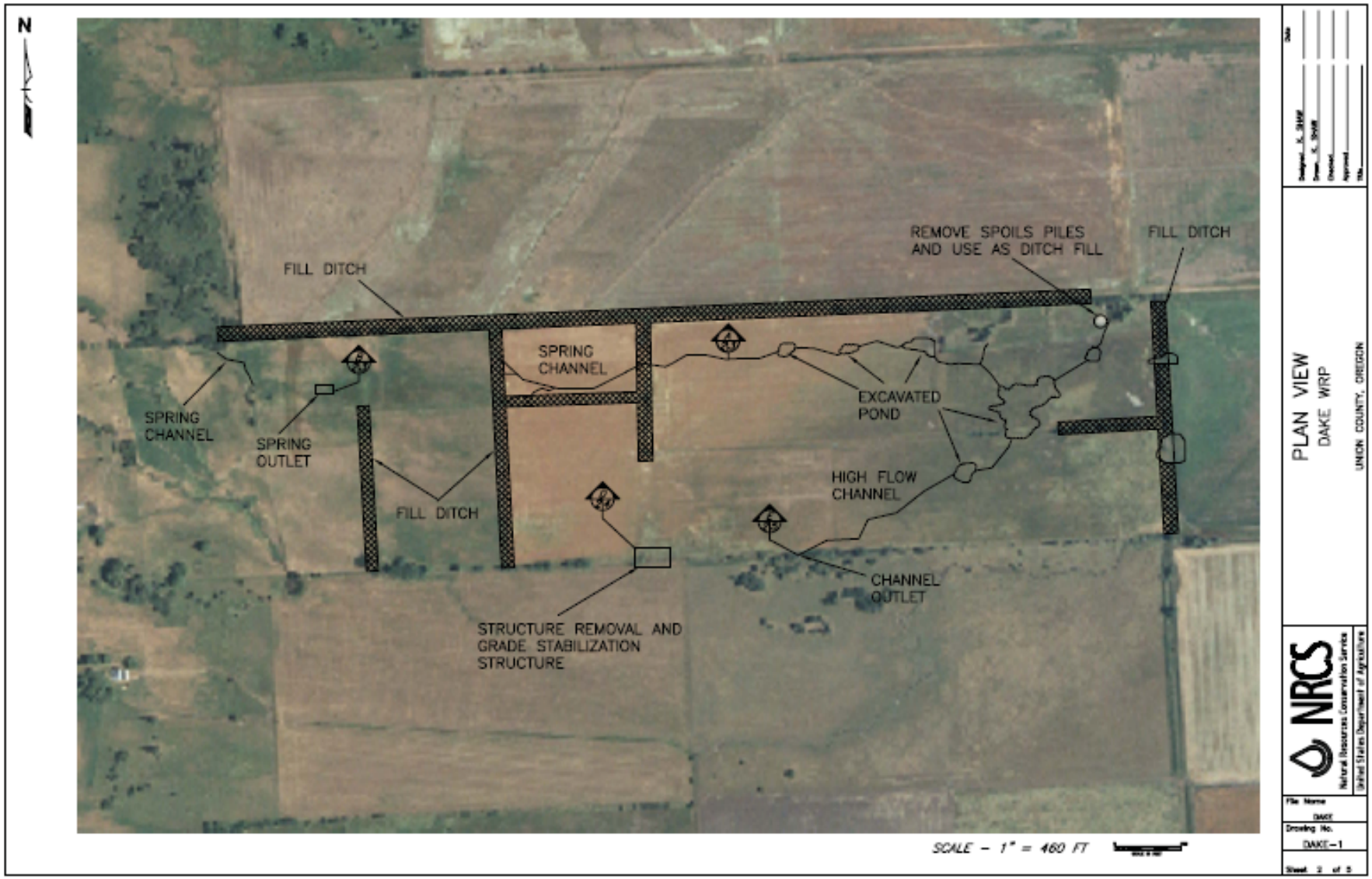


Figure 3 End Creek Restoration Project, Phase 4 Planview



Environmental Compliance/Regulatory Reviews

CTUIR, ODFW, and NRCS staff worked cooperatively to address regulatory compliance requirement and secure necessary permits and clearances to implement the project. Project permitting for the End Creek project complex was largely completed during early 2006. Additional work completed during 2007 included cultural resource surveys, consultation with SHPO, and completion of an Environmental Assessment under NEPA by NRCS.

Construction Subcontracting, Administration/Inspection, Materials, & Project Layout

NRCS and the landowner provided construction subcontracting and inspection for the project. CTUIR provided administration of BPA-GRMW funds for the project.

Restoration Channel Design and Construction

Project planning and design was accomplished over an approximate 2 year period and involved interagency and landowner meetings, coordination with adjacent private landowners, and development of funding proposals. NRCS staff provided a leading role in project design, with ODFW provided topographic survey data and both CTUIR and ODFW provided input into the project design process in cooperation with the landowner.

Construction specifications utilized during project implementation were generally maintained within (+/-) $1/10^{th}$ of an inch whenever possible to ensure stream channel dimension, pattern, and profile was constructed per channel designs. Channel construction inspection was continuous with field staff providing field staking and elevation survey throughout the construction process. Elevation control was provided by elevation benchmarks established throughout the project area using Topcon lazer survey equipment and direct read and/or survey rods.

5. PROJECT PHOTOGRAPHS

Project photos not available from landowner and NRCS as the time of this draft report. Pre-project aerial photographs were taken by CTUIR staff during spring 2007 and will be repeated during 2008.

6. PROJECT EXPENDITURES

Table 2 illustrates the original, planned budget and project metrics. Several adjustments to the project design and schedule were made by project sponsors to address issues associated with adjacent private landowners and the McDonald Creek reach which forms the boundary between the Dake parcel and two adjoining parcels. Table 3 illustrates a budget modification subsequently developed to address project adjustments.

Table 2 End Creek Restoration Project, Phase 4 (Dake Parcel) Budget

End Creek (Dake) Restoration Project Budget FY2007

Phase 4 Summary (Dake)

Work Item	Description	Detail	Bid/Cost Estimate		BPA-GRMW Request	NRCS-WRP Dake	Total
Item 1	Mobilization	Lump Sum	$3,500.00		$0.00	$3,500.00	$3,500.00
Item 2	Construct McDonald Cr	3,359 ft, 5,039 yds	$13,436.00		$13,436.00	$0.00	$13,436.00
Item 3	Cross Vanes	13 structures, 130 yds (10yds/site)	$3,932.00		$3,932.00	$0.00	$3,932.00
Item 4	Large Wood Placement	200 whole trees	$2,500.00		$2,500.00	$0.00	$2,500.00
Item 5	McDonald Cr Reclamation	2,000 ft (partial, 1.8 yds/ft), 3,600 yds	$13,824.00		$0.00	$13,824.00	$13,824.00
Item 6	Floodplain Ponds	2 ponds, 3.43 acres, 5,502 yds	$19,257.00		$0.00	$19,257.00	$19,257.00
Item 7	Spring Channel Construction	3 channels, 7,555 ft, 2,267 yds	$4,755.00		$4,755.00	$0.00	$4,755.00
Item 8	Ditch Reclamation	2 ditches (South & North/South) 6,790 feet, 9,761 yds	$28,795.00		$0.00	$28,795.00	$28,795.00
Item 9	Earthen Terraces	NA	$0.00		$0.00	$0.00	$0.00
Item 10	Contract Planting	200 whole shrub transplants & 10,000 square feet of mechanical sedge/rush matt installation	$16,000.00		$7,753.00	$8,247.00	$16,000.00
Item 11	Head Gate Removal	1	$500.00		$500.00	$0.00	$500.00
Item 12	Ag field conversion (native seeding)	100 acres (fall 2006)	$25,000.00		$0.00	$25,000.00	$25,000.00
		Project Phase Total	**$131,499**		**$32,876.00**	**$98,623.00**	$131,499.00

Table 3 End Creek Restoration Project, Phase 4 (Dake Parcel) Budget (Modified)

August 2007 BPA Contract Modification							Funding Partner			
Work Item	Description	Detail (Revisions highlighted in BlueRed	Bid/Cost Estimate	BPA-GRMW Request	Revised BPA Budget	Difference	NRCS-WRP Dake	Revised NRCS-WRP Dake	Difference	
Item 1	Mobilization	Lump Sum	$3,500.00	$0.00	$1,500.00	$1,500.00	$3,500.00	$1,500.00	-$2,000.00	
Item 2	Construct McDonald Cr	3,359 ft, 5,039 yds	$13,436.00	$13,436.00	$0.00	-$13,436.00	$0.00			McDonald Cr reconstruction delayed due to adjacent landowner issues
Item 3	Cross Vanes	13 structures, 130 yds (10yds/site) (1 Structure)	$3,932.00	$3,932.00	$3,500.00	-$432.00	$0.00			Single structure and stabilization planned at headgate removal site
Item 4	Large Wood Placement	200 whole trees	$2,500.00	$2,500.00	$0.00	-$2,500.00	$0.00			Task delayed due to notes above for McDonald Cr
Item 5	McDonald Cr Reclamation	2,000 ft (partial, 1.8 yds/ft), 3,600 yds	$13,824.00	$0.00			$13,824.00	$0.00	-$13,824.00	See above notes
Item 6	Floodplain Ponds	2 ponds, 3.43 acres, 5,502 yds (1,200 yards)	$19,257.00	$0.00	$2,976.00	$2,976.00	$19,257.00	$11,424.00	-$7,833.00	
Item 7	Spring Channel Construction	3 channels, 7,555 ft, 2,267 yds(900 yds)	$4,755.00	$4,755.00	$5,400.00	$645.00	$0.00	$5,400.00	$5,400.00	
Item 8	Ditch Reclamation	2 ditches (South & North/South) 6,790 feet, 9,761 yds	$28,795.00	$0.00	$8,400.00	$8,400.00	$28,795.00	$8,400.00	-$20,395.00	
Item 9	Earthen Terraces	NA	$0.00	$0.00			$0.00			
Item 10	Contract Planting	200 whole shrub transplants & 10,000 square feet of mechanical sedge/rush matt installation (Purchase 18,000 willow cuttings from CTUIR Native Plant Nursery)	$16,000.00	$7,753.00	$4,000.00	-$3,753.00	$8,247.00	$0.00	-$8,247.00	Task modified to incorporate willow materials purchase planned for installation during spring 08
Item 11	Head Gate Removal	1	$500.00	$500.00	$600.00	$100.00	$0.00	$600.00	$600.00	
Item 12	Ag field conversion (native seeding)	100 acres (fall 2006) (Purchase 1,300 pounds of native seed mix)	$25,000.00	$0.00	$6,500.00	$6,500.00	$25,000.00	$6,500.00	-$18,500.00	Seed purchase
		Project Phase Total	**$131,499.00**	**$32,876.00**	**$32,876.00**	**$0.00**	**$98,623.00**	**$33,824.00**	**-$64,799.00**	Note that NRCS will keep project funds in reserve for additional restoration work associated with McDonald Creek.

7. REFERENCES

Grande Ronde Model Watershed. 2001. Willow Creek Watershed Assessment

Meehan, William R., Editor, 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats, American Fisheries Society Special Publication 19, Bethesda, Maryland, 1991.

McGowan, Vance. 2005. End Creek Restoration Project Design Report. Oregon Department of Fish and Wildlife, Northeast Oregon Regional Office.

Nehlsen, W., J. E. Williams, and J. A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries Bulletin, American Fisheries Society, Bethesda, Maryland.

Northwest Power and Conservation Council. 2004. Grande Ronde Subbasin Plan.

Northwest Power and Conservation Council. 2001. Grande Ronde Subbasin Summary.

Oregon Department of Agriculture. 1990. Upper Grande Ronde Subbasin Water Quality Management.

Oregon Department of Environmental Quality. 2000. Upper Grande Ronde TMDL.

Oregon Department of Fish and Wildlife and National Marine Fisheries Service. 1990. Past and present abundance of Snake River sockeye, Snake River chinook, and lower Columbia River coho salmon. A report prepared for Senator Mark Hatfield, U. S. Senate.

Oregon Department of Fish and Wildlife and four other agencies. 1990. Grande Ronde River Subbasin, salmon and steelhead production plan. Northwest Power Planning Council, Portland, Oregon.

Oregon Department of Fish and Wildlife. 1991. Summaries of fish sampling during 1990, aquatic inventories project. Oregon Department of Fish and Wildlife, Portland, Oregon.

Rosgen, D., 1996 Applied river morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Rosgen, D.L. 1998. The reference reach – a blueprint for natural channel design. Presented at the ASCE, Denver, CO.

Union County Soil and Water Conservation District. 2002. Willow Creek Coordinated Resource Management Plan.

Appendix A – NRCS Project Design Report

UNITED STATES DEPARTMENT OF AGRICULTURE

NRCS Natural Resources Conservation Service

Design Report

Landowner/Operator:	Dake WRP				
Job Location:	6 miles North of Island City, OR east of Hunter Road				
County:	Union	SWCD:	Union	Farm/Tract No.:	
Referral No.:	WRP	Prepared by:	K. Shaw	Date:	July 07

(1) Summary:

The WRP project consists of removing an irrigation structure from McDonald Creek that is impeding fish passage. Once the structure is removed a roughened chute grade stabilization structure will be placed in the area to stabilize the 1.8 ft drop left by the metal structure removal. Downstream a grade stabilization structure will be placed below a high flow outlet from McDonald Creek. The outlet will have the invert placed at 1/3 of the bank height to take high flows out of the system and reduce downstream erosion in McDonald Creek. 11,420 ft of ditch will be filled to recreate the natural hydrology in the WRP. 3,780 ft of spring channel will be created or connected in a uniform flow down to the east end of the project. Small open water ponds will be placed in the spring channels. Maximum pond depth will be 3 ft. A large excavated pond will manifold the spring channel flows and the high flow channel from McDonald Creek.

All necessary permits have been obtained and cultural resources properly addressed as indicated by the following initials of the Project Leader. AB

(2) Description of the job:

The spring channel restoration will use existing topography and channels present onsite. Minimal excavation will be required to connect these existing channels and swales to flow water to the east end of the project site. The fill for the ditch removal will come from the excavated ponds. The ponds are placed periodically to offer diverse habitat in the WRP. One of the landowner's main goals is to turn the eastern section of the WRP into a healthy camas meadow. The increased hydrology and the reconnection of the spring outflows across the surface will help meet this goal. It is anticipated that the eastern end of the WRP will be underwater or have sheet water across it's entirety during a normal spring runoff. The design will not alter the runoff characteristics that would impact neighboring landowners. To the north and east the properties are also in the WRP program. To the south is McDonald Creek which will cutoff surface flows to the south.

Flows in the spring channels are anticipated to be from 60 gpm in the spring to 10 gpm later in the season. The channels are sized to keep the water near the surface to benefit as much habitat as possible.

The southern boundary of the WRP abuts McDonald creek. Due to the creek being on the property line and a CREP easement on much of the neighboring property no restoration will be

done to the channel. The WRP will be planted heavily along this area to promote brush and trees establishment in the area.

Job Class III

Practice Standard	Limiting Factor	Job Class
412	Flow Capacity = 6 cfs	II
410	Flow Capacity = 51 cfs Net Drop = 1.8ft	III
378	Hazard = a Effective Height = excavated Storage = >3ac/ft Drainage area = >1 sq mile	I

(3) Design objectives:

Two principal design objectives are:

1. Improve the natural hydrology for the WRP 30 year easement.
2. Improve wildlife habitat.

(4) Basis for design:

- NRCS FOTG Section IV Practice Standards
  - 412 – Grassed Waterway
  - 410 – Grade Stabilization Structure
  - 378 – Pond (excavated)
- Agriculture Handbook Number 590
- EFM Chapters 3, 4, 5, 11
- EFH-2 Hydrology
- NRCS Soil Survey of Union County Area, Oregon
- Rip Rap sizing spreadsheet developed by S. Durgin

(5) General basic data:

A survey of the WRP easement was conducted, and the data is contained in the Appendix.

(6) Location and layout:

The project is located approximately 6 miles south of Island City, Oregon in Section 26, 27, T1S, R38E. The location is noted on Sheet 1.

(7) Hydrology:

The peak discharge for the drainage area of the pond was determined using EFH-2, Chapter 2 (worksheet in the Appendix). Estimated runoff events for 5- 10- and 25-year storms are shown in the following table.

Frequency (year) =	**5**	**10**	**25**
Peak Q (cfs) =	**18**	**25**	**33**

(8) Hydraulic design:

Roughened chute:

The Roughened chute was designed using WINXSPro for at-a-station hydraulic computations. Flows were determined from the above hydrology computations. The structure will not change the channel size or orientation. The main reasoning for the drop structure is to remove the 1.8 ft vertical drop that will be present once a metal irrigation diversion is removed for fish passage in McDonald Creek. The roughened chute will have 24" boulders placed in the flow path to break up sheet flow and create resting areas and habitat for aquatic species. The banks will need to be protected due to the inlet layout of McDonald creek. An oxbow was created by the straightening of the reach in previous times. If the banks are left unprotected high flow events could weaken the area and allow channel migration.

Spring and Overflow channels:

Hydraulic design data for all channel sections are shown in the NRCS hydraulic Computation outputs included in the Appendix. Locations of all channel sections are referenced in Sheet 2. Minimal excavation will be necessary to build the new channels. The spring channels are designed at 0.4 ft deep with a 1 ft top width to match existing channels naturally present onsite. The high flow channel from McDonald Creek is designed with a 2 ft bottom width and a 4 foot top width with a flow depth of 1 foot. The area will most likely be flooded during runoff events that will activate this channel.

Pond:

Excavated ponds will be placed on the flood plane to capture and retain the surface water from the site. The ponds will also supply the needed material to fill the existing ditch system that was built to drain and cutoff surface flow thus making the area farmable by a previous landowner. The maximum depth of the ponds will be 3 ft. The ponds will have no structures to control flows.

(9) Foundations and/or embankment design: N/A

(10) Structural design: N/A

(11) Environmental considerations:

The WRP restoration design is a minimalist approach to use the naturally occurring topography and channels present to recreate historic hydrology on the site. A specification for Pollution Control is also included in the construction package.

(12) Construction drawings:

Contained in the Construction Drawings and Specifications package.

(13) Specifications:

Contained in the Construction Drawings and Specifications package.

(17) Operation and maintenance:

O&M Plan is included in the Construction Drawings and Specifications package.

(18) Construction review:

Inspection Plans are included in the Construction Drawings and Specifications package.

(19) Authority:

Authorizing signatures are on the Cover Sheets of the Design Report Cover Sheet, and the Construction Drawings and Specifications package.