Catherine Creek - 37 Stream and Fish Habitat Restoration
Completion Report

Bonneville Power Administration Project Number 1992-026-01
Contract # 58036
Contract Period July 16, 2012 – February, 2013

Completed by: Craig Schellsmidt, Kate Frenyea - Union Soil and Water Conservation District
March 2013

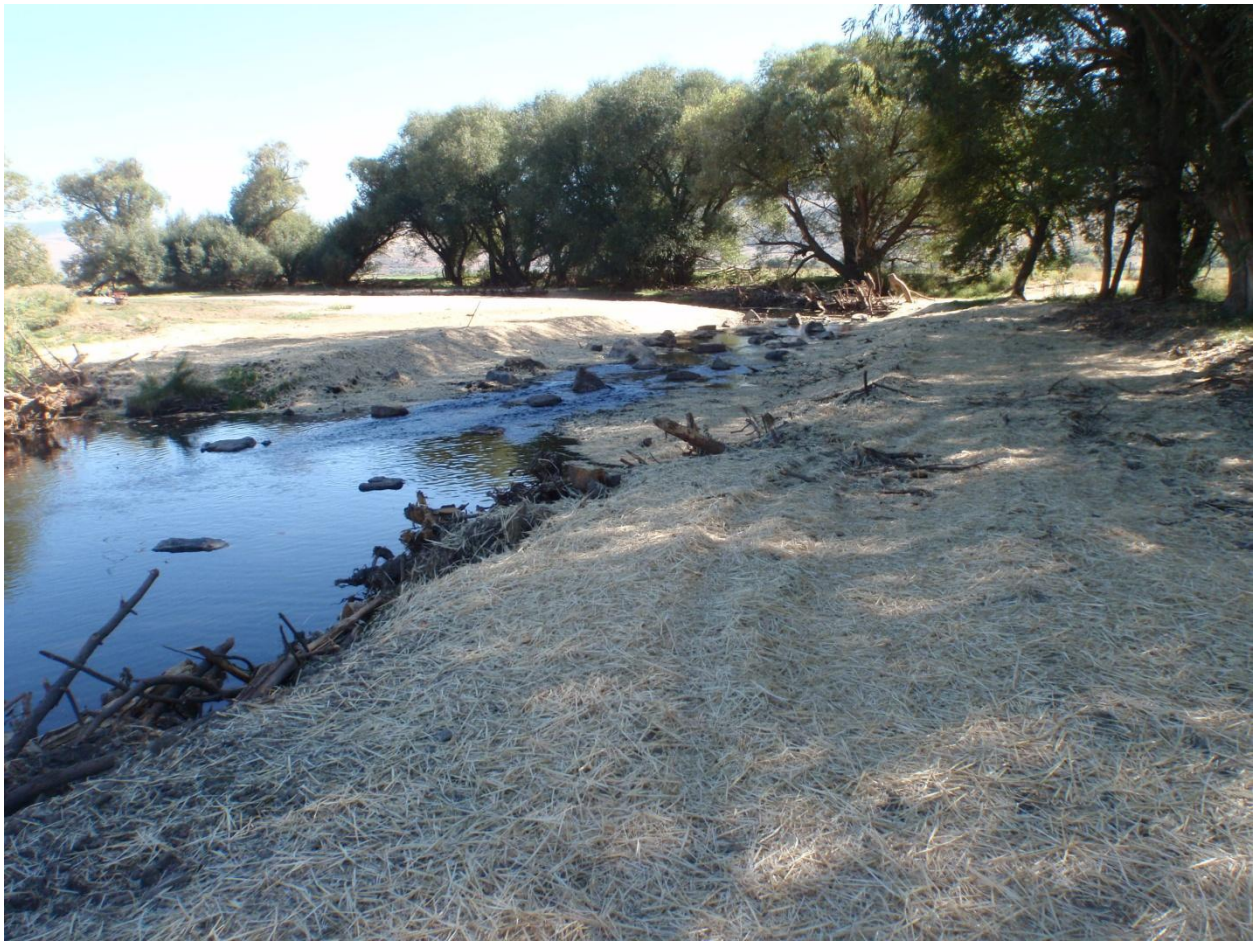

Photo 1: Completed Boulder, Large Wood Structure, Racking Materials, Sedge Mat Placement, Excavated Floodplain and Activated Old Meander Channel to become Main Stream Channel again, Preserve Old Meander Channel Existing Mature Trees, Re-seeded, Mulched, and Replanted with Willow Whips, Container Plants, and Protected with Panel Pods all Disturbed Riparian Areas.

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Introduction

This project is located on a private ranch 1.7 miles west of Union, Oregon on Catherine Creek in the Upper Grande Ronde River Basin. Catherine Creek is a major tributary to the Grande Ronde River and the project is 37 miles upstream from the confluence. The project encompasses approximately 30 acres and both banks of 0.75 miles mainstem Catherine Creek and associated wetlands. Historically, the Grande Ronde River and Catherine Creek have been channelized for flood control and subjected to poor agricultural practices. Straightened channels, livestock overgrazing, and crop/pasture encroachment has minimalized or eliminated riparian vegetative buffers between farm land and the streams. This has caused severe erosion and bank instability issues leading to decreased water quality and loss of stream complexity and fish habitat. This increase in stream sediment load and riparian vegetation loss results in high stream temperatures and is the major TMDL factor in Catherine Creek.

Catherine Creek restoration is highly important as the Creek plays an important role in the Upper Grande Ronde River Basin with the recovery of Snake River Spring/Summer Chinook Salmon, Steelhead, and Columbia River Bull Trout. Each is listed as threatened species under the Endangered Species Act (ESA). Grande Ronde River Basin ESA survival numbers are among the lowest of any groups in the Columbia Basin. Historically, Spring Chinook spawned, reared, and migrated within this Catherine Creek project's area. The National Marine Fisheries Service has listed the lack of physical habitat and stream complexity, high water temperatures, poor riparian conditions, and fine sediment inputs as the main threats to the Spring Chinook Salmon and Steelhead populations. Bull trout are also located in Catherine Creek and face the same issues. During the winters 2009 through 2013, the Upper Grande Ronde/Catherine Creek Tributary Assessment Plan "Overwintering" fish tracking study was conducted by BOR/ODFW on Chinook Salmon smolts in the Upper Grande Ronde/Catherine Creek. Over 200 radio tagged smolts were tracked. The Study's research confirms this project site is within a high priority area for critical juvenile Chinook Salmon wintering habitat, previously thought to function mainly as a migration corridor. A significant number of smolts and juveniles are present in this stretch of Catherine Creek. As part of the Assessment Plan study, ODFW conducted physical habitat surveys on the Creek and listed the project's area as extremely limited for Salmonid spawning and rearing habitat. The ODFW habitat surveys as well as this project's technical design team indicate the current level of channel complexity and habitat quality are particularly low in this reach with high intrinsic potential and substantial use by juvenile Salmonids.

The concerned landowner/lessee contacted the District about the severe erosion, bank instability, and high water event flooding issues. Multiple site visits with the District and BOR, CTUIR, NMFS, ODFW, and USFW further identified the loss of stream complexity, wetland functions, and fish habitat issues. The project partners in consultations with the landowner/lessee determined this should be a priority project.

Accordingly, this project addressed many of the recommended restoration activities of the OWEB Basin Priorities, Upper Grande Ronde River Subbasin Agricultural Water Quality Management Area Plan, ODEQ Upper Grande Ronde TMDLs, NWPCC Grande Ronde Subbasin Plan, FCRPS BiOp, and the Northeast Oregon Snake River Recovery Plan.

Research based on the Assessment Plan study found this project's reach in poor to fair condition. Stream segments exhibit a lack of deep pools, little complex cover, channel incision, and poor riparian vegetation communities with some large trees and little overhanging vegetation. Prior channelization has removed the meander bends and point bars that are essential to create and maintain deep pools. Current pool locations are adjacent to existing car bodies and other informal riprap, under a private bridge, and near a few willow trees with localized scour. The localized scour is generally a result of sediment deposition in mid-channel bars and, to a lesser extent, initial starts of point bars forming as the creek slowly evolves

back to a more meandering stream form. Sediment storage in the channel is causing localized bank erosion, channel over-widening, and the channel is becoming shallower which further exacerbates many of the problems already present in the area. Existing head cuts have migrated upstream to the project area and incised the channel 3 feet, furthering hydrologic disconnection to the floodplain. Stream bank erosion is prominent along many portions of the creek which have nearly vertical, actively eroding stream banks that contribute excessive sediment to Catherine Creek.

Since the fall of 2010, both sides of the project riparian area was temporarily fenced, approximately 17.7 acres enclosed, to exclude livestock and rest the project area until construction was completed. Construction of approximately 0.75 miles of permanent conservation easement boundary, consisting of 4 strand barbed wire exclosure fence was funded and installed under the CTUIR/BPA easement program. This allows the project protection and the opportunity to mature under the 15 year conservation easement.

Limiting Factors

The project area is located at River mile 37 within Reach UGS10A (Summer Steelhead) and Reach CCC3 (Spring-Summer Chinook) (Northeast Oregon Snake River Recovery Plan, Draft (NOAA, March 2012) and BiOp Expert Panel Draft Reach Delineations (BPA/BOR, April 2012). Geographically, these reaches encompass Middle Catherine Creek from the confluence of Pyles Creek upstream to the North and South Forks of Catherine Creek. The Project Area is also located within Reach 3 of the Bureau of Reclamation Tributary Assessment (BOR, February 2012) and has been identified as one of the highest priority reaches for restoration actions.

Primary habitat limiting factors identified within the project area have been developed through literature review, field visits by basin biologists, and field investigations and reference of the NOAA Fisheries NE Oregon Snake River Recovery Plan and BiOp Expert Panel Process commissioned by BOR and BPA. Key habitat limiting factors, discussed in more detail in Section 8, include:

CCC3 and UGS10A - Middle Catherine Creek (Pyles Cr. To North and South Forks of Catherine Creek)
4.1: Riparian Condition: Degraded riparian conditions
4.2: Riparian Condition: Large wood Recruitment
5.1: Peripheral and Transitional Habitats: Side channel and wetland conditions
5.2: Peripheral and Transitional Habitats: Floodplain condition
6.1: Channel Structure and Form: Bed and channel form
6.2: Channel Structure and Form: In-stream structural complexity, lack of habitat quantity/diversity (low abundance of pool habitat, and channel complexity)
7.2: Sediment Conditions: Increased sediment quantity/excess fine sediment
8.1: Water Quality: Temperature, elevated summer stream temperatures, low DO levels
9.2: Water Quantity: decreased water quantity, lower summer flows

Goals and Objectives

Project Goal Statement

The overall project goal was to restore fish habitat within the natural character and function of Catherine Creek while protecting and maintaining the utility and economic viability of a working ranch. The project goal addressed the critical habitat limiting factors in Catherine Creek, a spawning and rearing tributary for Spring-Summer Chinook Salmon and Summer Steelhead in the Upper Grande Ronde River Basin.

Project Specific Objectives

- **Protect Habitat:** Develop a riparian conservation easement along both sides of 0.75 mile of Catherine Creek. The conservation strategy includes either a BPA Riparian Conservation Easement and or a FSA CREP Easement. This would be a separate contract agreement implemented immediately after construction. Stream banks within the project area are currently fenced with temporary electric fence and livestock are excluded from grazing the riparian area.

- **Enhance Floodplain Connectivity and In-stream Structural Diversity and Complexity:** Re-activate historic channel meanders to facilitate a dynamic stable stream channel with accompanying habitat types (riffle, run, pool, and glide), habitat diversity, and complexity.

- **Enhance Riparian Habitat Condition:** In conjunction with stream channel restoration and protection efforts, (exclosure fencing and removal of livestock from riparian corridor), increase riparian plant communities through planting, seeding, and natural recruitment.

Implemented Actions

After several design review meetings involving project partners and permit/fish agency staff the final project design was completed by ICF International (ICF) via a Bureau of Reclamation IDIQ contract. USWCD, Reclamation, ICF, CTUIR, and ODFW provided project management and review/inspection with ICF providing final engineering approval. NEPA compliance, cultural resources, and wetland delineation was completed through ICF via a Reclamation IDIQ contract. All permits with no apparent serious issues were obtained prior to construction contractor solicitation. USWCD conducted a public contractor bid solicitation, review, and approval process according to USWCD policy. Funding was secured for project administration/management and construction though the Bonneville Power Administration.

Partney Construction, Inc. (PCI) was awarded the construction contract and began construction July 16th, 2012. All in-stream construction was conducted during the in-stream work window for this Catherine Creek section of July 1 – August 15. Construction proceeded ahead of schedule and at a rapid pace. PCI completed all tasks by August 31st, 2012, 45 days ahead of schedule. In October 2012, CTUIR/BPA secured a 15 year habitat easement through the project area, and a 4 strand barbed wire riparian fence was constructed around the project area. As of December, 2012 all of the final design construction, plantings, reseedings, and protective pods have been completed.

All project work was "as built" following the ICF final design specifications. Seven additional large wood structures were installed and extra racking materials were placed at select large wood structures to better reinforce and stabilize the stream banks. As much pre-construction Catherine Creek riparian vegetation as possible was preserved and maintained at the project site. The existing trash, rock, wood, and other debris such as concrete and car bodies collected over time were removed off site to an appropriate upland location. Sections of original livestock exclosure fencing was removed during construction and reinstalled after construction on both Creek sides as well as protecting the water gap/hardened crossing with permanent easement fencing. Eco-block and silt screen fabric barriers were installed upstream and downstream of in-stream construction areas to trap soil sediment and debris from entering the stream during construction. These barriers were installed to dewater sites and maintain fish passage throughout construction.

ODFW and other partnership agency staff conducted 3 separate fish salvages within the barriers prior to any in-stream construction. The fish salvage effort consisted of trained ODFW staff operating a shocker and partnership agency staff netting and transporting captured fish to an upstream clear and continuous

flowing release site. A total of 1,284 Chinook and 231 O. mykiss were salvaged and released in Catherine Creek well above the construction sites.

Protect Habitat:

- Developed a 15 year riparian conservation easement along both sides of 0.75 mile of Catherine Creek.
- Constructed 1.4 miles of 4-strand barbed wire fence to exclude cattle grazing, protecting 21 acres of riparian, stream, and wetlands.
- Installed 38 protective pods using wire ranch panels to protect planted trees and shrubs from deer and elk browse.

Enhance In-Stream Structural Diversity and Complexity:

- The hydro modified channel was realigned, lengthening the channel segment from an existing 2,450 feet to approximately 3,000 feet.
- Channel sinuosity within the project reach increased from 1.20 to ~1.38 (measured historical sinuosity in this reach prior to hydro modification was 1.90).
- Average width/depth ratio decreased from an existing average of 22.6` to 18.6`.
- Existing incised and near-vertical stream banks were pulled back from a slope of 1.5:1 to 3:1 (horizontal/vertical) to decrease soil erosion, increase pool scour and depth potential, and support re-vegetation.
- Over 100 linear feet (125 cubic yards) of informal bank armoring composed of metal scrap and concrete debris was removed and replaced by the habitat enhancing structures.
- Three existing pools were enhanced and five new pools were created by channel reconfiguration and stabilization with LWD habitat structures.
- Distinct riffle, glide and pool habitat segments were created through channel reconfiguration, selective LWD and boulder placement, and substrate augmentation.

Enhance Floodplain Connectivity:

- A total of 81 engineered LWD structures, including 64 Type I, 11 Type II, and 6 Type III were installed at specific locations throughout the project Reach to maintain the desired channel configuration and increase habitat complexity. LWD components included:
- 81 logs, 18 in. minimum diameter by 20 ft. length with root wads intact.
- 25 logs, 15 in. minimum diameter by 20 ft. length with root wads intact.
- 69 logs, 18 in. minimum diameter by 15 ft. length, no root wads.
- 5 logs, 12 in. minimum diameter by 20 ft. length no root wads.
- 5 logs, 18 in. minimum diameter by 20 ft. length no root wads.
- Woody debris of various diameters and lengths was placed as racking material. Primarily coniferous logs of varying size and composition were integrated into each set of structures to increase habitat complexity.
- A new 399 foot (0.36-acre) side channel was constructed. This channel will activate during typical spring flows. The channel incorporated a buried rock sill at the inlet to prevent possible head cutting and capture by the main channel.
- 250 1-4-foot diameter boulders were placed within the existing and constructed channel segments to create additional stream complexity.
- Approximately 130 feet (0.14 acre) of abandoned channel was converted into low-water alcove habitat. Eight coniferous trees with intact branches and root wads were placed in the alcove to increase habitat complexity.

- Approximately 730 feet (1.07 acre) of abandoned channel was converted into high flow floodplain.

Enhance Riparian Habitat Condition:

- Channel realignment reconnected remnant riparian vegetation adjacent to historical channel segments.
- Site-appropriate native grasses (approximately 600 lbs.) including locally derived Great basin wild rye, blue-bunch wheatgrass, Idaho fescue, and tufted hair grass were planted on 16 acres of stream banks, upland terraces, and adjacent riparian habitat.
- De-compaction and re-vegetation of 2.0 acres of staging sites and access corridors.
- Construction of a single permanent livestock watering access point at the upper end of the Project at the temporary vehicle crossing.
- Installment of 1.52 miles of riparian conservation easement boundary 4-strand barbed wire riparian fences, protecting 21 acres of riparian, stream, and wetland habitat.
- Approximately 6200 willow whips and 1350 containerized plants (Black Cottonwood, River Birch, Hawthorne, Currant, and Dogwood) were planted on floodplain terraces, point bars, and within log structures to provide stability, natural recruitment, and protection from high flow events.
- All disturbed areas away for the stream banks were seeded with a pasture mix (11.5ac) and riparian areas (4.5ac) seeded with a riparian native species mix. Straw mulch (31.5 ton on 16ac) was placed after completion on all construction, seeding, and plantings. 6300sf of sod/rush mattes and 3,150sy of erosion control blankets were placed.
- 38 protective pods were constructed using wire ranch panels to protect plants from deer and elk browse.

Improve Water Quality:

- Decrease summer water temperatures modifying channel width to depth ratio from 22.6` to about 18.6`.
- Increase shade by developing a healthy riparian plant community, and increase water table by improving groundwater interaction.

Benefits

The project potentially benefits overall watershed health by establishing and increasing fish habitat, water quality, stream and floodplain complexity, and riparian vegetarian which reduces the Catherine Creek limiting factors. The project site is within historic ESA listed Salmonid spawning, rearing, and over-wintering habitat. ODFW fish monitoring and BOR Tributary Assessment studies indicate serious lack of stream complexity and fish habitat particularly in lower Catherine Creek between Union, Oregon and Pyles Creek where this project is located. Project benefits address these issues by developing an enhanced, more stable and diverse reach of Catherine Creek with higher ecosystem value especially with respect to anadromous Salmonids. The project area will further sustain Steelhead, Chinook, and Bull trout as well as other species. All will benefit from the proposed improvements to in-stream and off-channel habitats increasing the rearing capacity for these species. In addition, the project area will be protected under a 15 year conservation easement.

Specific project benefits include:

- Modifying channel width to depth ratio from 22.6` to about 18.6`.

- Bank reshaping has improved edge-water habitat and will increase fish refuge habitat during high flow events.
- Floodplain habitat area and connectivity was increased by excavating 4.86 acres of inset floodplain along incised portions of the project reach enhancing a larger floodplain, and increasing flood stage capacity as well as flood control.
- Restoration of sinuosity and complexity with a more natural meander wavelength at bank full channel widths will sustain helical flow in bends and thereby develop deeper pools.
- Channel realignment reconnected remnant riparian vegetation adjacent to historical channel segments.
- New scour pools, runs, and riffles of various sizes and complexity were created, and channel length increased from a pre-project length of 2,450 feet to approximately 3000 feet.
- Bioengineered LWD structures will maintain the new desired channel configuration and increase stream and habitat complexity.
- Increased potential for storage of sediment at controlled locations.
- A reconnected historic oxbow and built side channels created back water habitat.
- Re-vegetation of native Willow, Cottonwood, River Birch, Alder, shrubs, and grass plantings will increase potential future LWD recruitment. The additional vegetation adds stability to stream banks and decreases erosion into stream.
- Plantings and enclosure riparian fencing will increase wildlife habitat created within the project area.
- A 15 year conservation easement will protect the project and allow it to mature.

Monitoring Plan

Monitoring Plan: The following monitoring plan has been developed to evaluate project objectives. Periodic visits to photo points and surveys will be conducted of monumented cross-sections to monitor stream restoration and channel processes.

a) Protect Habitat: 7 photo points were established in 2012 to provide pre and post-implementation qualitative data on vegetation and channel conditions. These photo points were repeated immediately post implementation, and will be repeated semi-annually, until the riparian easement lease has expired. Hobo pendant loggers are deployed April to November to record temperature data at 1-hour intervals at upstream and downstream project boundaries.

b) Enhance In-Stream Structural Diversity and Complexity: An assessment of existing channel morphology has been completed and provided a baseline to monitor channels and cross sections over time. In addition, ODFW through BOR conducted a modified Hankins/Reeves survey during the summer 2010. This provides an excellent baseline to evaluate habitat development over time. Stream channel profile, cross sections, and habitat surveys will be repeated in subsequent years post implementation to monitor changes in channel morphology and habitat complexity.

c) Enhance Floodplain Connectivity: This objective will be monitored with the establishment of photo points or direct inspection during or after flooding.

d) Enhance Riparian Habitat Condition: Planting efforts will be monitored through stocking surveys. Photo points will be repeated annually to document vegetation changes. In addition, planting efforts implemented under the easement program will be monitored through stocking surveys.

e) Improve Water Quality: In addition to the monitoring efforts listed above, water quality (temperature) will be recorded for the duration of the riparian easement lease. Temperature data will be used in an EPT (extensive post treatment) monitoring design. It is anticipated the analysis of these data will consist of summary statistics for each year/probe location. Additional tests for differences in mean maximum weekly water temperatures between probe locations and years will be conducted. Differences between years in the number of hours when water temperature reaches lethal limits (>=25°C) or reaches limits likely to affect Salmonid growth (>=20°C) could be tested for using a generalized linear model.

Project Maintenance

USWCD, CTUIR, ODFW staff, and the landowner will maintain the project. Extensive maintenance of in-stream habitat enhancement structures and exclosure easement fencing is not anticipated. Maintenance associated with the conservation easement includes annual fence inspection, repair and maintenance of planted materials consisting of managing competing vegetation, and protection devices to minimize depredation and increase plant survival rates.

Weed Management Plan

Weed management has periodically been attempted within the project area. The landowner/lessee agrees weed control is their responsibility and in their best interests to control weeds on the property. However, with limited weed control knowledge and resources weed eradication success has been inadequate. Several invasive species such as Burdock, Reed Canary grass, and various thistle species including Bull, Scotch, and Yellow Star are present. Prior to beginning construction, ODFW mowed the site which didn't eradicate weeds but attempted to prevent seed production and spread in 2012 during construction.
To facilitate weed control, BOR has agreed to provide funding to the District to contract a weed management company for biannual weed control for a three year period. This insures a weed management plan will be implemented after construction and through the first three years after the project area was entered into a protective easement program. After easement enrollment, the landowner/lessee agrees weed control is a priority and will work with the District and contractor to use appropriate herbicide, application, and management methods to control weeds within the project easement area, especially for those listed above.

The landowner/lessee has agreed to continue weed control through chemical and mechanical methods on their property adjacent to the easement area. The lessee has an 8' sweep applicator mounted to an ATV to be used to apply herbicides. The lessee also has several other applicators including a wand backpack for spot applications. Importance will be placed on controlling the Reed Canary grass with time appropriate spot applications. Only time appropriate approved riparian area chemicals will be permitted.

In addition to the planting's plan defined in the final design, the project's excavated spoils distributed in the designated upland pastures were reseeded immediately after construction with a dry land pasture mix of Fawn Fescue (40%), Intermediate Wheat grass (20%), and Orchard grass (40%). The landowner/lessee will monitor and provide weed control biannually by chemical and mechanical application and grazing management to retard the weed seed germination and growth in those spoils areas. The project's spoil's stockpile was reseeded with this dry land mix as a cover to minimalize invasive weeds. It is realized the spoils will have invasive weed species seed beds. But it is anticipated with an immediate heavy pasture mix seeding, these forage pasture grasses in combination with appropriate weed control methods will out-compete the weeds. The project's replanted riparian and disturbed areas were irrigated to ensure maximum new plantings survival success rates and minimalize invasive weeds.

Public Outreach

The landowner/lessee has visited with several neighbors about this project's objectives and progress. The District highlights this project as a "model" example of a stream restoration project when visiting with other landowners about potential projects. An adjacent upstream landowner and the District have begun a Catherine Creek restoration project as a result of witnessing this project. The La Grande Observer featured this project in a September, 2012 article. The District also featured this project in its 2011-2012 Annual Report which was distributed as an insert to 11,300 Union County residents in two January, 2013 La Grande Observer editions. The District will also feature the project in its informational brochure, event display, and project power point presentations to the public and natural resources agencies.

Lessons Learned

Private landowners cannot possibly implement large scale projects such as this one without the technical assistance, guidance, and support from a lead agency with considerable project management and coordination experience. These large scale river restoration projects necessitate such significant resources it is ideal to partner with other natural resources agencies to provide landowner assistance with project requirements such as design, permitting/consultation, cultural resource, and funding processes.

The landowner/lessee is very happy with the project's construction and completion. However, they were originally concerned about the pasture grazing/irrigation/construction schedules in relation to the in-stream work window for fish. Those schedules don't necessarily correspond with the designated fish work date window so it can be very difficult for the landowner and construction contractor to schedule pasture grazing/irrigation/construction timelines. The contractor was able to finish well ahead of schedule due to a high level of efficiency developed from years of past stream restoration project experience. This also enabled the District to complete the project contract significantly below the requested funding amount.

The District went through a public construction bid solicitation process with established bid review and approval criteria policy. This allowed the District to award the construction contract to a highly experienced contractor who implemented the project at an accelerated pace completing the project well ahead of schedule, well within the in-stream work window, and well below the engineer's design construction cost estimate and BPA approved funding budget.

Acknowledgments

The Union Soil and Water Conservation District would like to thank the landowner, Trudy Yeargain, lessee, John Hefner, and all of the project's partnership agencies including Bonneville Power Administration, Bureau of Reclamation, Confederated Tribes of the Umatilla Indian Reservation, Oregon Department of Fish and Wildlife, ICF International, and the Grande Ronde Model Watershed. Without the generous funding support of BPA and these project partners contributing cost share for design, permitting consultation, cultural resources, review and inspection, and final easement protection this project would not have been possible.

CC-37 Project Construction Metrics

Project Element	Metric
Channel Construction	2163
Side Channel	390
Stream bank Treatment (Ft)(Large Wood Structures)	1245
Whole Trees w/ rootwad (Type 1-3, + whole trees)(pcs)	205
Type I	64
Type II	11
Type III	6
# Lg Wood (racking members)	280
Planting Acres	7.9
Live Willow Whips	6200
Containerized Plants	1350
Sedge/Rush Mattes (sq. ft.)	6300
Floodplain Seeding	4.5 acres, 225#
Upland Seeding	11.5 acres, 368#
Plant Protection Pods	38 (acreage TBD from survey)
Conservation Easement (Ac)	21
Fence Construction	1.52 (perm), 0.16 (Temp)
Livestock Crossing	1

1992-026-01
Union Soil & Conservation District
Catherine Creek 37 Stream & Fish Habitat Restoration 2012
July 16, 2012 - June 30, 2013
CR 227251
Final Budget

	Approved Budget	Project Total	Difference
Personnel	$14,000	$14,000	None
Site Preparation			
Mobilization (5% of construction total)	$18,887	$15,200	$3,687
Cofferdams and Dewatering	$8,000	$11,500	-$3,500
Site Access			
Temporary Site Access Routes	$2,500	$3,500	-$1,000
Temporary Creek Crossing	$3,300	$8,500	-$5,200
Earthwork			
Channel And Floodplain Excavation	$65,550	$43,549	$22,001
Excavated Soil, As Fill placed/compacted On-Site	$24,100	$14,425	$9,675
Excavated Soil Disposed On-Site at Spoil Areas	$51,090	$43,536.50	$7,554
In-Channel Habitat Boulders	$37,500	$13,750	$23,750
Salvaged Cobble/Gravel On-Site placed in Channel	$8,000	$8,000	$0
Imported Cobble/Gravel placed in Channel	$9,900	0	$9,900
Stabilized Livestock Crossing	$3,000	$2,000	$1,000
Boulder/Cobble Sill	$800	$650	$150
Large Wood Structures			
Type 1 LWD Structure	$59,850	$37,050	$22,800
Type 2 LWD Structure	$19,200	$9,600	$9,600
Type 3 LWD Structure	$18,500	$12,500	$6,000
Full Trees In Alcove	$4,000	$3,600	$400
Racking Material Placed As Directed By C.O.	$4,000	$12,800	-$8,800
Erosion Control, Seeding, Planting			
Temporary Erosion And Sediment Control	$3,000	$3,000	$0
SWPPP/SPCC Plan	$2,000	$5,040	-$3,040
Seeding - Seed Mix 1	$2,200	$7,990	-$5,790
Seeding - Seed Mix 2	$7,350	$10,724.65	-$3,375
Straw Mulch	$11,920	$6,292	$5,628
Sod Salvage And Placement	$2,810	$3,512.50	-$703
Erosion Control Blanket	$14,805	$6,300.00	$8,505
1 Gallon Container Plant	$5,750	$7,015.00	-$1,265
Plant Protection Pods (10 plants/pod) 345,16'X48' panels	$6,900	$7,686.55	-$787
Plant Protection Pods (10 plants/pod) 345, 5' T posts	$1,722	$1,721.55	$0.45
Total Approved Budget	**$410,634**		
Total Project Expense		**$313,442.75**	
Total Remaining			**$97,191.25**

CC-37 Stream and Fish Habitat Restoration Completion Photos

BPA Project # 1992-026-01

Contract # 58036

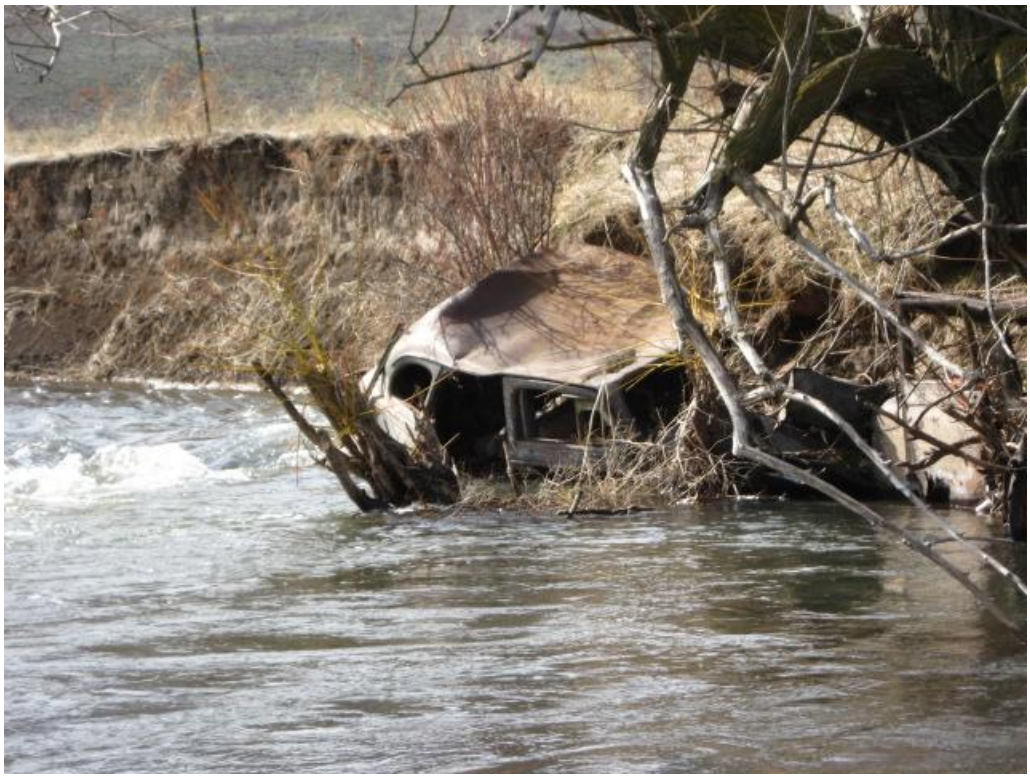

Photo 1. Vertical banks and car body "bank stabilization" pre-construction.

Photo 2. Vertical banks, pre-construction.

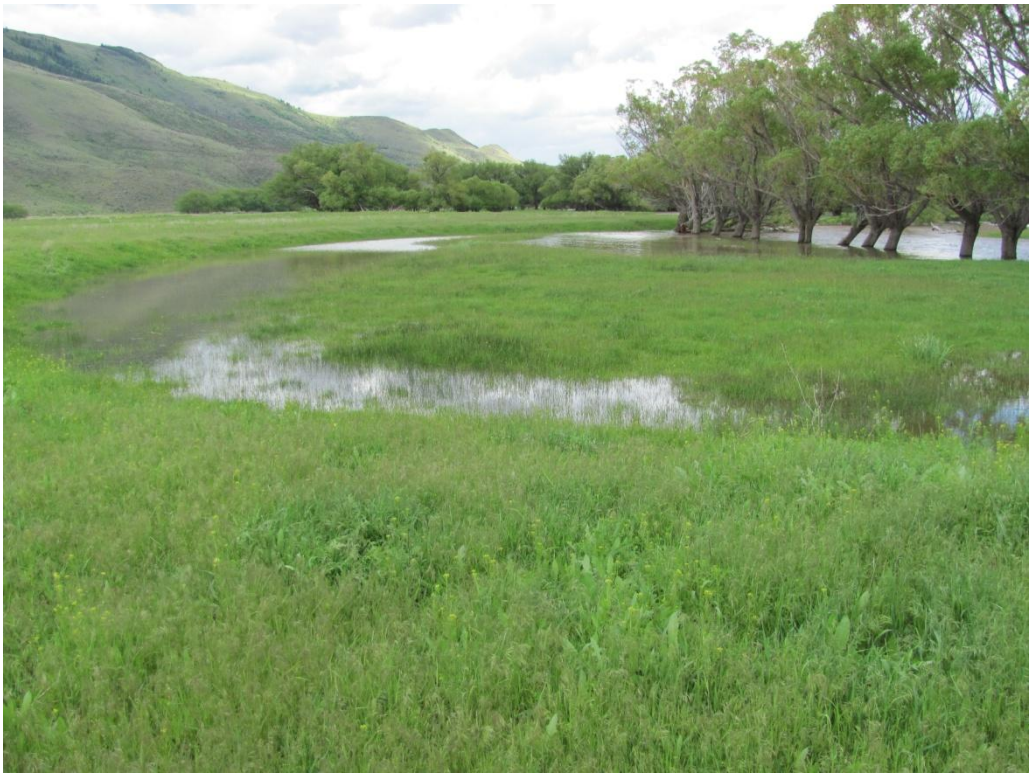

Photo 3. Southside location of upper side channel, pre-construction.

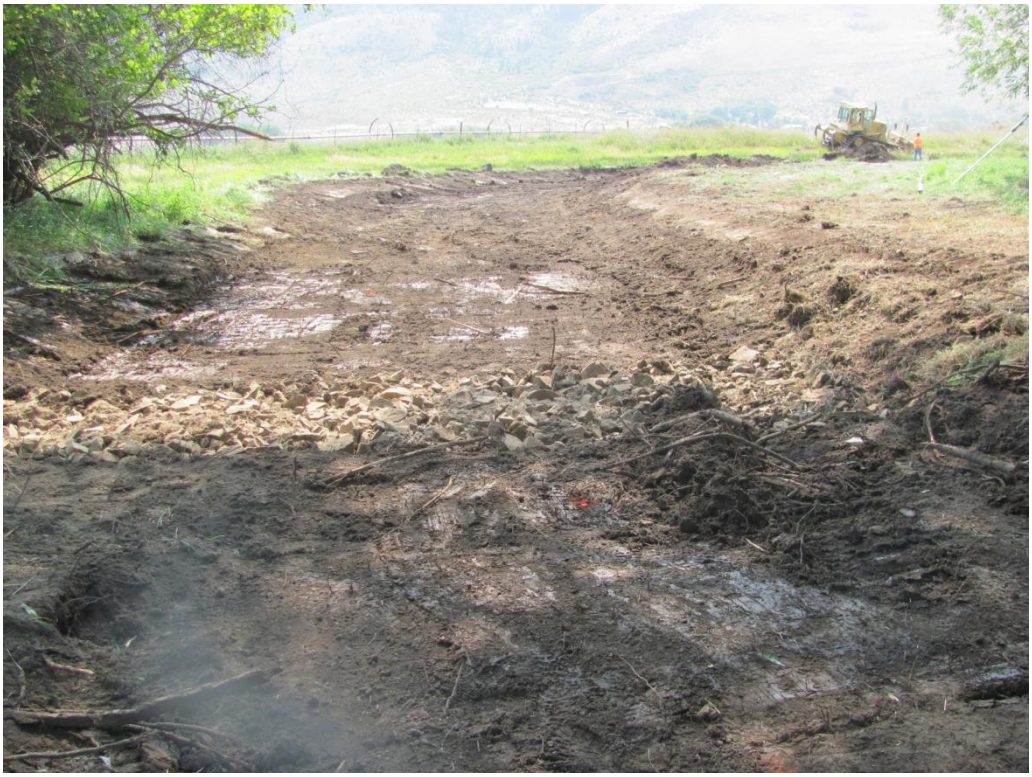

Photo 4. Completed upper side channel with entrance rock sill for sediment and flow control.

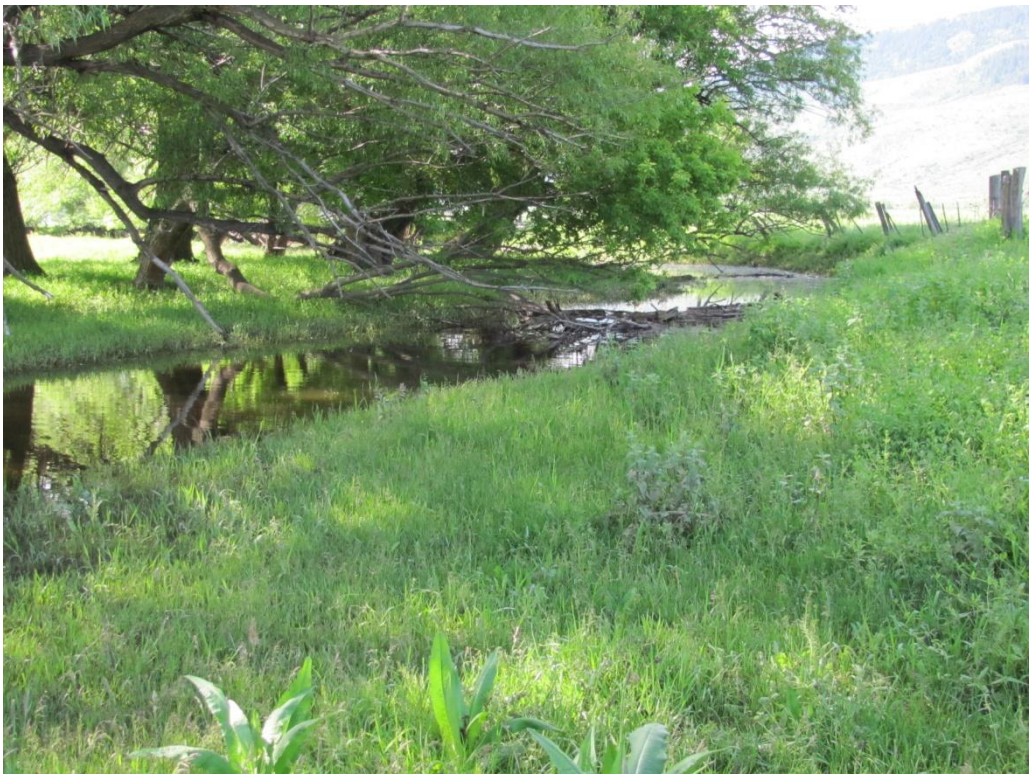

Photo 5. Location of disconnected old meander, pre-construction.

Photo 6. Excavation of new meander.

Photo 7. Upstream end of new meander. Excavated and re-sloped (3:1) vertical banks and widened floodplain. In-stream boulders, large wood structures, racking materials, and sedge mat placement. Banks were re-seeded, mulched, and planted with whips, container plants, and protected with panel pods.

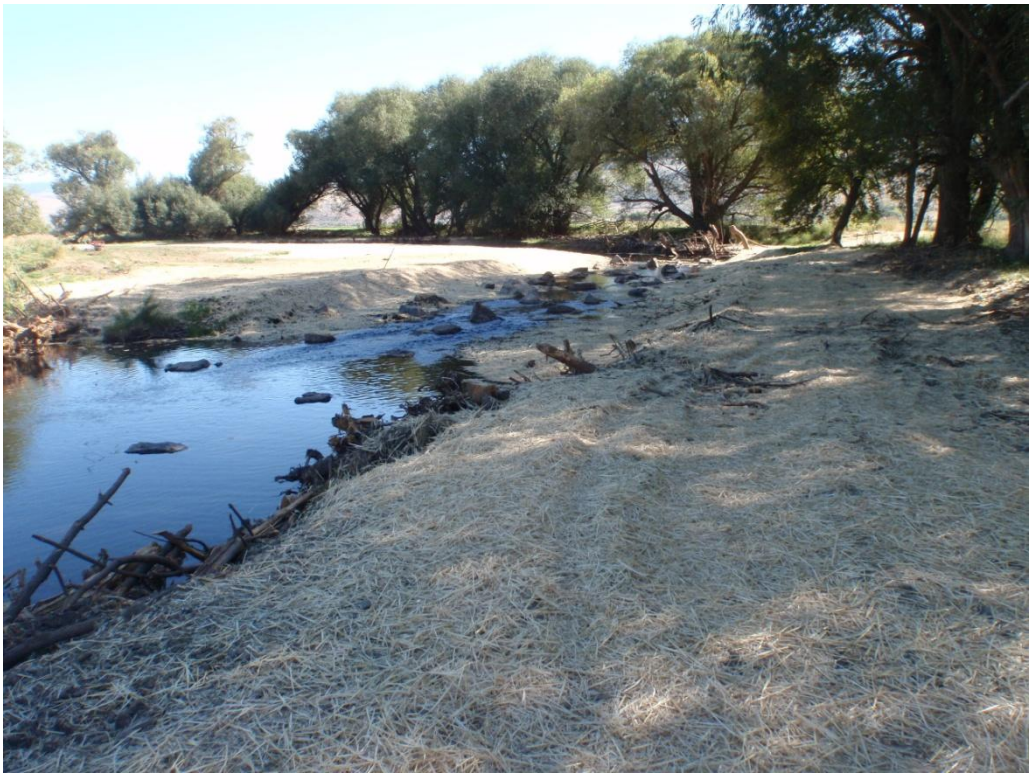

Photo 8. Downstream end of new meander. Excavated and re-sloped (3:1) vertical banks and widened floodplain. In-stream boulders, large wood structures, racking materials, and sedge mat placement. Banks were re-seeded, mulched, and planted with whips, container plants, and protected with panel pods.

Photo 9. Typical large wood structure and racking material placement throughout project area.

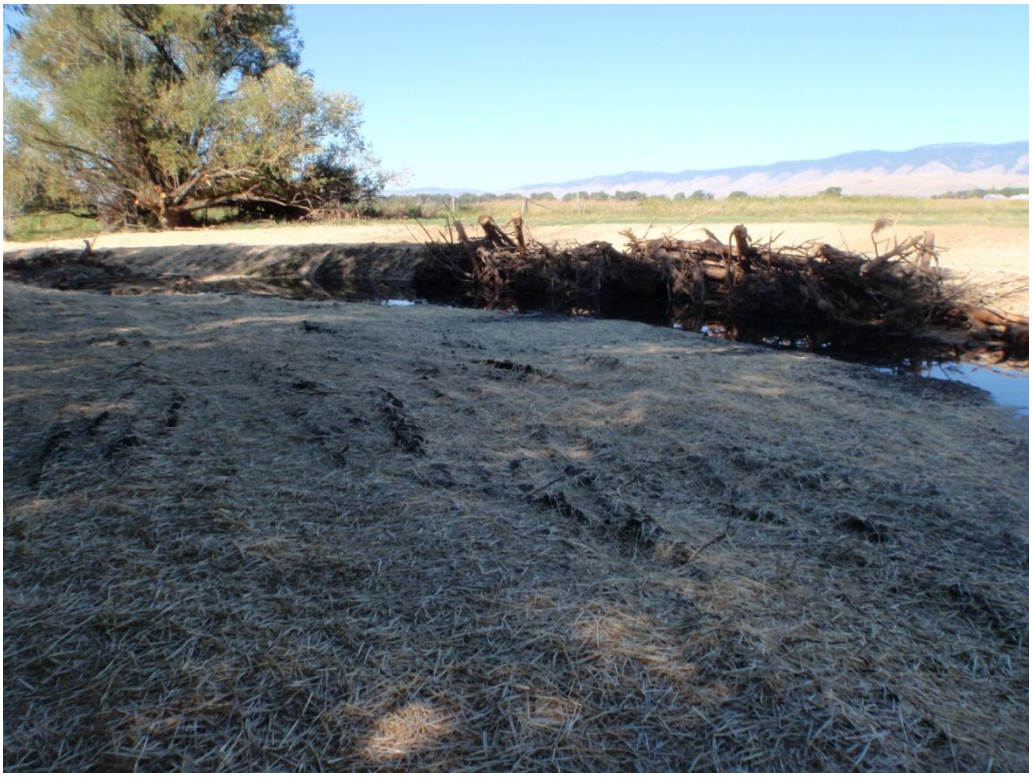

Photo 10. New meander. Excavated and re-sloped (3:1) vertical banks and widened floodplain. Large wood structures and racking materials placement. Banks were re-seeded, mulched, and planted with whips, container plants, and protected with panel pods.

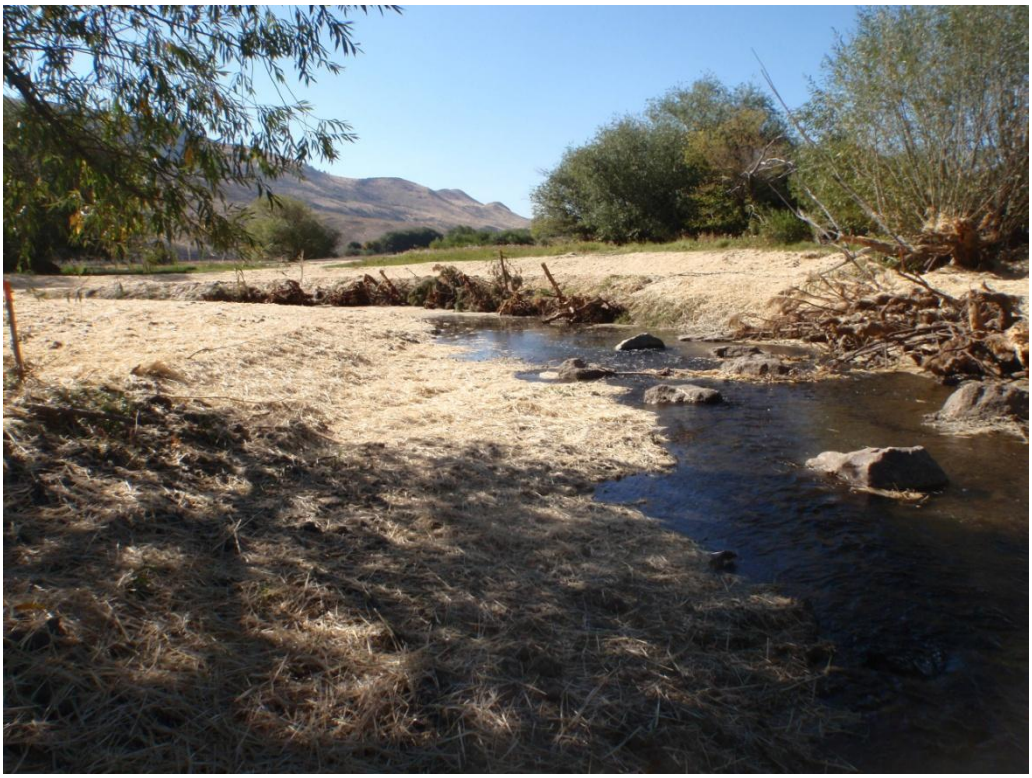

Photo 11. Excavated and re-sloped (3:1) vertical banks and widened floodplain. In-stream boulders, large wood structures, racking materials, and sedge mat placement. Banks were re-seeded, mulched, and planted with whips, container plants and protected with panel pods.

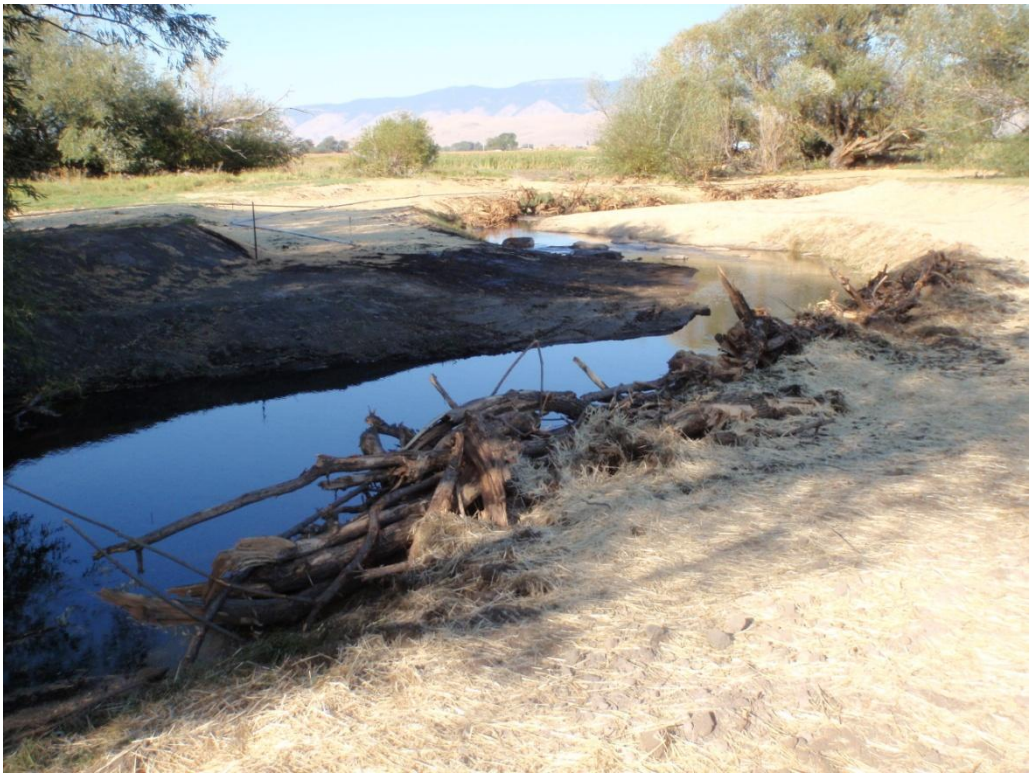

Photo 12. New meander. Excavated and re-sloped (3:1) vertical banks and widened floodplain. Large wood structures and racking materials placement. Banks were mulched, re-seeded, and planted with whips, container plants and protected with panel pods.

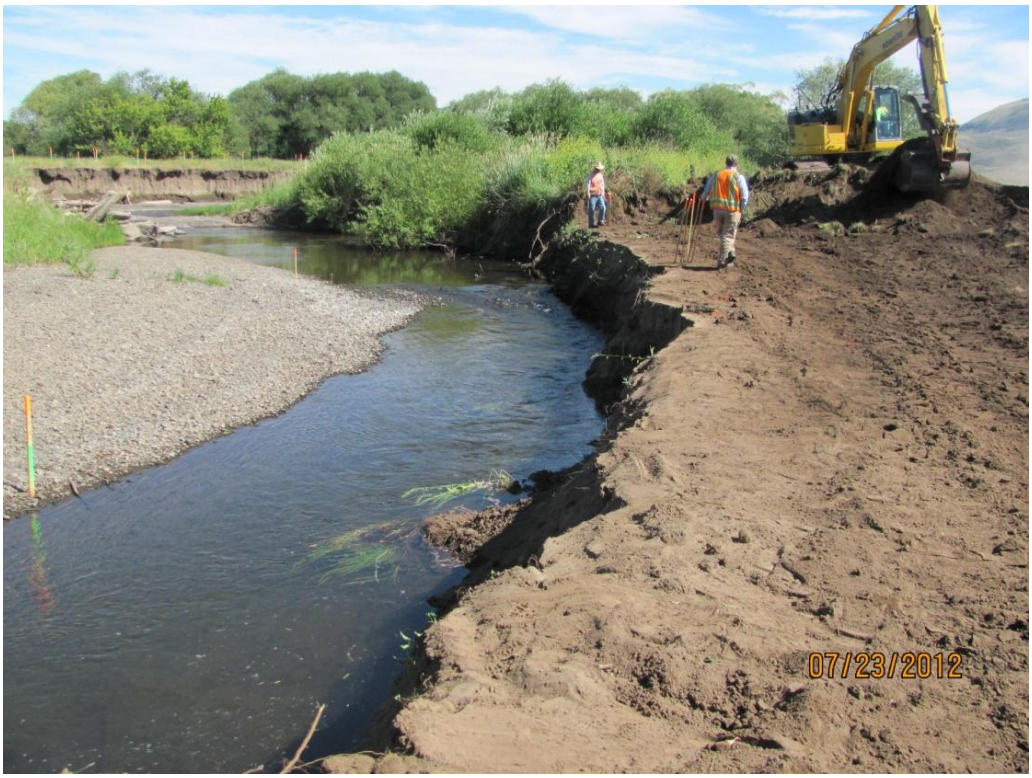

Photo 13. Vertical Banks prior to construction re-sloping and setback.

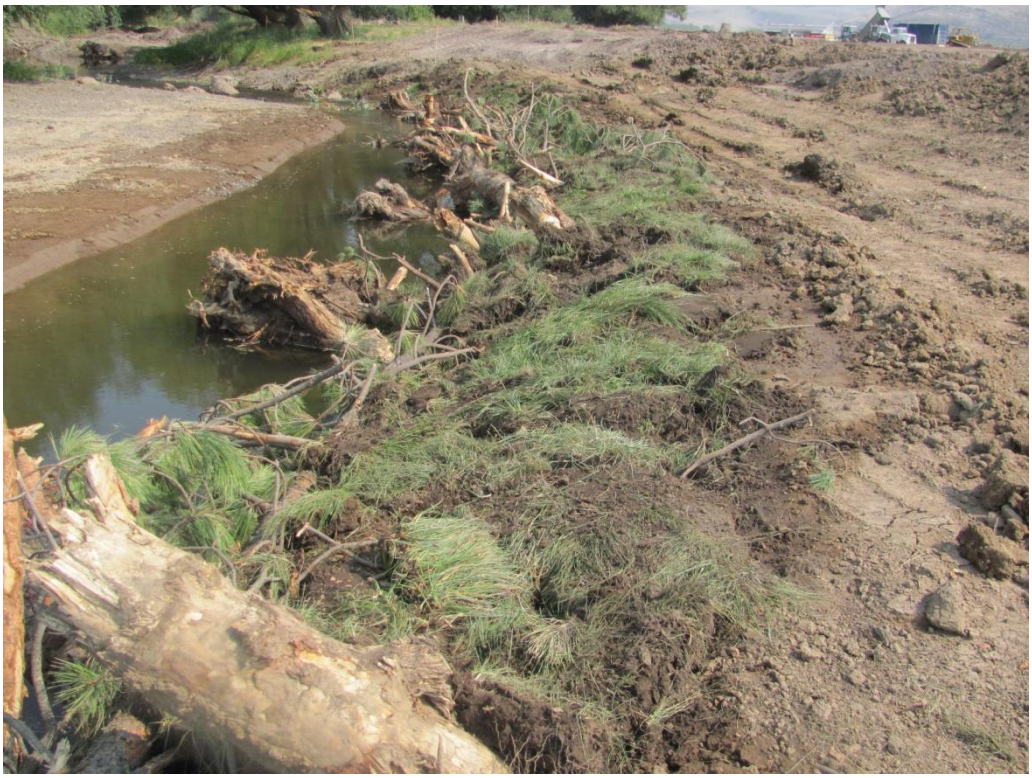

Photo 14. Excavated and re-sloped (3:1) vertical banks and widened floodplain. Large wood structures, racking materials, and sedge mat placement. Banks were mulched, re-seeded, and planted with whips, container plants, and protected with panel pods.

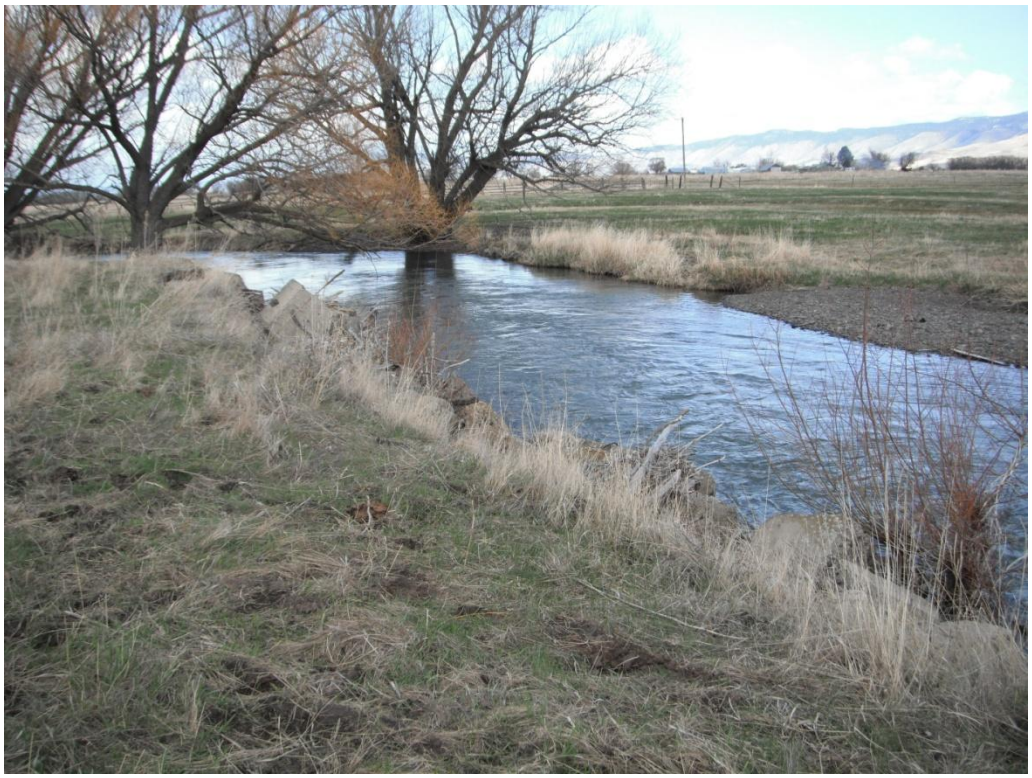

Photo 15. Eroded banks, mid-project, prior to construction.

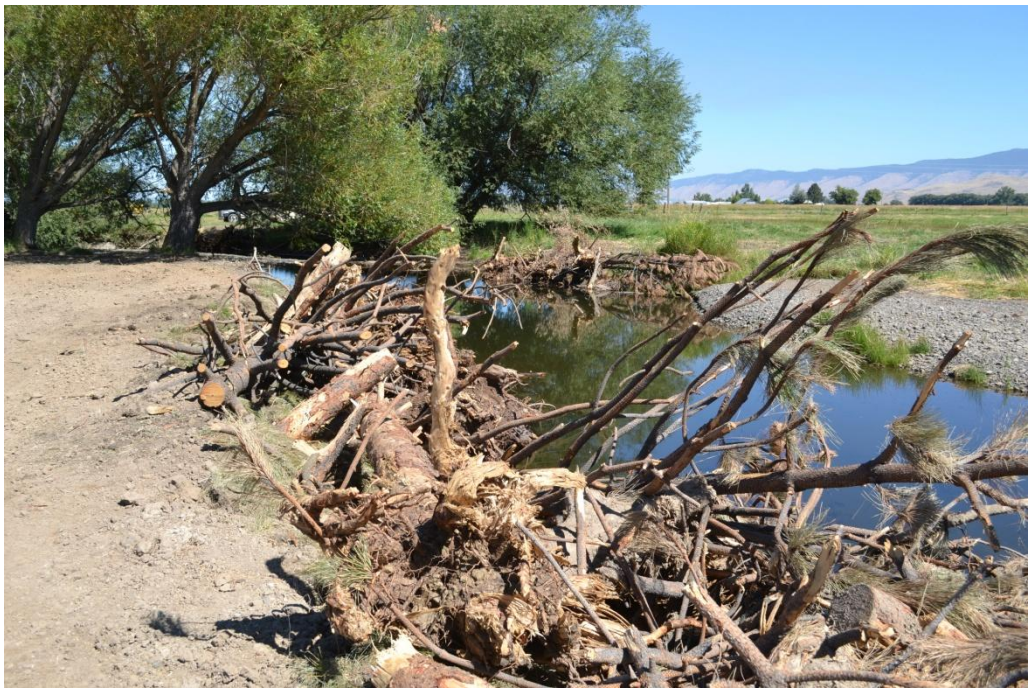

Photo 16. Excavated and re-sloped (3:1) vertical banks and widened floodplain. Large wood structures, racking materials, and sedge mat placement. Banks were mulched, re-seeded, and planted with whips, container plants, and protected with panel pods.

Photo 17. High water alcove with erosion control blanket, re-seeded, mulched, re-planted with whips, container plants, and protected with panel pods.

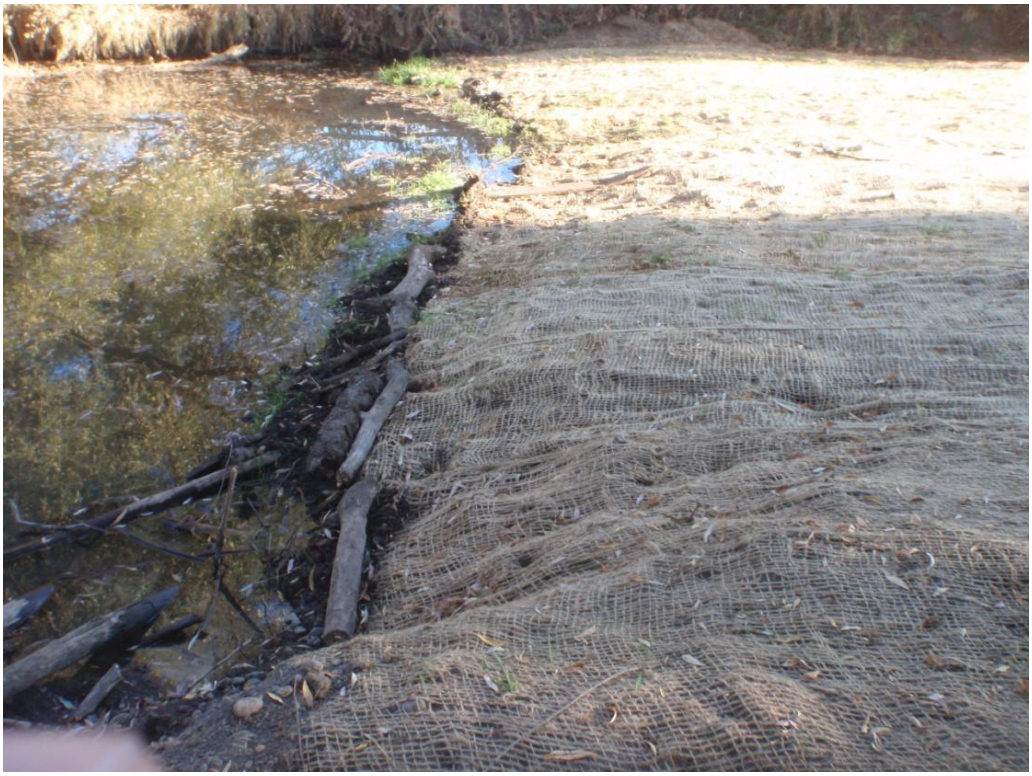

Photo 18. High water alcove with erosion control blanket, re-seeded, mulched, re-planted with whips, container plants, and protected with panel pods.

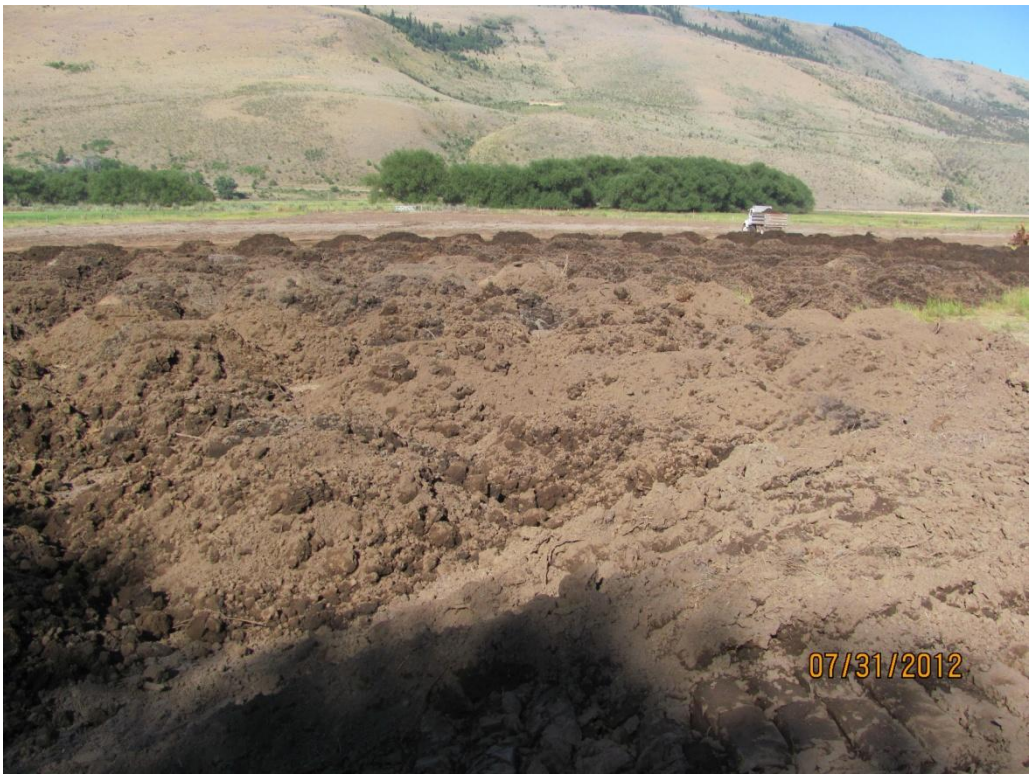

Photo 19. Excavated spoils material placed on pasture.

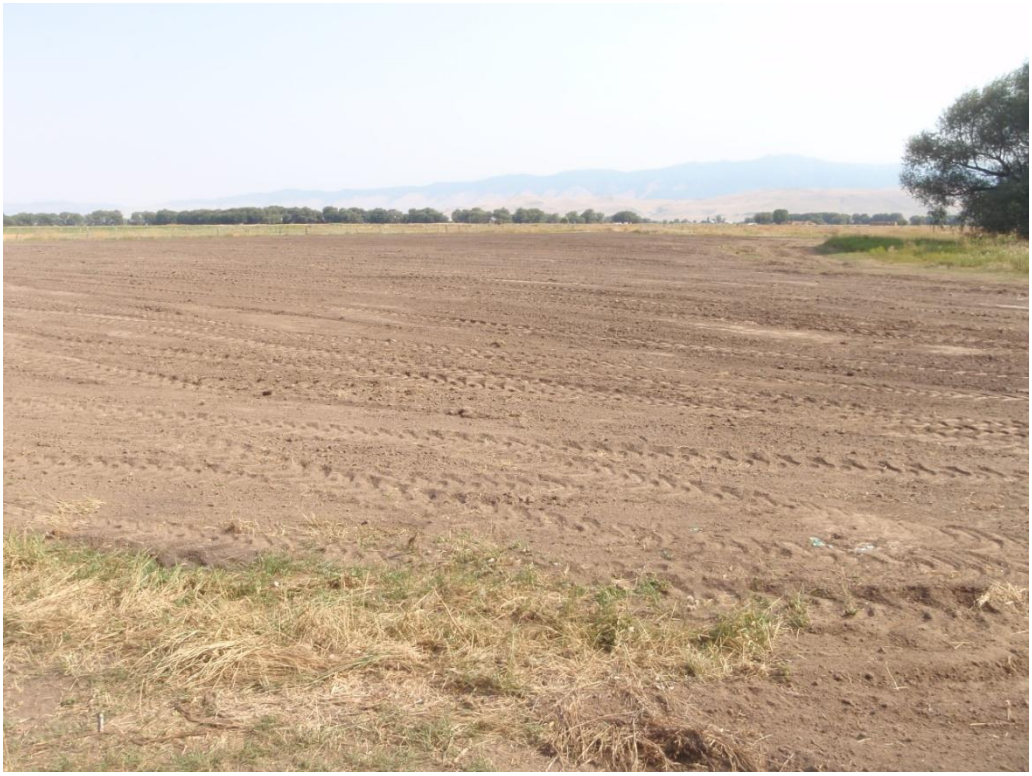

Photo 20. Completed excavated soils material leveled, mulched, and re-seeded on pasture.

Photo 21. Temporary bridge crossing for construction equipment, protecting valuable fish habitat and passage.

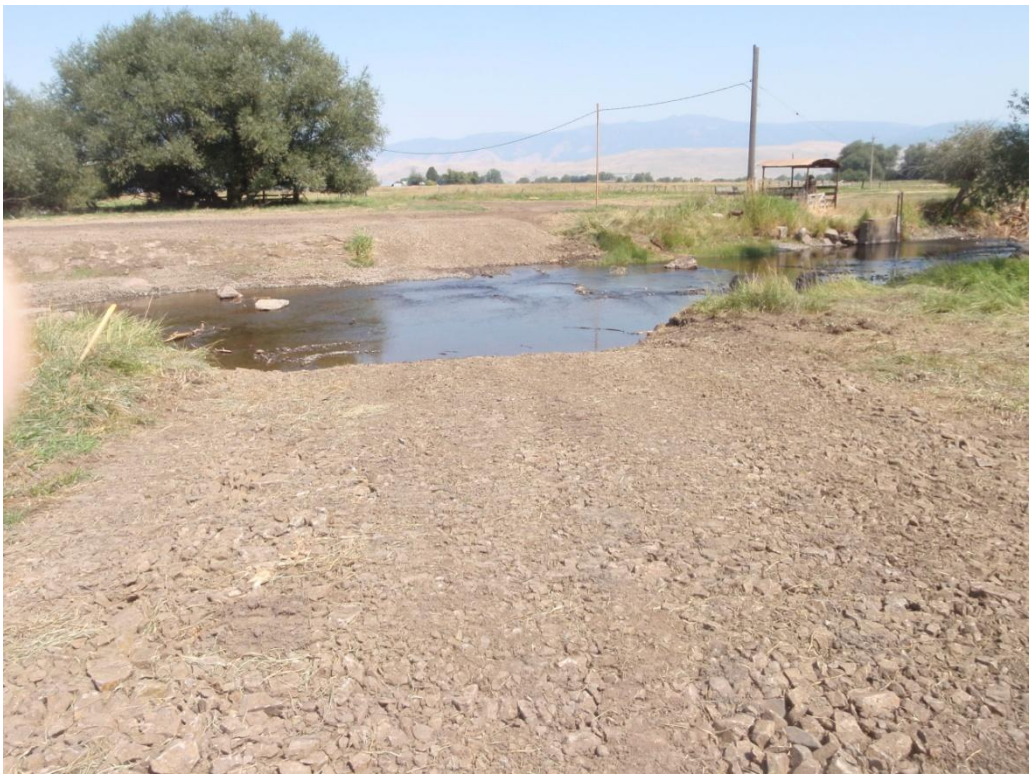

Photo 22. Completed hardened water crossing.

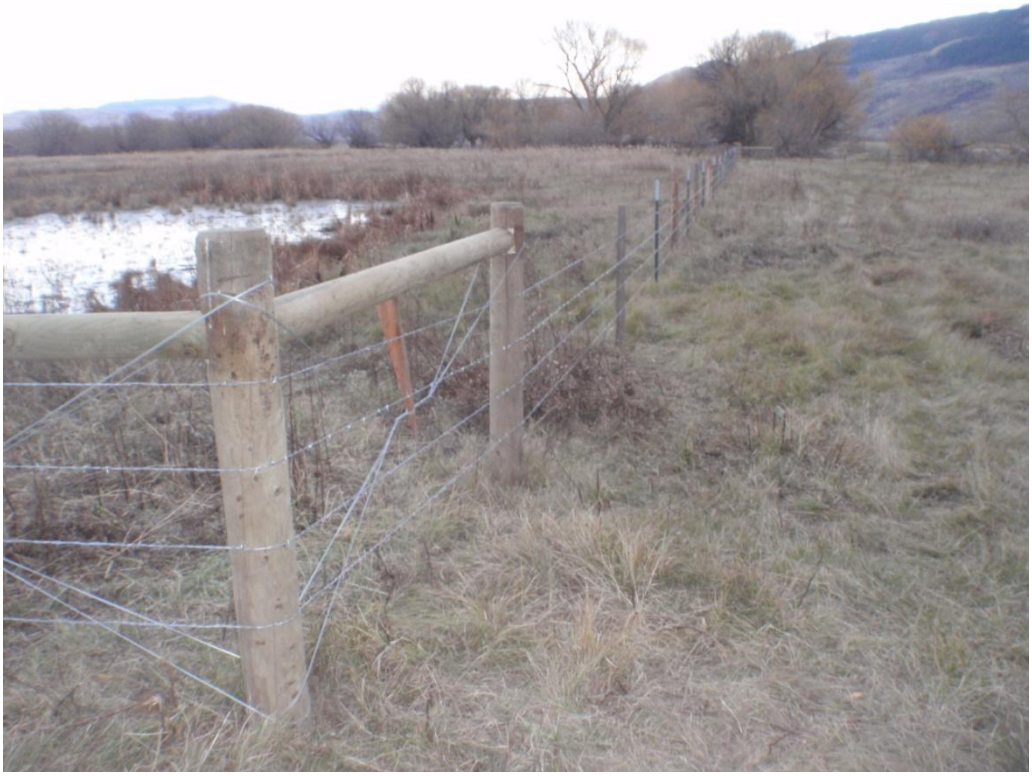

Photo 23. 15 year exclosure fencing protecting wetland area.

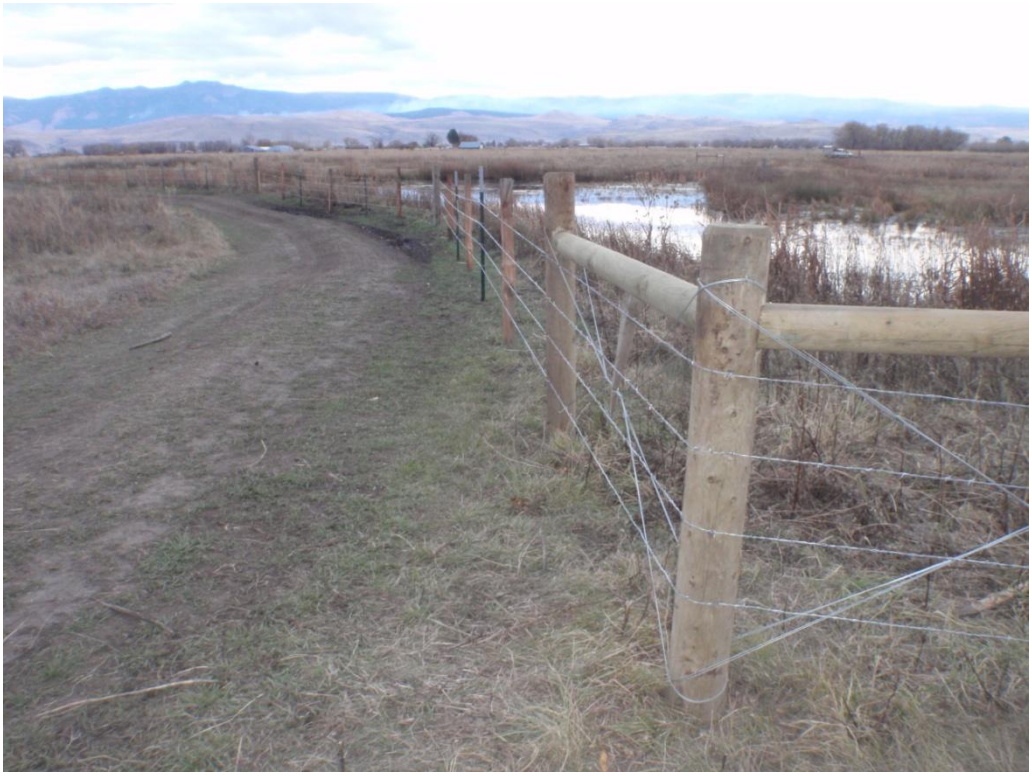

Photo 24. 15 year exclosure fencing protecting wetland area.