

GRANDE RONDE MODEL WATERSHED

Watershed Enhancement Project Proposal

April, 2012

- 1. Project Name:** Catherine Creek - 37 Stream and Fish Habitat Restoration
- 2. Applicant:** Union Soil and Water Conservation District
- 3. Participating Landowner(s) and Agencies:**

Landowner: Trudy Yeargain
Yeargain Family LLC
66926 Miller Lane, Union, Oregon 97883
541-562-5473 (home)

Lessee: John Hefner
67151 Miller Lane, Union, Oregon 97883
541-910-7078

Project Partners: Union Soil and Water Conservation District (USWCD)
Project Sponsor

Grande Ronde Model Watershed (GRMW)

Bonneville Power Administration (BPA)

Confederated Tribes of the Umatilla Indian Reservation (CTUIR)
Grande Ronde Fish Habitat Program

Oregon Department of Fish and Wildlife (ODFW)
Grande Ronde Fish Habitat Program

U.S. Bureau of Reclamation, (BOR)
Federal Columbia River Salmon Recovery Team

- 4. Project Contact:** Craig Schellsmidt, District Manager
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- 5. Project Location:** Latitude: 45.2167 N. Longitude: -117.9050 W.
The proposed 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. The project is 37 miles upstream from the confluence. The project encompasses approximately 30 acres and both banks of 0.75 miles main stem Catherine Creek and associated wetlands. The property legal description is: Township 4S South, Range 39 East WM, Section 14, NW ¼ and SW ¼, Union County Tax Lots 400, 500, 600. (Please see Figure 1, location map)

6. Project Limiting Factors, Goals, and Objectives:

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 |

The overall goal of the project is to address 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. The following specific project goals and objectives were previously presented in the USWCD Catherine Creek-37 Project Prospectus as submitted to the Grande Ronde Model Watershed in February of 2011.

This project's goals to protect habitat, enhance floodplain connectivity and in-stream structural diversity and complexity, and enhance riparian habitat conditions assists Salmon/Steelhead populations and habitat. The project potentially increases water quality, reduces excessive sediment and high water temperatures, creates or enhances complex fish habitat and stream channel, especially large complex pools and large wood structures, and increases riparian vegetation. Consequently, addressing the limiting factors for

Spring/Summer Chinook, Steelhead, and Bull Trout in the Upper Grande Ronde/Catherine Creek Subbasin. By stabilizing both bank sides with large woody structures, riparian plantings, reconnecting back water habitat/oxbows, creating new or enhancing existing stream channel, then placing this project under a conservation easement program, benefits these ESA fish populations and habitat.

The following identifies project specific objectives and references specific needs identified in the Grande Ronde Subbasin Plan:

Project Goal Statement

The overall project goal is 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.

Project Specific Objectives

- a. **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.

Subbasin Plan Reference: Habitat Protection (page 258)

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

- b. **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.

Subbasin Plan Reference: Channel Conditions (page 260)

- Maintain existing LWD (large woody debris) by promoting BMPs (best management practices) for forestry practices. Add LWD where deficient and appropriate to meet identified short-term deficiencies.
- Reconnect channels with floodplain or historic channels where appropriate and feasible.
- Install in-channel structures (LWD, boulders).
- Remove or relocate channel confinement structures such as draw-bottom roads and dikes where appropriate and feasible.

- c. **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.

Subbasin Plan Reference: Riparian Conditions (page 262)

- Improve the density, condition, and species composition of riparian vegetation through planting, seeding, improved grazing, and forest management practices.

Subbasin Plan Reference: Sediment Conditions (page 261)

- Manage grazing in riparian areas following grazing plans designed to improve riparian condition; could include exclusion, partial season use, development of off-site water, and herding.
- Reestablish riparian vegetation by planting trees, shrubs, sedges (native species preferred).
- Stabilize active erosion sites, where appropriate, through integrated use of wood structures (limited use of rock if necessary) and vegetation reestablishment.
- Encourage landowner participation in riparian management incentive programs, e.g. CREP, WRP, or EQIP.
- Promote/implement development of grazing plans to improve upland vegetative condition.

Any proposed channel modifications to include re-alignment and channel construction are to address objective “b” with a stated objective “...to facilitate a dynamic stable stream channel with accompanying habitat types (riffle, run, pool, and glide), habitat diversity, and complexity”. These goals and objectives guide the creation of multiple design alternatives as well as the selection of the Preferred Alternative.

7. Project Design Alternatives:

The design for the CC-37 Project represents an approach that balances the needs and desires of the landowner with those of fish and wildlife. Some restrictions placed on the project design team included limiting the proposed work location to the Reach downstream of an existing bridge, limiting the overall width of the floodplain and sinuosity of the channel, and maintaining the existing stream crossings and continued operation as a working cattle ranch. Despite these limitations, the design team realized substantial improvements could be made to the stream habitat on the site.

Three unique alternatives were examined prior to the selection of the Preferred Alternative.

Alternative 1—No Action, Leave As Is

A no action plan, beyond easement fencing, was discussed in detail by several USWCD, Reclamation, ODFW, and CTUIR staff. High flows during the spring of 2010 and 2011 provided increased channel complexity, especially as small amounts of large wood were naturally deposited in the project area. However, habitat surveys conducted by ODFW in 2010 and field evaluation by the design team indicated the current level of channel complexity and habitat quality are particularly low in a Reach that has high intrinsic potential and substantial use by juvenile Salmonids. If left on its own, Catherine Creek within this Reach would naturally progress toward a more complex and sustainable form. However, the existing lack of riparian complexity with limited LWD input, combined with high and nearly vertical stream banks, would take an unacceptably long time to develop to the full potential as high-quality Salmon spawning and rearing

habitat. In the last 60 years, Catherine Creek has moved very little except at a few select locations with highly erodible soils and poor riparian conditions. Old car bodies and other forms of informal riprap are in place in the Reach and further lead to a homogenous and relatively locked-in channel.

Alternative 2—Return to Historic Meanders

Historic channel meander scrolls can be seen across the project area and show up clearly in historic aerial images and LiDAR terrain models. The original conceptual alternative of placing the channel into the pre-1930s channel planform was assessed to determine the benefits of returning the Creek to a former channel location. This alternative was not further developed because it was determined historic physical conditions may not meet current physical processes, specifically sediment input and transport, which have been altered to such a degree that restoring the Creek to its former pattern may not be sustainable.

Historic meander scars indicate the channel in this Reach was once tortuous and had a very low gradient. Therefore, it was likely a Reach with relatively high suspended sediment load (fines) and minimal bed load (gravels). Further evidence is provided by the location of the project area on the lower end of a remnant alluvial fan and extending into fluvio-lacustrine soils. Following channel straightening above and within this reach in the 1950s, it appears sediment transport processes have changed. What was once a highly sinuous reach indicative of a relatively low energy environment may have changed into the extension of an alluvial fan with encroachment of larger materials including gravels and small cobbles within and beyond the project's area. Consequently, there was concern the former channel planform may not sustain current sediment transport and deposition conditions.

Alternative 3—Re-meander in Place

A third alternative considered re-meandering the existing channel in its current location. This alternative would have lengthened the channel only slightly, changed in sinuosity from 1.20 to 1.21, and maintained the channel in a high-energy state. Maintaining bed and bank stability would have required an excessive use of structures and would provide only minimal reconnection to the floodplain. This alternative would increase project costs, require more maintenance, and be more difficult to accomplish during the in-stream construction window. Natural habitat complexity available in the old meander scrolls would not be used, and the new, artificial belt width of the channel would likely be the only portion fenced off and protected.

Preferred Alternative

The selected design represents a combination of Alternatives 1, 2, and 3. It provides the stability features requested by the landowner, long term protection via fencing, a diversity of habitat types, and places the new channel in a location where natural processes of sediment deposition, lateral erosion, and channel migration could occur over longer periods of time.

The proposed channel planform was selected to utilize remnant meander scrolls where practical, while maximizing the preservation and enhancement of existing good quality habitat, riparian areas, and wetlands. The proposed design develops channel meanders and pool-riffle sequences outside of the straightened creek to promote natural levels of stream stability, while recognizing that a return to a pre-1930s alignment may not be possible under current flow and sediment regimes. The design also develops and maintains the Creek with abundant and complex habitats to include deep pools, cover, and other refugia that promote natural organic matter input and food sources.

The proposed design also includes increased floodplain connectivity and functions through the development of substantial areas of inset floodplain along incised portions of the Creek. The addition of LWD and in-stream rock structures further enhances in-stream complexity. This design develops more stable channel dimensions, pattern, and profile. This planform balances erosion and deposition to the extent possible given existing sediment and hydrologic regimes, and landowner constraints. Sediment transport competency is a primary design criterion in most channel restoration designs. The resulting channel will provide a moderate increase in sinuosity ($k = 1.38$) and would accelerate the channel along its current trend toward achieving dynamic equilibrium.

Some basics included in the design and the reasoning behind them is as follows:

- The channel pattern was selected to match natural channel meander wavelength patterns and radius of curvatures relative to channel forming flow widths.
- Structures to assist with lateral and vertical stability are made up of natural materials (wood, rounded gravels).
- High terraces along the channel would be sloped to develop connected floodplains at an elevation promoting the development of a healthy riparian community, overhanging vegetation, flood water storage areas, and off-channel refugia.
- Approximately 100 feet of concrete riprap would be removed and replaced with habitat enhancing large wood structures. Large wood and rock structures would be placed to enhance pool formation, reduce erosion rates to natural levels, and develop diverse habitats.

Off-channel habitat would be created through the construction of a side channel at the upper portions of the project to provide slow water/winter juvenile rearing habitat. This feature would further add to the habitat diversity, quality, and quantity throughout the project, including high water refugia.

8. Project Description:

The proposed project is located on a private ranch 1.7 miles west of Union, Oregon on Catherine Creek (river mile 37) in the Upper Grande Ronde River Basin. The project encompasses approximately a 0.75 segment of Catherine Creek. The project is located within the 2011 BOR's Catherine Creek Tributary Assessment and the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp) Area.

The CC-37 project was first identified by USWCD following contact by the landowner/lessee who was concerned about severe erosion, bank instability, and high water

event flooding issues within the segment of Catherine Creek on their property. After multiple site visits with USWCD and BOR, CTUIR, ODFW, National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (USFWS) it was agreed that this Catherine Creek Reach is important to migration and provides over-wintering habitat for ESA-listed Salmonids. In addition to the concerns raised by the landowner/lessee, the agencies also identified loss of stream complexity, wetland function impacts, and fish habitat issues within this Reach. Based on these determinations, the CC-37 project was developed and identified as a high priority restoration action. In addition to addressing many of the recommended restoration activities of the FCRPS BiOp, the project was also determined to be consistent with multiple other regional management and conservation plans and guidance, including the Oregon Watershed Enhancement Board's (OWEB's) Basin Priorities, Upper Grande Ronde River Subbasin Agricultural Water Quality Management Area Plan, Oregon Department of Environmental Quality (DEQ) Upper Grande Ronde Total Maximum Daily Loads (TMDLs), Northwest Power and Conservation Council (NWPPCC) Grande Ronde Subbasin Plan, and the Northeast Oregon Snake River Recovery Plan.

Current ODFW and BOR research confirms this Catherine Creek project site as a high priority area for critical juvenile Chinook Salmon wintering habitat. The project provides a coordinated approach to address habitat limiting factors associated with priority Endangered Species Act (ESA) fish habitat in the Upper Grande Ronde Subbasin for threatened Snake River ESU Summer Steelhead, Spring/Summer Chinook, and Bull Trout on a private cattle ranch. The project assists the private landowner with providing infrastructure to manage livestock (exclosure fences and off-channel water developments) and improve water resources for fish and wildlife habitat conservation purposes within the Catherine Creek system.

This project provides in-stream habitat enhancement, including stream channel excavation, historic channel meanders activation, large wood additions, and stream bank stabilization through bioengineering techniques. Following completion of "active" in-stream habitat actions, the project reach will be protected under a conservation easement program, either BPA and/or FSA CREP program.

The CC-37 project is one of multiple similar projects in the Grand Ronde Subbasin that are needed to address the habitat protection and enhancement requirements of the FCRPS BiOp for fish species listed by the ESA. Within the Subbasin, the USWCD has been working collaboratively with representatives from BOR, ODFW, and the CTUIR to develop feasible plans for reconnecting floodplain and increasing channel complexity to address limiting biologic factors for many listed fish, including Spring Chinook, Summer Steelhead, and Bull Trout. Catherine Creek has long been identified as an important passage corridor for such species and—because of its long history of agricultural-related impacts—represents an important stream on which to focus fish habitat protection and enhancement efforts.

On this basis, BPA funding is sought as part of their collective program to mitigate for the adverse effects of operating the FCRPS. BPA will be primary funding entity for this project's construction and the lead action agency, Reclamation is managing the design, and

the USWCD is managing the construction of the project with assistance from ODFW and CTUIR.

Existing Conditions:

Environmental baseline conditions were derived from various sources; including baseline field surveys, site aerial photography and LiDAR imagery, habitat characterization reports, and communication with the landowner and other agency staff with knowledge of the action area. Baseline channel morphology and habitat surveys were completed during the summer and fall of 2010 and the winter and spring of 2011. Project partners have worked together to compile datasets and develop baseline assessment data with an accompanying hydraulic model and a 100-year flood event model. Additional limiting factors and existing conditions data were compiled from ODFW habitat surveys performed in 2010 and from the BOR Catherine Creek Tributary Assessment. Anderson Perry completed a Wetlands Delineation Report in the summer/fall of 2011.

- The existing channel is relatively homogenous with minimal habitat availability and complexity. Current ODFW fish monitoring and BOR assessment confirms this project site is a high priority critical area for juvenile Chinook Salmon over-wintering habitat. During the winters of 2009-2011 the ODFW fish tracking study of over-wintering juveniles in the area showed a preference for deeper pools with cover habitat (overhanging vegetation and/or submerged LWD).
 - There are a minimal number of deep and complex pools in the project area.
 - Typically, where pools are present they are simple, lack cover, and are occasionally highlighted by cement blocks and car body riprap.
 - There is a lack of LWD which has reduced the available cover habitat and ability to sustain deep pools.
- The channelized reach is best described as a plane-bed channel with few pools that has limited hyporheic function.
- High summer water temperatures are common during the warm irrigation season.

The following is a summary of the existing conditions identified during the initial project assessment:

Generally, the project Reach is in poor to fair condition with stream segments exhibiting 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, over widening, and the channel is becoming shallower which further exacerbates many of the problems already present in the area. Current head cuts exist that have migrated upstream to the project area that incised the channel 3 feet, furthering the hydrologic disconnection to the

floodplain. Stream bank erosion is prominent along many portions of the Creek which have nearly vertical, actively eroding stream banks and contribute excessive sediment into Catherine Creek. Channelization and past intensive in-channel grazing practices have led to:

- High channel project reach width/depth ratios average 22.6 and sinuosity is 1.20.
- Loss and suppression of riparian vegetation with the subsequent loss of future channel complexity.
- High summer water temperatures and low winter temperatures and icing.
- Stream bank erosion and unstable stream banks leading to excessive fine sediment loads in the channel.

Specific Actions:

The project encompasses approximately 30 acres and both sides of 0.75 miles main stem Catherine Creek and associated wetlands. Figure G-3 illustrates the conceptual restoration channel alignment and placement of project structures. The following provides an overall summary of project habitat metrics and construction quantities. Planned actions include:

The following provides an overall summary of project habitat metrics and construction quantities.

1. Restoring the channel to a more natural configuration

- The currently hydro modified channel will be realigned, lengthening this channel segment from an existing 2,450 feet to approximately 3,000 feet.
- Channel sinuosity within the project reach will increase from 1.20 to 1.38 (measured historical sinuosity in this reach prior to hydro modification was 1.90).
- Average width/depth ratio will decrease from an existing average of 22.6 to 18.6.
- Existing incised and near-vertical stream banks will be pulled back to 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.
- Approximately 125 cubic yards of existing bank armoring (riprap, concrete debris) will be removed.

2. Increasing channel complexity

A total of 74 engineered LWD structures, including 57 Type I, 12 Type II, and 5 Type III (Sheets C-20 and C-21) will be installed at specific locations throughout the project Reach to maintain the desired channel configuration and increase habitat complexity. LWD components include:

- 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 wad.

- 5 logs, 12 in. minimum diameter by 20 ft. length no root wad.
- 5 logs, 18 in. minimum diameter by 20 ft. length no root wad.
- Woody debris of various diameters and lengths placed as racking material. Primarily coniferous logs of varying size and composition will be integrated into each set of structures to increase habitat complexity.
- A new 0.36-acre side channel will be constructed. This channel will activate during typical spring flows. The channel will incorporate a buried rock sill at the inlet to prevent possible head cutting and capture by the main channel.
- 250 1-4-foot diameter boulders will be placed within the existing and constructed channel segments to create additional stream complexity.
- Approximately 130 feet (0.14 acre) of abandoned channel will be converted into low-water alcove habitat. Eight coniferous trees with intact branches and root wads will be placed in the alcove to increase habitat complexity (Sheets C-6 and C-7).
- Approximately 400 feet (0.50 acre) of abandoned channel will be converted into a floodplain bench activated during high stream flows (Sheet C-5).
- Approximately 330 feet (0.57 acre) of abandoned channel will be converted into a floodplain bench activated during high stream flows (Sheet C-7).
- Over 100 linear feet of informal bank armoring composed of metal scrap and concrete debris will be removed and replaced by the habitat enhancing structures (Sheet C-4).
- Three existing pools will be enhanced and five new pools will be created by channel reconfiguration and stabilization with LWD habitat structures.
- Distinct riffle, glide and pool habitat segments will be created through channel reconfiguration, selective LWD and boulder placement, and substrate augmentation.

3. Increasing floodplain connectivity

- Floodplain habitat area and connectivity will be increased by excavating 4.86 acres of inset floodplain along incised portions of the project Reach. The inset floodplain will be set at bank full flow and replanted with native riparian species to provide flood energy dissipation.
- A new 420 foot side channel will be constructed to provide off-channel habitat during spring flows and will provide backwater overwintering habitat (Sheet C-9).
- Bank reshaping will improve edge habitats and increase juvenile fish refuge habitat during high flow events.

- Approximately 0.07 acre of historic channel will be re-graded to increase channel connectivity to an existing, spring-fed oxbow wetland (Sheet C-5).

4. Improving riparian habitat conditions

- Channel realignment will reconnect remnant riparian vegetation adjacent to historical channel segments (Sheets L-1 and L-2).
- Riparian replanting component of the project includes restoration of site-appropriate native vegetation on 4.86 acres of stream banks and adjacent riparian habitat (Sheet L-2).
- Integration of the Project with an interrelated conservation easement and riparian fencing project along 0.75-mile segment of Catherine Creek encompassing the project area.
- De-compaction and re-vegetation of 2.0 acres of staging sites and access corridors (Sheet L-1).
- Construction of a single permanent livestock watering access point at the upper end of the Project at the temporary vehicle crossing (Sheet G-4).
- Integration of the project with an interrelated conservation easement and a riparian fencing project that will be implemented concurrently by the Natural Resources Conservation Service (NRCS).

A summary of quantities is provided on Sheet G-2 of the plan set. The table below provides a summary of construction materials, clearing, spoiling, earthwork, and habitat structure elements.

Construction Materials Quantities, Clearing Area, and Cut and Fill Volumes

| Construction Activity/Element | Action | Quantity | Units |
|--|----------------|-----------------|--------------|
| Site access and staging | Clear and grub | 5 | ac. |
| Channel and Bank Reconfiguration | | | |
| Excavate new channel, reshape banks and floodplain | Cut | 22,020 | cy |
| Backfill and compact old channel | Backfill | 5,200 | cy |
| Haul and dispose excess excavated fill, haul and dispose debris (car bodies, concrete rubble, etc.). Excess fill will be spread on adjacent agricultural uplands at ODFW approved location | Cut/dispose | 16,820 | cy |
| In-Channel Habitat Boulders (250 2-foot diam.) | Fill | 780 | cy |

5. Currently, both sides of the Catherine Creek project riparian area are temporarily fenced to exclude livestock until construction is completed. Construction of approximately 0.75 miles of permanent conservation easement boundary 4-5 strand barbed wire enclosure fences will be installed under the CREP program.

6. Effort will be taken to maintain the trees and vegetation supporting the current riparian areas and encouraging natural recruitments. After construction project site re-vegetation will be installed on newly excavated flood plains, laid back banks, and in areas as needed. Erosion control blankets such as bio mats and coconut mesh will be installed prior to planting. Plantings will consist of 4-6' live stakes (Willows, Cottonwoods, Alders, etc.) at a density of one per 8-12 sq. ft.. In addition, native shrubs, grasses, and more mature trees will be planted in and around structures, terraces, and bank full benches to provide stability, natural recruitments, and safety from high flow events. To ensure maximum plant survival rates approximately 50% of plantings will be within 115 protective pods. These hog panel pods are more durable, can be rotated, and are salvageable. In addition, revegetation survival rates will be maximized with the use of an established irrigation system.

Note: The landowner has committed to enroll the project into a conservation easement as delineated on Figure 1. Project sponsors expect the landowner will enroll in the FSA CREP program following construction. Costs for initial re-vegetation of the project area have been incorporated into this proposal to ensure riparian vegetation is established during fall 2012. It is currently unknown whether the CREP enrollment can be completed in time such that the CREP program can cover fall 2012 planting costs. CREP pre-planning has been initiated between USWCD, the landowner and lessee, and NRCS. This process will continue into the summer to facilitate CREP enrollment. Should that process be completed in time, planting costs as well as fencing costs would be covered under that program and funds identified in this proposal for planting will be returned to BPA.

7. Trap and haul (salvage) fish, amphibians, and reptiles from project areas prior to channel diversions and in-channel restoration activities. All in-water work will be conducted within the ODFW defined August 1-September 30 work window. This benefits existing aquatic organisms by minimizing mortality during construction and other restoration activities.
8. All project spoils will be spread across approximately 23 acres of on-site pastures and or stockpiled within the project area.

Benefits:

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 will be protected and allowed to mature under a 10-15 year conservation easement.

Specific project benefits include:

- Modifying channel width to depth ratio from 22.6 to about 18.6.
- Existing near-vertical stream banks will be let back to a slope of 1.5:1 to 3:1. Bank reshaping improves edge habitat and increases fish refuge habitat during high flow events and reduces high water energy erosion impacts.
- Floodplain habitat area and connectivity will be increased by excavation 4.86 acres of inset floodplain along incised portions of the project reach which enhances a larger floodplain, 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 sustain helical flow in bends thereby developing deeper pools.
- Channel realignment will reconnect remnant riparian vegetation adjacent to historical channel segments.
- Increase and or improve the number of complex pools from 3 to 8 within the project area.
- Creation of scour pools, runs, and riffles of various sizes and complexity.
- Creation of new complex meandering stream channel and enhancement of existing channel. Within the re-meandering portion, the channel length will increase from an existing 2,450 feet to approximately 3,000 feet. A gain of over 500 feet of river channel.
- 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.
- Reconnect a historic oxbow and building side channels create back water habitat.
- Replace current LWD recruitment from almost non-existent conditions. Revegetation of native Willow, Cottonwood, Alder, shrubs, and grass plantings will increase potential future LWD recruitment. The additional vegetation will also add stability to stream banks and decrease erosion into stream.
- Plantings and exclosure riparian fencing will increase wildlife habitat created within the project area.
- A conservation easement will protect the project and allow it to mature.

Project Maintenance: USWCD, CTUIR staff, and the landowner will maintain the project. Extensive maintenance of in-stream habitat enhancement structures and exclosure 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.

Permits: Project partner staffs are completing all environmental compliance requirements in cooperation with BPA staff. These requirements include ESA and cultural resource consultations, and Oregon DSL and USCOE Fill Remove and Wetland Mitigation permit authorizations. BOR conducted a cultural resources survey in the summer/winter of 2011. To date, the cultural resource consultation is near completion and the permitting process has begun with all permit applications submitted.

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

- a) **Protect Habitat:** Photo points will be established in 2012 to provide pre-implementation qualitative data on vegetation and channel conditions. These photo points will be repeated immediately post implementation, then every 3 years thereafter, until the riparian lease has expired.
- 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 through the establishment of photo points or direct inspection during or after flooding.
- d) **Enhance Riparian Habitat Condition:** Vegetation surveys (such as a shrub intercept or 'green-line' survey) are being undertaken during 2012 and will be repeated 3 and 5 years post project. In addition, planting efforts implemented under the CREP program will be monitored through stocking surveys.
- e) **Water Quality:** In addition to the monitoring efforts listed above, water quality (temperature) will be recorded for the duration of the riparian lease. Temperature data will be used in an EPT (extensive post treatment) monitoring design. It is anticipated the analysis of these data would 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 using either a paired t-test and/or a mixed model repeated measures analysis (providing these data meet the assumptions of the tests).

Work Dates: Project implementation is scheduled to be completed during the Summer/Fall of 2012. Specific dates for various project aspects include:

- Habitat, Hydrologic, Geomorphic Survey/Analysis: Fall/Winter 2010/11.
- Pre-design completed: Winter 2011.
- Permitting/Consultations: Winter/Spring 2011/2012.
- Final design completed: Winter/Spring 2011/2012.
- Construction: Summer/Fall 2012.
- Monitoring: Initiated in 2010 (baseline) and continued through 2027.

9. Project Budget:

BPA funds will be utilized for construction, materials, and project management coordination. (See Budget Page) BPA project funds will support our local economy by

offering compensation and jobs for local contractors, material suppliers, and personnel. Funds from this project are much needed in our local communities.

Multiple Union SWCD past project budgets, experience, and conversations with contractors, suppliers, and other agency's staff provided information to develop an accurate project budget. Project management and administration were based on the District's experience with other projects and the amount of staff time it takes to complete a large complex stream restoration project. BPA funds will be utilized to coordinate project partner's efforts and maintain project schedules, obtain landowner and partnership agency's reviews and approvals, coordinate construction, schedules, solicit bids, develop and award contracts, inspect construction, monitor project post construction, obtain all necessary invoices, and produce all required forms and reports. In addition, USWCD staff will assist the landowner in preparing for CREP enrollment, development of fencing and planting plans, and implementation of subcontracts.

The budget estimate was developed using costs from previous stream restoration projects as well as current R.S. Mean's costs. Unless otherwise noted the unit costs reflect the costs to purchase, transport, and place materials. The lump sum cost associated with the backwater habitat includes excavation required to lower the areas to allow inundation as well as excavation, rock, and geotextile fabric required to construct an inlet structure for the planned back water habitat areas.