

Aiwohi-Cisco Dry Creek Habitat Restoration
A Columbia River Basin Fish Habitat Project

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Introduction/Background Information:

Dry Creek, a perennial fish bearing tributary of Willow Creek located West of Summerville, Oregon in Union County, is a highly productive mid-elevation spawning and rearing habitat for Snake River summer steelhead. Existing conditions indicate an overwidened system where overland flow is limited during summer months. Large sections of Dry Creek flow sub-surface through deep alluvial deposits, but surface flow is typically present throughout the project site, providing critical habitat in the few existing pools during summer months.

Existing Condition

Past land use practices have confined the stream to a single channel, resulting in decreased sinuosity and increased channel gradient. This has reduced channel complexity and increased sheer stress on stream banks causing active bank erosion, and thereby impeding riparian vegetation establishment. Over the past 7 years scientific research has been conducted throughout the Dry and Willow Creek Basins (CTUIR, ODFW) with Dry Creek designated as a high priority stream for restoration in the Grande Ronde Basin.

Stream temperature data was collected for five years in correlation with a restoration project previously completed downstream. This data indicates that stream temperatures remain cool through the summer months. Additional data indicates that Dry Creek produces more steelhead redds than other index reaches in the Grande Ronde Basin. Stream temperatures warm quickly downstream from the project area, suggesting the lower 1 mile of Dry Creek could provide significant summer refugia for steelhead for both upstream and downstream migrants.

An engineered design was developed in 2017 that detailed actions intended to increase floodplain connectivity, stream sinuosity, spawning habitat, channel complexity, and riparian plant vigor and diversity. Project partners included review team members from CTUIR, GRMW, ODFW and the landowner, Mary Aiwohi. Implementation funding for the 2018 field season was awarded through the Grande Ronde Stepwise process from OWEB and BPA. A construction contractor was selected through a competitive bid process and the project was implemented in 2018.

Dry Creek is a tributary within the Willow Creek watershed, located in the northwestern part of the Grande Ronde River valley in Union County, Oregon. Willow Creek is a tributary to the Grande Ronde River near River Mile 105. Willow Creek and its tributaries originate in higher elevation coniferous forest and flows southeast through rural areas with agricultural farms and irrigated fields dispersed throughout the valley and foothills. Approximately 25 percent of the land within the watershed is U.S. Forest Service managed timberland, while the privately-owned land within the foothills and valleys is used for irrigated agriculture, livestock grazing, and small non-industrial rural residential farms (GRMWP, 2001).

The Willow Creek watershed, particularly Dry Creek, is considered productive areas for ESA-listed Snake River summer steelhead (*Oncorhynchus mykiss*). Redd count data from the 1960s and 1970s suggest that Dry Creek was historically one of the largest producers of summer steelhead within the Upper Grande Ronde Subbasin (GRMWP, 2001). The upper reaches of the watershed may have also historically supported spring Chinook salmon (*Oncorhynchus tshawytscha*).

Since the late 1800s, human settlement and land use practices have resulted in altered watershed and stream conditions that have limited steelhead and salmon productivity throughout the Upper Grande Ronde Subbasin. The primary habitat limiting factors in the Willow Creek watershed include large wood deficiencies; lack of stream-side shade; high summer water temperatures; elevated sediment and nutrient inputs; loss of wetlands; stream channelization; and stream flow depletion (GRMWP, 2001).

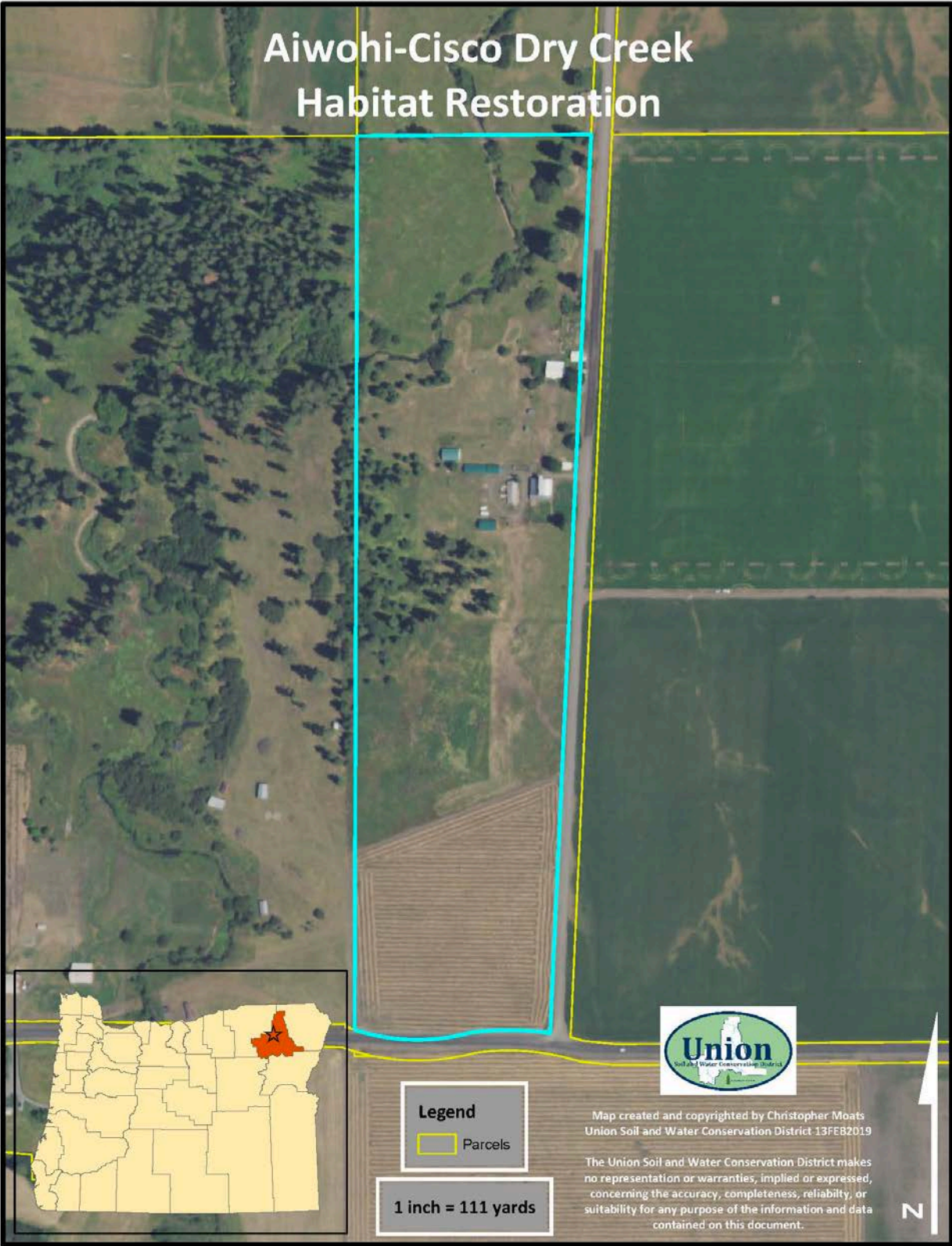


Figure 1. Project location map.

The Aiwohi-Cisco project reach of Dry Creek exhibits degraded functional conditions typical of stream response to past agricultural practices. Historic livestock production and cropping practices included

straightening of the Aiwohi Dry Creek stream channel, removal of streamside riparian vegetation, and damage to the stream channel and banks from livestock and machinery. These conditions have resulted in a simplified, incised, over-widened stream with elevated water temperatures during late summer months.

The primary goal of the Dry Creek Aiwohi Cisco Habitat Restoration project was to enhance and increase the natural channel function and geomorphic processes that improve habitat suitability for spawning and rearing summer steelhead, spring Chinook salmon, and other native fish and wildlife resources. The engineered final design was developed to improve the hydrogeomorphic function of the stream channel, banks, and floodplain, thereby fostering stream evolution toward recovering the functionality of Stages 1 and 3 of the Stream Evolution Model (SEM) defined by Cluer and Thorne (2014). Restoration objectives were used as a guide to identify restoration actions that will achieve the overall project goal of improved geomorphic functioning and fish habitat quality. Implemented restoration actions included fish passage restoration and legacy structure removal, improve secondary channel and floodplain interactions, increase habitat-forming natural material and instream structures, planting riparian vegetation, and channel reconstruction.

Project priorities included restoring juvenile rearing habitat for steelhead during both summer and winter months, as well as spawning habitat for adult steelhead. The following site-specific project objectives were developed to address primary limiting factors:

- Increase the number of large wood pieces and jams
- Increase the quantity and quality of habitat diversity
- Increase juvenile rearing habitat
- Increase adult spawning habitat
- Increase stem density (number per area) of native shrubs and trees
- Improve site-appropriate native vegetation
- Increase floodplain connectivity
- Increase width:depth ratio at greater than 2-year peak flows
- Improve channel morphology closer to fully functional form
- Increase number and depth of pools

Discussion of Completed Work:

The work completed for the Aiwohi-Cisco Dry Creek Habitat Enhancement Project was conducted on Private land approximately one mile west of the town of Summerville Oregon. Project construction started on August 27, 2018 and all instream work was completed on October 15, 2018.

Environmental Compliance:

All environmental compliance documents were completed for construction prior to the instream work window of 2018. The Joint Permit Application was submitted by the District to Oregon Division of State Lands and the U.S. Army Corps. of Engineers for Dry Creek. Herbicides will be used for noxious weed treatment, but were not funded under this BPA contract. All waders and equipment used for the project were either exclusively used in basin or were sterilized prior to use for the project.

Salvage & Transport fish from the Dry Creek Construction Project:

Fish salvage work for the entire project reach was completed from September 17 through September 19, 2018. A total of 451.7 cubic meters of the existing Dry Creek channel were salvaged over the three-day period. During the first two days, fish salvage was completed by two staff using one electro-fisher. On the third and final day an additional 4 staff from the CTUIR and the Bureau of Reclamation (BOR) assisted to finish fish salvage operations. The Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act (NMFS 2000) was used as a guideline for salvage. Project

biologists recorded:

- a. salvage area average width, depth, and length in meters
- b. water temperature in degrees centigrade (at start and end of salvage passes)
- c. number of passes per site
- d. fish captured were counted by species
- e. type of capture method (seine or electrofishing) was recorded
- f. When electrofishing the pulse width (nms), frequency (hertz), voltage, and the number of seconds on electro-fisher were recorded for each pass.
- g. Salvage operations using electro-fisher were suspended when water temperatures reached $\geq 18^{\circ}\text{C}$.
- h. Captured fish were placed in aerated coolers and transported to release sites within 10 minutes of capture.
- i. No in-water construction activity commenced until salvage operations were complete.
- j. Any fish mortality was recorded and dead fish retained for inspection by NOAA staff.

Block nets were placed at the top and bottom of each unit (Figure 2). Once the unit was depleted of fish the bottom net was replaced and installed at the top of the next unit. This was continued from the downstream end of the project reach to the top until all units were salvaged. After checking the conductivity, the electro-fishers were set to 350 volts and 30 hertz and were maintained at this rate for the entire fish salvage operation. Stream temperatures during fish salvage never exceeded 11°C .



Figure 2. Block net placed for conducting fish salvage on Dry Creek during the 2018 in-water work window.

A total of 89 juvenile steelhead from three age classes were captured over the entire project reach. A total of 59 age 1, 24 age 2, and 6 age 3 steelhead were caught. All steelhead captured were released with no mortality. A total of 1,207 non-salmonid species were also caught consisting of 1,035 sculpin species, 171 red sided shiner, and one dace species. No juvenile chinook were captured during fish salvage operations. All fish captured during fish salvage were relocated about 0.6 miles downstream of the project site (at the McKenzie Lane Bridge). Fish needed to be placed below the project area because of a lack of surface flow upstream of the project reach.

Install Large Wood Structures:

Project objectives were achieved through construction that was initiated on August 27, 2018 and

completed October 15, 2018. A total of 26 large wood structures were constructed using 115 key member pieces. There was a total of 8 bank root wad structures, 10 vertical post structures, and 8 longitudinal log structures installed in Dry Creek during this restoration effort. Racking material was much larger than specified in the plan set, resulting in several positive project benefits. An additional longitudinal log structure was built at station 27+00 (the upstream end of the project) on the right bank to better stabilize the toe of the slope. Additional racking material was distributed on the floodplain.



Figure 3. Newly created high flow side channel inundating during a winter flow event in Dry Creek.

Realign, Connect, and/or Create Channel-New Channel and Construct Side Channels:

Channel sinuosity was increased from 1.15 to 1.81 as channel length increased from 1,140 feet to 1,730 feet. The increased number of channel habitat units and the decrease in shear stress through the reach will allow for greater spawning opportunity. The floodplain connectivity through the project site increased by 2.69 acres with a 0.38 acres of wetland habitat created. The increase in floodplain connectivity has led to a significant increase in the width-to-depth ratio for the project site. The restoration approach constructed an inset floodplain to improve connectivity with instream flow and reduce potential flooding issues (Figures 4 through 9). Active floodplain surfaces were created at design elevations for an average width of 80 feet from the active channel edge. The number of pools were

increased from 4 to 12 and depth of all existing pools was increased. The combination of these project elements improved channel morphology.

During construction 3 side channels were created and designed to inundate during high flow events and then dry up at summer low flow so the limited base flow is not split into multiple channels. An additional 197 feet of high flow side channel was created (Figure 3).

Install Riparian Fence:

Riparian enclosure fence was constructed to protect the new channel and floodplain from grazing and was entirely funded through the NRCS CREP program. The new enclosure fence was constructed at the maximum average width allowed for a CREP project of 180 feet on both sides of the stream for a total length of 3,443 feet.

Plant Vegetation-Willow Trenching:

Upon completion of construction, the disturbed areas were reseeded and planted with native plant species. Planting and seeding of the riparian area and floodplain were funded through this BPA agreement and an NRCS CREP agreement. The BPA funded willow planting for the project and CREP provided funding for seeding, willow planting and the planting of potted and plug plants. The project site was revegetated with 4,600 locally harvested willow stakes, 380 native potted plant species, and 322 native plug species.

Approximately 2,500 willows were planted throughout the newly constructed floodplain through funding from the BPA. The initial plans called for willow trenching by excavating long narrow rows and then planting the willows below the water line. In coordination with the project engineers and the construction contractor this method was abandoned because of concerns that trenching in the new floodplain surface would destabilize the banks and terraces and weaken the overall floodplain integrity. The 7-foot long willow stakes were installed with the aid of a 6-foot metal stinger mounted to an excavator. Holes were punched to the maximum depth, stakes were placed in the holes, and backfilled with the stinger to achieve appropriate compaction.

The total stream miles planted was 0.32 miles and a total of approximately 8 acres. Tree and shrub species planted within the project area include: Water birch, Red osier dogwood, Black hawthorn, Black cottonwood, Golden currant, Woods and Nutka rose, Booth willow, Coyote willow, Blue elderberry, Snowberry, and Ponderosa pine. Upland areas, access roads, and other disturbed areas were planted with locally-adapted grass species which include Idaho fescue, Bluebunch wheatgrass, Basin wildrye, and Tufted hairgrass. Swale complexes and side channels were planted with Nebraska sedge and Beaked sedge. Potted and plug plants were planted in the fall of 2018 by the District and the Powder River Correctional Facility inmate work crew. Trees and shrubs were planted using hand augers and shovels. Grass seeding was conducted by hand seeding or by an ATV-mounted seeder, and was harrowed after seeding by Tri-County Weed. A pressurized irrigation system will be installed after spring and plants will be irrigated throughout the summer months.

Provide Construction Oversight & Management:

Construction management oversight was conducted by the District. Project partners from the Grande Ronde Model Watershed and Oregon Department of Fish and Wildlife also assisted with construction oversight. Engineering support was provided through OWEB funds by GeoEngineers, Inc.



Figure 4. Photopoint #2, taken pre-project on August 23, 2018



Figure 5. Photopoint #2, taken post project on October 1, 2018.



Figure 6. Photopoint #3, taken pre-project on August 23, 2018



Figure 7. Photopoint #3, taken post project on October 1, 2018



Figure 8. Photopoint #7, taken pre-project on August 23, 2018



Figure 9. Photopoint #2, taken pre-project on October 1, 2018

Project & Contract Administration:

The District completed project management, administration, project completion reporting, and status reports. The project incorporated design criteria to facilitate stable channel form with decreased width-to-depth ratios and riffle cross sectional area, increased sinuosity with appropriate radius pools and channel profile conducive to improving floodplain connectivity with activation of peripheral juvenile rearing habitat and reductions in solar heat loading. The number of pools increased from 16 pools per mile to 48 pools per mile after construction. The project improved floodplain roughness to encourage sediment deposition, bank building processes and improved riparian vegetation response. Large wood placement decreased streambank erosion and sedimentation to provide rapid vegetation regrowth and soil stability. Peripheral habitats (floodplain complexes and side channels) were increase in size and amount to increase juvenile rearing habitat, wetland development and hyporheic connectivity.

Monitoring:

Monitoring surveys will occur frequently enough to capture change that could result in a significant reduction in the desired habitat conditions. Surveys should occur during a similar timeframe each cycle and should occur under similar flow conditions. Monitoring surveys were conducted prior to construction (i.e. baseline condition) and immediately following construction for the as-built condition, and will be completed after the first bankfull event and then at a schedule based on flow conditions (e.g., exceeding the 2-year peak discharge). Photograph and visual inspection surveys will be conducted on an annual basis. Monitoring based on actual flow events have more meaning than simply doing a monitoring effort every year, however, no more than 5 years will lapse between any monitoring event to ensure that a significant number of monitoring events occur within the first ten years following construction. Vegetation will be monitored every year to ensure survival of plants and evaluate conditions of plant communities. Post-project monitoring frequency is based on discharge recurrence intervals.

Baseline conditions will be developed from data collected in late 2017 and 2018 for project design. The first post-restoration monitoring effort will be completed immediately following construction in late-summer/early-fall 2018. Subsequent annual and discharge-dependent monitoring is expected to occur through 2022 and beyond, as necessary.

Permanent photographic monitoring points have been established on the Cisco Living Trust property to monitor visual changes of the Dry Creek Aiwohi-Cisco Habitat Restoration project. A total of 4 locations have been monumented with steel t-posts and 7 photographs were taken (Table 1 and Figure 10). A latitude and longitude are documented for each monumented location and a compass bearing for each photograph is noted (map datum WGS 84). Pre-project photographs were taken on August 23, 2018 and will be repeated after construction activities are completed and on an annual basis thereafter.

Table 1. Monumented photograph points for the Dry Creek Aiwohi-Cisco Habitat Restoration project.

Monument Location	Photo Point	Latitude	Longitude	Bearing
1	1	N 45°29.587'	W 118°01.674'	235
	2	N 45°29.587'	W 118°01.674'	157
2	3	N 45°29.549'	W 118°01.652'	302
	4	N 45°29.549'	W 118°01.652'	180
3	5	N 45°29.493'	W 118°01.703'	15
	6	N 45°29.493'	W 118°01.703'	258
4	7	N 45°29.496'	W 118°01.748'	148

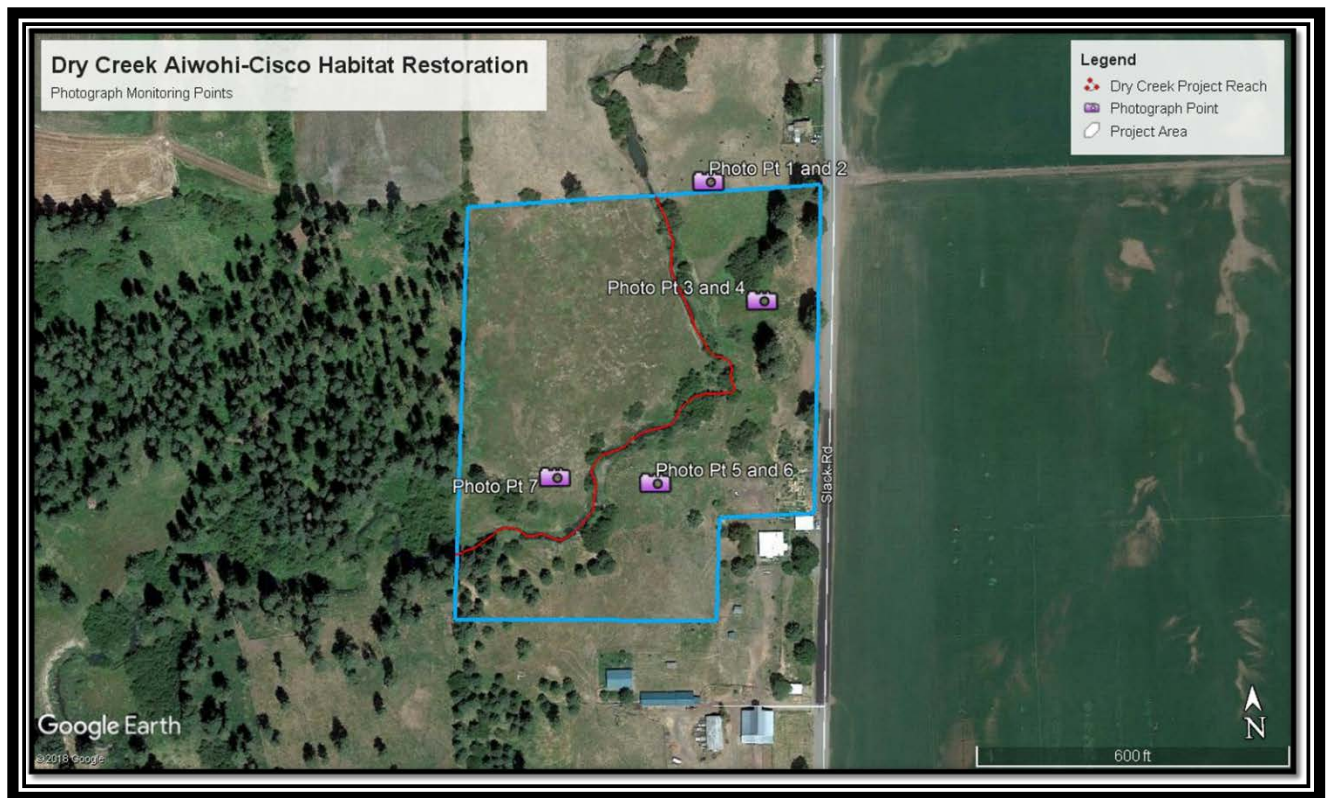


Figure 10. Photo-monitoring points for the Dry Creek Aiwohi-Cisco Habitat Restoration project.

Regional Plans

The District based restoration planning goals and objectives on information and analysis results from several assessments and strategy plans applicable to the Grande Ronde Subbasin. Designed project actions were developed as solutions that address limiting factors and ecological concerns (Table 2) identified within the following plans.

ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon (*Oncorhynchus tshawytscha*) & Snake River Basin Steelhead (*Oncorhynchus mykiss*) (NMFS 2017)

Limiting factors first identified in the Draft Proposed ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon and Snake River Steelhead were addressed with this project. The Recovery Plan has since been finalized by NMFS in 2017 and still identifies those limiting factors. The project created better flow conditions and improved sediment routing processes through the project site. The project was designed to restore both floodplain connectivity and wetland function.

Grande Ronde Subbasin Plan (NPCC 2004)

The Northwest Power and Conservation Council Grande Ronde Subbasin Plan identifies several management strategies that were employed in the design of this project. The project design utilized riparian management strategies that promote riparian and wetland function, exclude livestock degradation through long term easements, and increased wildlife corridors.

The Oregon Plan for Salmon and Watersheds (Oregon Watershed Enhancement Board)

The mission of the Oregon Plan is to restore native fish populations and supporting aquatic systems to productive and sustainable levels for environmental, cultural, and economic benefits. The Plan established specific measures around the factors that contributed to the decline in fish populations and watershed health. Most of these measures focus on actions to improve water quality and quantity and habitat restoration, and are consistent with goals of the Dry Creek project. In addition, the Dry Creek project included voluntary landowner restoration efforts and collaborative partnerships with state and

federal agencies, GRMW, and CTUIR.

Oregon's Native Fish Conservation Policy (ODFW 2002)

The purpose of Oregon's Native Fish Conservation Policy is to ensure the conservation and recovery of native fish. The Policy identifies three goals:

1. Prevent the serious depletion of native fish.
2. Maintain and restore naturally produced fish in order to provide substantial ecological, economic and cultural benefits to the citizens of Oregon.
3. Foster and sustain opportunities for fisheries consistent with the conservation of naturally produced fish and responsible use of hatcheries.

The project was designed and implemented to ensure the conservation and recovery of native fish.

The Oregon Conservation Strategy (ODFW 2016)

The Oregon Conservation Strategy is an overarching plan to conserve Oregon's fish and wildlife, and their habitats. Conservation strategy species include spring/summer Chinook salmon, summer steelhead, bull trout, and redband trout. The project was designed to improve riparian habitat and water quality and to address the limiting factors for strategy species, and is consistent with conservation goals of the strategy.

Limiting Factors Identified for the Project Reach

The Aiwahi-Cisco Dry Creek Restoration Project addressed limiting factors as standardized in the NOAA Fisheries Ecological Concern Categories and identified in Table 2.

Table 2. *Limiting factors and Ecological Concerns addressed by restoration actions of Aiwahi-Cisco Dry Creek Habitat Restoration.*

Limiting Factor ID	Ecological Concern	Limiting Factor Subcategory ID	Limiting Factor
1	Habitat Quantity	1.1	Anthropogenic Barriers
2	Injury and Mortality	2.1	Predation
3	Food	3.3	Altered Prey Species Composition and Diversity
4	Riparian Condition	4.1	Riparian Vegetation
		4.2	LWD Recruitment
5	Peripheral and Transitional Habitat	5.1	Side Channel and Wetland Condition Bed and Channel Form
		5.2	Floodplain Condition
6	Channel Structure and Form	6.1	Bed and Channel Form
		6.2	Instream Structural Complexity
7	Sediment Conditions	7.2	Increased Sediment Quantity
8	Water Quality	8.1	Temperature
		8.2	Oxygen
9	Water Quantity	9.2	Decreased Water Quantity

Lessons Learned & Adaptive Management

Knowledge is gained throughout a project's life cycle on improving project effectiveness and implementation efficiency, and opportunities are identified to better meet project goals and objectives.

Project planning teams discover both strengths and weaknesses through the documentation of lessons learned and adaptive management strategies. This process provides an opportunity for team members and partners to discuss successes during the project, unintended outcomes, and recommendations for others involved in similar future projects. Planning teams are able to evaluate actions that could have been more effective, address the root causes of problems that occurred, and develop ways to avoid problems in future project stages. Use of lessons learned is a principal component of an organizational culture committed to continuous improvement and adaptive management. Lessons learned mechanisms communicate acquired knowledge more effectively and ensure that beneficial information is factored into planning, work processes, and activities. The mechanisms or processes used to collect, share, and disseminate lessons learned may vary, but in general such a process is comprised of five main elements: defining the project, collecting information, verifying applicability, storage, and dissemination.

The final proposed channel alignment and location of design features were based on the digital elevation model and low elevation aerial photographs. Although final layout and staking was completed to guide construction, the exact location of the new channel and structure features were not marked until they were built. This resulted in minor adjustments to the alignment in order to retain natural vegetation and utilize existing floodplain features as much as possible. Completing a more thorough field layout by marking alignment locations and structure details prior to project construction could save time and unneeded field adjustments to engineered drawings.

Project planning and implementation in the Grande Ronde Subbasin is one example of efforts to learn and adapt management programs through time. Historically, basin partners developed projects in an opportunistic approach based on land access and landowner willingness to participate. Projects were largely identified and developed with willing landowners based on course scale planning established through the Grande Ronde Subbasin plan completed in 2004 (NPCC 2004). In 2013, basin partners initiated a strategic planning process (ATLAS) for Catherine Creek and the Upper Grande Ronde River based on salmon and steelhead life history requirements to stratify the watersheds by biological significant reaches, assign relative importance of limiting factors, define key actions to address limiting factors, and develop a ranking and prioritization system to clearly identify geographic and reach priorities and both short and long term strategies to focus watershed restoration actions in areas with the most biological need and the highest probability of benefit. The process engaged multiple basin partners and leveraged the best available science and local expertise available to develop a road map that all partners can utilize to identify, develop, and implement strategic watershed and fish habitat restoration and enhancement projects. Transitioning the opportunistic approach to a strategic planning approach may be one of the most important adaptive management changes employed in the basin for prioritizing and strategizing work in Catherine Creek and the Grande Ronde River to address survival gaps for Snake River Spring/Summer Chinook salmon and steelhead populations in the Grande Ronde Subbasin.

The District continues to monitor and evaluate performance of projects and conservation measures developed to improve watershed and fishery resources in the Grande Ronde Subbasin. Post project construction and monitoring data, along with staff experience and collaboration with basin partners, collectively informs and helps improve our understanding of how different techniques and approaches to restoration respond. In addition, new solutions can be developed and innovative approaches applied to addressing habitat limiting factors for salmon and steelhead populations.

Conclusion

Restoration actions were designed to maximize habitat benefit while minimizing costs and have reset the project site on a course from diminished aquatic habitat function to a self-sustaining system. The pre-project condition of the stream was incised within 5- to 10-foot banks with very little chance of habitat uplift. In coordination with a CREP agreement, livestock grazing will be excluded within a 180-foot floodplain easement on both sides of the Dry Creek channel. The completed project condition has

increase floodplain connectivity and achieved a more natural geomorphic condition.

Project implementation was partially funded by BPA and was permitted through the HIP III programmatic biological opinion. The HIP III programmatic requirements are consistent with the Oregon Aquatic Habitat Restoration and Enhancement Guide. The Oregon Plan for Salmon and Watersheds, Oregon's Native Fish Conservation Policy, and the Oregon Conservation Strategy outline strategies for maintaining and enhancing native populations of fish and wildlife. The project was conducted in a high priority reach of Dry Creek (lower valley reach) to promote and enhance conditions for naturally produced steelhead populations. The project was designed to focus on restoration of both riparian function and increased wetland habitat while greatly improving water quality throughout the project reach and downstream. The project includes voluntary landowner efforts to restore ecological conditions in collaboration with the Union SWCD, state and federal agency project partners, the watershed council and local tribal organizations.

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