ROBINSON CREEK RESTORATION PLAN

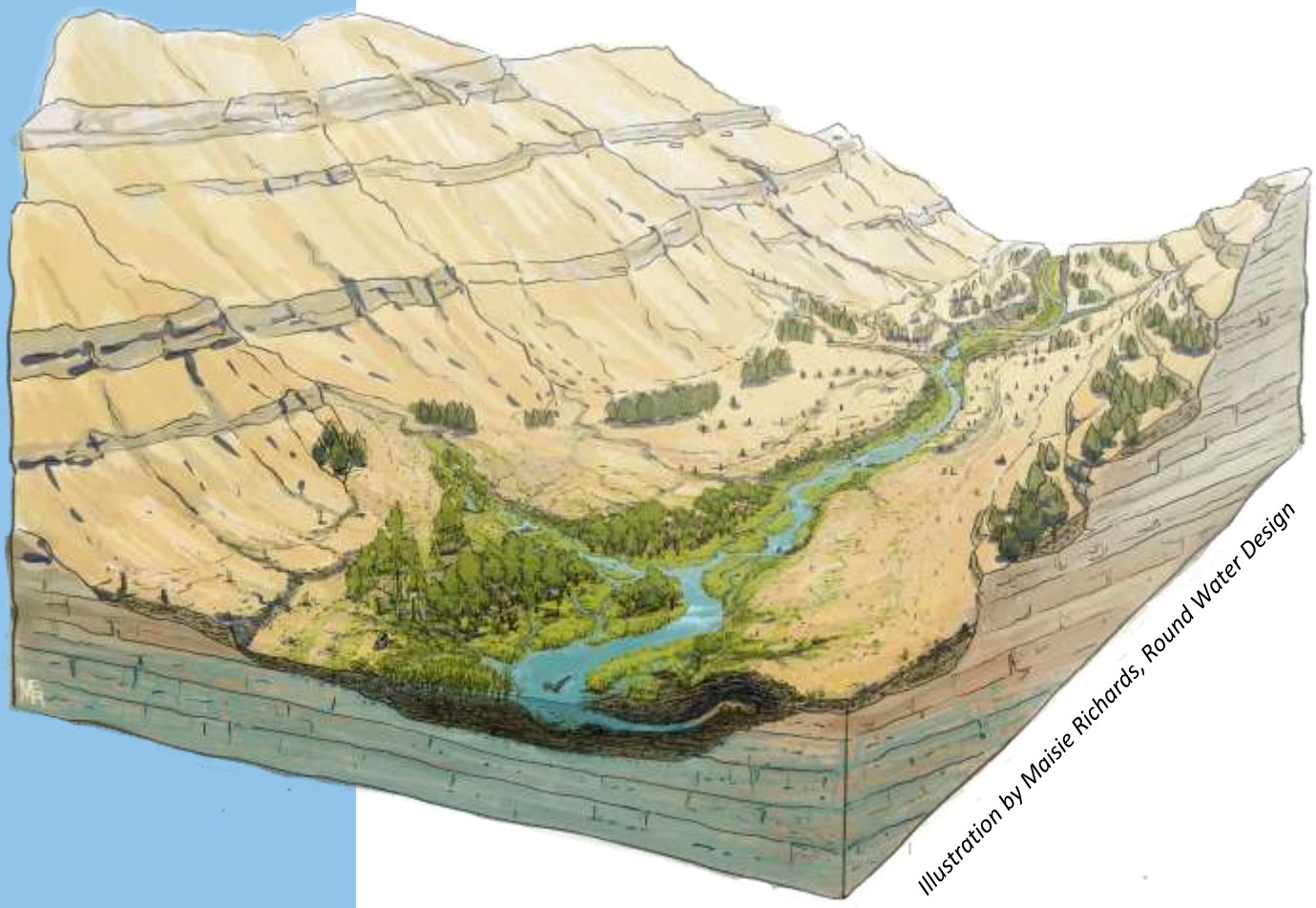

Illustration by Maisie Richards, Round Water Design

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Jefferson Jacobs, jjacobs@onda.org
Riparian Restoration Manager
Gena Goodman-Campbell, gena@onda.org
Stewardship Program Director
Oregon Natural Desert Association
www.onda.org | 541-330-2638

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Table of Contents

Tables

Figures

Appendices

ACKNOWLGEMENTS

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1.0 INTRODUCTION

The Oregon Natural Desert Association (ONDA) is collaborating with the Confederated Tribes of Warm Springs (CTWS) to restore watershed function and health on Robinson Creek as part of an ongoing partnership in support of the CTWS' conservation goals at Pine Creek Conservation Area (PCCA).

Pine Creek Conservation Area is a 34,000-acre property located in Wheeler County owned and managed by CTWS. Robinson Creek, an important tributary of Pine Creek and the Lower John Day River, includes designated Critical Habitat for Mid-Columbia steelhead trout and essential salmonid habitat (US National Marine Fisheries Service, 2009), and serves as a connective corridor for fish and wildlife moving from the lower elevations of the John Day Basin to higher elevation ponderosa pine forests. Historic livestock grazing and other agricultural activities coupled with climate change impacts have severely degraded natural processes and habitat function on Robinson Creek, leaving it deeply incised with poor instream habitat, reduced riparian habitat quality and quantity, and reduced instream flow.

This plan describes the background, proposed approach and restoration design for a four-mile process-based restoration project to be implemented over multiple phases by ONDA in partnership with CTWS.

1.1 Site History

Confederated Tribes of Warm Springs, which include the Warm Springs, Wasco, and Northern Paiute Tribes, have a rich history and tradition of stewardship across a vast territory that encompasses much of what is now central and eastern Oregon. Pine Creek is located in the John Day Basin near the geographic center of the lands ceded by the Confederated Tribes of Warm Springs in the Treaty of 1855 (Kappler, 1904).

Post-settlement, the dominant land use in the Pine Creek area was livestock grazing of sheep and cattle. Major ranching operations were established prior to and during the homestead era, which began locally in the 1860s. Livestock numbers peaked in the early 1900s, and impacts to rangeland and riparian areas were severe (Confederated Tribes of Warm Springs, 2004).

Confederated Tribes of Warm Springs identified the former Pine Creek Ranch as a Bonneville Power Administration (BPA) Wildlife and Watershed Mitigation Project site and acquired the property in 1999 using BPA mitigation funds for the purposes of mitigating the effects of the construction, inundation, and operation of the federal hydroelectric John Day Dam affecting the Columbia River basin and its tributaries (Confederated Tribes of Warm Springs, 2004). In 2001, CTWS again used BPA mitigation funds to expand PCCA with the purchase of Wagner Ranch, which extends south and west from the eastern portion of the original PCCA boundary to the John Day River. Land exchanges with the Bureau of Land Management were completed in 2021, consolidating CTWS' land holdings into the current 34,009-acre area.

Pine Creek Conservation Area is managed in accordance with the 2004 Pine Creek Conservation Area Management Plan. CTWS' primary goals for PCCA include the protection, management, and restoration of conservation values, using "strategies designed to achieve and maintain native habitat that is naturally self-sustaining" (Confederated Tribes of Warm Springs, 2004).

Since CTWS acquired PCCA, ONDA has developed a long-term partnership with CTWS to perform extensive restoration work throughout the property. Together ONDA and CTWS have already:

- Constructed dozens of beaver dam analogues and other instream structures to reconnect streams to their floodplains, and enable the expansion of riparian habitat recovery on Critical Steelhead Habitat on Pine Creek.
- Planted tens of thousands of trees and shrubs in springs and riparian areas throughout PCCA, including Robinson Creek, Little Pine Creek and Pine Creek.
- Removed more than 100 acres of juniper from riparian areas and springs to enhance habitat quality and stream flows.
- Mapped, dismantled and removed more than 80 miles of obsolete barbed wire fence to improve wildlife habitat connectivity.

Over the course of nearly two decades, ONDA and CTWS have planted riparian vegetation in all suitable locations along Robinson Creek given its degraded condition. The next step outlined in this plan is to expand suitable planting areas to increase riparian habitat quality and quantity and improve watershed function.

1.2 Regional Context

The John Day River is one of the longest undammed rivers in the contiguous United States and it is the only major tributary of the Columbia River that remains free-flowing (Figures 1, 2). The John Day River was historically one of the most significant anadromous fish producing rivers in the Columbia River basin, and today the river is home to two of the last remaining intact wild populations of anadromous fish in the basin. However, fish populations are depressed relative to historic levels, and the Middle Columbia River steelhead distinct population segment (DPS), which includes the John Day population, was listed as threatened under the Endangered Species Act of 1973 (ESA) on January 5, 2006 (71 FR 834).

Steelhead in the John Day Basin depend on small, cold tributary streams to survive through the hot and dry summer months in this arid landscape. Robinson Creek is one of the largest tributaries to Pine Creek, and both of these John Day tributaries are designated as critical habitat by the National Oceanic and Atmospheric Administration National Marine Fisheries Service (US National Marine Fisheries Service, 2009) (70 FR 52630).

The conservation and protection of Mid-Columbia steelhead and their habitat are guided by state and federal recovery plans, including the *Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan* (US National Marine Fisheries Service, 2009), and the *Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment* (Oregon Department of Fish and Wildlife, 2010).

Degraded tributary habitat is one of the “Main limiting factors and threats” for the John Day watershed identified in Section 6.4.2 of the federal recovery plan for Mid-Columbia steelhead, which also identifies improving habitat connectivity and conditions as “Key Actions proposed” in Section 7.3.2 (US National Marine Fisheries Service, 2009). More specifically, Section 8.2.5 of the Oregon Steelhead Recovery plan identifies “degraded floodplain connectivity and function,” “degraded channel structure (key habitat

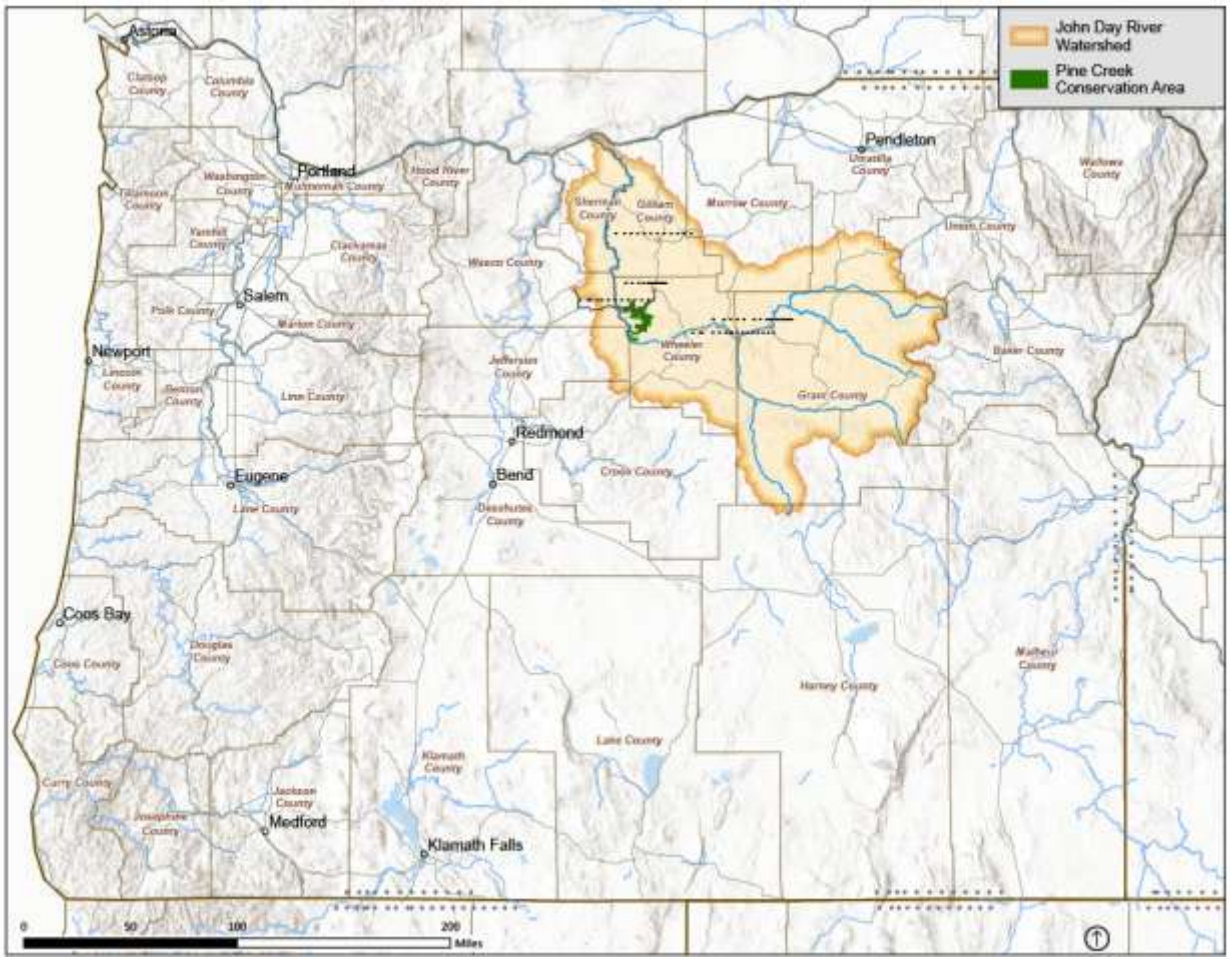


Figure 1. John Day River Watershed

quantity and habitat diversity),” and “water quality (temperature)” as primary tributary habitat limiting factors for the Lower John Day watershed (Oregon Department of Fish and Wildlife, 2010).

This restoration plan focuses on addressing key liming factors and threats to Mid-Columbia steelhead and other native fish by restoring instream and riparian habitat connectivity and function on Robinson Creek, as well as improving water quality and quantity.

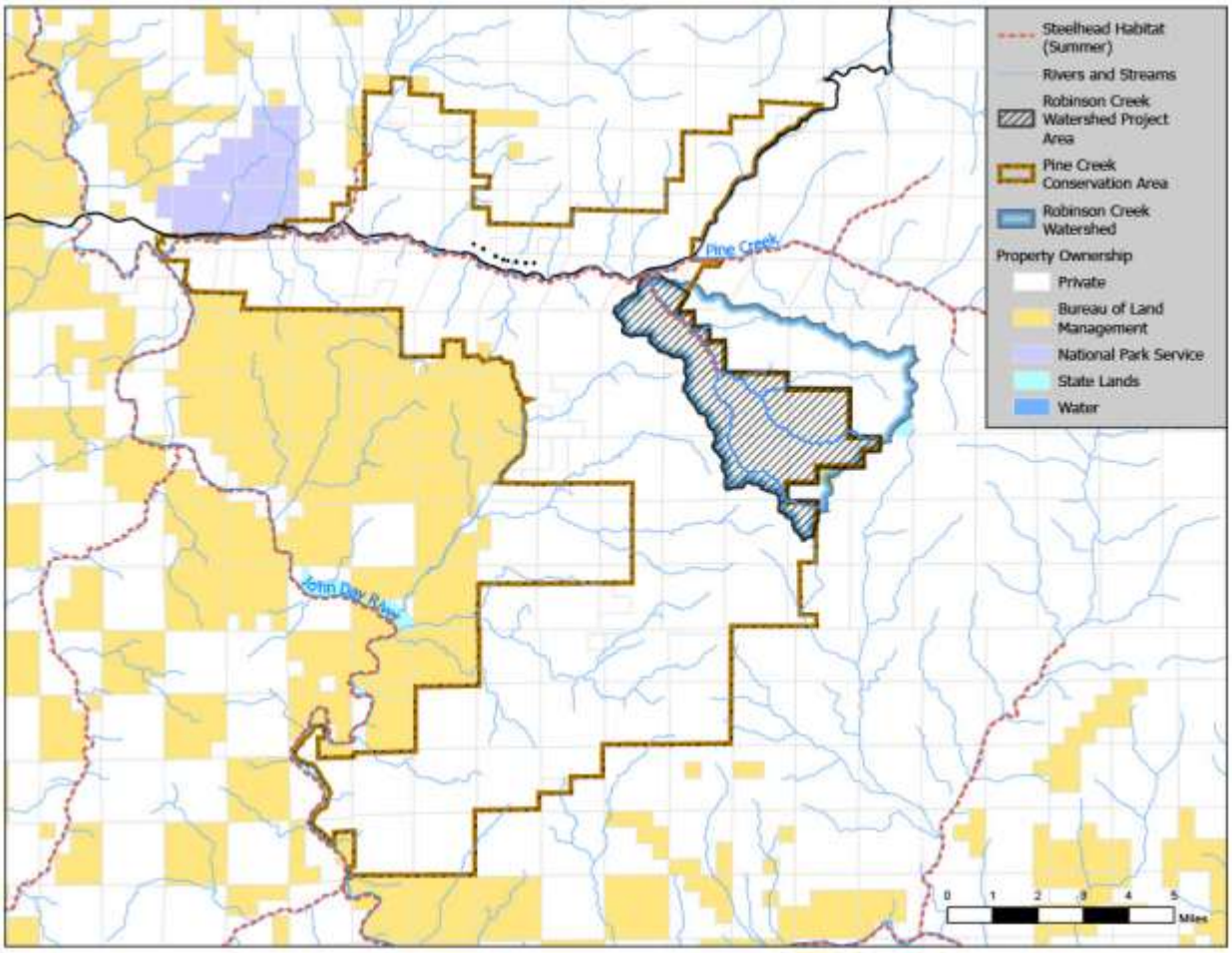


Figure 2. Robinson Creek Watershed and Pine Creek Conservation Area

2.0 EXISTING CONDITIONS

The cumulative, long-term impacts of intensive livestock grazing and agricultural use to riparian areas influenced the existing ecological conditions throughout the Pine Creek Conservation Area, and on Robinson Creek specifically (Confederated Tribes of Warm Springs 2004, Figure 3). As outlined in the *Pine Creek Conservation Area Management Plan*, these historic impacts include:

- Soil compaction and reduction of plant biomass from upland grazing increased run-off and erosive potential of streams.
- The invasion of bunchgrass habitats by annual grasses such as cheatgrass and medusahead, combined with juniper encroachment, increased the "flashiness" of watersheds, with the consequence of greater erosion during high flow events.
- Agricultural activities and settlement were concentrated in productive floodplains, irrigated with water diverted from the river and creek. Plowing floodplains into agricultural fields caused direct losses of native plant communities, and increased erosion.
- The invasion of noxious weeds has further displaced native vegetation in riparian areas and floodplains.
- Grazing within riparian areas further accelerated erosion through direct impacts to riparian vegetation.
- Beaver were trapped for their pelts, to the point of near extirpation from many areas. The temporary loss of beaver dams exacerbated the increased erosion from other impacts, leading to incision by stream channels, and loss of access to historic floodplains. (Confederated Tribes of Warm Springs, 2004).

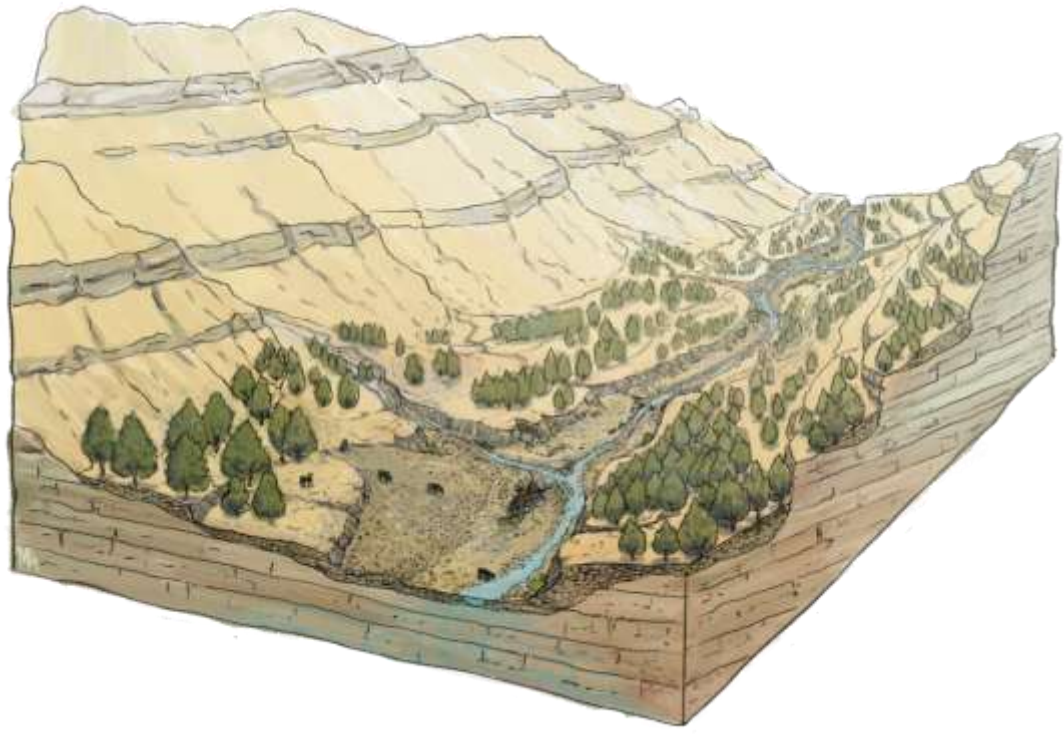


Figure 3. Artist's Rendering showing post-degradation, pre-restoration conditions.

The Robinson Creek watershed historically provided ten of miles of cool, perennial streams with high quality instream, riparian and floodplain habitat, serving as a migratory corridor for fish and wildlife to move between the lower elevation John Day River system into higher elevation tributaries and ponderosa and aspen forests. Due to the historic impacts described above, Robinson Creek lost structural resilience and became a deeply incised channel with unreliable and discontinuous flows along the majority of its length. Incision led to the draining and drying of the surrounding floodplains, resulting in a diminished water table and the loss of riparian habitat. Surrounding uplands and aspen stands were invaded by western juniper, and tributaries became flashier and eroded as the watershed's overall water holding capacity was reduced.

Additionally, geological constrains impact stream flows on Robinson Creek as depicted in the cut-away edge of the illustration in Figure 3. The bedrock of the valley bottom resembles the stair-step lava flow visible in the surrounding valley walls, with a cliff that drops down to a horizontal shelf of impermeable bedrock buried under a ramp of permeable cobble. As water flows down the stair-step formation, it percolates into the porous cobble areas until it reaches the impermeable bedrock beneath. During periods of lower stream flows, water levels are often not high enough to support surface water flows. These portions of the stream may not appear to be flowing, though water is present beneath the surface of the porous cobble ramps.

As a consequence of the conditions described above, surface water no longer flows along the entire stream length contiguously year-round, trapping steelhead and other fish in small isolated pools as water levels drop.

Most of the precipitation in the area falls in the form of rain during the months of November, December and early January. There is another pulse of moisture in the late spring from mid-April to mid-May. Average temperatures reach their peak in July and August, as do water deficits, with evaporation demands typically outpacing available moisture throughout the summer months. (Confederated Tribes of Warm Springs, 2004). As noted in the reach descriptions below in Section 2.1, several sections of Robinson Creek typically run dry by July or August under the existing conditions.

To address the root causes of riparian area degradation, CTWS removed livestock grazing and other agricultural activities upon acquiring PCCA. The cycle of decline has been further slowed by more than a decade of small-scale riparian planting projects in limited suitable locations, as well as an ongoing seven-year juniper management project led by CTWS. However, the full recovery of the creek to a condition which is closer to its ecological potential and provides for steelhead and wildlife habitat needs requires the development and implementation of a more comprehensive restoration project that creates the conditions for long-term, self-sustaining riparian habitat recovery.

2.1 Reach Descriptions

Approximately 13 miles of streams and tributaries in the Robinson Creek watershed were investigated through field surveys conducted between July 7, 2023 and October 17, 2024. Full reach description narratives are provided in the Appendix A. Reach description summaries are provided below in Table 1. The watershed was divided into these 13 reaches (Figure 4) over the course of the survey effort based on:

- Natural geomorphic delineations such as gradient, valley bottom width, depth of incision, and general composition of valley-bottom materials (e.g., alluvium, bedrock)
- Hydrology, specifically the degree to which late summer surface flow is present
- Biological characteristics such as the type and extent of woody riparian vegetation present, and state fish habitat designations
- Human infrastructure, management and logistical considerations such as the presence of roads, campgrounds that must be maintained, and the ability to access an area in order to conduct restoration work

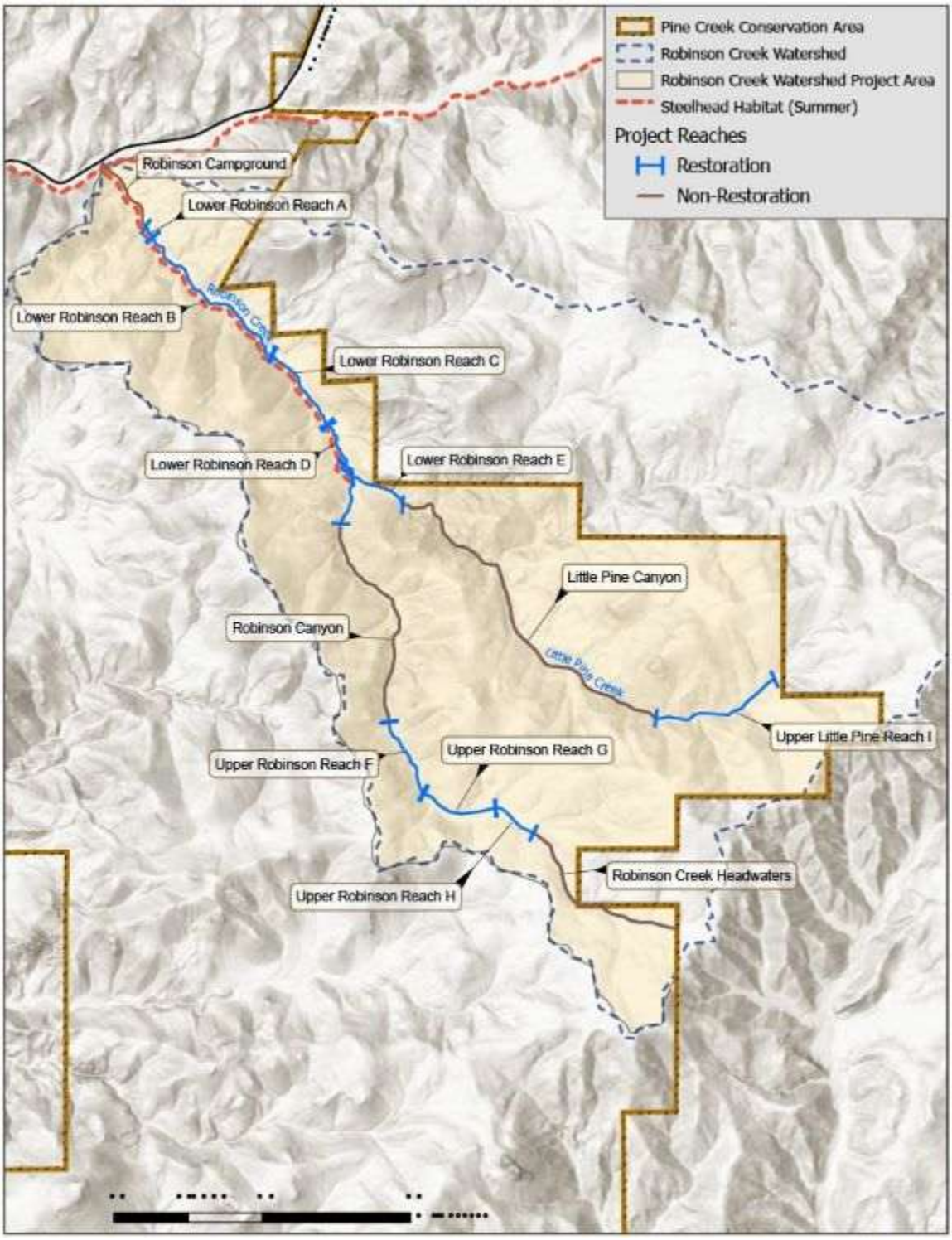


Figure 4. Robinson Creek Restoration Reaches

Table 1. Reach description summaries

	Geomorphology				Hydrology		Biology		Infrastructure and Access
Reach Name	**Character**	**Length (Miles)**	**Incision**	**Flood Plains**	**Perennial %**	**Gradient**	**Steelhead Habitat**	**Riparian Veg. %**	
Robinson Campground	Valley	0.42	Low	Wide	50% (Sept. '23)	2.6%	Yes	90%	Road and campground. ATV stream crossings. Historic home site on floodplain.
Lower Robinson Reach A	Valley	0.06	Low	Wide	100% (Sept. '23)	4%	Yes	100%	ATV trail on adjacent terrace.
Lower Robinson Reach B	Valley	0.93	Low	Med.	93% (Sept. '23)	3.6%	Yes	76%	ATV trail on adjacent terrace.
Lower Robinson Reach C	Valley	0.46	Low	Wide	5% (Sept. '23)	3.3%	Yes	5%	ATV trail on adjacent floodplain. ATV stream crossings
Lower Robinson Reach D	Confined Valley	0.23	Low	Wide	100% (Sept '23)	3.7%	Yes	100%	ATV trail on adjacent floodplain. ATV stream crossings. Cabin on adjacent hillside.
Lower Robinson Reach E	Valley Confluence	0.62	Med.	Narrow	10% (Sept '23)	4.9% (LP) 5.3% (R)	Partial	7%	ATV trail on adjacent terrace. ATV stream crossing.
Robinson Canyon	Rocky Canyon	1.12	Med.	None	66% (July '23)	9.9%	No	54%	No infrastructure. No Access
Upper Robinson Reach F	Valley	0.39	Low	Wide	31% (July '23)	3.5%	No	1%	ATV trail on adjacent Floodplain. ATV stream crossing.
Upper Robinson Reach G	Broad Valley	0.38	High	None	61% (July '23)	3.9%	No	37%	4WD Road on adjacent Terrace Potential historic sites on adjacent terrace.

Table 1. (continued)

Upper Robinson Reach H	Broad Valley	0.29	High	None	34% (July '23)	3.4%	No	<1%	4WD Road on adjacent Terrace
Robinson Headwaters	Valleys	Variable	Variable	Variable	<10% (July '23)	Variable	No	1%	Push-up dams at springs, ATV routes.
Little Pine Canyon	Rocky Canyon	2.79	Low	None	99% (July '23)	6%	No	70%	No infrastructure. No Access
Little Pine Reach I	Confined Valley	0.66	High	None	100% (July '23)	8%	No	85%	4WD Road on adjacent Terrace

Character: "Valley" sloping walls consisting of a small proportion of exposed rock as opposed to soil and a flat valley floor. Confined valleys have limited width of valley-bottom and are more canyon-like. "Broad Valleys" have substantially wide valley bottoms. "Rocky Canyon" a narrow confined canyon predominantly composed of bedrock or large rock outcroppings

Length: indicates the length of the existing stream channel.

Incision: Describes depth of incision from the most accessible floodplain. "Low" 1-3 feet, "Medium" 3-5 feet, "High" 5 to 20 feet.

Floodplains: Describes the width of the floodplain most likely accessed by the proposed project work. "Narrow" 1-10 feet, "Medium" 10-30 feet "Wide" 30 to valley-wide.

Perennial %: The percent of the total reach length where surface water was observed to be flowing on the given date.

Gradient: The percent change of elevation over the course of the existing stream channel for the reach.

Steelhead Habitat: Whether the reach falls within NMFS designated critical habitat for steelhead.

Riparian Veg. %: Describes the % of the total length of the reach which has a narrow strip of woody riparian vegetation growing along the immediate banks of the current stream channel

3.0 PLANNING AND SCOPING

With the support of an OWEB Technical Assistance grant and match funding from NewSun Energy, ONDA has collaborated with CTWS to develop this watershed restoration plan for Robinson Creek. The resulting riparian restoration plan is based on ONDA's tested approach to riparian restoration, as well as the direct experience and observations of ONDA and CTWS staff over the past two decades of work at PCCA.

During the planning phase of the project, which began in July 2023, approximately fifteen miles of stream channels and tributaries in the Robinson Creek watershed were investigated via on-the-ground surveys, and divided into restoration reaches as described above.

ONDA staff also collected and summarized additional data to inform discussions with CTWS as to the prioritization of restoration reaches. These included:

- The creation existing condition narratives for each reach
- Installation of trail camera "photo gauges" at six locations to monitor flows and track the timing of seasonal cycles
- Serviced and updated existing monitoring equipment for remote water table well monitoring at three sites
- Established and documented geo-located drone monitoring flight paths for priority restoration reaches
- Established geo-located photo monitoring points
- Began the process of compiling relative, existing long-term data-sets (such as avian monitoring, vegetation layers and photo-monitoring) which can be used to monitor results of future restoration work

The sum of this fieldwork and data collection, combined with initial discussions of ONDA's restoration approach, have been used to inform consultations with PCCA staff and receive their initial input regarding priorities and infrastructure needs or conflicts, as well as expectations of various proposed restoration approaches.

Throughout the planning process, ONDA consulted with PCCA managers, as well as CTWS staff, leadership, and Tribal members to understand:

- Desired outcomes;
- Project opportunities and limitations;
- Knowledge or insights about the site and its restoration needs and potential; and
- Project roles and responsibilities among potential implementation partners

ONDA also consulted with Oregon Department of Fish and Wildlife regional fisheries staff, who reviewed and provided input on the reach-specific restoration actions and designs presented below in section 3.3.

4.0 APPROACH

This restoration plan adopts a design approach based on the principles described in the in the *Low-tech Process-based Restoration of Riverscapes: Design manual* (Wheaton et al, 2019) and the *The Beaver Restoration Guidebook* (Pollock et al, 2023) as well as the experience and observations of ONDA staff over nearly two decades of successful restoration work across Oregon's high desert. The general steps summarized in Figure 5 are used create an adaptable, customized restoration plan based on an understanding of a site's unique suite of natural and human elements.

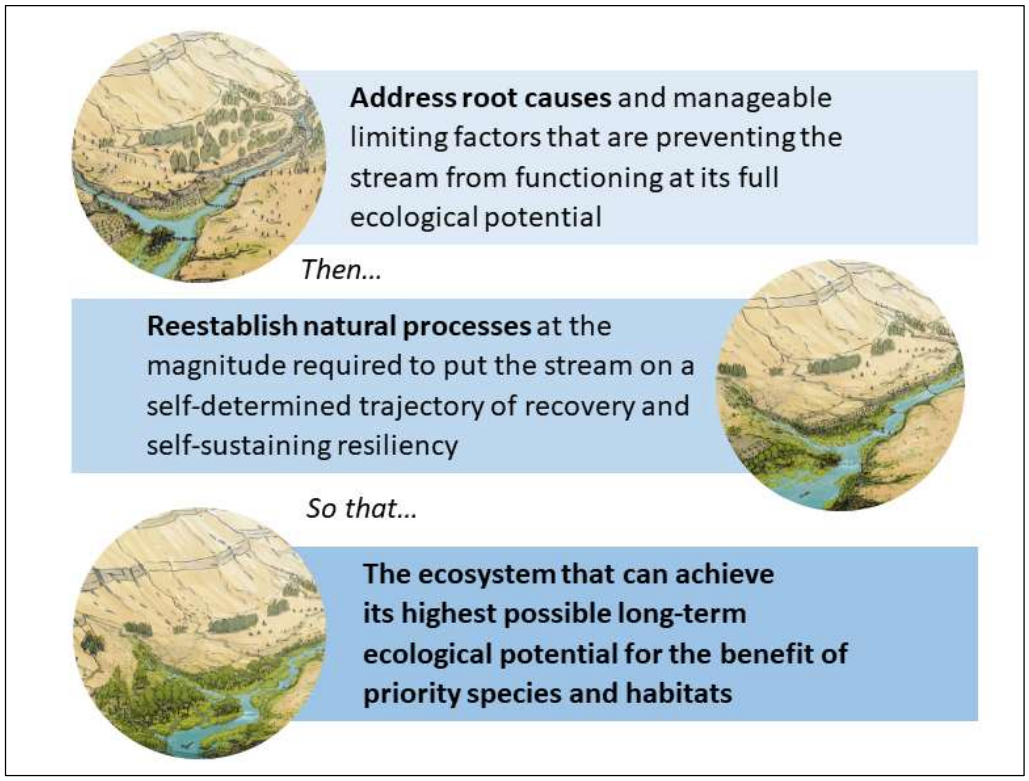


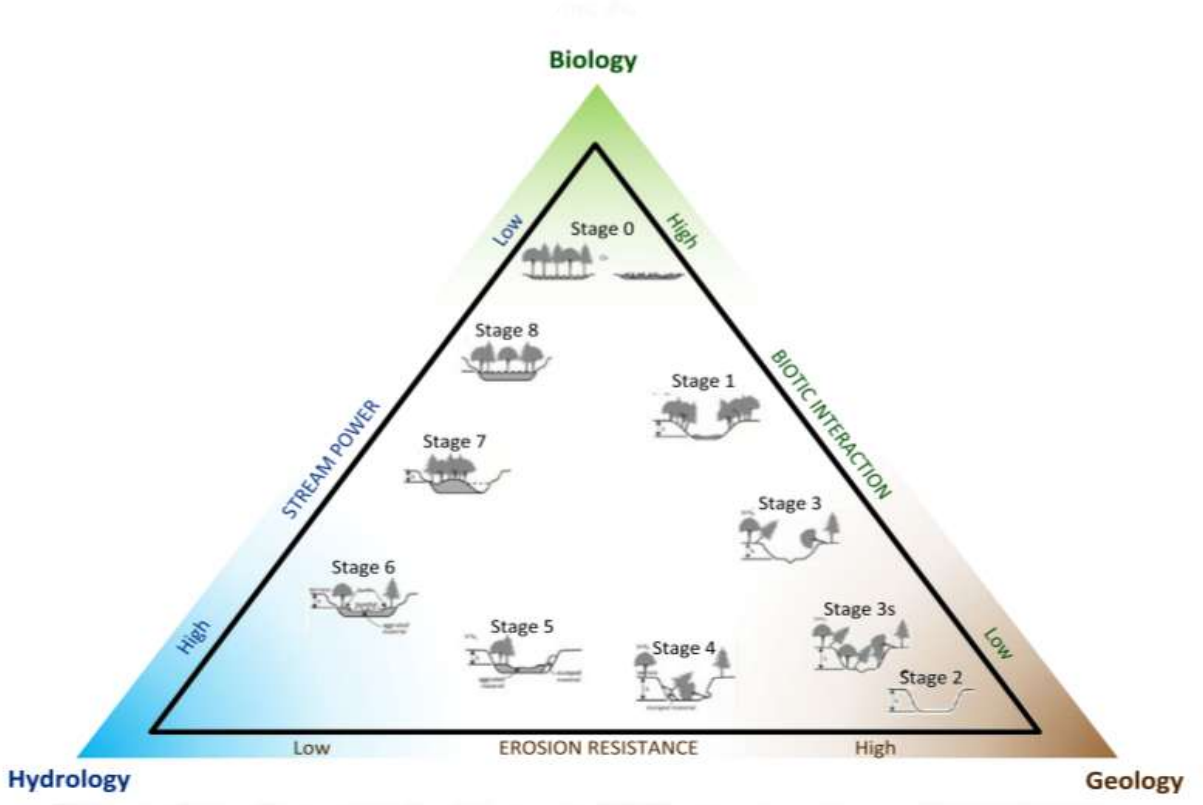
Figure 5. Restoration Approach

First, an understanding of the site is developed using direct observation and the collection of data with western scientific methods, as well as the guidance of Indigenous Knowledge. Each project is approached in a holistic manner, taking into account current conditions and their historic root causes, understanding and balancing the needs, contributions and interactions of native flora and fauna, and incorporating the needs and knowledge of human communities. This understanding then informs the creation of the vison and goals of a project, and the restoration objectives and the actions needed to achieve them.

While each watershed is unique, there are often similar conditions resulting from historic agricultural uses throughout the high desert of central and eastern Oregon. These conditions, which were outlined

in detail in the Site History and Existing Conditions sections of this plan, have led to the wide scale degradation of both riparian and upland habitats. One of the primary impacts of this degradation is an imbalance in the volumes and temporal patterns of hydrologic inputs from the uplands, resulting in deeply incised creeks which efficiently convey water off of the landscape without allowing it to soak into the underground water table. With lower hydrologic inputs and reduced residence times of existing flows, stream systems become flashy and are unable to provide sufficient soil moisture throughout the year to support the recovery of riparian vegetation. Additionally, the combined impacts of western juniper expansion and historic overgrazing on native plant diversity and abundance have resulted in a lack of food sources for herbivores such as deer and elk. In many areas, this dynamic has progressed to the point where a relatively small number of native browsers can effectively suppress passive recovery in both uplands and riparian areas. The result is a landscape dominated by a vegetation community populated by plant species which are not preferred by native fauna, and that are neither the correct type, nor in sufficient amounts to positively impact overall riparian habitat health.

Castro and Thorne's Stream Evolution Triangle (Figure 6, Castro and Thorne 2019) depicts how the state, or current condition, of a stream is influenced and controlled by three main factors: Biology (typically thought of as "vegetation", but includes influence of everything from mussel beds to beavers),



from Castro and Thorne, 2019

Figure 6. Stream Evolution Triangle

Hydrology (the interaction of water cycles with the landscape), and Geology. Stream state or condition can vary depending on the weighting of the three controlling factors within the Stream Evolution Triangle (SET), with example of real-world stream conditions represented by the diagrams of stages of degradation (or recovery) within the triangle. The lower zone of the SET represents the least beneficial habitat that is in the least healthy, most degraded state.

In the case of Robinson Creek, the stream is missing key biological controls (i.e., beaver and robust riparian vegetation), has limited flows, and is confined by geologic factors, with the stream channel reduced to cobbles and exposed bedrock in many places. Without intervention, the stream state will likely remain confined to the lower portion of the SET.

5.0 VISION, GOALS AND OBJECTIVES

5.1 Vision

The desired future condition is one in which Robinson Creek flows throughout its entire historic length, with thriving and resilient instream and riparian habitat that meets the needs of fish and wildlife, and supports sustainable traditional uses by Indigenous communities.

The following indicators will tell us when the restoration of Robinson Creek has been successful:

- **Improved Hydrology:** The stream flows perennially throughout designated steelhead habitat, with enhanced groundwater recharge and water table elevation supporting riparian vegetation and overall ecosystem health.
- **Natural Flow Regimes:** The stream experiences seasonal fluctuations in flow that mimic natural patterns, supporting biodiversity and ecological processes such as fish migration and sediment transport.
- **Floodplain Connectivity:** The stream reconnects with its floodplains during high-flow events, allowing for sediment deposition, water storage, and habitat expansion.
- **Aggraded Streambed:** The streambed has been raised through sediment accumulation, stabilizing the channel and preventing further incision, promoting healthier aquatic habitats.
- **Increased Biodiversity:** Riparian and aquatic plant communities are diverse and abundant, supporting a variety of wildlife species, including fish, amphibians, birds, and invertebrates.
- **Stable Streambanks:** Streambanks are stabilized by native vegetation, reducing excessive erosion and sediment loss.
- **Improved Water Quality:** Water temperatures are within the tolerance range of steelhead.
- **Habitat Quality:** The restored stream provides critical habitat for native species, such as Mid-Columbia steelhead, and other species of concern, contributing to overall ecosystem health.
- **Resilience to Disturbance:** The restored system is resilient to future disturbances, with natural processes (e.g., plant succession, sediment transport) supporting long-term equilibrium without ongoing interventions.
- **Resilient to Climate Stress:** The restored system is more resilient to climate extremes (e.g., droughts, floods, fires) due to improved water storage, groundwater recharge, and healthy vegetation cover.

To achieve this vision, project implementation will focus on restoring sufficient hydrologic and geologic processes in support of the recovery and maintenance of biological processes, which can move the stream into a more resilient condition. The following illustrations depict the way that the stream and floodplain are expected to evolve over the course the project, from the early degraded site condition (Figure 7), to the early phases of restoration (Figure 8), to improved conditions as the system responds to restoration actions (Figure 9), and ultimately supporting a condition that provides resilient riparian habitat that is on a self-sustaining trajectory of recovery (Figure 10).

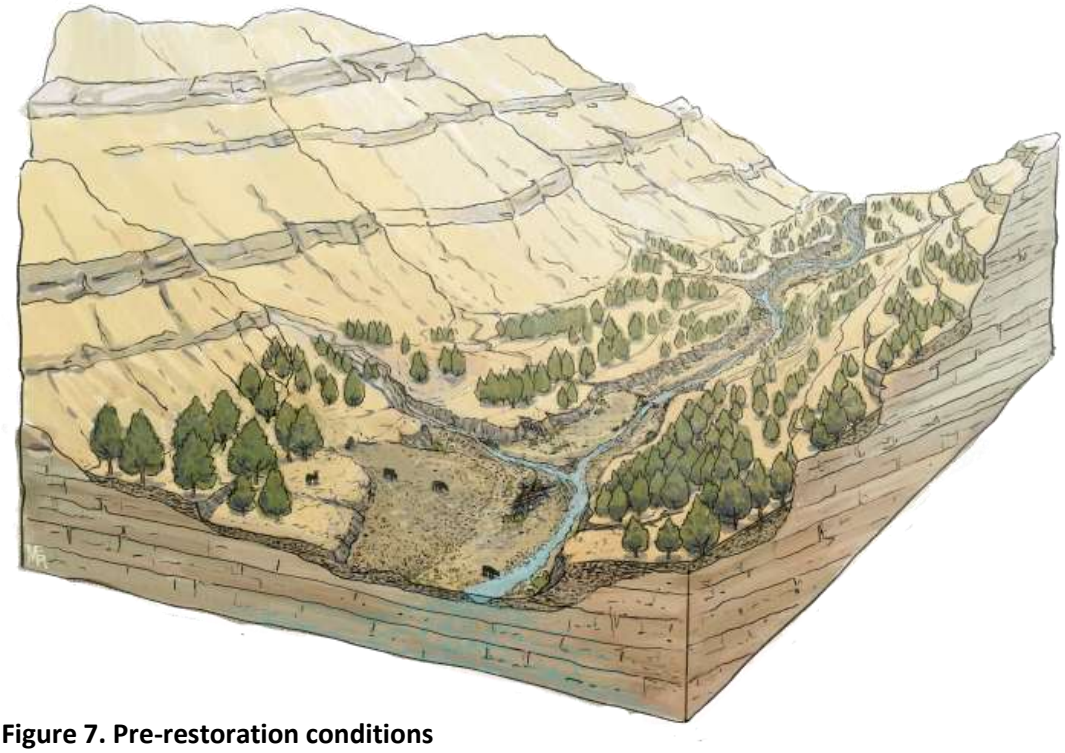


Figure 7. Pre-restoration conditions

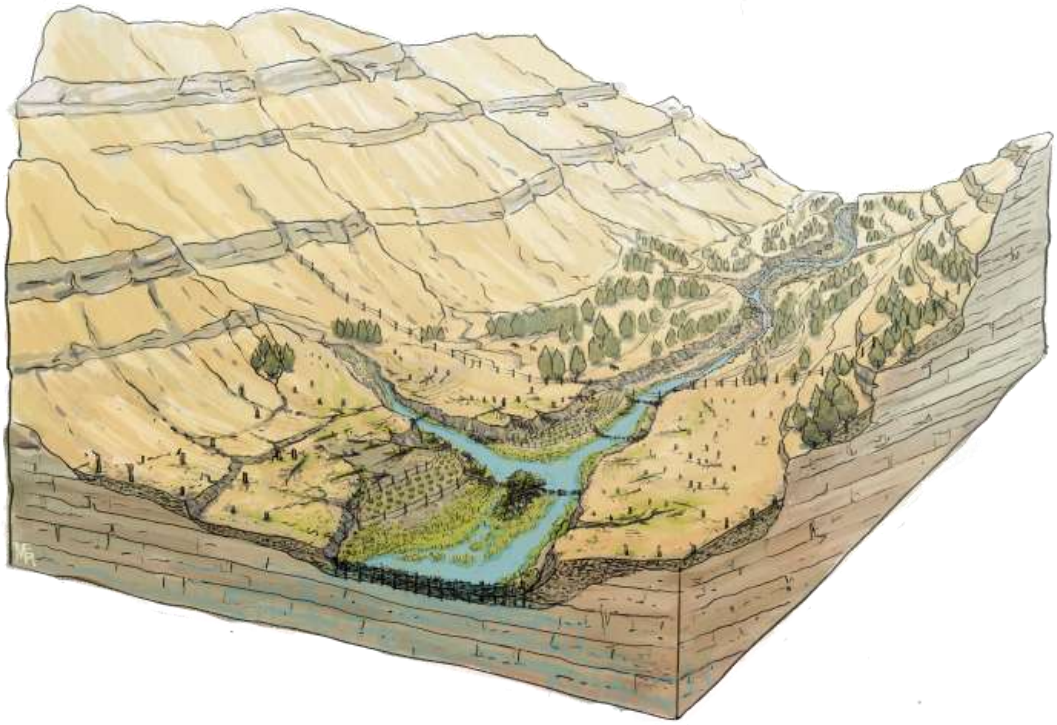


Figure 8. Restoration implementation year 1

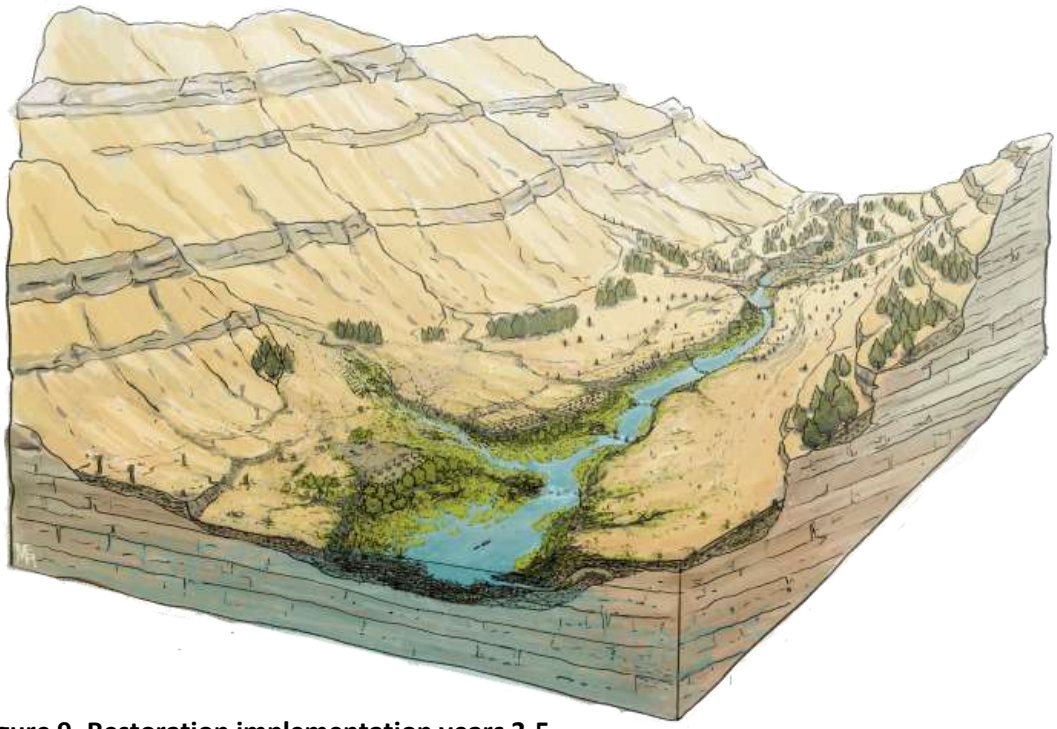


Figure 9. Restoration implementation years 3-5

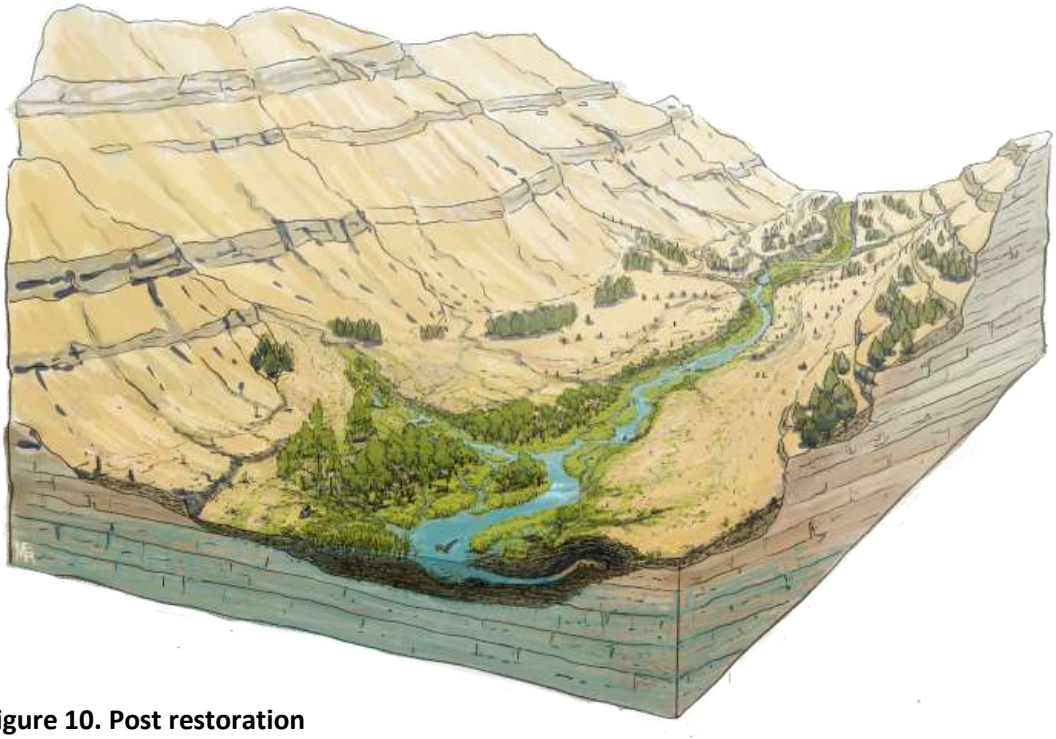


Figure 10. Post restoration

5.2 Goals

The goals for this project were developed to address the factors currently limiting the recovery of Robinson Creek to the envisioned future state described above.

The overall project goal is to restore and sustain the physical and biological processes necessary to support abundant, diverse and resilient instream and riparian habitat on Robinson Creek.

The goal for hydrological function is to restore balance between erosion and aggradation of sediment to recharge ground water, raise the water table, and support sustainable stream flows throughout the year. This will support the goal for riparian habitat, which is to increase the quantity and diversity of woody plants such as willow, cottonwood, dogwood, currant, aspen, and other trees and shrubs. Achieving these two goals will catalyze restored natural processes that will eventually result in a self-sustaining healthy stream system requiring little to no future maintenance or intervention.

5.3 Objectives

Because each reach is unique, objectives are defined at the reach scale as described in Section 6.2 below. Achieving the overall project goals depends on the degree to which individual reach objectives are met. Due to the watershed scale of the issues being addressed, individual reach objectives should be viewed as necessary components of the overall project, not a stepwise approach where individual reaches are restored in sequence. The restoration actions for each reach are intended to complement each other and are not intended as individual projects that can be completed independent from one another. Therefore, work within all restoration reaches will be conducted as simultaneously as is practical over five years depending upon the factors described in more detail below in Section 6.1.

6.0 IMPLEMENTATION

6.1 Implementation Phases

The project is designed to be implemented in three overlapping phases over five years, using an adaptive, process-based approach as the ecosystem responds to restoration activities. Funding availability will determine the pace of implementation and the degree to which multiple reaches can be implemented simultaneously.

Because this project aims to work with the natural systems on Robinson Creek to achieve restoration goals, natural disruptions such as flood, fire, drought or unusually low precipitation years could present challenges that impact the project timeline or prevent us from completing all aspects the project as currently planned. By breaking down the project into reach-specific objectives that can be completed in multiple overlapping phases, this plan provides multiple paths to completing the project and achieving the overarching restoration goals.

6.1.1 Phase 1: Monitoring Establishment and Structure Installation

Phase 1 focuses on establishing monitoring systems and installing instream structures, such as beaver dam analogues (BDAs) and Post Assisted Log Structures (PALs), to begin transforming the hydrology and morphology of the stream by accelerating and enhancing the ability of the system to capture water, sediment and nutrients.

To track hydrological changes, a network of monitored water table wells will be installed, providing data on soil moisture conditions that will guide planting decisions in Phase 2. Additionally, soil test pits will be dug in potential planting areas to assess soil composition and the relative ease or difficulty of digging in that location. These monitoring systems will inform the specific locations of instream structures and adaptive modifications to structures throughout the project, as well as the geographic extent, species composition and timing of Phase 2 planting activities.

Instream structures will be installed at high densities and strategically located to raise water tables and store portions of winter and spring floods within the underground water table adjacent to the creek. Water held in floodplain soils will support existing vegetation as well as new riparian plantings, and will increase perennial instream flows as stored water is slowly released over time back into the creek.

Instream structures will be maintained and adaptively modified annually based on flow and sediment conditions. This phase will overlap with Phase 2**,** as structures continue to evolve and create water table improvements to support plantings. Depending on the existing conditions in each reach and the pace of its response to restoration actions, it could take 1-10 years to reach planting readiness.

Removing western juniper from the floodplain during Phase 1 will provide an on-site source of building material for instream structures, as well as additional hydrological benefits and riparian habitat benefits through the reduction of evapotranspiration and precipitation interception cover.

Phase 1 will vary in duration by reach, depending on hydrological progress, and will include ongoing maintenance and adjustments throughout the five-year project period.

6.1.2 Phase 2: Planting

The second phase will focus on riparian planting to enhance biological processes and to complement and sustain improvements to hydrology and stream morphology (Figure 6). Extensive riparian plantings will be installed along streambanks and across the floodplain in areas where soil moisture will support successful riparian plantings. The careful matching of plant species and types (e.g., deep cuttings versus potted plants) with documented soil moisture conditions which can sustain their establishment and survival throughout the dry season, requires the deliberate monitoring strategy that is implemented at the beginning of Phase 1 and continued through the life of the project. Because of anticipated natural fluctuations in precipitation and the likelihood for highly variable hydrologic response to structure installation in Phase 1, planting may occur iteratively and repeatedly at any given site to account for changes over time and to maximize the extent, density and success of riparian revegetation.

Plantings will begin in September of the first year of Phase 2 when sufficient soil moisture is available. Willow and cottonwood cuttings, which can be planted deeply to access moisture, will be the primary species used, with an emphasis on diversifying the types of willow present and avoiding coyote willow to prevent monoculture development. In areas with high soil moisture, potted plants, including aspen, chokecherry, and water birch, may be installed to increase species diversity, but will be used sparingly due to their higher cost and the increased logistical difficulty of transporting and installing them. To improve survival, biodegradable cardboard weed mats will be installed around potted plants.

6.1.3 Phase 3: Monitoring and Adaptive Management

Following the completion of Phases 1 and 2, ONDA will adaptively manage the project sites as the stream continues to adjust to the physical and biological changes resulting from structure installation, riparian planting, and anticipated natural events (e.g., floods, fire, drought, etc.).

Adaptive management will consist of:

- Repairing damage to instream structures and maintaining structural requirements for fish passage.
- Augmenting existing structures (within permitted guidelines) to respond to hydrologic or aggradation improvements
- Responding to observed water table improvements by expanding water table well arrays and associated plantings

6.2 Restoration Actions by Reach

Out of the 13 total reaches surveyed, nine reaches, totaling four miles in length, are best suited to the restoration approach described above to achieve the desired future conditions based on the physical, hydrological and ecological attributes of each reach, with consideration given to potential infrastructure conflicts and the accessibility of each reach. Attributes informing the determination for the four “No Restoration Action” reaches (approximately 8 total miles) are summarized in Table 2. It is important to note that while this plan does not propose active restoration for these reaches, they will benefit from improvements to hydrological function achieved in adjacent reaches. Additionally, due to the presence of perennial springs, opportunities for additional upland or spring restoration activities within these reaches exist outside the scope of this plan.

In general, the proposed restoration actions in the nine restoration reaches fall into three categories: juniper removal, instream structure installation, and planting. The overarching goals for each of these three restoration action categories are summarized in Table 3.

Table 4 provides a more specific overview of proposed restoration actions within each of the nine restoration reaches, and the anticipated outcomes of restoration in each reach. Sections 3.3.1 through 3.3.9 reiterate the reach-specific outcomes, and describe the specific restoration objectives and associated actions and metrics in detail.

Table 2. Summary of "No Restoration Action" determinations

Reach Name	Restoration Action Determination	Attributes informing determination of "No Restoration Action"
Robinson Campground	No Restoration Action	Critical road and campground infrastructure present on the low floodplains. Flows will benefit from all upstream work.
Robinson Canyon	No Restoration Action	Difficult access. Narrow bedrock morphology does not provide sufficient opportunities for significant ecological or hydrological improvements to justify prioritizing work resources here.
Robinson Headwaters	No Restoration Action	Limited season surplus flows do not provide sufficient opportunities for significant hydrological improvements to justify prioritizing work resources here. Localized upland spring restoration opportunities exist outside the scope of this plan.
Little Pine Canyon	No Restoration Action	Extremely difficult access. Narrow bedrock morphology does not provide sufficient opportunities for meaningful ecological or hydrological improvements.

Table 3. Summary of Restoration Actions and Anticipated Outcomes

Restoration Action	Anticipated Outcomes of Restoration Action
Juniper removal	1) Reduce year-round evapotranspiration losses from near surface and deep water table. 2) Reduce precipitation interception cover, as well as negative impacts on desired riparian species. 3) Provide green material for instream structure construction.
Instream Structure Construction	Directly increase the length and duration of seasonal and perennial flows by improving the rate and volume of seasonal recharge of water-tables via increases in: 1) Residence time of seasonal flows (with a corresponding decrease in stream power) 2) Hydrologic head pressure forcing water infiltration into soil and hyporheic flows 3) Area for water infiltration into soil and volume of soil available for seasonal storage 4) Aggradation of sediments to lift the thalweg and therefore build and maintain growth of water table improvement processes Expand the latitudinal and longitudinal acreage of area suitable for planting native, deciduous riparian vegetation by: 1) Raising floodplain water tables to levels which provide suitable soil moisture to support establishment of plantings. 2) Maintaining suitable soil moisture at required depths in planting sites throughout the dry season. *Note: Structures are intended to be temporary (5-10 years), jumpstarting initial conditions which will be maintained by the establishment and recovery of the riparian habitat.
Riparian Planting	Create long-term, resilient processes ensuring the maintenance and continued improvement of morphological and hydrological gains. Directly contribute to instream and riparian habitat and conditions beneficial to priority species.

Table 4. Summary of Restoration Objectives by Reach

Reach Name	Restoration Action(s)	Restoration Objectives by Reach
Lower Robinson A	1) Floodplain juniper removal	Reduce juniper-associated hydrologic impacts on existing perennial flows, reduce competition with existing riparian vegetation and provide material for Lower Robinson Reach B structures.
Lower Robinson B	1) Floodplain juniper removal 2) <75 small BDAs 3) Planting on inset floodplains	Restoration of contiguous perennial flow and water table recovery throughout the reach supporting planting of riparian vegetation throughout longitudinal and latitudinal extent of suitable inset floodplains. Note: BDA size focusses on fish-passage permit compliance due to steelhead habitat.
Lower Robinson C	1) Floodplain juniper removal 2) <35 small BDAs 3) Planting on valley floor floodplains	Restoration of contiguous perennial flow and water table recovery throughout reach supporting planting of riparian vegetation coverage at all suitable sites throughout the valley bottom. Note: BDA size focusses on fish-passage permit compliance due to steelhead habitat.
Lower Robinson D	1) Floodplain juniper removal 2) <15 small BDAs 3) Planting on valley floor floodplains	Capitalizing on existing contiguous perennial flow to improve water table recovery throughout the reach, supporting passive recovery of existing vegetation, and planting of additional riparian vegetation on all suitable portions of the valley bottom which don't interfere with ATV passage. Note: BDA size focusses on fish-passage permit compliance due to steelhead habitat.
Lower Robinson E	1) Floodplain juniper removal 2) <45 small and medium BDAs 3) Small-scale opportunistic plantings	Improve the volume of water table engagement in support of perennial flows in downstream reaches, with potential for improvements in the length and duration of perennial flows and the establishment of small areas of riparian vegetation in direct association with the footprint of those hydrologic improvements. Note: BDA size below the confluence focusses on fish-passage permit compliance due to steelhead habitat, and more on rim to rim connectivity above the confluence.
Upper Robinson F	1) Floodplain juniper removal 2) <30 medium instream structures 3) Planting on valley floor floodplains	Restoration of contiguous perennial flow and water table recovery throughout the reach, supporting planting of riparian vegetation coverage on up to 50% of valley bottom in a way that allows for ATV passage. Note: BDA sizes will be larger in this reach than in steelhead habitat reaches, and focus more on floodplain connectivity.

Table 4. (continued)

Upper Robinson G	1) <20 large instream combination BDA/PAL instream structures Opportunistic planting in immediate association with structures and eventual planting on valley floor floodplains	Rapidly aggrade the channel through the active addition of material in the form of large PAL structures in order to capitalize on deep former floodplain sediments available for substantial seasonal flow storage and the active reestablishment of riparian plant communities throughout the valley floor (while still allowing ATV passage). Note: This reach is above steelhead habitat and does not support other fish. Therefore, instream PAL structures (designed with input from ODFW regional fish biologists) will focus on increasing material volume within the channel and quickly raising water tables in large increments. Plantings immediately associated with structures are intended for temporarily increasing structural resilience. Essentially no juniper present.
Upper Robinson H	1) Juniper removal at adjacent spring 2) <15 combination BDA/PAL instream structures 3) Opportunistic planting in immediate association with structures, and at adjacent springs	Rapidly aggrade the channel through the active addition of material in the form of large combination BDA/PAL instream structures in order to capitalize on deep former floodplain sediments available for substantial seasonal flow storage, increases in length and duration of perennial flows and the eventual, active re-establishment of riparian plant communities throughout the valley floor (while still allowing ATV passage), and the active establishment of riparian vegetation throughout the spring-fed acreage. Note: This reach is above steelhead habitat and does not support other fish. Therefore, instream PAL structures (designed with input from ODFW regional fish biologists) will focus on increasing material volume within the channel and quickly raising water tables in large increments. Plantings immediately associated with structures are intended for temporarily increasing structural resilience.
Little Pine I	1) Juniper removal at adjacent springs 2) <35 combination BDA/PAL instream structures 3) Opportunistic planting in immediate association with structures, and at adjacent springs	Rapidly aggrade the channel through the active addition of material in the form of large combination BDA/PAL instream structures in order to capitalize on deep former floodplain sediments available for substantial seasonal flow storage and the eventual, active re-establishment of riparian plant communities throughout the valley floor (while still allowing ATV passage). Note: This reach is above steelhead habitat and does not support other fish. Therefore, instream PAL structures (designed with input from ODFW regional fish biologists) will focus on increasing material volume within the channel and quickly raising water tables in large increments. Plantings immediately associated with structures are intended for temporarily increasing structural resilience.

6.2.1 Lower Robinson Reach A

Objectives

Reach contribution to project goal: Reduce year-round juniper evapotranspiration loss and competition with desired riparian woody vegetation

Reach Objective #1: Cut 1 acre of juniper from the stream floodplain.

Restoration Actions

Reach ACTIONS for Objective #1 Reduce Juniper Competition:

- Live junipers present in the valley bottom will be cut down concurrently with BDA construction in upstream reaches to provide live/green BDA-weave construction material. The trunks will be left where they fall as large woody debris.

Instream Structures:

- Because of this reach's location immediately upstream of the Robinson Creek Campground and its low, easily breached floodplains, no action will be taken to raise or extend the water table within this reach to avoid potential damage to downstream infrastructure.

Planting:

- No additional planting is planned within this reach during the scope of this project. Existing woody riparian vegetation already covers the existing floodplain and appears to be spreading on its own, and no work will be undertaken to directly further expand the water table in this reach.

Monitoring

Reach MONITORING for Objective #1 Reduce Juniper Competition:

- September drone flights along programmed, georeferenced repeatable routes, for visual comparisons and potential future comparisons.

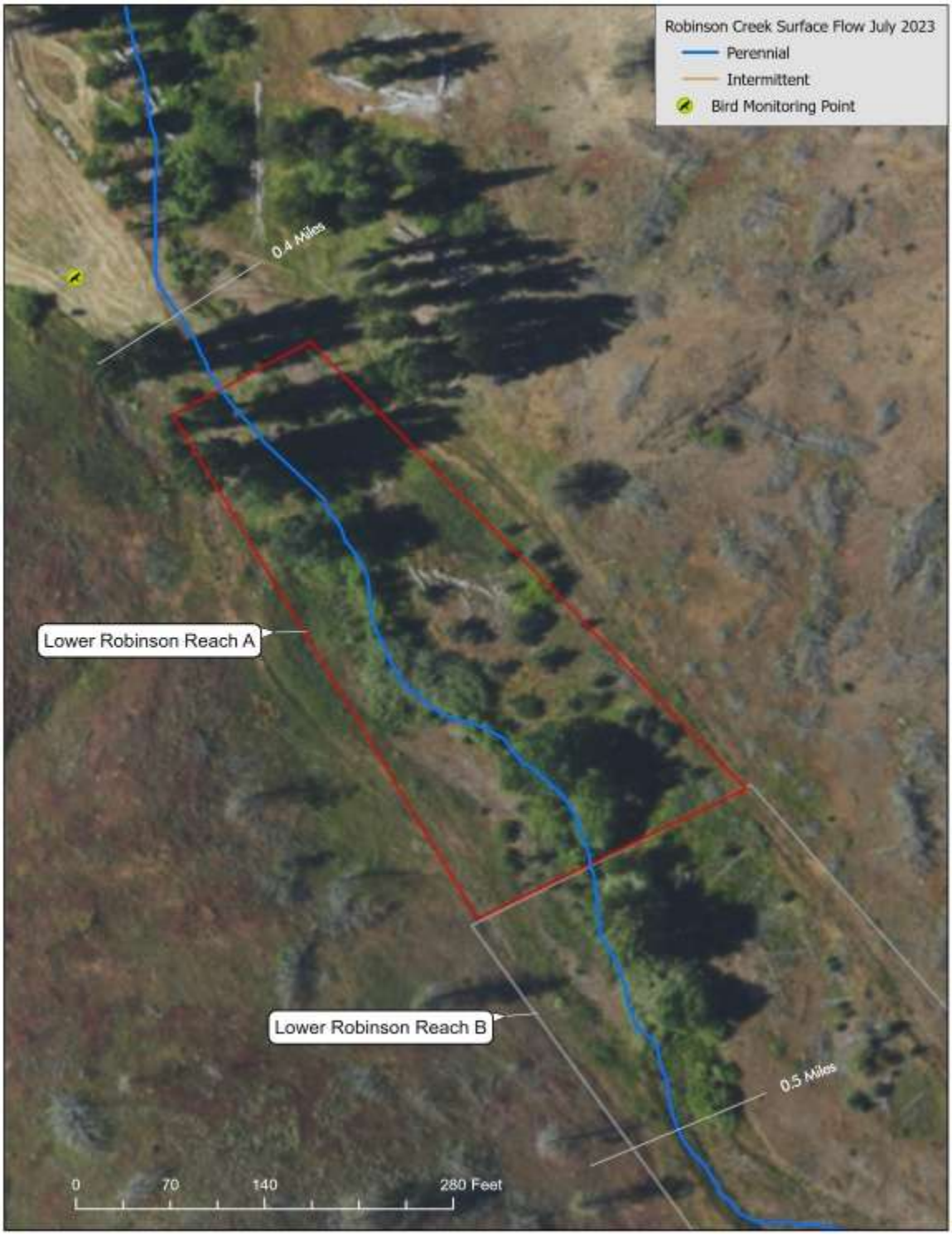


Figure 11. Lower Robinson Reach A

6.2.2 Lower Robinson Reach B

Looking upstream from the bottom end of the reach. Notice vegetation band planted in area of former creek location.

Objectives:

Reach B contribution to overall project goal: Water table and instream flow improvements within this reach will benefit these goals in downstream reaches and result in increased fish habitat and enhanced water quality. Improvements to the density and extent of deciduous woody riparian plant coverage within this reach will help maintain processes and morphologies supporting water table recovery, as well as helping address landscape-scale deficiencies in riparian habitat values.

Reach Objective #1 Monitoring and Initial Site Conditions:

- Measure the hydrologic metrics of success achieved by Reach Objectives #2 and #3, which will guide the implementation and expectations for Reach Objective #4.
- Track the success of Reach Objective #4 and establish initial site conditions that will guide adaptive improvements in implementation towards similar objectives on other reaches.

Reach Objective #2 Reduce Juniper Competition:

- Reduce year-round evapotranspiration loss, precipitation interception cover, and competition with desired riparian plant species in support of reach Objective #3 and #4.
- Produce BDA construction material for use in Reach Objective #3

Reach Objective #3 Hydrologic Improvements:

- Increase instream surface flow duration and longitudinal extent throughout the length of the reach.
- Increase water table recharge and residence time as measured by lateral and longitudinal improvements in "depth to late summer water table" in support of Reach Objective #4.

Reach Objective #4 Riparian Habitat Expansion:

- Increase riparian habitat extent throughout all suitable planting locations within the reach at densities of no less than 6,000 stems per acre.
- Increase resilience of instream structures with opportunistic plantings directly into the structures.

Background Justification:

While the reach currently lacks continuous perennial flow, the dry periods are short, and hyporheic reservoirs refill within one or two days. This flow pattern, combined with existing vegetation, suggests that it is possible to raise water tables enough to restore contiguous surface flows and elevate surface water levels. This would enable significant seasonal water storage in the floodplain, providing late-summer flows.

Soil surveys show the banks consist mainly of cobblestones, mixed gravels, and fine sediments, which offer low infiltration resistance and high water storage capacity. With improvements in water table accessibility, volume, and duration, the narrow bands of existing vegetation could be expanded through active planting on the inset floodplains.

The proposed restoration actions within this reach will not interfere with the use of the ATV trail in the short to medium term (<10 years).

Restoration Actions

Reach ACTIONS for Objective #1 Monitoring and Initial Site Conditions:

- Dig soil test pits and approximately 30 water wells to assess hydrologic conditions and monitor planting suitability in floodplain areas.

  Water table wells will consist of 1.5 inch diameter PVC pipe installed to a depth of 3 feet, at densities of 30 to 50-foot spacing, only within inset or adjacent floodplains less than 5 feet above thalweg and no further than 100 feet from the current stream channel. Exact distribution of well locations will be field-fit based on machinery access, changes observed over the course

of monitoring (i.e. wells may be added based on positive hydrologic response), and soil conditions observed during installation.

Because of the narrow potential planting areas, lack of evidence of valley bottom seeps, and difficult digging conditions, the number of water wells within this reach is expected to be approximately 30. Water table wells will be installed during phase 1.

Reach ACTIONS for Objective #2 Reduce Juniper Competition:

- Live junipers present in the valley bottom will be cut down concurrently with BDA construction to provide live/green BDA-weave construction material. The trunks will be left where they fall as large woody debris.

Reach ACTIONS for Objective #3 Hydrologic Improvements:

- Construct 50 to 75 regulatory fish passage compliant BDAs.

  Lower Robinson B is within the mapped portion of historic steelhead habitat. Fish of up to 6-inch length are often seen immediately upstream and downstream of this reach. Therefore, any BDAs constructed within this reach will conform strictly to the 6-inch jump height permitting requirements.

  To achieve the necessary uplift of water tables for riparian habitat restoration and hydrologic improvements will require the installation of between 50 and 75 small BDAs. On average, this translates to one BDA every 62 feet along the reach to raise water tables and promote sediment aggradation. However, the exact spacing of the BDAs will be adjusted in the field based on site conditions, such as the ability to drive posts into shallow cobble or bedrock, with a minimum spacing of 20 feet between BDAs.

  The placement of BDAs will also take into account local topographical features that offer opportunities for channel reconnection and clustering in areas with the best potential for targeted revegetation during Phase 2. The initial BDA placement is not fixed for the entire project; as aggradation and soil moisture conditions evolve, BDAs may be abandoned, built upon, or relocated to more effective locations based on ongoing monitoring and site responses.

  Sufficient sediment loads for aggradation of the stream bed will be provided by seasonal floods from side gullies and eroding banks, as well as sediment and loose senescent vegetation washed in from reconnected floodplains.

Reach ACTIONS for Objective #4 Riparian Habitat Expansion:

- Native woody riparian vegetation will be installed at high densities (up to 1 plant per $2ft^2$) in areas where soil moisture has been determined to be present at sufficient depths throughout the previous growing season.

Plantings will only occur in areas where sufficient soil moisture is present throughout the growing season. These conditions will be assessed as hydrological improvements progress through the installation of in-stream structures and groundwater recharge. The primary focus is on planting riparian vegetation at high densities on suitable inset floodplains in incised areas. No planting is planned for historic valley-bottom benches or valley-bottom seeps, as they are either too far from the creek or absent.

In areas requiring deep plantings, only native species suitable for cuttings (e.g., willow, cottonwood, red-osier dogwood) will be used. If perennial moisture is within 6 inches, potted species like aspen, choke-cherry, and alder may be planted, though large-scale potted plantings are unlikely in this reach.

Exact planting locations and species will be determined after soil pits and water wells are monitored to assess hydrological conditions. The reestablishment of the riparian plant community is crucial for habitat restoration, structural resiliency, and long-term ecological stability.

Due to narrow floodplains and difficult planting conditions, total planting area will be less than 0.25 acres, with fewer than 5,000 plants. The species used will be primarily willow and cottonwood cuttings.

- Install willow cuttings directly into structures whenever moisture persistence allows.

  Soil moisture improvements and sediment aggradation within and around the structures themselves may occur before conditions improve sufficiently for plantings on the adjacent floodplains. These improvements may allow for the planting of willows directly into the structures, establishing biological processes that will aid in the structures resilience and effectiveness. These plantings will likely be high mortality and require repeated efforts.

Monitoring

Reach MONITORING for Objective #2 Reduce Juniper Competition:

- September drone flights along programmed, georeferenced repeatable routes for visual comparisons and potential future orthophotographic comparisons. (same as for Objective #3 and #4)

Reach MONITORING for Objective #3 Hydrologic Improvements:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #3).
- Document the extent of surface flow present each September.
- Photo-points of each structure (spring and fall).
- Photo gauge monitoring: 2Xdaily photographs of stream channel to track the presence, timing, and qualitative surface flow volume (same as for Objective #4).

- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #4).

Reach MONITORING for Objective #4 Riparian Habitat Expansion:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #2)
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #3).
- Photo points of each large planting (each fall before leaf-drop)
- Survival estimates each fall for first three years after planting.

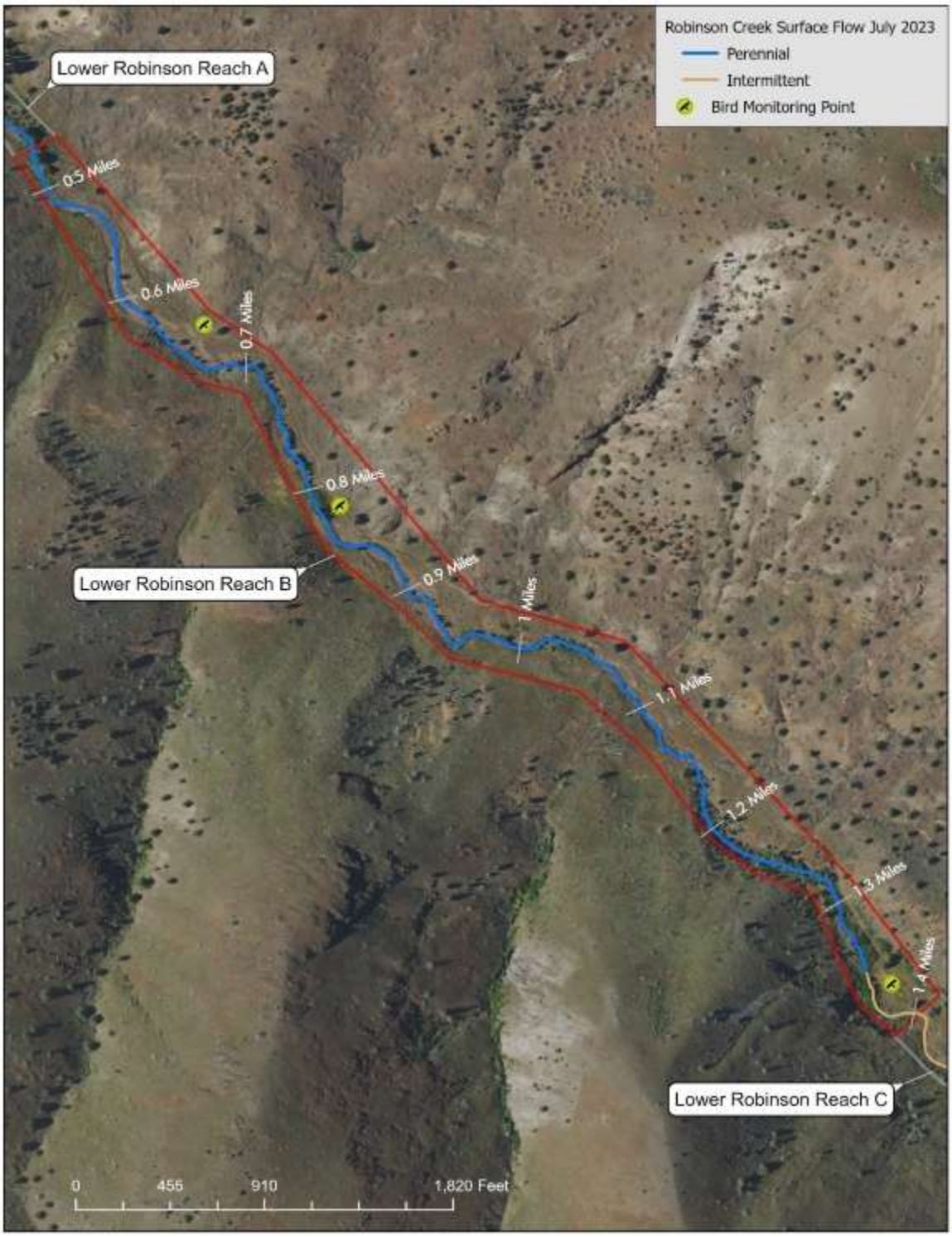


Figure 12. Lower Robinson Reach B

6.2.3 Lower Robinson Reach C

Looking upstream across the crossing that defines the downstream end of the reach.

Objectives

Reach C contribution to overall project goal: Water table and instream flow improvements within this reach will benefit these goals in downstream reaches and result in increased fish habitat and water quality. Improvements to the density and extent of deciduous woody riparian plant coverage within this reach will help maintain processes and morphologies supporting water table recovery, as well as helping address landscape-scale deficiencies in riparian habitat values.

Reach Objective #1 Monitoring and Initial Site Conditions:

- Measure the hydrologic metrics of success achieved by Reach Objectives #2 and #3: which will guide the implementation and expectations for Reach Objective #4.
- Track the success of Reach Objective #4 and establish initial site conditions that will guide adaptive improvements in implementation towards similar objectives on other reaches.

Reach Objective #2 Reduce Juniper Competition:

- Reduce year-round evapotranspiration loss, precipitation interception cover, and competition with desired riparian plant species in support of reach Objective #3 and #4.
- Produce BDA construction material for use in Reach Objective #3

Reach Objective #3 Hydrologic Improvements:

- Increase instream surface flow duration and longitudinal extent throughout the length of the reach.
- Increase water table recharge and residence time as measured by lateral and longitudinal improvements in "depth to late summer water table" in support of Reach Objective #4.

Reach Objective #4 Riparian Habitat Expansion:

- Increase riparian habitat extent throughout all suitable planting locations within the reach at densities of no less than 6,000 stems per acre.
- Increase resilience of instream structures with opportunistic plantings directly into the structures.

Background Justification:

The project area currently has perennial flow only in the upper portion of the reach, but seasonal flow returns quickly after precipitation events, indicating the presence of water that can recharge the water table in the broad, low floodplains. Initial inspections suggest these floodplains have substrates that can store significant amounts of water, making them suitable for riparian planting. Most planting sites will be concentrated in the upper half of the reach, where the valley-wide floodplains are accessible, representing the best opportunity for vegetation restoration on Lower Pine Creek.

In the lower half of the reach, the construction of BDAs will be crucial to capture seasonal high flows and fine sediments in the alluvial fan. These BDAs will slow water and promote water retention upstream, supporting hydrological improvements in the upper portion of the reach. While the alluvial fan is expected to be the last section to achieve continuous perennial flow, the improvement of watershed hydrology, aggradation of the upstream portion, and establishment of riparian vegetation will eventually lead to more fine sediments and water, facilitating long-term goals like aggrading the incised channel and restoring perennial flow in the alluvial fan.

The low, broad floodplains may eventually interfere with the use of the ATV trail in the upper portion of the reach (in more than five years), particularly in the form of wider and deeper crossings, along with potentially moist or occasionally flooded areas. This is a mid-term concern as the water table is elevated to support riparian habitat restoration.

Restoration Actions

Reach ACTIONS for Objective #1 Monitoring and Initial Site Conditions:

- Dig soil test pits and up to 50 water wells to assess hydrologic conditions and monitor planting suitability in floodplain areas.

  Water table wells will consist of 1.5 inch diameter PVC pipe installed to a depth of 3 feet, at densities of 30 to 50-foot spacing, only within the inset floodplains (lower half of the reach) and adjacent valley-wide floodplains (Upper half of the reach) less than 5 feet above thalweg and no further than 100 feet from the current stream channel. Exact distribution of well locations will be field-fit based on machinery access, changes observed over the course of monitoring (i.e. wells may be added based on positive hydrologic response), and soil conditions observed during installation. Water table wells and test pits will also be dug within the footprint of the valley bottom seep located on the floodplain on the southwestern side of this reach.

  Because of the broad valley-wide potential planting areas, and the presence of potentially suitable planting conditions associated with the valley bottom seep, and the potential ease of access of machinery to these locations the number of water wells within this reach is expected to be up to 50. Water table wells will be installed during phase 1.

Reach ACTIONS for Objective #2 Reduce Juniper Competition:

- The few remaining junipers present in the valley bottom will be cut down concurrently with BDA construction to provide live/green BDA-weave construction material. The trunks will be left where they fall as large woody debris.

Reach ACTIONS for Objective #3 Hydrologic Improvements:

- Construct 25 to 35 regulatory fish passage compliant BDAs.

  Lower Robinson Reach C is within the mapped portion of historic steelhead habitat. And fish of up to 6-inch length are often seen immediately upstream and downstream of this reach. Therefore, any BDAs constructed within this reach will conform strictly to the 6-inch jump height permitting requirements.

  To achieve the necessary uplift of water tables for riparian habitat restoration and hydrologic improvements, the project will require the installation of between 25 and 35 small BDAs along the reach. On average, this means installing one BDA every 68 feet to raise water tables and promote sediment aggradation. However, the exact spacing of BDAs will be field-fit based on site conditions, particularly the ability to drive posts into shallow cobble or bedrock, with a minimum spacing of 20 feet between BDAs.

  The placement of BDAs will also consider small-scale topographical opportunities for channel reconnection and clustering of BDAs in areas with particularly promising floodplains for targeted revegetation in Phase 2. While initial BDA placements are planned, they may evolve over time.

Depending on aggradation rates and soil moisture responses, some BDAs may be abandoned, rebuilt on top of previous structures, or constructed in new locations.

Sediment required for streambed aggradation will come from seasonal floods, side gullies, eroding banks, and sediment/vegetation washed in from reconnected floodplains. This will help build the necessary sediment loads to support the overall goals of the project

Reach ACTIONS for Objective #4 Riparian Habitat Expansion:

- Native woody riparian vegetation will be installed at high densities (up to 1 plant per $2ft^2$) in areas where soil moisture has been determined to be present at sufficient depths throughout the previous growing season.

  Plants will be installed only where soil moisture is sufficient for survival throughout the growing season. Hydrological conditions will be monitored as in-stream structures and groundwater recharge improve.

  The focus is on high-density riparian planting in suitable areas of the upper floodplains. Smaller-scale plantings may occur in the lower floodplains if conditions improve by project completion.

  Deep plantings will use native species for cuttings (willow, cottonwood, red-osier dogwood). Potted species (e.g., aspen, choke-cherry) may be used where moisture is within 6 inches, but large-scale potted plantings are unlikely, except near the spring seep.

  Planting specifics will depend on hydrological monitoring of soil moisture and conditions. The goal is to restore riparian habitat and build long-term ecosystem resilience.

  The total planting area is expected to be less than 1.5 acres, with fewer than 20,000 plants, primarily willow and cottonwood cuttings.

- Install willow cuttings directly into structures whenever moisture persistence allows.

  Soil moisture improvements and sediment aggradation within and around the structures themselves may occur before conditions improve sufficiently for plantings on the adjacent floodplains. These improvements may allow for the planting of willows directly into the structures, establishing biological processes that will aid in the structures resilience and effectiveness. These plantings will likely be high mortality and require repeated efforts.

Monitoring

Reach MONITORING for Objective #2 Reduce Juniper Competition:

- September drone flights along programmed, georeferenced repeatable routes for visual comparisons and potential future orthophotographic comparisons. (same as for Objective #3 and #4)

Reach MONITORING for Objective #3 Hydrologic Improvements:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #3).
- Document the extent of surface flow present each September.
- Photo-points of each structure (spring and fall).
- Photo gauge monitoring: 2Xdaily photographs of stream channel to track the presence, timing, and qualitative surface flow volume (same as for Objective #4).
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #4).

Reach MONITORING for Objective #4 Riparian Habitat Expansion:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #2)
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #3).
- Photo points of each large planting (each fall before leaf-drop)
- Survival estimates each fall for first three years after planting.

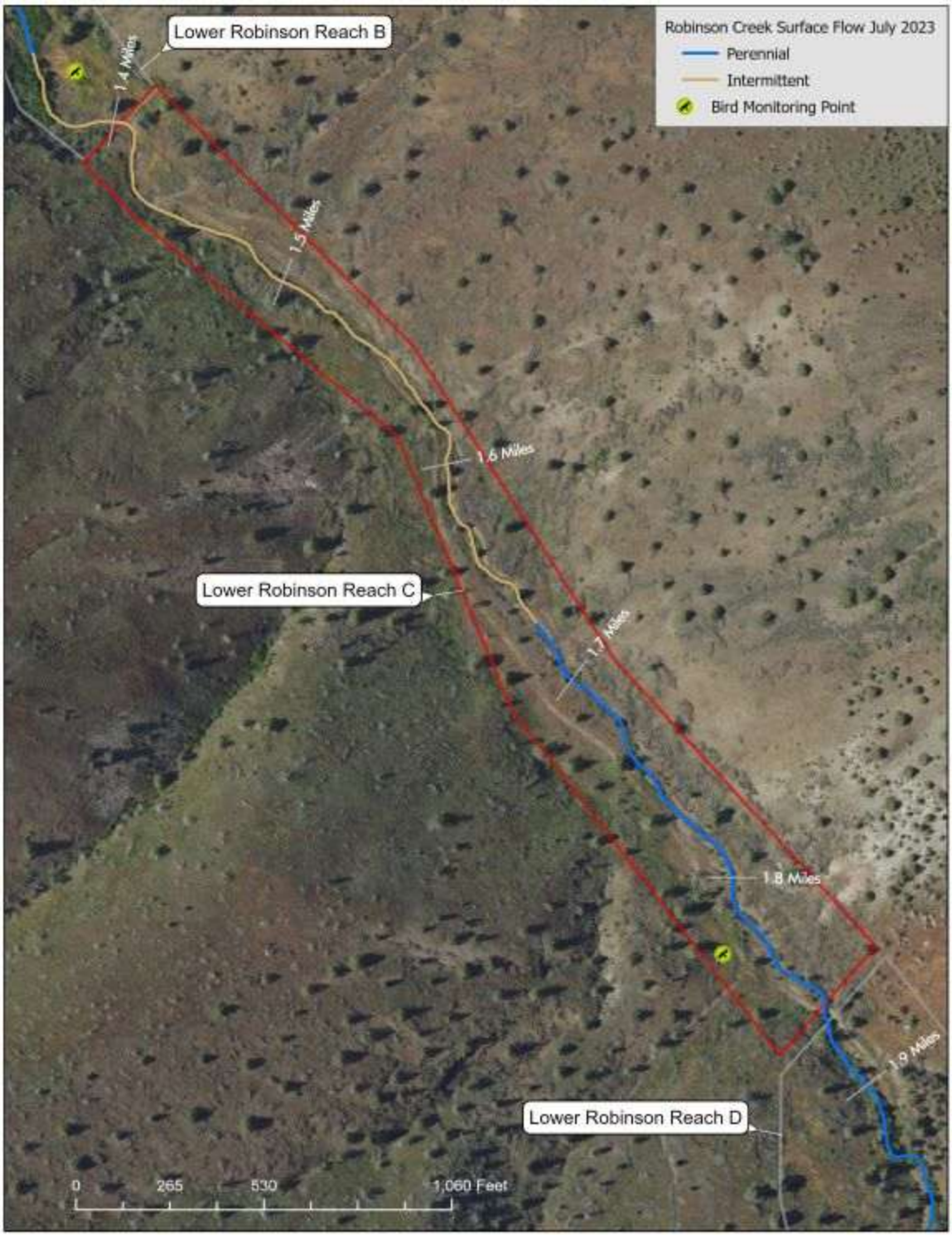


Figure 13. Lower Robinson Reach C

6.2.4 Lower Robinson Reach D

Looking downstream at one of the ATV crossings within the reach.

Goals and Objectives

Reach D contribution to overall project Goal: Improvements to the water table and instream flows in this reach will benefit downstream areas, enhancing fish habitat and water quality. Expanding the density and extent of deciduous woody riparian vegetation will support water table recovery and address landscape-scale deficiencies in riparian habitat.

Reach Objective #1 Monitoring and Initial Site Conditions:

- Measure the hydrologic metrics of success achieved by Reach Objectives #2 and #3: which will guide the implementation and expectations for Reach Objective #4.
- Track the success of Reach Objective #4 and establish initial site conditions that will guide adaptive improvements in implementation towards similar objectives on other reaches.

Reach Objective #2 Reduce Juniper Competition:

- Reduce year-round evapatranspirational loss, precipitation interception cover, and competition with desired riparian plant species in support of reach Objective #3 and #4.
- Produce BDA construction material for use in Reach Objective #3

Reach Objective #3 Hydrologic Improvements:

- Increase water table recharge and residence time as measured by lateral and longitudinal improvements in "depth to late summer water table" in support of Reach Objective #4.

Reach Objective #4 Riparian Habitat Expansion:

- Increase riparian habitat extent throughout all suitable planting locations which do not directly interfere with ATV passage within the reach at densities of no less than 6,000 stems per acre.
- Increase resilience of instream structures with opportunistic plantings directly into the structures.

Background Justification:

The perennial flows in this reach provide an opportunity for BDAs to capture and store seasonal high flows within the adjacent low floodplains. Initial inspections suggest the floodplains contain a mix of substrates, including cobble, which allows for moderate water storage.

A well-established band of diverse riparian vegetation is actively expanding and is expected to benefit from water table improvements. Additional plantings may be needed to accelerate and extend vegetation coverage. The narrow canyon and dense vegetation create a natural "trap," helping mitigate the erosive effects of future heavy rainfall.

Multiple ATV crossings and dense vegetation will require careful, adaptive placement and maintenance of planting and in-stream structures to avoid conflicts with existing infrastructure.

Restoration Actions

Reach ACTIONS for Objective #1 Monitoring and Initial Site Conditions:

- Dig soil test pits and approximately five water wells to assess hydrologic conditions and monitor planting suitability in potentially plantable floodplain areas.

  Water table wells will consist of 1.5 inch diameter PVC pipe installed to a depth of 3 feet, at densities of 30 to 50-foot spacing, within valley-wide floodplains less than 5 feet above thalweg. Exact distribution of well locations will be field-fit based on machinery access, changes observed over the course of monitoring (i.e. wells may be added based on positive hydrologic response), and soil conditions observed during installation. Water table wells and test pits will not be dug within the ATV trail.

Because of the narrowness of the valley and the shortness of the reach, approximately five water table wells will be installed within this reach. Water table wells will be installed during phase 1.

Reach ACTIONS for Objective #2 Reduce Juniper Competition:

- The few remaining junipers present in the valley bottom will be cut down concurrently with BDA construction to provide live/green BDA-weave construction material. The trunks will be left where they fall as large woody debris.

Reach ACTIONS for Objective #3 Hydrologic Improvements:

- Construct 3 to 5 regulatory fish passage compliant BDAs.

  Lower Robinson Reach C lies within mapped historic steelhead habitat, and fish up to 6 inches are commonly observed upstream and downstream. Therefore, any BDAs constructed in this reach will comply with the 6-inch jump height requirements.

  To raise water tables and support riparian habitat expansion, 3 to 5 BDAs will be needed, spaced approximately 240 feet apart. Exact spacing will be field-determined based on site conditions, including the ability to drive posts into shallow cobble and avoid blocking ATV trail crossings. BDAs will be no closer than 20 feet apart. Placement may evolve over time based on aggradation rates and soil moisture responses, with BDAs potentially being relocated, abandoned, or built atop previous structures.

  Sediment for streambed aggradation will be supplied by seasonal floods and sediment from reconnected floodplains. Elevating the water table and expanding riparian vegetation may interfere with ATV trail use within 5 years, potentially making the trail impassable without regular maintenance.

  Reach ACTIONS for Objective #4 Riparian Habitat Expansion:

- Vegetation recovery within this reach may be achieved via passive recovery. However, if existing vegetation does not spread after 2 seasons of water table recovery. Native woody riparian vegetation will be installed at high densities (up to 1 plant per $2ft^2$) in areas where soil moisture has been determined to be present at sufficient depths throughout the previous growing season.

  Plants will be installed only where sufficient soil moisture is present throughout the growing season. These conditions will be assessed as hydrological processes improve through the installation of instream structures and groundwater recharge.

Riparian vegetation recovery will focus on high-density planting across suitable floodplain areas, excluding the ATV trail. Vegetation in the trail will be maintained by periodic cutting.

In areas requiring deep plantings to reach perennial soil moisture, native species like willow, cottonwood, and red-osier dogwood will be used. Where moisture is within 6 inches of the surface, potted species like aspen, choke-cherry, and alder may be considered, though large-scale use of potted plants is unlikely.

Since planting conditions will result from instream improvements and rely largely on passive vegetation recovery, it is not possible to predict exact plant species or numbers until soil and water conditions are monitored.

The re-establishment of the riparian plant community will enhance habitat values and provide long-term structural resiliency, preventing future degradation and supporting restoration efforts.

Available planting areas are less than 0.1 acres, and active planting will rely on willow and cottonwood cuttings due to the expected depth to perennial moisture.

- Install willow cuttings directly into structures whenever moisture persistence allows.

  Soil moisture improvements and sediment aggradation within and around the structures themselves may occur before conditions improve sufficiently for plantings on the adjacent floodplains. These improvements may allow for the planting of willows directly into the structures, establishing biological processes that will aid in the structures resilience and effectiveness. These plantings will likely be high mortality and require repeated efforts.

Monitoring

Reach MONITORING for Objective #2 Reduce Juniper Competition:

- September drone flights along programmed, georeferenced repeatable routes for visual comparisons and potential future orthophotographic comparisons. (same as for Objective #3 and #4)

Reach MONITORING for Objective #3 Hydrologic Improvements:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #3).
- Document the extent of surface flow present each September.
- Photo-points of each structure (spring and fall).
- Photo gauge monitoring: 2Xdaily photographs of stream channel to track the presence, timing, and qualitative surface flow volume (same as for Objective #4).

- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #4).

Reach MONITORING for Objective #4 Riparian Habitat Expansion:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #2)
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #3).
- Photo points of each large planting (each fall before leaf-drop)
- Survival estimates each fall for first three years after planting.

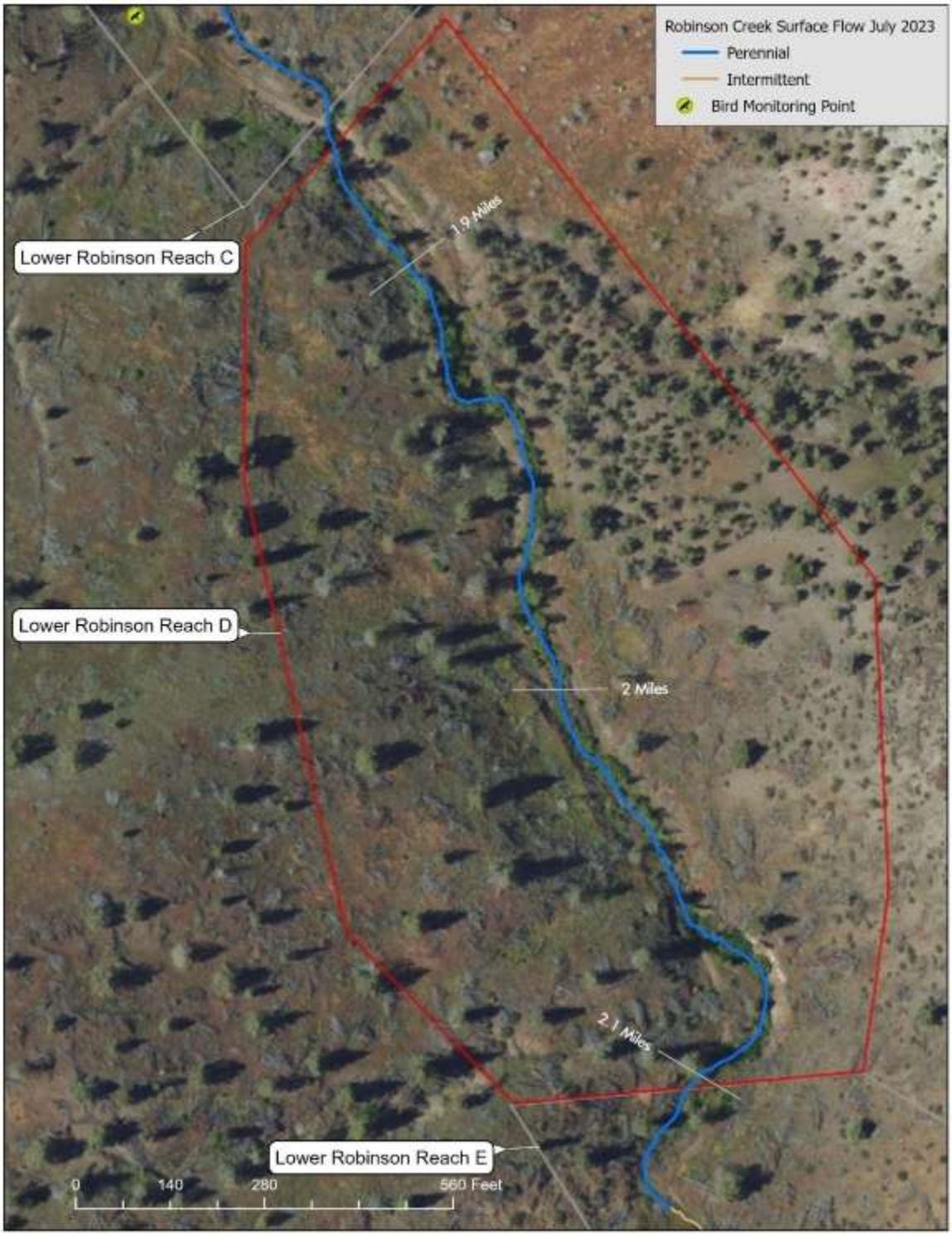


Figure 14. Lower Robinson Reach D

6.2.5 Lower Robinson Reach E

Looking upstream from above the lower crossing that delineates the lower end of the reach. Little Pine on left, Robinson on right.

Goals and Objectives

Reach D contribution to overall project Goal: Water table and instream flow improvements within this reach will benefit these goals in downstream reaches and result in increased fish habitat and water quality in those downstream reaches.

Reach Objective #1 Monitoring and Initial Site Conditions:

- Measure the hydrologic metrics of success achieved by Reach Objectives #2 and #3.

Reach Objective #2 Reduce Juniper Cover:

- Produce BDA construction material from the few remaining juniper on this reach for use in Reach Objective #3

Reach Objective #3 Hydrologic Improvements:

- Increase water table recharge and residence time as measured by lateral and longitudinal improvements in “depth to water table”.

Reach Objective #4 Riparian Habitat Expansion:

- Increase resilience of instream structures with opportunistic plantings directly into the structures.

Background Justification:

The lack of substantial perennial flows, and established riparian vegetation within this reach, indicate that expectations as to improvement should be limited to structurally-based hydrologic improvements that can be built on in future phases, and not include significant improvements to riparian habitat cover within the short term (<5 years). However, opportunistic plantings will occur, where suitable, to directly contribute towards the resilience of the structures themselves.

Restoration activities on this reach will not interfere with ATV trail because of the height of the trail above the creek. However, elevating the water table, may begin to interfere with use of the ATV trail crossing during times of highest flows in the long-term (>10 years).

Restoration Actions

Reach ACTIONS for Objective #1 Monitoring and Initial Site Conditions:

- Install up to 10 water wells to assess and track hydrologic conditions.

  Water table wells will consist of 1.5 inch diameter PVC pipe installed to a depth of 3 feet, at densities of 30 to 250-foot spacing, within floodplains less than 5 feet above thalweg. Exact distribution of well locations will field-fit based on digging conditions and additional wells may be added due to changes observed over the course of monitoring (i.e. wells may be added based on positive hydrologic response).
  Because of the lack of machine access, and the initial focus on hydrologic rather than vegetation goals within this reach, fewer than 10 water table wells will be installed within this reach. Water table wells will be installed during phase 1.

Reach ACTIONS for Objective #2 Reduce Juniper Competition:

- The few remaining individual junipers present in the valley bottom will be cut down concurrently with BDA construction to provide live/green BDA-weave construction material. The trunks will be left where they fall as large woody debris.

Reach ACTIONS for Objective #3 Hydrologic Improvements:

- Construct a total of up to 45 BDAs.

  Reach E includes a 460-foot section below the confluence of Little Pine and Robinson Creek, which is mapped as steelhead habitat. Fish up to 6 inches in length are often seen just downstream, so any BDAs constructed within this portion will adhere to the 6-inch jump height requirements.

The remaining 0.54 miles of Reach E, above the steelhead habitat, lacks surface flow for six months each year and has no observed fish. After consultation with ODFW, it was determined that up to 39 BDAs could be constructed up to 1.5 feet taller than the 6-inch limit. Due to long dry periods, these BDAs will require additional fill on the upstream side to maintain flow over their crests during the wetted portion of the year. These design adjustments will improve floodplain connectivity and accelerate hydrological benefits to downstream fish-bearing reaches.

To raise the water table and improve hydrology, BDAs will be installed at an average spacing of 1 BDA every 73 feet. Exact spacing will be field-adjusted based on conditions like cobble over bedrock and the need to avoid blocking the ATV trail. BDAs will be spaced no closer than 20 feet, with future placement depending on sediment aggradation and soil moisture responses. BDAs may be abandoned, rebuilt, or relocated based on ongoing monitoring.

Sediment for aggradation will be sourced from seasonal floods and reconnected floodplains.

- **Reach ACTIONS for Objective #4 Riparian Habitat Expansion:**
- Install willow cuttings directly into structures whenever moisture persistence allows.

  Soil moisture improvements and sediment aggradation within and around the structures themselves may occur before conditions improve sufficiently for plantings on the adjacent floodplains. These improvements may allow for the planting of willows directly into the structures, establishing biological processes that will aid in the structures resilience and effectiveness. These plantings will likely be high mortality and require repeated efforts.

Monitoring

Reach MONITORING for Objective #2 Reduce Juniper Competition:

- September drone flights along programmed, georeferenced, repeatable routes for visual comparisons and potential future orthophotographic comparisons. (same as for Objective #3 and #4)

Reach MONITORING for Objective #3 Hydrologic Improvements:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #3).
- Document the extent of surface flow present each September.
- Photo-points of each structure (spring and fall).
- Photo gauge monitoring: 2Xdaily photographs of stream channel to track the presence, timing, and qualitative surface flow volume (same as for Objective #4).
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #4).
- Two automated deep water well monitoring gauges (one each on Little Pine and Pine Creek)

Reach MONITORING for Objective #4 Riparian Habitat Expansion:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #2)
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #3).

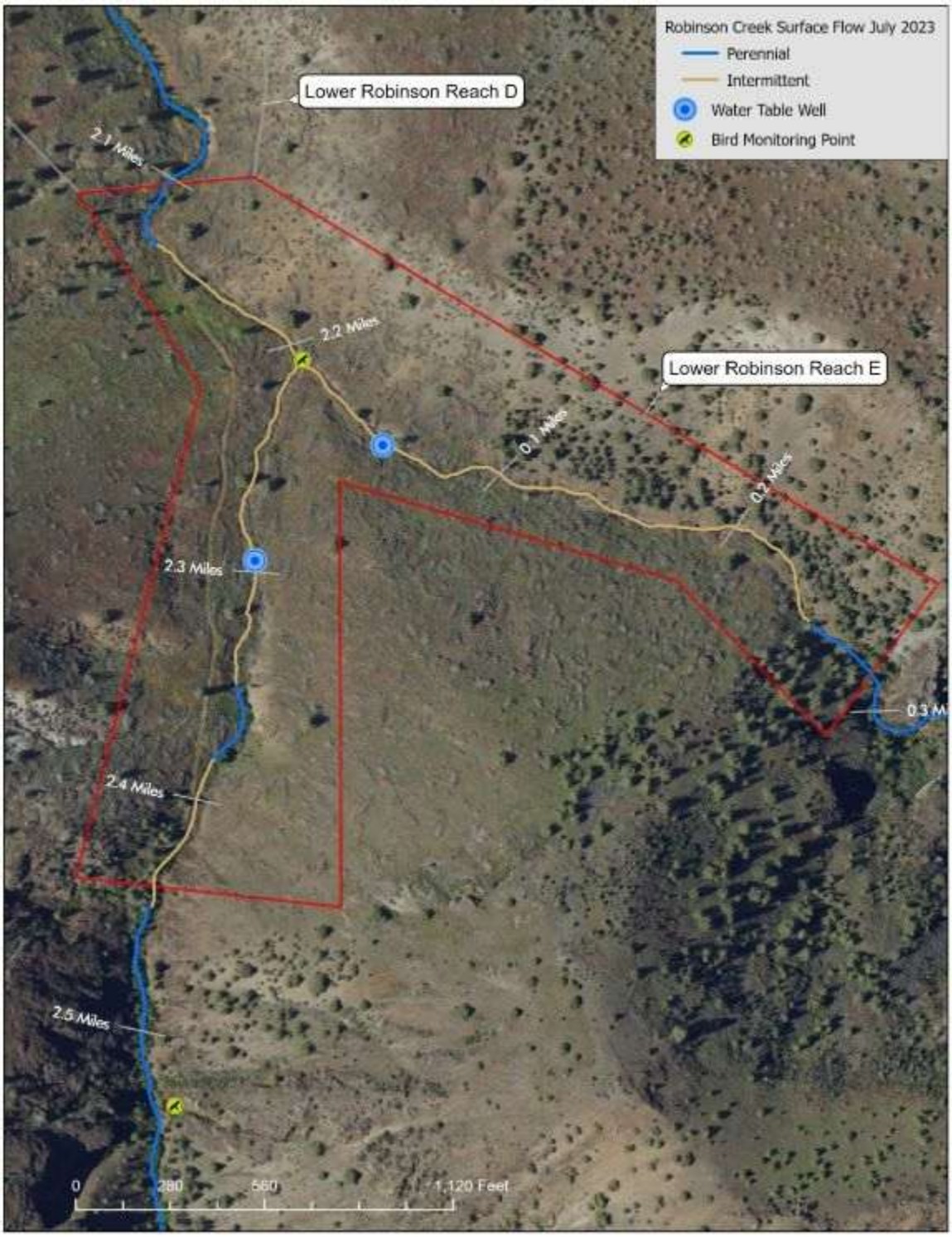


Figure 15. Lower Robinson Reach E

6.2.6 Upper Robinson Reach F

Accessible floodplains, and uncut juniper stands within the lower half of Upper Robinson Reach F.

Goals and Objectives

Reach F contribution to overall project Goal: Water table and instream flow improvements within this reach will benefit these goals in downstream reaches and result in increased fish habitat and water quality within lower reaches. Improvements to the density and extent of deciduous woody riparian plant coverage within this reach will help maintain processes and morphologies supporting water table recovery, as well as helping address landscape-scale deficiencies in riparian habitat values.

Reach Objective #1 Monitoring and Initial Site Conditions:

- Measure the hydrologic metrics of success achieved by Reach Objectives #2 and #3: which will guide the implementation and expectations for Reach Objective #4.
- Track the success of Reach Objective #4 and establish initial site conditions that will guide adaptive improvements in implementation towards similar objectives on other reaches.

Reach Objective #2 Reduce Juniper Competition:

- Reduce year-round evapatranspirational loss, precipitation interception cover, and competition with desired riparian plant species in support of reach Objective #3 and #4.
- Produce BDA construction material for use in Reach Objective #3

Reach Objective #3 Hydrologic Improvements:

- Increase instream surface flow duration and longitudinal extent throughout the length of the reach.
- Increase water table recharge and residence time as measured by lateral and longitudinal improvements in "depth to late summer water table" in support of Reach Objective #4.

Reach Objective #4 Riparian Habitat Expansion:

- Increase riparian habitat extent throughout all suitable planting locations within the reach at densities of no less than 6,000 stems per acre.
- Increase resilience of instream structures with opportunistic plantings directly into the structures.

Background Justification:

Although perennial flows are currently limited to the upper half of this reach, the flow volumes there are high, and seasonal flows are regular and dependable. BDAs in this non-fish-bearing reach can be built larger to quickly capitalize on these flow patterns. Combined with the broad valley floodplains and available juniper removal, this reach has strong potential for hydrologic improvements that can support riparian plantings and contribute to watershed-wide goals. It offers the best near-term (<5 years) planting opportunities on Upper Robinson and Little Pine Creeks.

Constructing BDAs in the lower half of the reach is crucial for capturing seasonal high flows and fine sediments within the alluvial fan. Slowing water in this section will back up water upstream, helping achieve goals in the upper reach. The lower portion of this reach (alluvial fan) may be slow to achieve perennial flow, but with improved watershed hydrology, aggradation in the upper reach, and regular access to floodplains, there will be increased sediment and water to support the long-term goal of aggrading the incised channel and returning perennial flow.

Restoration activities will not interfere with the ATV trail due to its height above the creek, though elevated water tables may begin to affect trail crossings at the top of the reach during peak flows within five years.

Restoration Actions

Reach ACTIONS for Objective #1 Monitoring and Initial Site Conditions:

- Dig soil test pits and approximately 40 water wells to assess hydrologic conditions and monitor planting suitability in potentially plantable floodplain areas.

Water table wells will consist of 1.5 inch diameter PVC pipe installed to a depth of 3 feet, at densities of 30 to 50-foot spacing, only within adjacent floodplains less than 5 feet above thalweg and no further than 100 feet from the current stream channel. Exact distribution of well locations will be field-fit based on machinery access, changes observed over the course of monitoring (i.e. wells may be added based on positive hydrologic response), and soil conditions observed during installation. Water table wells will be installed during phase 1.

Reach ACTIONS for Objective #2 Reduce Juniper Competition:

- Live junipers present in the valley bottom will be cut down concurrently with BDA construction to provide live/green BDA-weave construction material. The trunks will be left where they fall as large woody debris.

Reach ACTIONS for Objective #3 Hydrologic Improvements:

- Construct approximately 30 BDAs.

  Reach F is located approximately 1.35 miles above the Steelhead Habitat portion of Robinson Creek, and no fish have been observed within or upstream of Reach E. After consultation with ODFW, it was determined that up to 30 BDAs can be constructed in this reach, up to 1.5 feet taller than the 6-inch regulatory limit. Given the long dry periods, these BDAs will require additional fill on the upstream side to prevent them from becoming too porous before re-wetting. This design modification will help better connect adjacent floodplains and accelerate hydrological benefits, which will ultimately support downstream fish habitat.

  BDAs will be constructed approximately every 75 feet, with spacing adjusted based on field conditions (such as shallow cobble over bedrock). BDAs will not be placed closer than 20 feet apart, and their placement may evolve over the course of the project. As aggradation and soil moisture responses are monitored, BDAs may be moved, abandoned, or built on top of previous structures to improve water storage and streambed aggradation.

  Sediment for aggradation will be supplied by seasonal floods, along with sediment and decaying vegetation from reconnected floodplains.

Reach ACTIONS for Objective #4 Riparian Habitat Expansion:

- Native woody riparian vegetation will be installed at high densities (up to 1 plant per $2ft^2$) in areas where soil moisture has been determined to be present at sufficient depths throughout the previous growing season.

  Plantings will only be installed where sufficient soil moisture is present throughout the growing season, and these conditions will be reassessed as hydrological improvements from instream structures and groundwater recharge progress. No plantings are planned for valley-bottom seeps, as they are absent in this reach.

Where deep planting is required to reach perennial moisture, only native species suitable for cuttings will be used (willow, cottonwood, red-osier dogwood). In areas with moisture within 6 inches of the surface, additional species (aspen, choke-cherry, golden current, alder, gooseberry, elderberry) may be used, though large-scale potted plantings are unlikely due to site conditions.

The final number, species, and locations for planting cannot be determined until soil pits and water wells are monitored to assess hydrological responses. The goal is to restore the riparian plant community to improve habitat, support structural resiliency, and prevent future degradation of the site. This will be an ongoing process that builds on earlier restoration actions.

Given the lack of perennial flow in the lower half of the reach, rocky conditions in the upper half, and absence of valley-bottom seeps, total planting area is expected to be less than 0.5 acres, with fewer than 2,500 plants.

- Install willow cuttings directly into structures whenever moisture persistence allows.

  Soil moisture improvements and sediment aggradation within and around the structures themselves may occur before conditions improve sufficiently for plantings on the adjacent floodplains. These improvements may allow for the planting of willows directly into the structures, establishing biological processes that will aid in the structures resilience and effectiveness. These plantings will likely be high mortality and require repeated efforts.

Monitoring

Reach MONITORING for Objective #2 Reduce Juniper Competition:

- September drone flights along programmed, georeferenced repeatable routes for visual comparisons and potential future photographic comparisons. (same as for Objective #3 and #4)

Reach MONITORING for Objective #3 Hydrologic Improvements:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #3).
- Document the extent of surface flow present each September.
- Photo-points of each structure (spring and fall).
- Photo gauge monitoring: 2Xdaily photographs of stream channel to track the presence, timing, and qualitative surface flow volume (same as for Objective #4).
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #4).

Reach MONITORING for Objective #4 Riparian Habitat Expansion:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #2)

- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #3).
- Photo points of each large planting (each fall before leaf-drop)
- Survival estimates each fall for first three years after planting.

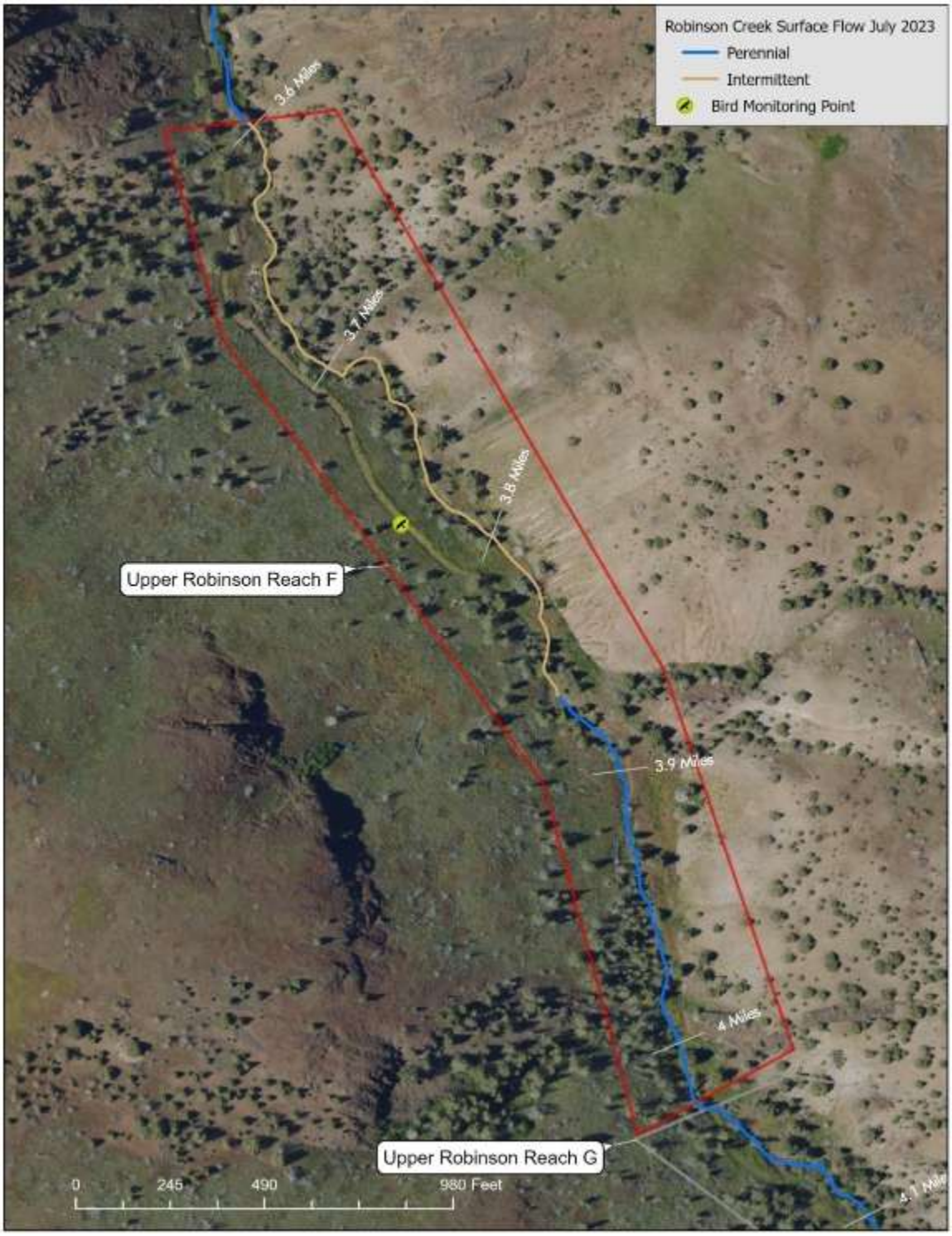


Figure 16. Upper Robinson Reach F

6.2.7 Upper Robinson Reach G

Looking upstream from near the bottom end of the reach.

Goals and Objectives

Reach G's contribution to overall project Goal: Provide downstream fish-bearing reaches with more consistent summer streamflow by banking winter floods in the high-quality floodplain and reducing evapotranspiration at the adjacent tributary spring. Morphological improvements will focus on raising the channel within the existing incision to reconnect with historic valley bottom terraces, rather than creating new inset floodplains. Riparian vegetation will be planted within the instream structures to support water table recovery and enhance riparian habitat, particularly near the streamside seep, to address landscape-scale habitat deficiencies.

Reach Objective #1 Monitoring and Initial Site Conditions:

- Measure the hydrologic metrics of success achieved by Reach Objectives #2 with water wells at the adjacent spring; and #3 (with flow duration and longitudinal extent throughout the reach): which will guide the implementation and expectations for Reach Objective #4.
- Track the success of Reach Objective #4 and establish initial site conditions that will guide adaptive improvements in implementation towards similar objectives on other reaches.

Reach Objective #2 Reduce Juniper Competition:

- Reduce year-round evapotranspirational loss, precipitation interception cover, and competition with desired riparian plant species in support of reach Objective #3 and #4 surrounding the spring seep site.
- Produce BDA construction material for use in Reach Objective #3

Reach Objective #3 Hydrologic Improvements:

- Increase structure with the stream channel to increase water table recharge and residence time as measured by improvements to instream surface flow duration, and longitudinal extent, throughout the length of the reach.

Reach Objective #4 Riparian Habitat Expansion:

- Increase habitat values at the adjacent spring seep site by planting at densities of no less than 6,000 stems per acre within areas of suitable year-round moisture at the spring seep.
- Increase resilience of instream structures with opportunistic plantings installed directly into the structures themselves.

Background Justification:

Although flow volumes in this reach are small, the wide, deeply incised valley-bottom offers a valuable opportunity to store large volumes of water, benefiting late summer flows downstream. Achieving this requires aggrading the channel to its former elevation and reconnecting historic terraces, as opposed to creating small inset floodplains which would not offer the same water storage capacity. Given the low flow volumes, deep incision, and large potential storage, full water-table recovery will extend beyond the 5-year project timeline. However, the work is designed to lay the groundwork for future restoration efforts.

The use of larger PAL and BDA structures in this non-fish-bearing, intermittent reach will accelerate aggradation, although the deep incision and narrow channel will limit planting opportunities. Restoration efforts will not interfere with the adjacent 4WD trail, both during and after the restoration process.

Restoration Actions

Reach ACTIONS for Objective #1 Monitoring and Initial Site Conditions:

- Dig soil test pits and approximately 5 water wells to assess hydrologic conditions and monitor planting suitability in potentially plantable floodplain areas surrounding adjacent spring seep.

  Water table wells will consist of 1.5 inch diameter PVC pipe installed to a depth of 3 feet, at densities of 30 to 50-foot spacing, only within the existing mesic footprint of the spring seep. Exact distribution of well locations will be field-fit based on machinery access, changes observed over the course of monitoring (i.e. wells may be added based on positive hydrologic response), and soil conditions observed during installation.

  Because of the extremely narrow and deep incised channel, and the lack of inset floodplain, it is not likely that water table wells will be installed along the stream channel itself during this project. The exception to this may to install water wells at the top of the reach below the push-up dams in Reach H. Water table wells will be installed during phase 1.

Reach ACTIONS for Objective #2 Reduce Juniper Competition:

- Live junipers present around the spring seep in the valley along the on the southeast end of the reach will be cut down concurrently with BDA construction to provide live/green BDA-weave construction material. The trunks will be left whole.

Reach ACTIONS for Objective #3 Hydrologic Improvements:

Construct 20 instream structures each combining a BDA and a Post Assisted Log Structure (PAL).

Reach F is located about 1.75 miles upstream from the Steelhead Habitat portions of Robinson Creek. No fish have been observed upstream of Reach E, and suitable instream conditions do not currently exist within or upstream of Reach G. After consulting with ODFW fisheries staff, it was determined that structures can be built in this reach that exceed fish passage jump height requirements. These structures will adhere to standard BDA and PAL designs and comply with regulatory permits from agencies like the Oregon Department of Environmental Quality, State Lands, and the Army Corps of Engineers.

The restoration will use dried juniper trunks, which are causing habitat and fire hazards in the area, as materials for constructing the PALs. Slash from these logs will be piled as directed by PCCA staff.

Approximately 20 structures will be installed, translating to about one BDA every 100 feet. BDA spacing will be field-adjusted based on site conditions, but structures will not be spaced closer than 20 feet. Future BDA placement may change based on aggradation rates, soil moisture responses, and ongoing monitoring. Sediment for aggradation will come from seasonal floods, eroding banks, and loose vegetation within the incised channel.

Reach ACTIONS for Objective #4 Riparian Habitat Expansion:

- Native woody riparian vegetation will be installed in areas where soil moisture has been determined to be present at sufficient depths throughout the previous growing season, at the spring seep, and near the pushup dams at the head of the reach. Planting will occur at high densities (up to 1 plant per $2ft^2$).

  Plants will only be installed where sufficient soil moisture is available throughout the growing season, with conditions assessed as hydrological processes improve.

  For deep plantings, only native species for cuttings (e.g., willow, cottonwood, red-osier dogwood) will be used. In areas with moisture within 6 inches, potted species (e.g., aspen, choke-cherry, golden currant) may be planted.

  Final plant types and numbers will be determined after monitoring hydrological responses following instream improvements and juniper removal at the spring seep.

- Install willow cuttings directly into structures whenever moisture persistence allows.

  Soil moisture improvements and sediment aggradation within the structures may occur before conditions are suitable for plantings on adjacent floodplains. This could enable the planting of willows directly into the structures, helping to establish biological processes that support their resilience. However, these plantings are expected to have high mortality and will require repeated efforts.

  Re-establishing the riparian plant community is vital not only for habitat value but also for long-term structural resilience and positive feedback loops that will maintain and build upon the restoration efforts.

  Given the limited planting locations, total planting acreage is expected to be under 0.1 acres, with fewer than 2,500 plants. Potted species will be prioritized at the spring seep, while cost-effective willow and cottonwood cuttings will be used on the structures themselves due to water fluctuations and expected mortality.

Monitoring

Reach MONITORING for Objective #2 Reduce Juniper Competition:

- September drone flights along programmed, georeferenced repeatable routes for visual comparisons and potential future orthophotographic comparisons. (same as for Objective #3 and #4)

Reach MONITORING for Objective #3 Hydrologic Improvements:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #3).
- Document the extent of surface flow present each September.
- Photo-points of each structure (spring and fall).
- Photo gauge monitoring: 2Xdaily photographs of stream channel to track the presence, timing, and qualitative surface flow volume (same as for Objective #4).
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #4).

Reach MONITORING for Objective #4 Riparian Habitat Expansion:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #2)

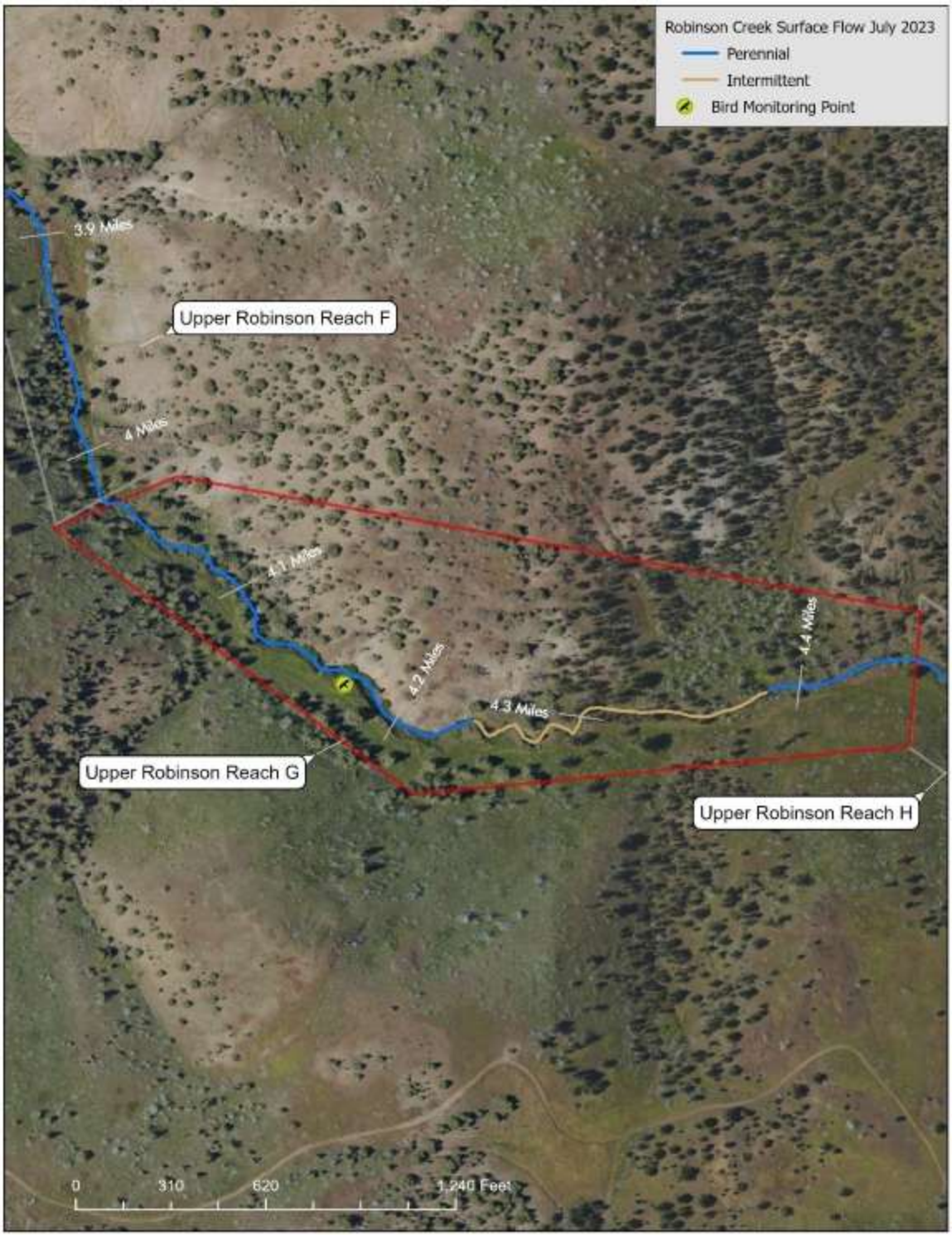


Figure 17. Upper Robinson Reach G

6.2.8 Upper Robinson Reach H

Looking downstream towards truck parked at downstream end of reach.

Goals and Objectives

Reach H's contribution to overall project Goal: Enhance downstream fish-bearing reaches by capturing winter floods in the large, high-quality floodplain, which will help maintain more consistent summer streamflow. Additionally, evapotranspiration loss will be reduced at the adjacent tributary spring. Morphological improvements aim to raise the channel within the existing incision to reconnect with historic valley bottom terraces, rather than creating new inset floodplains. Riparian vegetation will primarily be planted within the restoration structures to support water table recovery, with additional plantings at the streamside seep and around push-up dams to address broader landscape-scale habitat deficiencies.

Reach Objective #1 Monitoring and Initial Site Conditions:

- Measure the hydrologic metrics of success achieved by Reach Objectives #2 with water wells at the adjacent spring and at push-up dams; and #3 (with flow duration and longitudinal extent

throughout the reach): which will guide the implementation and expectations for Reach Objective #4.
- Track the success of Reach Objective #4 and establish initial site conditions that will guide adaptive improvements in implementation towards similar objectives on other reaches.

Reach Objective #2 Reduce Juniper Competition:

- Reduce year-round evapotranspirational loss, precipitation interception cover, and competition with desired riparian plant species in support of reach Objective #3 and #4 surrounding the spring seep site.
- Produce BDA construction material for use in Reach Objective #3

Reach Objective #3 Hydrologic Improvements:

- Increase structure with the stream channel to increase water table recharge and residence time as measured by improvements to instream surface flow duration, and longitudinal extent, throughout the length of the reach.

Reach Objective #4 Riparian Habitat Expansion:

- Increase habitat values at the adjacent spring seep site by planting at densities of no less than 6,000 stems per acre within areas of suitable year-round moisture at the spring seep and at the push-up dam sites.
- Increase resilience of instream structures with opportunistic plantings installed directly into the structures themselves.

Background Justification:

Although flow volumes in this reach are small, the wide, deeply incised valley bottom offers an opportunity to "bank" large amounts of water in the watershed, benefiting late-summer flows downstream. This can only be achieved by raising the channel to its historic elevation and reconnecting the terraces. Creating small inset floodplains would forfeit the higher-volume storage potential of these terraces and be less effective for improving downstream flows. Given the combination of low flow volumes, deep incision, and large storage potential, full water-table recovery will exceed the 5-year timeline, but the current work will lay the foundation for future restoration efforts.

The use of larger PAL and BDA combination structures in this non-fish-bearing reach will accelerate aggradation. However, due to the long-term nature of hydrological recovery, there will be few opportunities for planting in the narrow, incised channel. Restoration work will not interfere with the adjacent 4WD trail during the project or in the foreseeable future.

Restoration Actions

Reach ACTIONS for Objective #1 Monitoring and Initial Site Conditions:

- Dig soil test pits and a total of approximately 15 water wells to assess hydrologic conditions and monitor planting suitability in potentially plantable floodplain areas surrounding the adjacent

spring seep and at the push-up dam sites.

Water table wells will consist of 1.5 inch diameter PVC pipe installed to a depth of 3 feet, at densities of 30 to 50-foot spacing, only within the existing mesic footprint of the spring seep. Exact distribution of well locations will be field-fit based on machinery access, changes observed over the course of monitoring (i.e. wells may be added based on positive hydrologic response), and soil conditions observed during installation.

Because of the extremely narrow and deep incised channel, and the lack of inset floodplain, it is not likely that water table wells will be installed along the stream channel itself during this project. Water table wells will be installed during phase 1.

Reach ACTIONS for Objective #2 Reduce Juniper Competition:

- Live junipers present around the spring seep in the valley along the on the southeast end of the reach will be cut down concurrently with BDA construction to provide live/green BDA-weave construction material. The trunks will be left whole.

Reach ACTIONS for Objective #3 Hydrologic Improvements:

- Construct 15 instream structures each combining a BDA and a Post Assisted Log Structure (PAL).

  Reach F is located over 2 miles above the Steelhead Habitat portions of Robinson Creek, with no fish observed upstream of Reach E and unsuitable instream conditions upstream of Reach H. After consulting with ODFW fisheries staff, it was determined that structures could be built within this reach that exceed the standard jump height requirements for fish passage, while still adhering to permitted designs for BDAs and PALs and meeting the requirements of state and federal agencies (ODFW, DEQ, DSL, and the Army Corps). Dried juniper trunks, which are causing habitat and fire fuel issues, will be used to construct the PALs, with slash piled as directed by PCCA staff.

  Fifteen structures will be placed roughly 100 feet apart, though BDA spacing will be field-adjusted based on the ability to drive posts into shallow cobble over bedrock. BDAs will not be placed closer than 20 feet apart. The initial BDA placement is flexible and may change over time based on aggradation rates and soil moisture responses. Future BDAs may be abandoned, built on previous ones, or placed in new locations.

  Sediment for streambed aggradation will be provided by seasonal floods from upstream, eroding banks, and sediment and senescent vegetation within the incised channel.

Reach ACTIONS for Objective #4 Riparian Habitat Expansion:

- Native woody riparian vegetation will be installed in areas where soil moisture has been determined to be present at sufficient depths throughout the previous growing season, at the

spring seep, and near the pushup dams at the head of the reach. Planting will occur at high densities (up to 1 plant per $2ft^2$).

Plants will only be installed in areas where sufficient soil moisture is available throughout the growing season. This will be assessed throughout the project as hydrological conditions improve from the cumulative effects of increasing instream structures and groundwater recharge.

Where deep plantings are necessary to reach perennial soil moisture, only native species suitable for cuttings (willow, cottonwood, red-osier dogwood) will be used. In areas where soil moisture is within 6 inches of the surface, additional species available in pots (aspen, chokecherry, golden current, alder, gooseberry, elderberry) may be planted.

Due to the reliance on instream improvements and juniper removal at the spring seep, it is not possible to determine the final number, type, or species of plants before soil pits and water wells are installed and monitored to assess hydrologic responses.

- Install willow cuttings directly into structures whenever moisture persistence allows.

  Soil moisture improvements and sediment aggradation within and around the structures may occur before conditions improve enough for plantings on the adjacent floodplains. These early changes may enable planting willows directly into the structures, supporting biological processes that enhance their resilience and effectiveness. However, these plantings are likely to experience high mortality and will require repeated efforts.

  The re-establishment of the riparian plant community is essential not only for habitat restoration but also for building structural resiliency and reinforcing positive ecological feedbacks. This will help sustain the initial restoration efforts and prevent future degradation.

  Due to limited planting opportunities, the total planting area is expected to be less than 0.1 acres, with fewer than 2,500 plants. Potted species will be prioritized at the spring seep, while willow and cottonwood cuttings will be used on the structures due to high water fluctuations and expected mortality.

Monitoring

Reach MONITORING for Objective #2 Reduce Juniper Competition:

- September drone flights along programmed, georeferenced repeatable routes for visual comparisons and potential future orthophotographic comparisons. (same as for Objective #3 and #4)

Reach MONITORING for Objective #3 Hydrologic Improvements:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #3).

- Document the extent of surface flow present each September.
- Photo-points of each structure (spring and fall).
- Photo gauge monitoring: 2Xdaily photographs of stream channel to track the presence, timing, and qualitative surface flow volume (same as for Objective #4).
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #4).

Reach MONITORING for Objective #4 Riparian Habitat Expansion:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #2)
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #3).
- Photo points of each large planting (each fall before leaf-drop)
- Survival estimates each fall for first three years after planting.

Figure 18. Upper Robinson Reach H

6.2.9 Upper Little Pine Reach I

Goals and Objectives

Reach I's contribution to overall project Goal: Supply downstream fish-bearing reaches with more consistent summer streamflows by capturing winter floods in the high-quality floodplain within this valley and removing juniper from several aspen stands adjacent to the stream. Morphological improvements will focus on raising the channel within the existing incision to reconnect with the historic valley bottom terraces, rather than creating new inset floodplains. Riparian vegetation efforts will prioritize planting directly within the structures to support water table recovery, as well as in adjacent aspen stands and streamside seeps to address landscape-scale riparian habitat deficiencies.

Reach Objective #1 Monitoring and Initial Site Conditions:

- Measure the hydrologic metrics of success achieved by Reach Objectives #2 with water wells at the adjacent aspen stand and springs; and #3 (with flow duration and longitudinal extent throughout the reach), which will guide the implementation and expectations for Reach Objective #4.
- Track the success of Reach Objective #4 and establish initial site conditions that will guide adaptive improvements in implementation towards similar objectives on other reaches.

Reach Objective #2 Reduce Juniper Competition:

- Reduce year-round evapotranspirational loss, precipitation interception cover, and competition with desired riparian plant species in support of reach Objective #3 and #4 within the valley bottom, and surrounding the spring seep sites and aspen stands.
- Produce BDA construction material for use in Reach Objective #3

Reach Objective #3 Hydrologic Improvements:

- Increase structure with the stream channel to increase water table recharge and residence time as measured by improvements to instream surface flow duration, and longitudinal extent, throughout the length of the reach.

Reach Objective #4 Riparian Habitat Expansion:

- Increase habitat values at the adjacent spring seep sites by planting at densities of no less than 6,000 stems per acre within areas of suitable year-round moisture at the spring seeps and the aspen stands.
- Increase resilience of instream structures with opportunistic plantings installed directly into the structures themselves.

Background Justification:

While flow volumes within this reach are small but perennial, the wide, deeply incised valley-bottom offers a valuable opportunity to "bank" millions of gallons of water in the upper watershed, benefiting late summer flows in downstream reaches. Achieving this requires aggrading the channel back to its

former elevation and reconnecting the historic terraces. Creating small inset floodplains would sacrifice the potential high-volume storage of the terraces, reducing water storage and release necessary for improving downstream flow regimes.

Given the low flow volumes, deep incision, and large potential storage, full recovery of the water table will extend beyond the 5-year timeline of this plan. However, the proposed work is designed to lay the foundation for future restoration efforts. The use of larger PAL and BDA structures in this non-fish-bearing reach will accelerate aggradation compared to typical expectations for this type of reach. Due to the long-term, iterative nature of hydrology recovery, opportunities for planting in the narrow, incised channel will be limited.

The depth of incision and width of the valley ensure that restoration activities will not interfere with the adjacent 4WD trail during or after the restoration process.

Restoration Actions

Reach ACTIONS for Objective #1 Monitoring and Initial Site Conditions:

- Dig soil test pits and a total of approximately 25 water wells to assess hydrologic conditions and monitor planting suitability in potentially plantable floodplain areas surrounding the adjacent spring seep and aspen stands.

  Water table wells will consist of 1.5 inch diameter PVC pipe installed to a depth of 3 feet, at densities of 30 to 50-foot spacing, only within the existing mesic footprint of the spring seeps or aspen stands. Exact distribution of well locations will be field-fit based on, changes observed over the course of monitoring (i.e. wells may be added based on positive hydrologic response), and soil conditions observed during installation.
  Because of the extremely narrow and deeply incised channel, and the lack of inset floodplain, it is not likely that water table wells will be installed along the stream channel itself during this project. Water table wells will be installed during phase 1.

Reach ACTIONS for Objective #2 Reduce Juniper Competition:

- Live junipers present around the spring seeps and adjacent aspen stands along the lower portion of the reach will be cut down concurrently with BDA construction to provide live/green BDA-weave construction material. The trunks will be left whole.

Reach ACTIONS for Objective #3 Hydrologic Improvements:

- Construct 35 instream structures each combining a BDA and a Post Assisted Log Structure (PAL).

  Reach I is located more than 3 miles above the Steelhead Habitat portions of Robinson Creek, with no fish observed upstream of Reach E and unsuitable instream conditions within or upstream of Reach I. After consultation with ODFW regional fisheries staff, it was determined that structures can be built within this reach that will exceed fish passage jump height requirements. These structures will adhere to standard permitted designs for BDAs and PALs,

meeting regulatory requirements from agencies such as Oregon DEQ, Oregon Department of State Lands, and the Army Corps of Engineers. Dried juniper trunks, which are creating habitat and fire fuel issues throughout the reach, will be used to construct the PALs, with slash from these logs being piled as directed by PCCA staff.

35 structures translate to roughly one BDA every 100 feet. However, exact BDA spacing will be field-fit based on site conditions, such as the ability to drive posts into shallow cobble over bedrock. BDAs will not be placed closer than 20 feet apart. The initial placement of BDAs is flexible, as future aggradation rates and soil moisture responses may require changes, including abandoning some structures, building on top of previous ones, or constructing new ones.

Sediment loads for aggradation will be provided by seasonal floods from upstream, eroding banks, and the substantial needle drop and loose vegetation within the incised channel.

Reach ACTIONS for Objective #4 Riparian Habitat Expansion:

- Native woody riparian vegetation will be installed in areas where soil moisture has been determined to be present at sufficient depths throughout the previous growing season, at the spring seeps, and aspen stands on the lower end of the reach. Planting will occur at high densities (up to 1 plant per $2ft^2$).

  Plantings will only occur where sufficient soil moisture is present throughout the growing season. These conditions will be assessed throughout the project as hydrological improvements are made through the cumulative effects of instream structures and groundwater recharge.

  For areas requiring deep plantings to reach perennial soil moisture, only native species suitable for cuttings will be used (willow, cottonwood, red-osier dogwood). In areas with perennial moisture within 6 inches of the surface, species available in pots (such as aspen, chokecherry, golden currant, alder, gooseberry, and elderberry) may be used.

  Because planting opportunities depend on the outcomes of instream improvements, as well as juniper removal at spring seeps and aspen stands, the final number, type, and species of plants cannot be determined until soil pits and water wells are installed and hydrologic responses are monitored.

- Install willow cuttings directly into structures whenever moisture persistence allows.

  Soil moisture improvements and sediment aggradation within the structures may enable planting willows directly into them, though high mortality is expected and repeated efforts will be needed. Re-establishing the riparian plant community is crucial for both habitat benefits and long-term structural resilience, supporting the initial restoration efforts and preventing future setbacks. Planting is expected to cover less than 0.25 acres with fewer than 5,000 plants. Priority

will be given to potted species at spring seeps and aspen stands, while willow and cottonwood cuttings will be used in the structures due to water fluctuations and expected mortality.

Monitoring

Reach MONITORING for Objective #2 Reduce Juniper Competition:

- September drone flights along programmed, georeferenced repeatable routes for visual comparisons and potential future orthophotographic comparisons. (same as for Objective #3 and #4)

Reach MONITORING for Objective #3 Hydrologic Improvements:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #3).
- Document the extent of surface flow present each September.
- Photo-points of each structure (spring and fall).
- Photo gauge monitoring: 2Xdaily photographs of stream channel to track the presence, timing, and qualitative surface flow volume (same as for Objective #4).
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #4).

Reach MONITORING for Objective #4 Riparian Habitat Expansion:

- September drone flights along programmed, georeferenced repeatable routes (same as for Objective #1 and #2)
- Manual measurements of water well arrays at least once monthly April through October on standardized day (same as for Objective #3).
- Photo points of each large planting (each fall before leaf-drop)
- Survival estimates each fall for first three years after planting.

Figure 19. Upper Little Pine Reach I

7.0 SCHEDULE

Provided that implementation funding is available as needed, the project will be implemented per the schedule outlined in Table 5. It is important to note that no actions will be taken until the plan achieves final approval by CTWS, and that no ground disturbing or vegetation altering restoration actions will be undertaken until all of the required clearances and permits listed below are obtained.

- Project-wide for Juniper removal, instream structures, planting and other digging activities: Cultural Clearance, and final project approval by PCCA manager
- Instream structures: ODFW fish passage, Oregon Department of Environmental Quality, Oregon Department of State Lands, Army Corps of Engineers.
- Any additional NEPA, permitting or analysis as required

Table 5. Project Implementation Schedule

Activity	2025	2026				2027				2028				2029				2030				2031			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Cultural clearance/ permitting	X																								
Juniper			X	X			X	X			X	X			X	X		X	X	X					
Instream Structures		X	25	25		X	50	50		X	50	50		X	20				X			X			
Planting				X				X		X	X	X	X	X	X		X	X			X				
Monitoring	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mid-project report									X	X	X														
Draft completion report																		X	X	X	X				
Final completion report																						X			

8.0 BUDGET

The project budget shown below represents best estimates of the total cost of completing the for all three phases of the project to be completed over five years. We assume costs will increase by approximately 5% per year, but also expects costs to fluctuate due market factors, such as the cost of materials and labor, or by natural factors discussed in the Implementation section.

Table 6. Project Budget

Expense Item	2025	2026	2027	2028	2029	2030	TOTAL
Staff/Labor	$15,455	$72,053	$74,215	$76,441	$78,734	$68,345	**$385,243**
In-Kind Labor (volunteers)		$12,862	$12,862	$12,862	$12,862	$12,862	**$64,310**
CTWS Staff	$6,525	$6,525	$6,525	$6,525	$6,525	$6,525	**$39,150**
Supplies/Materials	$2,000	$7,000	$27,000	$26,000	$20,000	$10,000	**$92,000**
Travel	$4,000	$10,000	$10,000	$10,000	$10,000	$10,000	**$54,000**
Indirect Costs (15%)	$3,218	$13,358	$16,682	$16,866	$16,310	$13,252	**$79,686**
Total Project Cost	$31,198	$121,798	$147,284	$148,694	$144,431	$120,984	**$714,389**

9.0 REFERENCES

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Appendix A

Detailed Reach Descriptions

Robinson Campground Reach

This reach is 0.66 miles long and extends upstream from the confluence Robinson Creek and Pine Creek to the upstream edge of Robinson Creek Campground.

Geomorphology

Stream gradient averages 2.8%. Floodplains mainly extend across the valley-bottom and are between one and four feet above the thalweg. Incision is greatest in the middle portions of the reach and least at the top and bottom of the reach. A six-foot head cut near the upper end of the reach has since healed into a large riffle, likely due to years of plantings that facilitated sediment accumulation.

Hydrology

Surface flow monitoring during the 2023 and 2024 seasons quantified similar patterns casually observed for this reach over the past decade: Surface flow is contiguous throughout this reach during the winter and into late spring or early summer, at which point the lower half of the reach dries out. This patterns is one that is frequently seen on John Day River tributaries and streams where alluvial fans provide deep porous material which does not effectively hold water throughout the season or near the surface.

Starting July 17, 2023 daily pictures were recorded by a trail camera at the manual stream gauge just upstream of the mouth of Robinson Creek. This photo-gauge shows surface flow in the reach until July 23, 2023. From July 24 to August 1, 2023, diurnal creek-drying patterns were observed: surface flows reappeared after dark, and dried up over the course of the morning. This is a typical pattern, demonstrating the influence of evapotranspiration from vegetation as it photosynthesizes during the day. The lower half of this reach was dry from August 2, 2023 to December 7, 2023 when contiguous surface flow returned to the reach. Surface flows lasted until August 18, 2024 when the lower portion (0.21 miles) of the reach dried up. Maximum observed flows during the winter of 2023 to 2024 occurred in February and at measured depths of 1.8 feet on the gauge. It is interesting to note that surface flows were observed in November 2023 for approximately one week within Lower Robinson Reach C and on Little Pine in Reach E; but this surface flow did not manifest at the Robinson Campground Reach photo-gauge. When surface flows returned in December 2023, they were observed 3 days after surface flows were observed at Photo-gauges 2 and 3, and four days after surface flows were observed at photo-gauge 4.

A water table well is located alongside the photo-gauge at the bottom of this reach. Previously installed automated systems for measuring water table depth had malfunctioned so measurements are not available. These systems have since been re-furbished are ready to re-install in the spring of 2025. A manual measurement of the water table well on October 18, 2024 did not detect any water within the well to a depth of 6 feet 4 inches below the surface. At this time no surface water was present in the adjacent lower half of the reach.

Side gullies do not represent contiguous perennial tributaries, or substantial hydrologic inputs outside of stochastic and rare precipitation events.

Biology

This reach is within the ODFW designated Steelhead habitat reach which extends from the John Day River, up Pine Creek, into Robinson Creek to the confluence of Robinson Creek and Little Pine Creek (Figure 1). Fish have been observed in persistent pools in this reach throughout the summer. Fish were not identified to species, but were up to 6 inches in length.

Homestead-era Lombardy poplars and apple trees are present on the floodplains in the upper half of this reach. Willows and cottonwoods are growing contiguously in a narrow band along the immediate banks of the perennial upper portion of the reach, with sparser patches present on the immediate banks of the seasonal lower half of the reach. This distribution reflects the manually planted origin of these trees; Shallow hand-planting of spring-time cuttings were only planted, and survived, in areas where surface flow was present. While suckering within these existing zones has occurred, very little longitudinal or latitudinal expansion has occurred.

Human Infrastructure

This reach of Robinson Creek serves as a critical infrastructure hub for the Conservation Area. Robinson Creek Campground consists of infrastructure for supporting the hunting and traditional use of the property, as well as provides the primary access routes to the property via the Jennies Peak Road and an ATV trail up the Robinson Creek valley. Additionally, a pioneer homestead site is located at the head of this reach. All of this infrastructure is located immediately in the low floodplains on the valley bottom.

Lower Robinson Reach A

This reach is 0.06 miles long and extends upstream from the top of the uppermost campsite at Robinson Creek Campground, to the upstream extent of contiguous perennial flow entering into the Robinson Creek Campground Reach.

Geomorphology

Stream gradient is 3.2%. Floodplains are generally inset approximately 1 to 2 feet above thalweg within the sloping valley-bottom floor.

Hydrology

This entire reach has perennial flow throughout its length. No water monitoring infrastructure is present on this reach. Side gullies do not represent contiguous perennial tributaries, or substantial hydrologic inputs outside of stochastic and rare precipitation events.

Biology

This reach is within the ODFW designated Steelhead habitat reach which extends from the John Day River, up Pine Creek, into Robinson Creek to the confluence of Robinson Creek and Little Pine Creek (Figure 1). Because of the thick vegetation, no fish observations have been made within this reach.

After many years of planting, this reach is thickly vegetated by woody riparian species including willow and cottonwood throughout the inset floodplains. A large number of small diameter junipers are also present throughout the inset floodplains as well as thick stands of teasel.

Human Infrastructure

The Robinson Creek ATV trail is located along the valley edge within this reach several feet above the stream channel.

Lower Robinson Reach B

This reach is 0.93 miles long and extends upstream from the top of Lower Robinson Reach A where perennial flow emerges from streambed, to the upstream edge of the thick stand of riparian vegetation supported by perennial flow emerging from the downstream end of the Metteer Creek alluvial fan.

Geomorphology

Stream gradient is 3.6%. Floodplains are generally inset approximately 2 to 3 feet above thalweg within the sloping valley-bottom floor. Inset floodplain width is highly variable but numerous locations exist where floodplains are up to 40 feet wide and 1 to 3 feet above thalweg. Stream channel bottom consists almost entirely of cobble with very little sand or sediment. The stream channel on the lower-most portion has moved out of the narrow strip of riparian vegetation.

Hydrology

July 2023 surface flow mapping showed 100% contiguous flow throughout this reach. By September 2023, surface flows were only present on 93% (0.83 miles) of this reach. Three portions dry up by the end of the summer (September) at the top (213 feet), bottom (354 feet), and two middle sections (121 and 70 feet long respectively). These reaches of September flows represent perennial flows observed consistently through the fall. No water monitoring infrastructure is present on this reach. Side gullies do not represent contiguous perennial tributaries, or substantial hydrologic inputs outside of stochastic and rare precipitation events.

Biology

This reach is within the ODFW designated Steelhead habitat reach which extends from the John Day River, up Pine Creek, into Robinson Creek to the confluence of Robinson Creek and Little Pine Creek (Figure 1). Water in this reach is typically just a few inches deep, and devoid of instream cover. Persistent pools and instream cover exist at the upstream end of the reach where vegetation is thicker. However, this thicker vegetation precluded fish observation opportunities.

After many years of planting, mature stands of willow and cottonwood are present in a narrow band immediately along the creek edge. Their longitudinal locations mirror the presence of perennial flows or easily accessed subsurface water. Their narrow latitudinal extent reflects the limits of suitable hand-planting conditions. In some areas suckering between individual trees is occurring and don't appear to be browse limited. No substantial sedge or rush communities are present. A large number of small to medium diameter junipers are also present throughout stream channel. Some upland spring areas high up on the south side of this reach contain vegetation that is obviously supported by access to subsurface spring flows which do not contribute surface flows to Robinson Creek.

Human Infrastructure

The ATV trail within this reach is located high above, and away from the stream channel.

Lower Robinson Reach C

Reach C is 0.47 miles long and extends upstream from the top of Lower Robinson Reach B, at the point where vegetation is no longer supported by perennial subsurface flows, up to where the canyon narrows and the ATV trail is forced to cross the creek.

Geomorphology

Stream gradient is 3.3%. Historic, valley-wide floodplains are approximately 2 to 3 feet above the thalweg. In some areas there are lower inset floodplains a few feet wide. Historic floodplains seem to consist of a good mix of soil sizes including sand, silt and gravel. Stream channel bottom consists almost entirely of cobble with very little sand or sediment.

Hydrology

July 2023 surface flows were recorded for the upper 0.19 miles of the reach (40%) and the lower portion was dry. By September 2023, only the upstream-most 117 feet of the reach had surface flows (5%). In October 2024, surface flow was present on the upper 0.14 miles of the reach (30%). Water depths during all of these observations were typically just on the order of a couple of inches at most. Data (July 2023 to October 2024) recorded by a photo-gauge on this reach indicate very quick returns of surface flows associated with precipitation events. However, on average, the lower portion of this reach is dry for a total of at least 4 months of the year. After a dry summer in 2023, surface flows were observed November 15, to November 22, 2023 and December 4, 2023 to July 23, 2024.

Side gullies do not represent contiguous perennial tributaries, or substantial hydrologic inputs outside of stochastic and rare precipitation events. In the past decade, Metteer Creek was the source of a short duration, localized thunderstorm caused flood event which caused substantial flooding on lower Robinson Creek with scour lines four feet high and 18 feet wide in some locations, and substantial movement of sediments and channel location. However, this even is the only such large flood event in the past 17 years on Robinson Creek. The toe-slopes and adjacent valley floor in the south western end of the reach show substantial mesic potential indicated by the presence of a large amount of Teasel.

Biology

This reach is within the ODFW designated Steelhead habitat reach which extends from the John Day River, up Pine Creek, into Robinson Creek to the confluence of Robinson Creek and Little Pine Creek (Figure 1). When and where it is present, water in this reach is typically just a few inches deep, and devoid of instream cover. Persistent pools and instream cover exist at the upstream end of the reach where vegetation is thicker. However, this thicker vegetation precluded fish observation opportunities.

Despite many years of planting, woody deciduous riparian vegetation is very sparse throughout this reach. As in other reaches, longitudinal distribution and density reflects the persistence of perennial surface water. The most, and densest vegetation is located in the upper perennial portion of the reach. No substantial sedge or rush communities are present. Numerous large juniper trees are present within the riparian area and adjacent floodplains as are several ponderosa pines.

Human Infrastructure

The ATV trail crosses this reach twice: once at the downstream end, and once at the upstream end. Otherwise it is located several feet above and away from the creek.

Lower Robinson Reach D

Reach D is 0.47 miles long and extends from the narrowing of valley at the head of Reach E, through the narrower canyon to the top of perennial flow just below the confluence of Little Pine and Robinson Creeks.

Geomorphology

Stream gradient is 3.6%. And the canyon is relatively narrow (approximately 40 feet): allowing for just enough room on the valley floor in many places for the stream channel and the ATV trail. Despite being narrow, valley-wide floodplains are present and are approximately 2 to 3 feet above the thalweg. Historic floodplains seem to consist of a good mix of soil sizes including sand, silt and gravel. Stream channel bottom consists almost entirely of cobble with some sand or sediment accumulating in vegetation traps or pools.

Hydrology

This entire reach has perennial flow throughout its length, with pool depths in mid-summer of several inches. Side gullies do not represent contiguous perennial tributaries, or substantial hydrologic inputs outside of stochastic and rare precipitation events.

Biology

This reach is within the ODFW designated Steelhead habitat reach which extends from the John Day River, up Pine Creek, into Robinson Creek to the confluence of Robinson Creek and Little Pine Creek (Figure 1). Fish up to 3 inches in length have been observed as late as October within this reach but were not identified to species.

Woody deciduous riparian vegetation (willows, cottonwood and red osier dogwood) grows thickly and contiguously along the immediate banks of this reach. In many cases the vegetation is suckering out over the width of the valley floor and blocking the ATV trail.

Human Infrastructure

The ATV trail crosses the trail five times within this reach, and although it is often several feet above the current channel, previous higher water events have caused damage to the trail within this reach likely due to the constrained nature of the valley. An old sheepherders cabin is located on a high toe-slope above the valley floor on the east side of the stream.

Lower Robinson Reach E

This reach encompasses the lower portions of both Robinson and Little Pine Creeks, above and immediately below, their confluence. The lower end of the reach is defined by the start of perennial flow at the head of Reach D. On Little Pine Creek the upstream extent of the reach is marked by the downstream mouth of the rocky canyon where it opens into a wider valley with floodplains. On Robinson Creek, the upstream extent of the reach corresponds with were the creek emerges from the narrow mouth of the canyon where perennial surface flow from upstream reach ends. Robinson Creek within this reach is 0.33 miles in length, and Little Pine Creek is 0.29 miles in length. In total, the combined stream miles in this reach are 0.62 miles.

Geomorphology

Despite being combined within the same reach description, Robinson and Little Pine Creeks vary in their geomorphology.

The gradient for Little Pine is 4.3%, measured between the mouth of the canyon and its confluence with Robinson Creek. The lower portion of Little Pine within this reach consists of a narrow incised channel with little to no inset floodplains. The upper portion of Little Pine within this reach has wider valley floor wide floodplains up to 40 feet wide that are in some cases less than a foot above the thalweg. These wider floodplains appear to have a good mixture of cobble, gravel, and fine soils.

Within this reach the gradient for Robinson Creek is 5.2%. The upstream end of this reach is very narrow with no, or very narrow, floodplains. The eroded banks of the creek are essentially the toe-slopes of the valley. Moving downstream, the valley begins to widen out in the area of the perennial flow and narrow inset floodplains a few feet wide and just a foot above thalweg are present.

Hydrology

The portion of Little Pine Creek within this reach has no perennial flow. The latest that surface flow was observed within this portion of the reach was 0.03 miles at the top of the reach in July (9%). The portion of Robinson Creek within this reach has a 0.04 miles-long section of perennial flow (13%) located near the top of the reach. Observations have frequently been made where Robinson Creek has had surface flow through this reach, but Little Pine has not had surface flow: And vice versa. Both Creeks have in this reach have photo-gauges recording data since July 2023 and deep water wells for automated data collection. Both wells had manual data recorded in October 18, 2024. At this time Little Pine was dry and the water table well was dry to the bottom at a depth of six feet, one inch below the surface. On Robinson Creek the stream was flowing its entire length within the reach, but the water table height was 6 feet four inches below the surface throughout this whole reach. The photo-gauge (#3) on Little Pine Creek recorded surface flows November 15 to 22, 2023 and December 4, 2024 through April 11, 2024 (at which point there was a camera malfunction). The photo-gauge (#4) on this reach of Robinson Creek recorded no surface flows in November 2023, but did record the presence of surface flows present from December 3, 2023 through July 31, 2024 (at which point there was a camera malfunction).

Side gullies do not represent contiguous perennial tributaries, or substantial hydrologic inputs outside of stochastic and rare precipitation events.

Biology

Designated steelhead habitat ends at the confluence of Little Pine and Robinson Creeks, so the large majority of this reach is above that point. No fish have been observed within this reach.

Within this reach on Little Pine, native woody riparian vegetation is represented by sparse individual willow clumps, likely growing up from multiple planting attempts in the past. These clumps may be expanding and suckering out in response to the protection from browsers afforded by the dense areas of downed whole juniper trees. On the lower third, all junipers have been removed from the valley bottom, leaving only some individual ponderosas. On the upper portion, the north side of the valley is a mixed juniper ponderosa forest that extends down into the valley bottom.

On Robinson Creek, native woody riparian vegetation is essentially entirely absent. Sparse individual willows are growing just downstream of the area of perennial flow, and thick, dense mature willows and cottonwoods are growing throughout the perennial portion of the reach. All juniper have been removed from the valley bottom along the Robinson Creek portion of this reach.

Human Infrastructure

No infrastructure is present within this reach on Little Pine Creek. The ATV trail crosses Robinson Creek at the downstream and upstream ends of the reach: and is otherwise high above the creek on the toe slope within the Robinson Creek portion of the reach.

Robinson Creek Canyon

This reach is 1.15 miles long and extends upstream along Robinson Creek from the top of Lower Robinson Reach E (which includes the confluence with Little Pine Creek) up to an area of steep gradient increase where surface flow is more reliably present at the bottom of Upper Robinson Canyon Reach F.

Geomorphology

Stream gradient is 6.6%. Floodplains are not common, or large, due to the narrowness and steepness of the rock or talus canyon walls. It is a difficult area to traverse due to the steep narrow hillsides. In general bedrock is often visible as a main component in the creek bed, or is very near the surface.

Hydrology

July 2023 surface flow mapping showed three areas of surface flows totaling under 0.75 miles (65%) on this reach (0.25 miles, 436ft and 0.41 miles in length). Two dry reaches, totaling 0.39 miles in length, separate out the areas with surface flow. No water monitoring infrastructure is present on this reach. Side gullies do not represent contiguous perennial tributaries, or substantial hydrologic inputs outside of stochastic and rare precipitation events.

Biology

This reach is above the ODFW designated Steelhead habitat reach which does not extend up past the confluence of Robinson and Little Pine Creek downstream of this reach (Figure 1).

The presence of a bare, steep section of bedrock at approximately the midpoint of the Robinson Canyon Reach that does not have substantial flows over it, or a deep pool below it, may be a barrier to fish movement upstream in all but the higher flows. No fish were observed within this reach during a July 2023 visit, however, the thick vegetation in a confined canyon did not provide conditions conducive to seeing fish.

Mature stands of willow and cottonwood (and a small stand of aspen) are present in a narrow band immediately along the creek edge. Their longitudinal locations mirror the presence of perennial flows or easily accessed subsurface water: and are absent from dry sections. Their narrow latitudinal extent in many cases reflects the physical limits imposed by the narrow rocky canyon. Willows are noticeably suckering out in some locations and don't appear to be browse limited.

Human Infrastructure

The ATV trail extends a short way up into, and down into, this canyon reach, but is not fully traversable from top to bottom due to the steep canyon walls. In many locations the ATV trail is in the creek channel.

Upper Robinson Reach F

This reach is 0.39 miles long and extends upstream from the gradient break where perennial flow begins again at the top of the Robinson Creek Canyon Reach and extends up to the head of this narrow valley where it narrows just above the natural stone dyke formation, at the crossing at the bottom of Upper Robinson Reach G.

Geomorphology

This reach has a gradient of 3.5%. Although it is a narrow valley, 50-foot-wide accessible floodplains (1 to 3 feet above thalweg) are present throughout. Near, and downstream of the alluvial fan at the center of the reach, the ground is made up a large proportion of cobble and corresponding to where perennial flow drains into the subsurface. But further from this area, both up and downstream, soil make-up is increasingly mixed with small gravels sand, fine soils and organic material. Bedrock is visible in the stream channel at the bottom limit of the reach where it drops into the canyon. This bedrock feature likely has preserved the gentle gradient within this reach and prevented further erosion.

Hydrology

Perennial surface flow is only present within the first 0.12 miles of this reach, with the lower portion of the reach going dry by July (31%). A photo-gauge was installed on this reach to record the presence/absence of surface flows with the non-perennial portion of the reach since April 10, 2024. Surface flows were observed at the photo gauge site from April 10, 2024 through October 17, 2024. The downstream limit of perennial surface flow is associated with the increased porosity of the alluvial fan in the middle of the reach.

Side gullies do not represent a suspected source of meaningful flows (surface or subsurface), outside of stochastic and rare precipitation events. Their catchments are relatively small.

Biology

This reach is above the ODFW designated Steelhead habitat reach which does not extend up past the confluence of Robinson and Little Pine Creek approximately 1.25 miles downstream of this reach (Figure 1). Fish have not been observed within this reach.

Thick aquatic vegetation (watercress) is present throughout the perennial section of the reach. Essentially no native woody deciduous riparian vegetation is present within this reach. Juniper has not been removed from the valley bottom on the lower third of the reach where a mixed conifer forest covers the floodplain.

Human Infrastructure

The ATV trail crosses Robinson Creek at the top of this reach and approximately halfway down. On the upper portion of the reach the trail is on the floodplain approximately three feet above the Thalweg. On the lower third of the reach the trail is located high above the creek on the toe-slope of the valley.

Upper Robinson Reach G

This reach is 0.43 miles long. It is defined most clearly by where the deepest incision is occurring. It extends upstream from the narrowing of the canyon just above the rock dyke in Upper Robinson Reach F where the ATV trail crosses the creek, to where floodplains are again accessible at the lower of two adjacent push-up dams.

Geomorphology

This reach has a gradient of 3.5%. The creek has cut a deep incision down the north side of the valley floor and is currently pressed against the bottom of the toe-slope. Incision depth has been measured at roughly 100 foot intervals throughout this reach. Incision depth at the head of this reach is 1 foot from historic floodplain down to the thalweg. Incision deepens incrementally to 20 feet at the approximate midpoint of this reach, where instream riparian vegetation is growing along the incision bottom starting from just below where perennial flow begins. Incision depth deceases incrementally from this point to approximately 5 feet, moving downstream to the bottom of the reach where the stream switches sides of the valley and crosses the ATV trail. Inset floodplains are limited to just 2 or 3 feet in width throughout this reach. Substantial scree colluvium falls into the incised channel from the adjacent valley wall on the lower section of the reach. Valley floor soils consist of a mix of small cobble, gravels and fine soils. The valley bottom throughout this reach is approximately 100 feet wide, and was potentially modified (leveled and stream channel moved) for use as a hay field.

Hydrology

This reach has a total of 0.28 miles of perennial flow (65% of reach). The perennial flow within this reach is typically only a couple of inches deep. Signs of regular season flooding, or high flows stemming from summer storms were not observed within this reach. A photo-gauge has not yet been installed within this reach. Side gullies do not represent contiguous perennial tributaries, or substantial hydrologic inputs outside of stochastic and rare precipitation events. However, a substantial spring seep is present in the valley entering into the southeast corner of the reach alongside the access road which may contribute subsurface inputs, but not with direct surface flow.

Biology

This reach is above the ODFW designated Steelhead habitat reach which does not extend up past the confluence of Robinson and Little Pine Creek approximately 1.75 miles downstream of this reach (Figure 1). Fish have not been observed within this reach.

An almost contiguous band of mature willow are growing within all but the last upper 250 feet of the lower section of perennial flow. These willows represent passive recovery since no active riparian planting has occurred upstream of Lower Robinson Creek E. Cattails are present in small patches within the section of perennial flow. Willows are essentially absent from the upper perennial section and the dry section of this reach. Juniper have been removed from the entire valley floor and toe-slopes throughout this reach except for the spring area alongside the access road in the southeast corner at the head of the reach.

Human Infrastructure

A 4WD route is present throughout this reach and crosses the creek at the lower end of the reach where it becomes an ATV trail. This route is up to 20 feet above the creek within the reach. This area has been used for pioneer-era agriculture. Structures and equipment were present within this valley before they were burnt by wildfires.

Upper Robinson Reach H

This reach is 0.29 miles long and extends from the lower of two adjacent push-up dams where the access road comes down to the creek from the Jennies Peak road. Its upstream extent is described by the confluence of two headwater tributaries.

Geomorphology

This reach has a gradient of 3.4%. The Geomorphology of Upper Robinson Reach H is very similar to Upper Robinson Reach G, but with a maximum incision depth of only 8.5 feet. The downstream end of the reach is not incised due to the likely presence of near-surface bedrock serving as a gradient control. The upstream end of the reach is just below an area of exposed bedrock in the valley floor and creek bottom. Both ends of the reach have very shallow levels of incision: < 1 foot at the downstream end, and approximately 2 feet at the upstream end. Incision is deepest at the top of the section with perennial flow. There are essentially no inset floodplains for the length of this reach. Valley floor soils consist of a mix of small cobble, gravels and fine soils.

Hydrology

Only the lower 0.1 miles of the reach flow perennially. These flows maintain surface water within two adjacent push-up dam/ponds that define the bottom of this reach. Spring-time seasonal flows of approximately up to six inches deep (2024) are present in the upper reach and appear to continue until May. The photo-gauge at the head of this reach was not installed until April 10, 2024 after flows had stopped for the year. Side gullies do not represent contiguous perennial tributaries or substantial hydrologic inputs outside of stochastic, and rare, precipitation events. However, the two branches immediately upstream of this reach (Headwaters of Robinson Creek) do appear to have regular, brief, early season flows and short, very dis-contiguous sections of perennial flow. Cumulatively they likely contribute to the early season flows within this reach. Additionally, an actively flowing spring on the southeast corner of the reach provides nearly continuous perennial surface flow to the creek.

Biology

This reach is above the ODFW designated Steelhead habitat reach which does not extend up past the confluence of Robinson and Little Pine Creek approximately 2.2 miles downstream of this reach (Figure 1). Fish have not been observed within this reach.

Besides a few individual willows growing near the push-up dams, and cattails growing within the push-up dam pools, there is no riparian vegetation present within this reach. While juniper have been cut-down throughout most of the valley within this reach, 4.25 acres of juniper remain standing surrounding the spring on the southeast corner of the reach.

Human Infrastructure

A 4WD route traverses the length of this reach. The route is located on the high floodplain up to 6 feet above thalweg. Two old push-up dams are present at the downstream end of this reach. The lower of

the two is breached and no longer functions as a pond. The upper dam is still functional and holds standing water throughout the year.

Pioneer era farming infrastructure were present in the upstream end of this reach. This included a small structure, and farming equipment. After wildfires, these resources are no longer clearly visible on the surface.

Headwaters of Upper Robinson Creek

This reach describes a 180-acre area of tributaries totaling a length of approximately 1.65 miles that feed into to Upper Robinson Reach H.

Geomorphology

Stream channels within this area are eroded to bedrock in many places. On the northern tributary, the small seasonal stream has eroded 20 feet below wide historic floodplains.

Hydrology

The majority of stream channels within this area are seasonal, with only short patches of perennial flow. Numerous push-up dams and associated ponds are present within this area.

Biology

This reach is above the ODFW designated Steelhead habitat reach which does not extend up past the confluence of Robinson and Little Pine Creek XX miles downstream of this reach (Figure XXX fish designation). Fish have not been observed within this reach.

Willow and cattails are present in patches associated with perennial flows or push-up dam ponds. Juniper has been essentially completely removed from the southern tributary, but remain uncut throughout the majority of the drier northern tributary.

Human Infrastructure

An ATV trail passes through the length of the southern tributary arriving at the top of the southern tributary's watershed. This ATV trail is located mostly high up in the uplands. The Jennies Peak 4WD road and a side road run along the rim of the southern tributary's watershed.

Little Pine Canyon

This reach is 1.82 miles long and extends up from the mouth of the rock canyon near the confluence of Little Pine and Robinson Creeks. Its upstream end is located in an area of aspen stands where the narrow canyon begins to open back up to narrow floodplains and becomes more of a narrow steep valley.

Geomorphology

This reach has a gradient of 6%. The lower third of Little Pine Canyon is a deep, narrow, solid rock canyon with a large proportion of exposed bedrock. The upper two thirds of the Canyon is a deep, narrow, incised valley. Two large, steep, narrow, side-canyons enter the canyon in its lower third with headwaters on adjacent private lands.

Hydrology

Perennial surface flow is present throughout a large proportion of the canyon, with some short sections drying out at different times of the year. The unnamed canyon has some areas of perennial flow, but does not seem to be a major contributor of perennial surface flow to the stream, although substantial juniper removal within the unnamed stream valley (and on Old Mill Creek) on the adjacent private lands begun a decade ago may improve this. Old Mill Creek, has perennial flows and at one time had sufficient historic flow volumes to power a saw mill on the adjacent private property. This stream remains dammed at the site of the mill.

Biology

This reach is above the ODFW designated Steelhead habitat reach which does not extend up past the confluence of Robinson and Little Pine Creek 0.29 miles downstream of this reach (Figure 1). Fish have not been observed within this reach.

Dense juniper ponderosa forest, scheduled for juniper removal, covers the majority of the valley and tributary valleys. This ponderosa forest represents a habitat within PCCA that is not present elsewhere. Within large portions of Little Pine Canyon the vegetation is often nearly impassible thickets of rose, willow and mock orange.

Human Infrastructure

No human infrastructure is present within this reach.

Upper Little Pine Reach I

This reach is 0.66 miles long and extends upstream from an area of aspen stands at the downstream limit of accessible floodplains. Its upstream extent is located at the confluence of two dry headwater tributaries.

Geomorphology

This reach has a gradient of 8%. The valley is defined by steep talus and dirt slopes with areas of exposed bedrock. Moving upstream from the downstream end, there are increasing numbers of inset floodplains. At least two head cuts (>6 feet tall) are located at the midpoint of the reach. The valley bottom consists of rich deep loams with high amounts of organic matter and mostly small particle sizes. This soil remains moist for long time periods and appears to be ideal for large amounts of seasonal water table storage, especially owning to the depth of incision (up to 20 feet) which could me aggraded. Incision is deepest at on the lower half, with areas of bedrock or compacted roadbed at the midpoint of the reach, which appear to have arrested erosion at those points.

Hydrology

The majority of this reach is perennial throughout the year. No photo-gauges have been installed on this reach. Side gullies do not appear to represent contiguous perennial tributaries, however there are numerous side gullies and seeps that are perennially wet and support mesic vegetation throughout the lower portion of the reach. Snow persists in this area longer than anywhere else in the watershed.

Biology

This reach is above the ODFW designated Steelhead habitat reach which does not extend up past the confluence of Robinson and Little Pine Creek more than two miles downstream of this reach (Figure 1). Fish have not been observed within this reach. Additionally, it is not likely that any fish could move up past the two large head cuts at the midpoint of the reach.

In general, the valley is a dense juniper ponderosa forest, with junipers being more dominant on the south aspect slopes and ridge tops and ponderosas more numerous on the north aspect slopes, and the valley bottom. This ponderosa forest represents a habitat within PCCA that is not present elsewhere. The lower half of the reach was recently burned hard. Large ponderosas were logged from this valley approximately a quarter century ago, and a very small amount of juniper removal work has been done in the upper 10% of the reach.

Several aspen stands are located on the lower half of the reach within, or next to, the incised channel; or around springs areas on the bottom of toe-slopes. These aspen stands are nearly all choked with juniper. Springs and numerous in-channel locations support cattails. The bottom stream channel is typically an impassable thicket of rose, mock orange and some willows. Juniper and ponderosa have frown up along the incised banks.

Human Infrastructure

The upper half of the reach has an old logging road that runs alongside it on the high toe-slope that is slightly over-grown with small diameter trees that allows access from the up-stream end of the valley via the Jennies Peak Road.