ANNUAL REPORT

CTUIR GRANDE RONDE WATERSHED RESTORATION PROJECT

A Columbia River Basin Fish Habitat Project

Northwest Power Planning Council Project # 1996-083-00

Report covers work performed under Bonneville Power Administration Contract 73982 REL 192
May 1, 2023 to April 30, 2024

Prepared By:
Deric Carson, Fish Habitat Biologist
Travis Dixon, Fish Habitat Biologist
Dallin Haynes, Fish Habitat Biologist
Allen Childs, Project Leader/Fish Habitat Biologist

Confederated Tribes Umatilla Indian Reservation
Department Natural Resources Fisheries Program
Pendleton, Oregon

Report Created: April 2024

"This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA."

CONFEDERATED TRIBES
UMATILLA INDIAN RESERVATION

BONNEVILLE POWER
ADMINISTRATION

Table of Contents

Table of Figures

List of Tables

Introduction

From time immemorial, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) culture and traditions have been interconnected to natural resources. The CTUIR retains aboriginal and treaty-reserved rights for fishing, hunting, pasturing of livestock, and gathering plant food and medicine throughout its Aboriginal Use Areas. Traditional access and use of available resources continue to be threatened by land and water development, watershed degradation, and climate change.

Efforts under this project provides support towards the overall Fisheries Habitat Program goal to protect, enhance, and restore functional floodplain, channel and watershed processes to provide sustainable and healthy habitat for aquatic First Food species (http://fisherieshabitat.ctuir.org/). Our Fisheries Habitat Program's hierarchical approach to restoration strategic planning, project development, and implementation and monitoring is guided by the CTUIR Department of Natural Resources (DNR) "First Foods" Mission and Policy (Quaempts et al 2018), which identifies physical and ecological processes ("key touchstones") of a highly functional and dynamic watershed important for providing water quality and fish habitat that supports First Foods integral for Tribal ceremonies and traditions (Umatilla River Vision, Jones et al. 2008; Upland Vision, Endress et al. 2019).

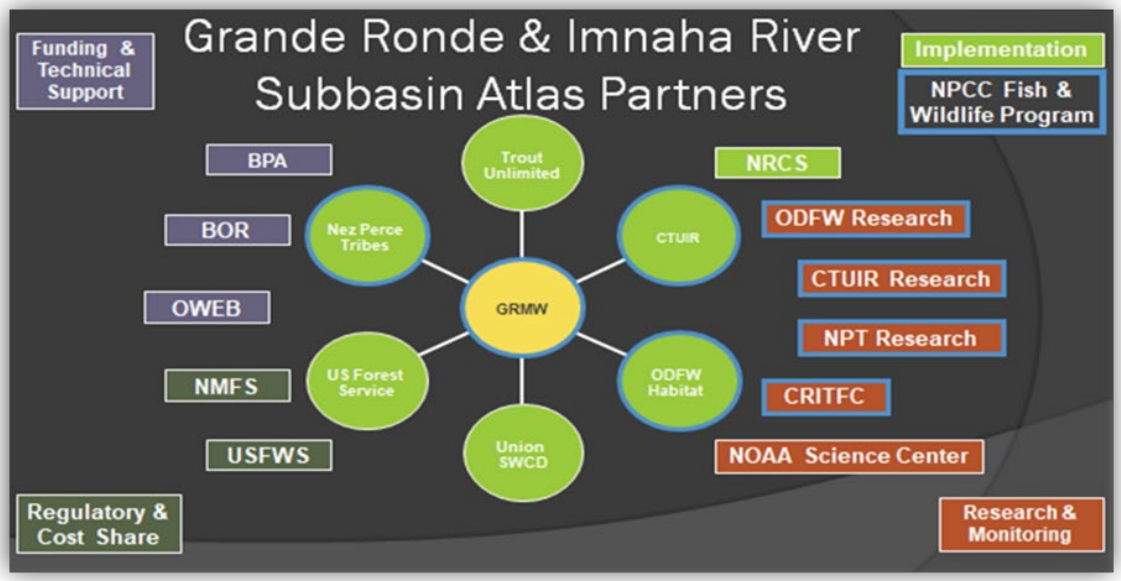
The CTUIR manages and implements multiple programs in the Grande Ronde, Umatilla, John Day, Walla Walla, and Tucannon River Basins under the Northwest Power Conservation Council (NPCC), Bonneville Power Administration (BPA) Fish and Wildlife Programs and the Columbia Basin Fish Accords and Extensions (2008, 2018) to restore habitat that supports fishery resources including Threatened Snake River spring-summer Chinook salmon (Oncorhynchus tshawytscha), summer steelhead (Oncorhynchus mykiss), and bull trout (Salvelinus confluentus).

Background

The CTUIR Grande Ronde Watershed Restoration Project (1996-08-300) was initiated in 1996 under the NPCC-BPA Early Action Project process to fund the CTUIR and to engage the CTUIR in basin conservation planning and fish habitat restoration. The CTUIR is a core partner with Grande Ronde Model Watershed (GRMW) Project (1992-026-01), Oregon Watershed Enhancement Board (OWEB), Focused Investment Program (FIP), and multiple basin resource managers. The CTUIR is represented on the GRMW Board of Directors, OWEB Core Partner Committee, and multiple technical teams and committees involved in basin planning and project prioritization through the GRMW Atlas.

Annual operating budgets have ranged from $61,000 in 1996 to $1,349,166 in 2023under the CTUIR-BPA Accord which has provided resources for project implementation, administration, planning, and project development. Annual operating budgets and associated tributary habitat efforts by the CTUIR were increased through the 2008 CTUIR-BPA Accord.

The Project has been successful in the development and implementation of several large habitat enhancement projects and has developed effective interagency partnerships, working at the policy and technical levels with the Grande Ronde Model Watershed Program (GRMWP), federal and state agencies, and private landowners, including Natural Resource Conservation Service (NRCS) Wetland Reserve Program (WRP), CREP, WHIP, and EQIP, OWEB, EPA-ODEQ 319, GRMW-BPA, CRITFC, NMFS, USFWS, ODOT, and NAWCA and developed an effective working relationship with multiple agencies and organizations.



During the 27-year project history, the CTUIR has contributed to the development of multiple fish habitat enhancement projects along 50+ river miles in the Grande Ronde Basin. In recent years the Project has developed, administered, and implemented six large-scale fish habitat and floodplain enhancement projects pursuant to the overall CTUIR Fisheries Habitat Program goal: “Protect, enhance, and restore functional floodplain, channel and watershed processes to provide sustainable and healthy habitat for aquatic species of the First Food order.” Guidance from the CTUIR’s River Vision has facilitated the shift towards larger, contiguous stream reaches, and broader scale projects that focus on restoring floodplains and physical and hydrological process to form and maintain complex and diverse habitats using the Atlas project prioritization approach. See links below for additional information.

Annual Reports and Project Data

Grande Ronde River Basin

Project Area Description

The Grande Ronde River originates in northeastern Oregon's Blue Mountains and flows northerly 212 miles to its confluence with the Snake River in southeastern Washington at river mile 169 (NPCC, 2004). Historically, the Snake River and its tributaries were likely the Columbia River basin's most productive drainage for salmon and steelhead, supporting more than 40 percent of all Columbia River spring and summer Chinook salmon and 55 percent of summer steelhead (NOAA, 2017). By the late 1800's, fish populations in the Grande Ronde were declining with sockeye and Coho being extirpated in the early 1900's.

Declines in Chinook, steelhead, and other native fish resulted in Tribal governments and State agencies eliminating or significantly reducing subsistence and sport fisheries by the mid-1970's (NPCC 2004). Further decline in salmon and steelhead returns led to Federal Endangered Species Act (ESA) Threatened listings of Snake River Spring-Summer Chinook and Summer Steelhead in 1992 and 1994 respectively (NOAA, 2017), and Columbia Basin Bull Trout in 1999 (USFWS, 2014). The Grande Ronde River and tributaries provide critical habitat for Snake River Chinook salmon, steelhead, and bull trout.

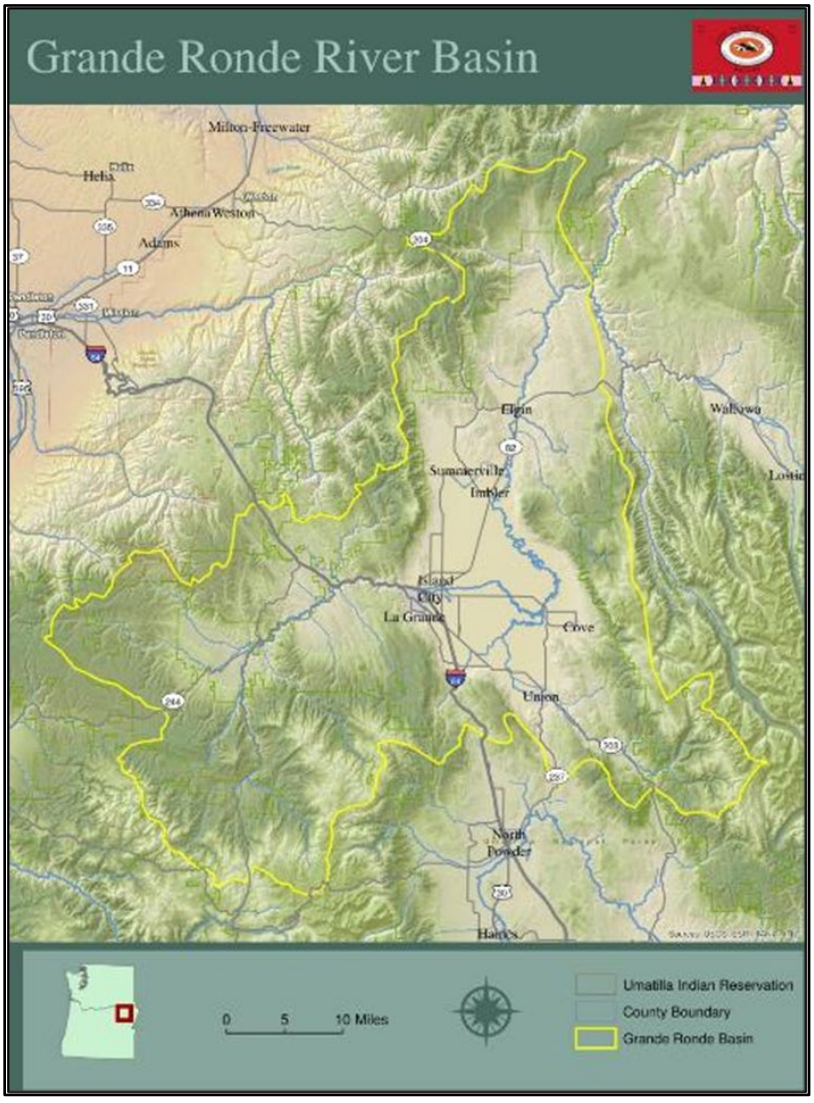


Figure 1. UPPER GRANDE RONDE SUBBASIN VICINITY

Degradation of instream and riparian habitat in the Grande Ronde Basin has been the dominant in-Basin cause of salmon and steelhead decline (NPCC 2004). Land use activities since the early 1800s include beaver trapping, logging, splash damming, grazing, mining, channelization, water withdrawals, road and railroad construction, and urban development. Past activities have degraded aquatic habitat conditions with extensive channel simplification (White et al. 2017, pg. 212-213), loss of large pool habitat (McIntosh 1994), significant thermal loading, and loss of cold-water refuge (Justice et al. 2017, Ebersole et al. 2003).

The Oregon Department of Environmental Quality (ODEQ) listed over 60 stream reaches in the basin on Oregon's list of water quality limited water body's 303 (d), 24 of which are listed for habitat modification, 27 for sediment, and 49 for temperature (NPCC 2004). Human-caused CO2 emissions have contributed to a summer warming trend of Pacific Northwest streams of approximately 0.14-0.27°C per decade between 1976 and 2015 (Isaak et al. 2017, 2018). Regional climate changes and forecasted warming trends are going to contribute to salmonid range contraction and decreased habitat capacity and suitability in the basin (Justice et al. 2017). Climate change is also expected to negatively influence hydrology and availability of water resources (Clifton et al. 2018), as well as increase pathways for invasive species (Rahel and Olden 2008).

Extensive evaluation of historic habitat degradation, current habitat condition, fish life histories, and habitat limiting factors have been the focus of ESA recovery planning, Biological Opinion (BiOp) Expert Panel, NPCC Fish and Wildlife Program as amended, basin planning (NPCC 2004), research and evaluation, and recent multi-disciplinary/agency strategic planning efforts. BPA and GRMW facilitated these efforts in the development of the Grande Ronde and Catherine Creek Atlas (Atlas) and Atlas User Guide (BPA et al. 2015 and 2017). The purpose of Atlas is to focus Basin partner efforts towards the most important restoration priorities in the right locations, right order, and focused on a process-based, landscape approach (BPA 2017). The core elements of Atlas are the integration of monitoring and research findings associated with focal fish limiting factors, habitat suitability, and life history requirements and the facilitation of much needed communication and collaboration between basin partners in the evaluation, prioritization, and development of restoration actions.

Additionally, the Atlas delineated biologically significant reaches (BSR) and associated life history use/timing, habitat limiting factors, prioritized habitat actions, and habitat objectives, providing a central location of data and a strategic approach that facilitates consistent project planning, development, and coordination within the basin partnership. The Atlas is an iterative and adaptive set of procedures adjusted to incorporate new empirical data, published research evidence, results from projects, and evolving local knowledge. The Atlases have been instrumental in promoting partner collaboration, and building a consistent framework for identifying, selecting, funding, and implementing restoration efforts in core Chinook salmon and steelhead habitats. In summary, the Atlas identifies the following critical life stages and limiting factors:

Catherine Creek Atlas

- Juvenile outmigration - high mortality rate
- Adult Chinook holding/spawning - high pre-spawn mortality rate
- Juvenile Chinook and steelhead summer/winter rearing - habitat capacity
- Adult Chinook immigration - thermal barriers

Upper Grande Ronde Atlas

- Juvenile outmigration - high mortality rate
- Adult Chinook holding/spawning - high pre-spawn mortality rate
- Juvenile Chinook and steelhead summer/winter rearing - habitat capacity
- Adult Chinook immigration - thermal barriers
- Adult steelhead spawning - lack of pools

Wallowa/Imnaha Atlas

- Adult Chinook holding/spawning - lack of pools, sediment, regulated flows
- Juvenile Chinook and steelhead summer/winter rearing - habitat capacity, regulated flows
- Adult Chinook immigration - anthropogenic barriers, reduced flows

The importance of restoring salmon, steelhead, resident fish, and other natural resources is central to the CTUIR's culture and traditions. Our Fisheries Habitat Program's hierarchical approach to restoration strategic planning, project development and implementation, and monitoring is guided by the "First Foods" DNR Mission and Policy (Quaempts et al. 2018) and River and Upland Visions (Jones et al. 2008; Endress et al. 2019). The CTUIR First Foods concept of "reciprocity" comes from a creation belief that acknowledges a moral and practical obligation that humans and the natural biota must care for and sustain one another. This belief arises from the human gratitude and reverence for the contributions these First Foods make to sustain humankind. The River Vision identifies physical and ecological processes ("key touchstones") of a highly functional watershed and dynamic river system important for providing water quality.

The CTUIR's habitat objectives and Atlas objectives were developed and linked to target species life histories and limiting factors with habitat action types specified and assigned for specific habitat uplift. (CTUIR Fisheries Habitat Program)

CTUIR fisheries programs are guided by the Northwest Power and Conservation Council Fish and Wildlife Program (NPPC 2014 and 2020 Amendments) with consistent goals and objectives associated with rebuilding Columbia and Snake River native fisheries. CTUIR programs focus on conserving and protecting the best remaining habitat (particularly cold-water refuges), reconnecting habitat and corridors, prioritizing near term resources in core areas, and building out to interconnect habitats and life stages. Floodplain restoration, hydrologic and geomorphic processes, groundwater and hyporheic functions, and habitat diversity and complexity are core features of ecological diversity and resilience.

The vision for the 2014 NPCC Fish and Wildlife Program is "a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, supported by mitigation across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydro system. This envisioned ecosystem provides abundant opportunities for tribal trust and treaty-right harvest, non-tribal harvest, and the conditions that allow for restoration of the fish and wildlife affected by the construction and operation of the hydro system" (NPCC 2020).

Project Goals and Objectives

The goal of CTUIR's tributary habitat programs is to protect, enhance, and restore functional floodplain, channel, and watershed processes to provide sustainable and healthy habitat for aquatic First Food species. Objectives are a means of achieving stated goals and include 1. Habitat protection and conservation, 2. Floodplain connectivity, 3. Channel morphology, 4. Instream structure and complexity, 5. Riparian restoration, 6. Water Quality, and 7. Fish passage.

Physical Objectives	Description	Measureable Criteria	Monitoring Technique	Effectiveness Criteria	Notes
1. Habitat protection and conservation	• Fee title acquisition • Term conservation easement	• Protected acreage	• Bi-weekly livestock trespass monitoring • Fence/water gap inspection • Boundary inspection	• Increased acreage protected	1. Livestock exclusion, direct benefit for riparian protection. 2. Habitat program directly involved with planning/management of acquisition/easements,
2. Floodplain reconnection	• Restore connectivity to promote hydrologic and physical processes that maintain complex and resilient habitats that hydrate/store, attenuate floods, and buffer water temperature.	• Inundation @ annual 1.25 flood flow • Summer base flow • Acreage inundated • Ground water elevations • Beaver habitat suitability (# acres)(**see notes**)	• UAV Imagery (remote sensing) • Groundwater wells • Stage recorders • Piezometer	• Inundated acreage (annual) • Groundwater elevation in relation to ground surface • Summer base flow discharge • Increase acre-foot (af) storage	1. Valley form and stakeholder/landowner buy-in are limiting factors for max potential of floodplain connectivity. 2. Increase floodplain connectivity as discharges increase without increasing flood damage to nearby infrastructure (if present). 3. Beaver habitat suitability will correlate with floodplain acreage.
3. Channel morphology restoration	• Increase stream length and channel complexity	• Lengths of main channel and side channels (miles) • Number of pools (**see notes**) • Sinuosity • Node density • Maintain side-channel activation	• Longitudinal profile • UAV (remote sensing) • River complexity index (RCI)	• Increase main and side channel lengths • Increase sinuosity (geomorphic template) • Increase pools (4'depth)/mi • Higher RCI than pre-project conditions • Side-channel and peripheral habitat persistence	1. RCI will follow standard protocol of Brown 2002. 2. Deriving a target value of pool frequency will be consistent with McIntosh et al. 2000 coupled with Rosgen morphology and BOR Tributary Assessment. 3. Sinuosity is contingent on geomorphic template of project reach.
4. Instream habitat structure and complexity	• Increase large wood (LW) in project reach	• Wood loading (pieces/mile) commensurate with reference condition wood loading (**see notes**)	• Survey prior to project start • UAV(remote sensing)	• Increase pieces/mile in relation to design based on reference	1. It is expected wood loadings will vary due to recruitment and dismissal of LW. 2. Large wood frequencies within the bankfull channel will be correlated to quantities associated with reference conditions (AQI 2005, CHaMP 2013-2015, Mcintosh et al. 1994). 3. Bioclimatic region, drainage area, and channel width are dominant predictors of instream wood load (Wohl et al. 2017).
5. Riparian restoration and management	• Restore riparian and floodplain vegetation	• Percent vegetation cover	• UAV imagery (remote sensing) • Stock/stem survival • Photo points	• Year 5: >80% fully vegetated (herbaceous cover, including sedges and rushes/herbaceous) • Year 5: 20% riparian and forest shrub tree cover • Year 25: >50% riparian and forest shrub tree cover	1. Riparian vegetation will be assessed through a combination of remotely sensed imagery and on-the-ground surveys. 2. Monitoring of vegetation can extend out to 15 years post-project completion.
6. Water quality	• Improve summer and winter altered thermal regime	• Stream temperature	• Forward looking infrared (FLIR) • Thermographs • Maximum Weekly Maximum Temperature (MWMT) • Diurnal fluctuation range	• Reduce # days under 25°C (lethal limit) • Increase #days within 10°C and 18°C (core cold temps for salmonids)	1. Contingent on funding availability, hyporheic exchange would be monitored.
7. Fish passage	• Improve fish passage for all life stages of targeted species (steelhead, chinook salmon, bull trout, and Pacific lamprey)	• Overflow capacity for floodplain connection • Native fish species present • Life history stages that require fish passage	• ODFW Fish Passage Criteria (635-412-0035)(**See notes**)	• Miles of restored or improved passage for targeted species	1. ODFW Chapter 635: Division 412 Fish Passage – 635-412-0035

Table 1- BIOLOGICAL OBJECTIVES AIM TO ASSESS RESTORATION PROJECT EFFECTIVENESS FOR THE CTUIR RM&E

Biological Objectives

Fish response to habitat actions for the Project are conducted by the CTUIR Grande Ronde RM&E Project (#2009-014-00). Biological objectives related to our habitat project are described in the RM&E proposal and were developed to assess the biological response to habitat actions. Physical habitat objectives were developed based on fish life histories, limiting factors and actions described in detail in the Atlas.

Biological Objectives	Measureable Criteria	Monitoring Technique	Effectiveness/Statistical Criteria	Notes
1. Salmon/steelhead abundance	• Adult abundance by species • Juvenile abundance	• Electrofishing (**see notes**) • Snorkel Surveys • Minnow traps	• t-test for pre vs. post project mean, alpha = 0.05 • 25% Increase over baseline with data	• Adult abundance monitoring contingent on permit
2. Salmon/steelhead productivity	• Pre-spawn survival • Trib survival of seasonal parr • Smolt-to-adult return (SAR)	• Adult weir (**see notes**)	• t-test for pre vs. post project mean, alpha = 0.05 • 25% Increase over baseline with data	• Only implemented on Lookingglass Creek • ODFW collects adult data within Grande Ronde basin.
3. Holding/spawning/ incubation/emergence	• Redd density by species (**see notes**) • Spatial arrangement of redds	• Spawning surveys (**see notes**)	• t-test for pre vs. post project mean, alpha = 0.05 • 25% Increase over baseline with data	• Gallagher et al. 2007

Table 2- Physical Habitat Objectives

Habitat Protection and Conservation

The Project actively pursues properties for fee title acquisition, conservation easements, and water conservation.

Floodplain Reconnection

Historic anthropogenic activities have severely altered floodplains, channel morphology and thermal regime contributing to habitat loss, degradation, and productivity of cold-water fishery habitat. Our floodplain objective is to restore the connection of rivers to their floodplain, recognizing "The river is the Floodplain." Floodplains perform diverse physical and ecological functions, including attenuation of water, sediment and organic matter (Wohl 2020). Floodplains are a repository of water, wood, sediment and nutrients, are resilient, and have high intrinsic value for ecological services, productivity, and resilience. The floodplain objective is to reconnect rivers to the historic floodplain and promote processes and function that creates and maintains habitat.

Channel Morphology Restoration

Main channel, side channels, pools, and off-channel areas provide rearing habitat for salmonid and other fish species, during all life stages. The Project aims to directly increase stream length and channel complexity to meet the needs of native fish species. Project restoration actions aim to restore or enhance main channel, side channel, and off-channel habitat, which include reconnecting or constructing perennial side channels, secondary channels, high-flow channels, floodplain ponds, wetlands, alcoves, and groundwater-fed off-channel habitat. The Project works with partners to evaluate the geomorphic template of the valley floor and hydraulics of given project reaches to determine the appropriate construction methods and utilizes comprehensive geomorphic assessment methods coupled with Rosgen morphology, BOR Tributary Assessments, and the River Complexity Index (RCI) to support desired project conditions.

Instream Habitat Structure and Complexity

Objective is to restore large wood density to increase complexity, cover consistent with reference conditions in the area (Wilderness areas, Minam basin) (McIntosh et al. 1994, White et al. 2017, Wohl et al. 2017).

Riparian Restoration and Management

Floodplain and river connection objectives are directly related to riparian objectives. Restoring floodplains promotes hydrologic and disturbance regimes that support moist soil conditions and hydrophilic vegetation. Encouraging development of conditions that generate natural recolonization of native sedges/rushes, shrubs, and trees and a variety of seral stages is preferred to artificial planting efforts. However, planting and seeding plans are implemented to facilitate riparian vegetation establishment. Riparian objectives are to enhance or re-establish riparian vegetation communities along stream reaches to increase riparian habitat diversity, restore canopy cover to increase shading, improve beaver habitat and facilitate beaver recolonization, and increase the likelihood of large wood recruitment over time.

Water Quality

Thermal restoration is dependent on restoring floodplain hydrology and channel morphology that promotes water storage, hyporheic functions, and restoration of riparian and wetland vegetation. Floodplain attenuation contributes to hyporheic lag, providing cold water refuge during summer and

warm water refuge during winter. See methods section for additional detail and references. Water quality improvement is a large task in a severely degraded thermal regime and broad actions are required to address these core limiting factors. In addition to floodplain, morphology, and riparian restoration, partners are active in water transactions, water purchases, coordinating with local farm bill programs to establish greenbelts, conservation easements and riparian restoration, and water conservation programs associated with irrigation.

Fish Passage

Reviews of the effectiveness of habitat improvement have consistently reported removal of barriers and/or installation of fish passage as significantly effective actions for increasing fish population numbers and are highest priority habitat improvement measures for salmon, steelhead, and other stream fishes (Roni et al. 2002, Roni et al. 2008). The Project aims to improve fish passage and restore longitudinal connectivity to impacted streams in the basin by working with The Umatilla Tribe Ceded Area Juvenile & Adult Passage Improvement Project (Project # 2009-026-00) and the US Forest Service to identify and correct potential fish impediments (typically culverts).

Recent Notable Watershed Restoration Efforts

Restoration actions during the period of 2014 to 2023 have resulted in reconnecting over 455 acres of floodplain habitat, protection of 1,083 acres of floodplains, uplands, and riparian areas through permanent and term conservation easements, 157 acres of floodplain and riparian habitat planted with over 47,000 native trees and shrubs, 13.5 miles of main channels restored or enhanced, 8 miles of side channels constructed, 147 large main channel pools created or enhanced, 74 side channel pools created or enhanced, and 589 large wood structures installed.

Notable CTUIR efforts in the Grande Ronde Basin include fee title land acquisitions in the Catherine Creek, Meadow Creek/Dark Canyon, and Lookingglass watersheds and implementation of large projects along Catherine Creek (CC44 Southern Cross), and the Grande Ronde River (Rock Creek, Bird Track Springs, Middle Upper Grande Ronde, and Longley Meadows). Since 2014, the project has sponsored six watershed projects in cooperation with partners, including the GRMW, OWEB, BPA, Bureau of Reclamation (BOR), Wallowa-Whitman National Forest (WWNF) and private landowners, encompassing over 4,135 acres of permanent habitat conservation (fee title acquisitions and permanent easements), 606 acres of term conservation easements, 348 acres of floodplain reconnection, 14 river miles of habitat restoration/ enhancement, creation/enhancement of 248 large and small pools, and over 400 miles of fish passage improvement (See CTUIR Umatilla Tribe Ceded Area Juvenile and Adult Passage Improvement Project # 2009-026-00).

Future project efforts include continuation with technical assistance on partner-sponsor projects (ODFW Catherine Creek Hall Ranch, WWNF Grande Ronde River Vey Meadows), and design and implementation of the following projects: 1) Middle Upper Grande Ronde River Phase 2 & 3 (2023), 2) Catherine Creek RM42 Fish Passage Project (2023), 3). McCoy Meadows Enhancements (2024-2025), 4) Lookingglass Restoration (2025). Additional project opportunities for conservation/protection, restoration, and passage will be ongoing and adjust to priorities and schedules with coordination through the GRMW partnership.

Noteworthy Accomplishments, FY2023

- Administered BPA contract for Grande Ronde Watershed Project. Highlights include personnel, purchasing, subcontracting for services, basin coordination, planning and design, and environmental compliance planning.
- Maintained and monitored conservation easements on the Grande Ronde River, Catherine Creek, Rock Creek, Meadow Creek, McCoy Creek, and Dark Canyon Creek (Figure 21).
- Initiated planning, field surveys, and design on projects planned for construction including:
    - Completed design and construction of Middle Upper Grande Ronde River (MUGRR) Project Phase 2 and 3.
    - Continued planning and design on Catherine Creek Hall Ranch as a partner, Lookingglass Conservation Property, McCoy Meadows Conservation Property and the Catherine Creek RM 42.5 Passage and Habitat. Provided technical assistance to USFS for Grande Ronde River Vey Meadow Project Design and initiated planning for gravel augmentation to MUGR project reach.
- Project Leader participated on the Grande Ronde Model Watershed Board of Directors and Technical Team.
- Project Leader and Assistant Biologist participated in the Technical Implementation Team as part of the GRMW Step Wise and Atlas Strategic Planning and Project Development Process.
- Staff conducted monitoring and evaluation activities on project areas, including expanded water temperature and groundwater monitoring efforts at restoration sites, photo point documentation, and UAV drone flight coordination.
- Assisted fish salvage operations conducted by CTUIR John Day Watershed Restoration, and Nez Perce Tribe at several locations.
- Assisted CTUIR Grande Ronde M&E in conducting Chinook salmon redds surveys on Lookingglass Creek.
- CTUIR habitat staff supported other research and monitoring efforts at project sites including AEM and CTUIR physical habitat monitoring program such as juvenile salmonid population estimation and adult redds distribution surveys, large pool topographic data collection.
- Project Leader and Biologists presented at meetings and information sessions including GRMW State of Science, GRMW Technical Team, and LaGrande Rotary Club.
- Staff led multiple project tours, including GRMW Board of Directors, USFS Regional staff, local placed-based planning group, and Columbia Basin Tributary Habitat Team.
- Pursued future restoration opportunities by continuing discussions with federal land managers and private landowners about restoration opportunities along Catherine Creek, Grande Ronde River, Meadow Creek, McCoy Creek, and Rock Creek.

Project Tours, Presentations, and Collaboration

- CTUIR DNR Fisheries Program Annual Meeting Presentation (March 2023)
- Lookingglass BPA HIPIV 15% Design Presentation (April 2023)
- Columbia Basin BiOp Tributary Habitat Steering Committee Tour and Presentation (Upper Grande Ronde and Catherine Creek Projects, April 2023)
- CTUIR Cultural Resource Committee, Catherine Creek Hall Ranch Presentation (BPA, ODFW, and CTUIR (April 2023)

- Union County Placed-Based Planning Tour, McCoy Meadows and Bird Track Springs (Basin partners, Union County Commissioners, Local Agricultural Operators) (April 2023)
- Wallowa Resources Pub Talk Presentation Grande Ronde Basin Fish Habitat Restoration (June 2023)
- Lookingglass 30% Design and Area of Potential Effect Presentation, Section 106/Environmental Permitting Presentation CTUIR Cultural Resource Program (August 2023)
- Oregon Women's Coalition Tour Bird Track Springs (August 2023)
- Grande Ronde Model Watershed Technical Team Presentation Upper Grande Ronde Project Complex Road Relocation Proposal Presentation (October 2023)
- Grande Ronde Model Watershed State of Science Presentation (November 2023)
- Meadow Creek Wallowa-Whitman National Forest Collaborative Planning, Presentations and Field Tours (June, November 2023)
- McCoy Meadows Master Plan Presentation to NRCS (December 2023)
- Assisted with Grande Ronde Qapqapnim Weele Community Science Project outdoor school at Bird Track Springs and Catherine Creek restoration project areas (May 2023, June 2023)

Project Planning and Design:

- Middle Upper Grande Ronde Phase 2 and 3 Design and Construction Preparation
- Catherine Creek RM 42.5 Fish Passage and Habitat Planning and Design Planning
- Catherine Creek Hall Ranch Planning and Design
- Meadow Creek Collaborative Master Plan Development
- McCoy Meadows Planning and Master Plan Development
- Upper Grande Ronde Project Complex Planning and Design
- Ronde River Ranch Initial Concept Planning

McCoy Meadows Planning, Master Plan Development and Coordination

Completed development of master plan in partnership with BOR. Effort included compilation of historic project information, development of hydraulic modeling of existing condition, assessment of current resource condition, and development of broad goals, objectives and concepts. Master plan developed to document project history, performance of past projects, existing condition, and departure from desired condition. Master plan provided basis to communicate with basin partners in identifying and developing strategies to plan, design, and implement future habitat actions.

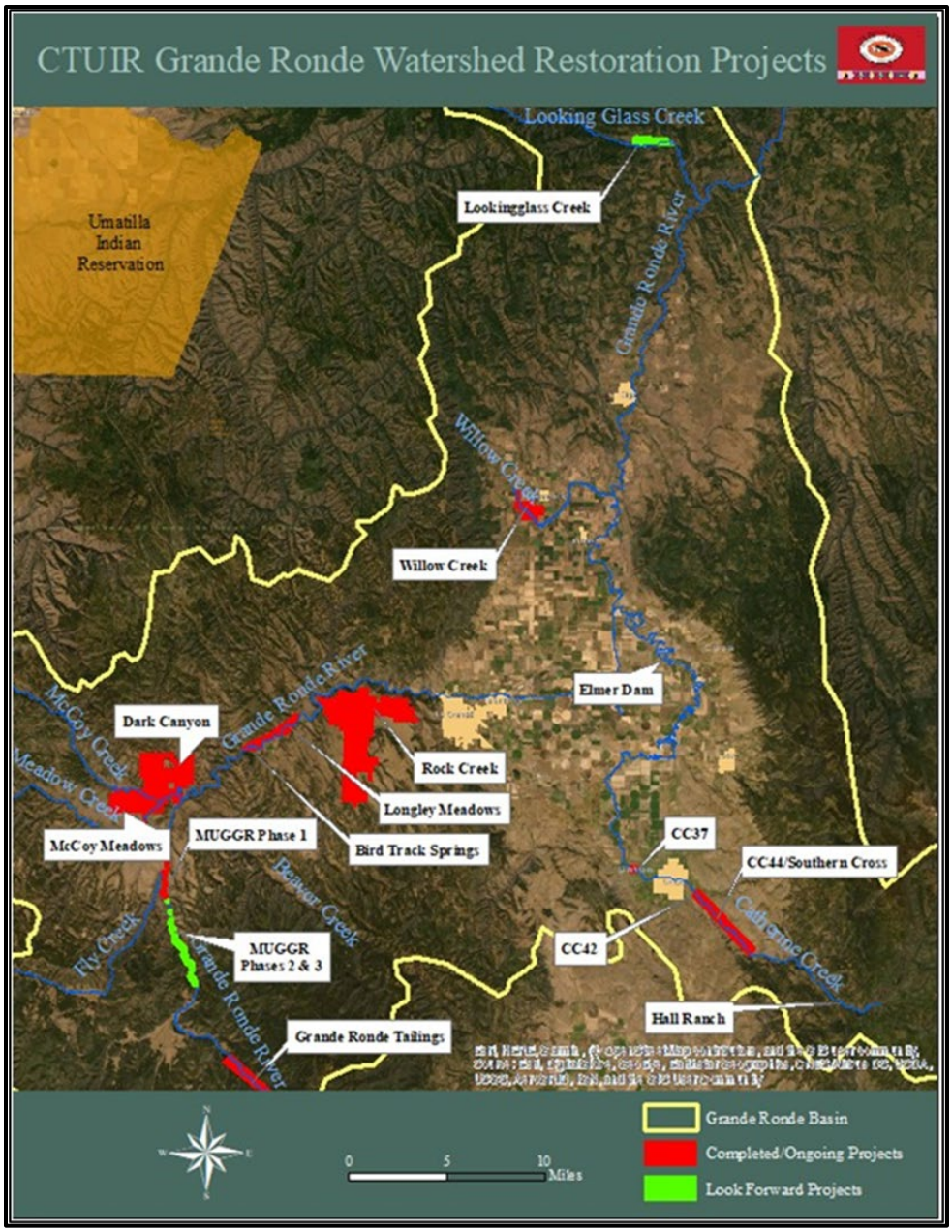


Figure 2. CTUIR GRANDE RONDE WATERSHED RESTORATION PROJECTS OVERVIEW MAP

FY 2023 Project Assessment

Middle Upper Grande Ronde River (MUGRR) Phase2/3

The Middle Upper Grande Ronde River Phase 2 and 3 Fish Habitat Enhancement (MUGRR) was sponsored and implemented by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) in partnership with the Wallowa-Whitman National Forest (WWNF), LaGrande Ranger District, Grande Ronde Model Watershed (GRMW), and Bonneville Power Administration (BPA). The project is located on WWNF lands along a 6-mile reach of the mainstem Grande Ronde River between river miles 158 and 164. The project area provides important spawning and rearing habitat for Threatened Snake River Basin

spring Chinook salmon. The reach is delineated as a Tier 1 priority in the Grande Ronde Atlas Strategy Plan, Biological Significant Reach (BSR) UGR 15. The reach also supports Threatened summer steelhead, bull trout and a host of native fishery resources.

Project construction was initiated in late November 2023 beginning with wood and boulder acquisition and staging. Project materials were secured from WWNF and private sources. Logging, wood material, stockpiling, and boulder haul was completed by a ground-based support contract administered by CTUIR. Project material staging and preparation for instream construction was completed in March 2023. Project construction was implemented July 6-14 by helicopter to place habitat boulders and wood structures. Wood structure pinning, boulder choker/cable retrieval, and site clean-up and landing access rehabilitation was completed by September 2023.

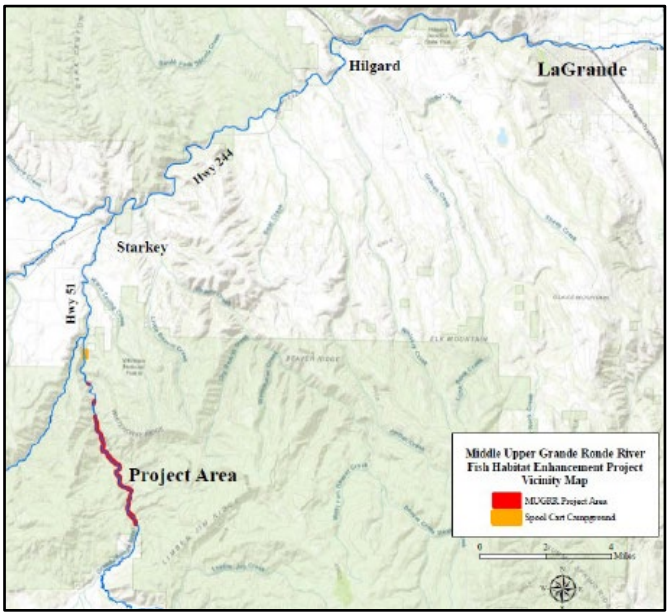


Figure 3. MUGGR PHASE 2/3 PROJECT LOCATION

The GRMW administered the helicopter construction contract with Columbia Helicopters, Inc., for two projects along Grande Ronde River on behalf of the CTUIR and WWNF on federal lands (MUGRR) and Oregon Department of Fish and Wildlife (ODFW) on private lands (Bowman Fish Habitat Project). CTUIR administered the ground-based support and materials acquisition contract. CTUIR and WWNF staff provided site layout, technical construction observation and site monitoring. WWNF staff provided wood structure pinning services post installation.

Project Overview

The project reach is a largely confined, high gradient canyon with interspersed semi-unconfined segments with homogeneous, plane bed riffle-run channel form that lacks habitat diversity, complexity, and large pools. Channel entrenchment is typical due to historic anthropogenic impacts. Riparian and wetland habitat is limited to stream margins and off channel hydric areas. Spawning habitat is severely limited with poor spawning gravel condition. Rearing habitat is limited due to lack of pools and velocity refuge, bedform diversity, and habitat complexity. All life stages are affected by thermal loading, though the reach is noted for nodes of cold-water refuge.

Figure 4. PRE-CONSTRUCTION PHOTO OF PROJECT REACH

Project Goals and Objectives

Habitat degradation in the Grande Ronde Basin has been a dominant in-Basin cause of salmon and steelhead decline (NPCC, 2004a). Land use activities since the early 1800s include beaver trapping, logging, splash damming, grazing, mining, channelization, water withdrawals, road and railroad construction, and urban development. Past activities have degraded aquatic habitat conditions with extensive channel simplification (White et al. 2017, pg. 212-213), loss of large pool habitat (McIntosh, 1994), significant thermal loading, and loss of cold-water refuge (Justice et al. 2017).

Fishery life histories, fish utilization and ranking, and habitat limiting factors for the project is presented in the Grande Ronde Atlas and incorporated by reference. The following summary is presented for reference in identifying and developing project goals and objectives:

- Juvenile outmigration - high mortality rate
- Adult Chinook holding/spawning - high pre-spawn mortality
- Juvenile Chinook and steelhead summer/winter rearing - habitat capacity
- Adult Chinook immigration - thermal barriers
- Adult steelhead spawning - lack of pools

The primary project goal is to improve spawning and rearing habitat and increase juvenile rearing habitat capacity. Habitat objectives were developed using the Atlas limiting factors and existing condition information collected from 2015 ODFW aquatic habitat surveys completed within the project area (ODFW, 2015, Whitehorse Cr. upstream to USFS Boundary Vey).

Project Objectives

1. Increase floodplain and habitat connectivity. Current condition is largely confined. The objective is to reconnect approximately 6.4 acres of historic floodplain at 1.25-year flow.
2. Promote channel morphology/bedform diversity, island braiding and side channel habitat. Objective is to activate/create 3,743 ft./1,141m side channel habitat. Approximately 2,181 ft/655m existing.
3. Increase large pool frequency from 0.26 pools/100m to 0.62/100m (McIntosh et. al., 2000). Includes enhancing 37 existing pools using sweeper wood structures and creating 10 new pools using channel spanning structures.
4. Habitat complexity, increase large wood and boulder structure to provide cover, velocity refuge, and organics. Meet/exceed wood loading reference >18 large pieces/100m (CHaMP, 2011-2017/CRITFC Assessment). Current condition is approximately 10.6/100m (ODFW, 2015)

Additionally, beaver recolonization is an objective or outcome related to core project objectives. Phase 1 project response indicates large wood structure, complexity and velocity refuge is suitable for beaver dam and lodge construction. Improved floodplain and hydrologic condition can promote increased hydric condition and vegetation response that can support summer and winter food supply.

Project Planning and Design

Project design was informed by field survey, habitat surveys (ODFW, 2015), hydrologic assessment, 1D hydraulic modeling, wood loading reference, assessment of Phase 1 project performance, and review of similar reaches and projects in the region (e.g., Minam, Tucannon). Hydraulic model outputs for baseflow, annual discharge, and 5 and 10-year flows were utilized to assess confinement, potential for island braiding, floodplain activation, and opportunity to enhance and/or create pool habitat.

Habitat project design elements included large wood structures and boulder additions. Three wood structure types were designed with specific habitat and geomorphic objectives. Type A Alluvial wood structures were developed to increase channel roughness, decrease velocity, and promote deposition to aggrade entrenched river segments. Site selection was targeted along stream segments with high potential to activate historic floodplain. Structure design was modeled utilizing a similar template utilized in the downstream phase 1 reach but modified by longitudinally lengthening the structure, decreasing the vertical profile height, and incorporating greater porosity compared to a higher profile, channel spanning structure. Gravel augmentation in a future project phase is planned to augment natural sediment deposition and further promote aggradation.

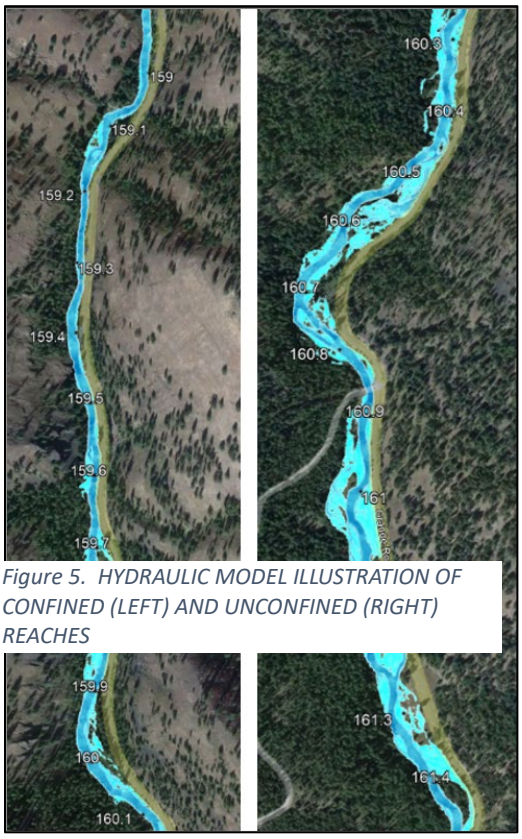


Figure 5. HYDRAULIC MODEL ILLUSTRATION OF CONFINED (LEFT) AND UNCONFINED (RIGHT) REACHES

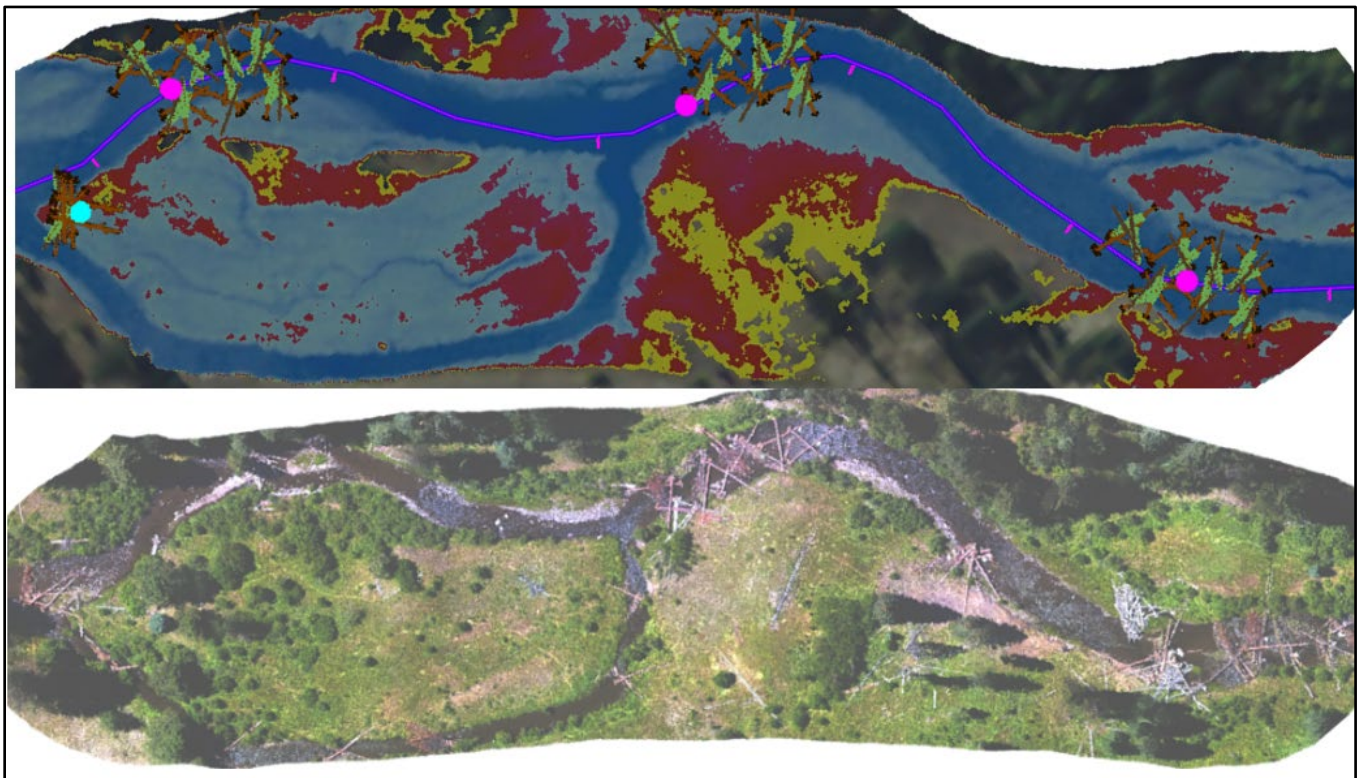
Type B structures were designed to develop and maintain complex pool habitat. These structures were typically placed in locations with previous and/or natural wood accumulations with existing pools. Wood placement at selected locations is intended to provide mass, additional complexity, mimic natural wood accumulations, and augment decaying wood material.

Type C structures were designed to promote island braiding and typically sited at upstream sections of existing islands and/or at locations where hydraulic modeling indicated potential for island braiding and split flow. Side channel habitat in the reach can provide quality, low velocity habitat for juvenile rearing and is used extensively by local beaver colonies that readily establish dams and lodges.

Additional cover wood for complexity and diversity was placed alongside channels and active floodplain areas to promote velocity diversity, sediment deposition, and to act as nurse logs to retain moisture and support hydric vegetation colonization. Habitat boulder complexes were installed in confined, high energy reaches to develop small pools, velocity refuge, and habitat diversity. All wood and boulder structures were placed by helicopter. Wood structures were secured using a combination of rebar pins and boulder placement. Habitat boulders were incorporated into project design to enhance habitat complexity, create small pocket pools and provide velocity refuge in high gradient, plain bed reaches. High resolution September 2021 aerial imagery was used to assess the project reach for areas where boulder additions would be most beneficial. Site selection avoided reaches with existing boulders. See illustrations of wood and boulder structure (Figure 6, Figure 7, Figure 8) for additional detail below.

Over 40 large wood structures and approximately 43 habitat boulder complexes were placed by helicopter along the project reach. Field adjustments to structure layout and location were made during construction by field crews. Multiple structures and boulder placements were adjusted and relocated to nearby locations to avoid large freshwater mussel beds. Field adjustments included relocating individual structures to nearby locations and or adding additional wood material to existing structures to utilize available wood material. As noted earlier, two field crews were responsible for field observation during construction which resulted in some variability in how and where structures were laid out and constructed.

The image below illustrates hydraulic model plan view of Type A wood structure layout and post construction ortho imagery (GRMW drone ortho mosaic imagery, August 2023). Tables summarize wood and boulder quantities and wood and structure feature details.



Habitat Structure Specifications & Quantities	No. Structures	Key Logs w/RW 18" DBH+, 45' L	Tree Tops/Racking 4-10" DBH, 15-20' L	Boulders 2-3.5 Ft. Dia.	Pins
TYPE A - Alluvial Wood Debris Structure	23	12	16	6	6
TYPE B - Deflector	13	8	6	4	4
TYPE C - Apex	7	5	4	3	2
TYPE D - Floodplain/Cover Wood	35	1	2	0	0
Habitat Boulders	43	0	0	9	0

Project Materials Summary by Structure Type

Wood Structure Type	Key Logs	Racking	Boulders	Pins
TYPE A - Alluvial Wood Debris Structure	276	368	138	138
TYPE B - Deflector	104	78	52	52
TYPE C - Apex	35	28	21	14
TYPE D - Floodplain/Cover Wood	35	70	0	0
Habitat Boulders	0	0	387	0
MATERIALS SUMMARY	**450**	**544**	**598**	**204**

Figure 6. HYDRAULIC MODEL PLAN VIEW (top), GRMW DRONE ORTHO MOSAIC IMAGERY POST CONSTRUCTION (middle). WOOD AND BOULDER QUANTITIES AND WOOD STRUCTURE FEATURE DETAILS (bottom)

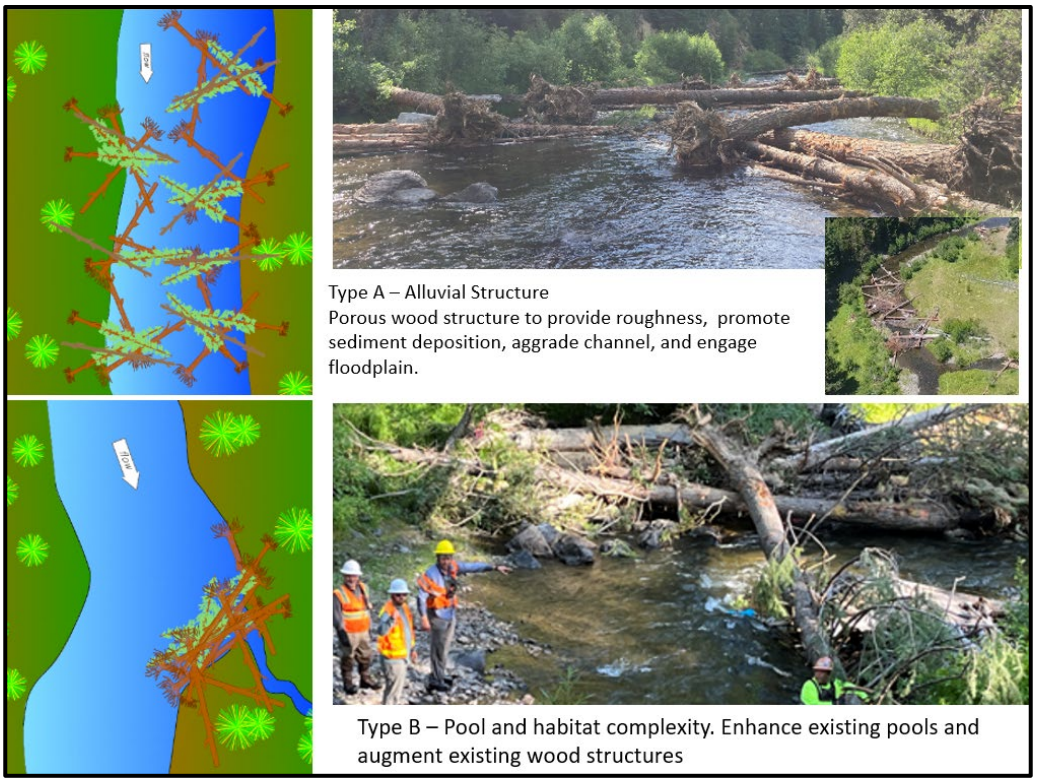
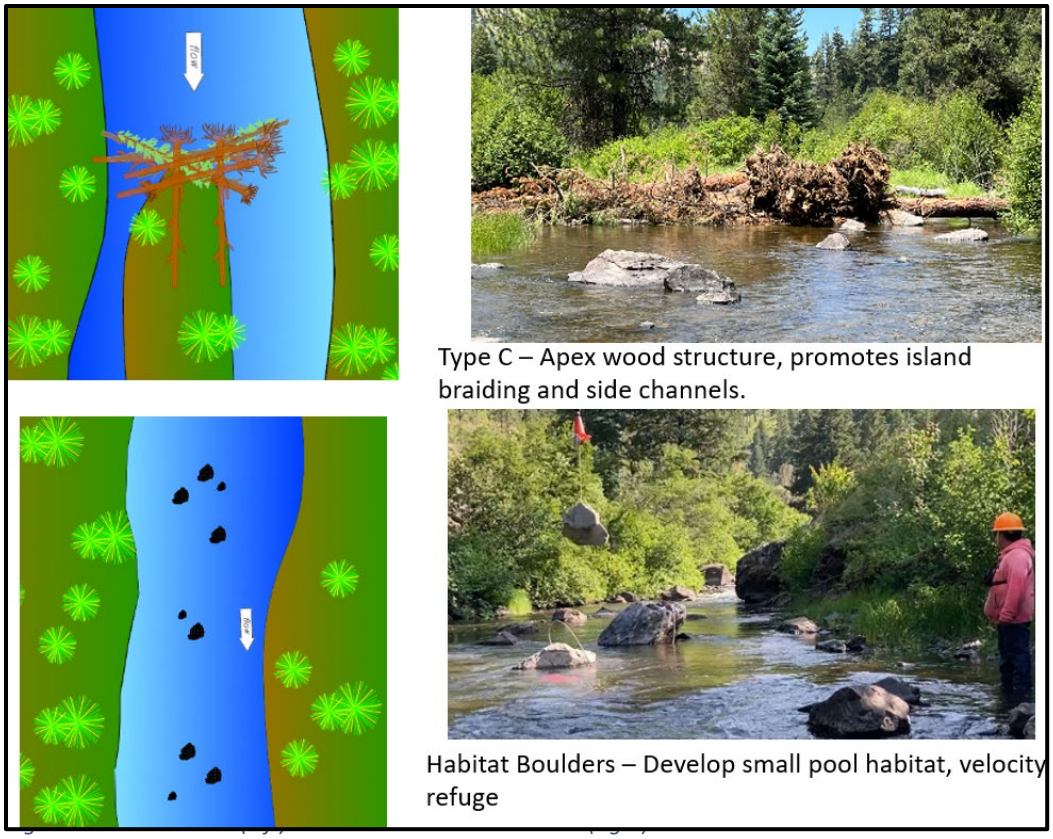


Figure 7. DESIGN VIEW (left) AND CONSTRUCTION PHOTOS (right) OF WOOD AND BOULDER STRUCTRUE TYPES USED ON THE MUGRR PROJECT



TYPES USED ON THE MUGRR PROJECT

Project Administration and Construction

The CTUIR provided project administration and construction oversight for the project in cooperation with the GRMW and WWNF. Tasks included design, facilitating GRMW funding stepwise process, development of BPA statements for work and budgets, ground-based construction contract solicitation, contractor selection, and construction contract administration. The GRMW in cooperation with CTUIR and BPA administered a contract for helicopter operations specified the MUGRR Phase 2 and 3 Project and ODFW sponsored Grande Ronde River-Bowman Project. CTUIR and GRMW developed a cooperative funding agreement to transfer funds from BPA-CTUIR MUGRR funding contract to cover helicopter construction expenditures. Combining both projects into one contract provided administrative efficiencies for both projects with a single contract solicitation, selection, and payment process.

Figure 9. PHOTO OF WINTER LOGGING FOR MUGRR PROJECT

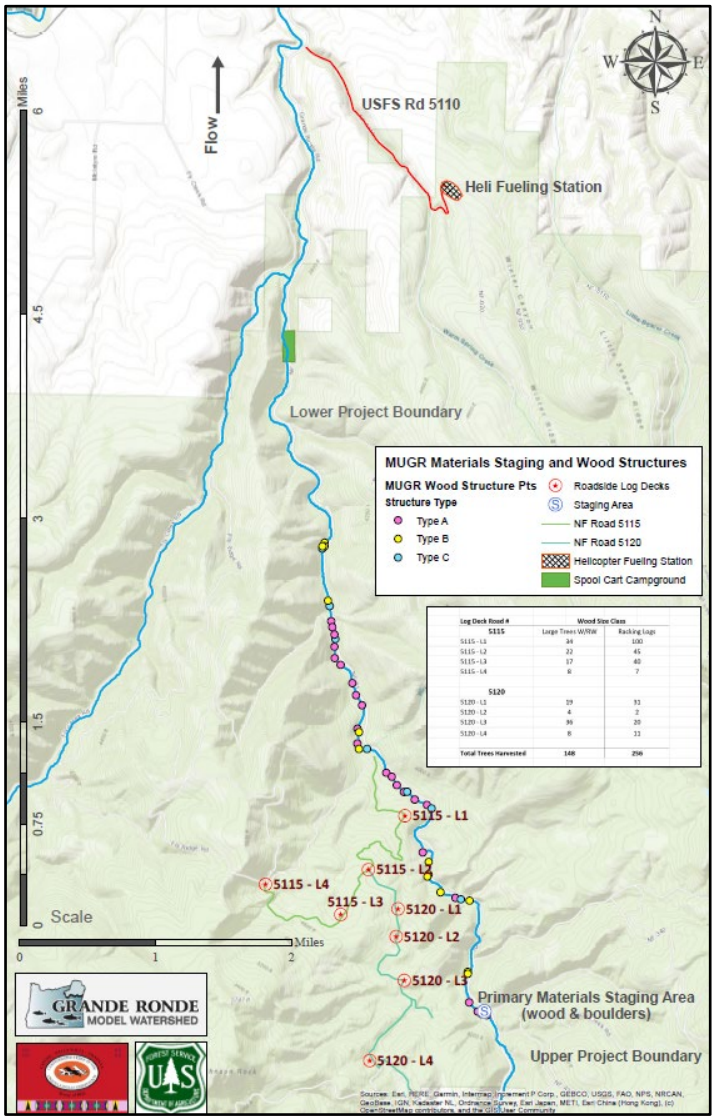


Figure 10. MAP OF STAGING AREAS, ACCESS ROADS, AND LOG DECKS FOR MUGGR PROJECT.

The CTUIR administered the ground-based support construction contract. Contract scope included winter logging and decking on WWNF land, preparation of wood and boulder landing, installation of access ramp to primary landing along Highway 51, logging and hauling commodity wood and boulders from private sources, purchase of cable chokers and rebar pins, boulder choker cable installation for aerial transport, construction support and log deck maintenance during helicopter operations, choker cable retrieval from boulders and site clean-up/remediation post construction.

Winter logging was initiated in early December 2023 on frozen, snow-covered ground to minimize soil disturbance and damage per WWNF forest management practices. Over 400 roadside trees with root wads were felled, skidded, and decked at designated landings along FS roads 5115 and 5120. Figure 5 illustrates access roads and roadside logging decks in relation to restoration project reach, Highway 51, primary landing, and helicopter fueling and maintenance landing. Logging operations on WWNF lands were completed by early January 2023.

Contractor completed log and boulder haul and delivery to designated landing located near upper project reach adjacent to Highway 51 on USFS land by late March 2023. The contractor was responsible for snow plowing Highway 51 under permit by WWNF to maintain winter access for heavy equipment. Boulder drilling and installation of choker cables was completed by May 2023 using the Hilti-SAFESET Method (Hilti SafeSet Installation - Hilti USA).

Large wood structure and boulder placement was completed by Columbia Helicopter during July 6 to 14, 2023. Site clean-up, retrieval of boulder cable chokers and wood structure pinning completed by early October 2023.

Figure 11. COLUMBIA HELICOPTORS RE-FUELING DURING CONSTRUCTION

Figure 10 illustrates the project reach, structure locations along the Grande Ronde River, Helicopter service and maintenance landing, roadside logging and decking locations and primary staging area along Highway 51.

Figure 12. PHOTO OF CREW BETWEEN HELICOPTER WOOD PLACEMENTS

Helicopter flight operations and construction was initiated on July 6th with safety brief between Columbia Helicopter representatives, CTUIR and WWNF field staff. Columbia was responsible for traffic management during operations and managed traffic with two traffic controllers stationed upstream and downstream of operational area in radio communication. Helicopter construction operations were initiated at the lowermost project reach and progressed upstream. Columbia Helicopter was required to check in daily with the Blue Mountain Interagency Fire Center for operational and safety briefs. Primary maintenance and fueling station were established at the FS-5110 Dry Beaver Ridge rock pit/landing north of the project area. As construction progressed upstream, a mobile aircraft fuel truck was stationed the on FS 4305 road to reduce flight time for re-fueling operations.

CTUIR and WWNF field staff provided two crews with a complement of two Columbia field operations managers. Operating with two separate crews was necessary to allow time for each crew to field mark structures in advance of materials delivery and improve operational safety by allowing more time for field crews to organize and prepare for helicopter placements between an average 5-8-minute helicopter turn time. Typically, each boulder and log were flagged for placement by field crew with bright flagging to ensure aerial visibility by helicopter pilot.

Columbia field staff maintained operational control during all flight operations and consulted with CTUIR/WWNF leads during wood structure construction and boulder placement while maintaining radio

communication with pilot. Following placement, Columbia crew retrieved each cable and cycled them back to landings for future flights.

Helicopter operations were completed on July 14th, 2023, over eight flight days. Helicopter operations were shut down for a day on July 11th due to a mechanical issue. A total of 65.5 helicopter flights hours were logged to complete project construction. The image below illustrates a Type A structure under construction. Note low profile of structure.

Figure 13. CREW RETRIEVING LOG CHOKER CABLES

Project Budget and Expenditures

The project was constructed on schedule, under budget, and safely with no major injuries to field staff or project workers. The following budget illustrates project line items, expenditures and cost share funding.

Middle Upper Grande Ronde River Fish Habitat Project Phase 2 and 3

Item	Description	Cost
Ground-Based Support Construction Contract	Logging and decking wood material at designated landings, commodity wood purchase and haul, boulder purchase and haul, rebar pins, boulder chokers,and log deck maintenance during helicopter construction	$466,467.00
Helicopter Contract	Helicopter placement of wood and boulders and structure constructon. 65.5 flight hours @ $8,700 per hour Note: Helicopter mobilization cost covered by ODFW-BPA Bowman Project Budget ($47,000)	$569,850.00
WWNF Cost Share	Wood Material (400 whole trees @ $150/each=$60,000) Labor Construction, Observation, Wood Structure Pinning ($9,000) Environmental Compliance (NEPA, Section 106, ESA) ($15,000)	$84,000.00
CTUIR-BPA Cost Share	Planning, project design and specifications, construction subcontracting, construction oversight and administration	$75,000.00
	Project Total	**$1,195,317.00**

Table 3- MUGGR Phase 2/3 Budget Breakdown

Daily Construction Observation Reports

Formal daily observation reports were not prepared. CTUIR staff conducted regular field visits to logging and landing sites throughout the operational period during winter 2022-2023 and spring 2023 to inspect project materials, coordinate with contractor, and document project status. Staff recorded notes, took photos, and maintained regular communication with contractor staff to ensure work was proceeding as planned, and provide technical assistance and direction.

Figure 14. MUGRR BOULDER STAGING AREA

Roadside logging operations on WWNF lands presented challenges related to locating suitable stockpile areas of sufficient size to temporarily store wood material while minimizing skidding distances to avoid damage to wood material and loss/breakage of brushy limbs and tops.
Additionally, log decks needed to be sited in areas with relatively open tree canopy with no overhead hazards (dead trees, snags) to support helicopter operations. CTUIR conducted regular site visits to coordinate operations with logging contractor and WWNF personnel. Staff assisted contactor with verification/identification harvest tree locations and marking, skidder routes, and suitable stockpile locations. As selected stockpile locations were filled, additional sites were identified, and field-verified with contractor.

Snowplow on snow covered and frozen conditions was highly successful in minimizing soil and ground disturbance in logging areas. Winter logging however, also presented challenges for vehicular access and snow plowing Highway 51 was necessary to maintain access for materials delivery to primary landing. Snowplow operations required a WWNF permit which was secured and managed by the contractor.

Figure 15. WINTER LOGGING AND STOCKPILING MUGRR PHASE 2/3

Columbia and agency staff conducted daily safety briefings and operational discussions to develop daily strategy and schedule. Pre-construction meetings were conducted with pilots, Columbia Helicopter support team, and field crews to ensure daily operations and safety related messages were communicated and understood. Pre-construction morning meetings also included review and development traffic control plans. Helicopter operation daily logs were maintained to record general information on project progress, accrued flight hours, safety and traffic related topics.

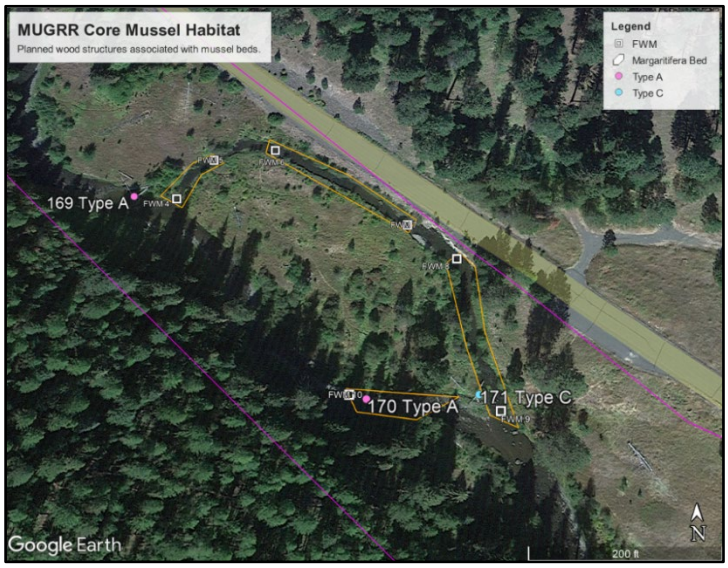


Figure 16. MUSSEL BED LOCATIONS ON MUGGR PROJECT REACH

Adaptive Management

Pre project freshwater mussel surveys conducted by CTUIR Fresh Water Mussel Program staff identified 23 separate colonies of Western Pearlshell mussels (*Margaritifera falcata*) along with core mussel habitat throughout the project reach. The population of mussels was estimated to be in the hundreds of thousands and well distributed throughout the project area. Observed mussel colonies were commonly associated with large wood structures from past habitat projects implemented by the WWNF, particularly in areas providing velocity refuge and sediment deposition associated with wood structures and side channels (example of survey information in figure 16 above).

Freshwater mussels are an important aquatic resource and CTUIR First Food. Many of the observed mussel colonies were identified in proximity to planned wood and boulder structures. Mussel program staff recommended avoidance to protect the resource from construction related damage and provided survey points and polygons of mussel beds about two weeks prior to planned construction. Mussel data was overlayed onto construction plans to assess locations and potential conflicts with planned structures. Field verification indicated that most mussel beds could be avoided by adjusting individual structure locations. Three Type A structures were relocated to locations outside surveyed bed. Multiple wood and boulder structures were also field adjusted to avoid beds observed during site layout. Overall, the impact on the project features designed to enhance fish habitat was minimal.

Figure 17. FRESHWATER MUSSEL BED ON MUGRR PROJECT

Pre-Construction Project Layout and Inventory

Pre project surveys of freshwater mussels have become an increasingly important aspect of fish habitat projects that needs to be incorporated into habitat project planning and design. The existence of freshwater mussels in project stream reaches can potentially alter the design of projects and increase project costs if resource information is not available early in the project planning phase. Conducting surveys in the early phases of project design will help practitioners develop plans to maximize ecological

uplift while taking mussel resources into consideration. Restoring hydrologic and geomorphic stream function and processes are critical to the success of habitat improvement projects and are fundamental objectives linked to restoring ESA listed fish species in the Grande Ronde Basin.

Figure 18. MUGRR Pre- Project Wood Layout

Ongoing Work Elements

The following sections present work elements followed by discussion of accomplishments for the project during the contract period.

Manage and Administer Projects

This work element includes a suite of management actions required to administer the project, including preparation of annual operations and maintenance statement of work and budgets, managing and preparing statements of work and budgets, and milestone and metrics reporting in Pisces, supervising and directing staff activities, conducting vehicle and equipment maintenance and management, payroll, purchasing, subcontracting for services, and participating in project planning and design, administering/inspecting habitat enhancement activities.

Administrative work completed during 2023 included: Subcontracted for design services for Catherine Creek RM 42.5 fish passage and habitat design, Lookingglass Fish Habitat planning and design, and Middle Upper Grande Ronde River Phase 2 and 3 ground support for wood and boulder material acquisition and stockpiling for summer 2023 helicopter construction. Additionally, CTUIR coordinated with GRMW and ODFW to develop a helicopter contract solicitation for the Middle Grande and Grande Ronde Bowman project sponsored by ODFW. Work included solicitation development, review of bid proposals, selection of contractor and development and issuance of contracts for specified work.

The Project Leader supervised 4 full-time and 1 nine-month permanent employees to accomplish fish salvage, riparian planting, and easement maintenance duties.

Environmental Compliance and Permits

Environmental compliance methods include development of appropriate documentation under various federal and state laws and regulations governing federally funded project work. Methods involve coordination with various federal and state agencies and development, oversight, and submittal of permit applications, biological assessments, cultural resource surveys, etc.

Primary accomplishments during the reporting period included coordination with BPA environmental compliance personnel to prepare supplemental documentation and reporting for ongoing and planned management actions. Completed BPA's HIP IV review for CC42.5 passage and habitat project and Lookingglass habitat restoration projects.

Additionally, CTUIR staff continued EC compliance in cooperation with USFS on Middle Upper Grande Ronde River Project Phase 2 and 3. Activities included participation in NEPA, ESA/ARBO, Section 106, and USCOE/ODSL fill removal permit processes.

Fish Salvage 2023

Fish salvage efforts were accomplished by project staff assisting ODFW Grande Ronde Habitat, CTUIR John Day Watershed Restoration, and USWCD on several fish habitat restoration projects. Project staff assisted Trout Unlimited with fish salvage efforts on the Sheep Creek Stewardship Project, and CTUIR John Day Watershed Restoration on the Desolation Creek Project. Fish salvage efforts were made whenever a section of live water was to be diverted away from construction sites, or after work site isolation when bypass channels were to be reclaimed and live water turned back into the main channel.

Figure 19. ELECTRO-FISHING ON SHEEP CREEK. TROUT UNLIMITED SHEEP CREEK STEWARDSHIP PROJECT

Coordination and Public Outreach/Education

Coordination and public education were undertaken to facilitate development of habitat restoration and enhancement on private lands, participate in Subbasin planning, ESA recovery planning, BiOp/Remand project development and selection processes, and assist with providing watershed restoration education. CTUIR technical staff coordinates through the GRMW on the Board of Directors and Technical Committee

to help facilitate development of management policies and strategies, project development, project selection, and priorities for available funding resources.

The Project Biologist participates in multiple basin programs and processes associated with project prioritization and selection, funding, and technical review. Focus during FY2023 included participation on the Grande Ronde Model Watershed Board of Directors, Executive Committee, and Grande Ronde Basin Technical Team to evaluate and select projects for funding recommendations through the GRMW Step-Wise Process. Additionally, CTUIR staff continued working on look forward projects with close coordination between BPA and BOR to develop core project complexes and initiate concept planning in conjunction with CTUIR-BPA Accord land acquisition strategies.

CTUIR staff also participated in a several educational and public outreach activities including project tours at the Bird Track Springs, Longley Meadows Projects, Middle Upper Grande Ronde, and Catherine Creek Projects with BOR staff, BPA staff, and USFS staff.

The Grande Ronde Qapqápnim Wéele Community Science Project, with support from GRMW and partnering with University of Idaho's IDAH20 Master Water Stewards, is involved with collecting water quality and riparian health data from monitoring sites in the vicinity of Bird Track Springs project area. Multiple times per year educators bring students from local schools out to collect biological and physical habitat data that relates to water quality, macroinvertebrates, and riparian vegetation. The Community Science Project's goals include empowering communities in the region, especially underserved youth, to see themselves as scientists and lifelong stewards of their environment, to be guided by and amplify our Indigenous neighbor's voices and increase our community's knowledge of natural resource issues.

Figure 20. COMMUNITY SCIENCE PROJECT AT BIRD TRACK SPRINGS WITH CENTRAL SCHOOL 5TH GRADE CLASS

Planting and Maintenance of Vegetation

The CTUIR habitat program annually participates and/or assumes the lead role in re-vegetation activities on individual habitat restoration and enhancement projects. Planting and seeding methods are developed to address site specific conditions and vegetation objectives. Natural colonization and manual techniques are utilized.

Following completion of each construction phase on the Longley Meadows Project, all disturbed areas were treated with native grass seed and covered with straw mulch. Cleared native vegetation, including sedge mats and willow clumps were salvaged and replanted, or used in the construction of wood structures. Native grass seed was distributed over approximately 10 acres of disturbed ground. Straw

mulch was used on seeded and planted areas to retain moisture for better grass seed establishment and to suppress competitive weeds.

Operation and Maintenance of Habitat & Structures/Field Crew Projects and Ongoing Work Elements

Grande Ronde Fish Habitat Project technical staff work to support program biologists furthering the goals and objectives of the CTUIR DNR Fisheries program. With direction from the program lead and biologists, the technical staff participate in planning, scheduling, and implementation of field operations and maintenance tasks. Much of the workload is comprised of regularly scheduled maintenance and monitoring operations. However, technicians are called upon on a regular basis to assist program biologists and project partners with a variety of ancillary activities. For the 2023 field season the technical crew consisted of one full time Fisheries Technician III, and three seasonal Fisheries Technician I.

Technical support is carried out within the Catherine Creek, Upper Grande Ronde River, and Lookingglass Creek sub-basins on both CTUIR lands and private properties. Regularly scheduled responsibilities include conservation easement fencing and riparian enclosure repair and maintenance; seasonal livestock watering access site construction and deconstruction; water temperature, groundwater, vegetation, streamflow, and icing monitoring; and project equipment repair, maintenance and purchasing. Other, less regular, responsibilities include but are not limited to: assisting project lead with technician staffing; assisting biologists with fish salvage operations; cultural resource stakeouts; wood and willow acquisition; riparian fence and beaver dam analog construction; and assisting project partners with general technical support.

Conservation Easements

The CTUIR operates and maintains nine conservation easements within the Grande Ronde River watershed (Figure 21) totaling 1218 acres and enclosed by 23 miles of fencing. As such, a major component of regular duties is the repair and maintenance of easement fences. The technical crew is responsible for communicating with landowners for scheduling purposes, surveying, maintaining and repairing easement fences. Site visits take place monthly, though larger parcels with heavier livestock pressure are visited on a bi-monthly schedule. Easement fences are visually inspected from ATVs where practical, and on foot when necessary. Maintenance and repairs including clip and staple replacement, wire stretching and splicing, tree removal, brushing, stay replacement, and water access maintenance are conducted as needed. When fences have been breached, cows are removed from within the easements, and the breaches found and repaired. Water access sites and water gaps are installed in the spring or early summer (as soon as river conditions allow) and taken down after cows have been removed in the fall. For efficiency, fence checks are often combined with other objectives such as data downloads from temperature and groundwater probes, collection of photo points, and/or retrieval of photo monitoring images. The technical crew is also responsible for repair and maintenance of ranch panel and single plant enclosures located on McCoy/Meadow Creeks, and Catherine Creek (Southern Cross/CC37). Conservation easement repair and maintenance represents the bulk of the technical crew's workload.

Monitoring

The Grande Ronde Fish Habitat Project monitors conditions within and adjacent to CTUIR fish habitat restoration projects in the Upper Grande Ronde, Catherine Creek, and Lookingglass sub-basins. The types of data collected include stream temperature, groundwater elevations, pre-construction and as-built surveys (longitudinal profiles and channel cross sections), riparian conditions (photo points), and time lapse images concerned with capturing ice, and high-water events. GRH currently monitors water temperature at 14 sites on Catherine Creek, 24 sites on the Upper Grande Ronde River and tributaries, and 3 sites on Lookingglass Creek. 15 groundwater monitoring probes are deployed in the Upper Grande Ronde River: 10 on the Bird Track Springs Project, and 5 on the Longley Meadows Project. Each field season photo points are taken across the project areas. GRH currently has 8 time-lapse cameras deployed: 3 on Catherine Creek (Southern Cross) and 5 on the Upper Grande Ronde River (Longley Meadows). Habitat technicians assist with deployment, downloads, status checks, and retrieval of temperature and groundwater probes and data; taking and cataloging photo points; and managing time lapse camera placement, setup, maintenance and downloads. Monitoring occupies a substantial portion of the technical crew's efforts. See Monitoring & Evaluation section for additional detail.

Project Equipment Maintenance

Technical staff are responsible for maintenance and repair of equipment used to accomplish program goals and objectives. Project equipment includes ATVs and UTVs, trailers, power tools (i.e. chainsaws, gas powered post drivers, earth augers, pumps etc.), and hand tools. Basic preventative maintenance tasks (oil, air filter, fluids) are carried out on ATVs/UTVs, and gas-powered tools as per manufacturers' schedule. Power and hand tools are maintained (cleaning, sharpening, tuning etc.) as needed based on conditions of use. Professional services are solicited when specific repair or maintenance needs exceed the knowledge and/or capabilities of the technical staff. In these cases, technical staff take the lead in procuring the necessary services. Equipment maintenance and repair require a smaller proportion of the technical staffs' time in relation to easement repair and maintenance, and monitoring.

Purchasing

The technical crew assists program biologists with identifying purchasing needs, researching equipment, gathering price quotes, submitting requests, and purchasing equipment. Purchasing support is carried out with guidance from biologists, and following CTUIR purchasing protocols. Budgeting for capital equipment is discussed with the Project Lead as the next fiscal year budget is being assembled. For non-capital equipment, price quotes are requested and submitted along with purchase requisitions to the CTUIR Department of Natural Resources (DNR) office. Typically, these activities are carried out by the lead technician with input from the technical crew. Effort expended on purchasing activities varies by year based upon program needs.

2023 Miscellaneous Program and Project Partner Support Activities

Miscellaneous program support activities vary by year and are largely dictated by project implementation schedules. Miscellaneous tasks undertaken during the 2023 field season included: partner agency monitoring support; fish salvage operations; Chinook spawning, snorkel, and riparian planting.

- Technicians assisted University of Idaho (UI) researchers with monitoring and data collection efforts associated with the Bird Track Springs project. GRH technicians deployed and downloaded data from 15 UI temperature probes.

- Technicians assisted biologists with MUGR phase 2/3 helicopter wood additions
- Technicians and biologists assisted the North Fork John Day Habitat Program with fish salvage for the Desolation Creek project.
- Technicians and biologists assisted Trout Unlimited (TU) with fish salvage operations for the Sheep Creek project.
- Technicians removed remaining individual riparian plant enclosures at Southern Cross project site.
- Technicians and biologists assisted CTUIR Grande Ronde Monitoring and Evaluation Program (GR M&E) with snorkel surveys at Lookingglass Creek, Chinook spawning surveys on Lookingglass and Catherine Creeks, and fire prevention mowing on the Lookingglass property.
- Technicians assisted project biologists with materials/equipment purchasing.

FY23 Noxious Weed Treatment

The CTUIR maintains an ongoing Cooperative Agreement with the Tri-County Cooperative Weed Management Area (CWMA) to chemically treat weeds, provide riparian vegetative enhancements

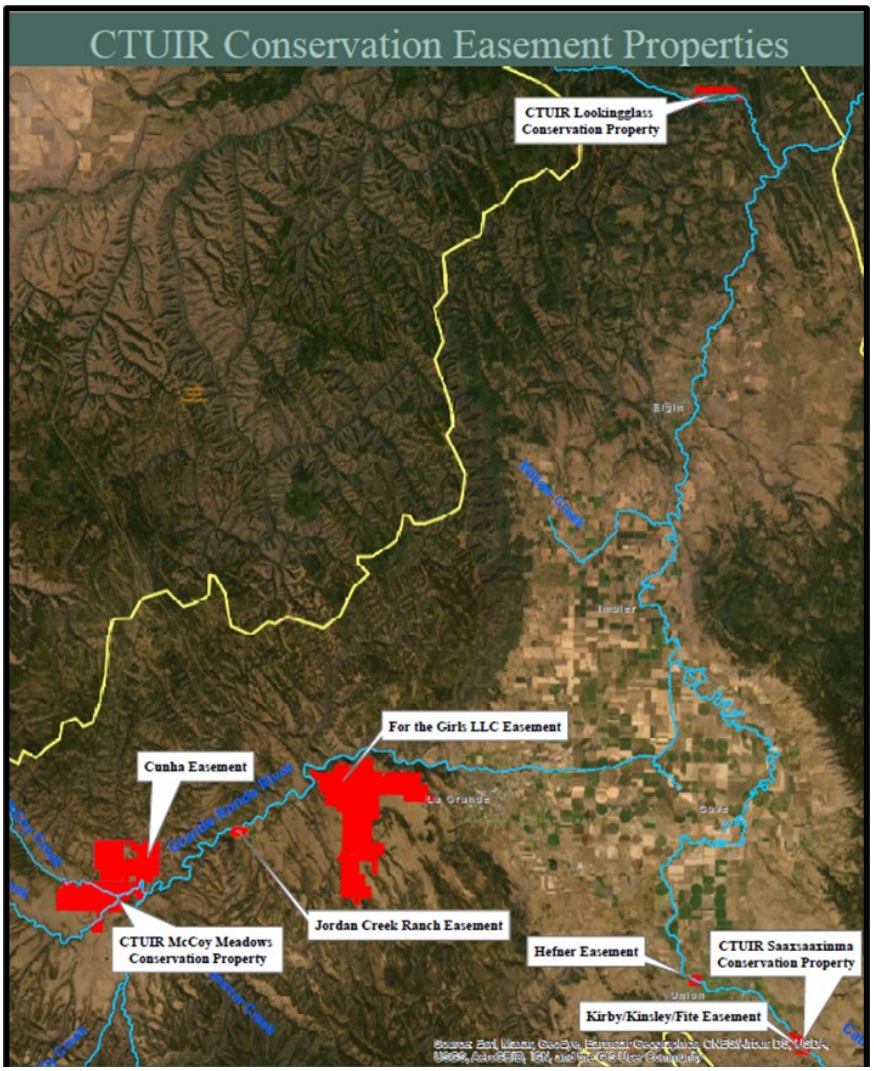


Figure 21. CTUIR GRANDE RONDE WATERSHED CONSERVATION EASEMENT PROPERTIES MAP

(riparian plants and seeding), and administer weed treatment contracts on approximately 160 acres of CTUIR-owned and CTUIR sponsored fish habitat enhancement projects. Project areas include approximately 10 acres within the Catherine Creek CC 37 Fish Habitat Enhancement Project easement boundary, approximately 20 acres of pastures and upland terraces within the CC 44 Southern Cross Ranch Fish Habitat Enhancement Project boundary and Fite easement boundary, approximately 10 acres within the Rock Creek Fish Habitat Enhancement Project, approximately 20 acres within the Lookingglass Conservation Property, approximately 10 acres within the Bird Track Springs Fish Habitat Enhancement Project, approximately 10 acres on the Longley Meadows Fish Habitat Enhancement Project, and approximately 80 acres on the McCoy Meadows Fish Habitat Enhancement Project. 2021 weed treatment activities include:

Lookingglass Creek

Lookingglass Creek has been treated for Meadow Hawkweed for the last several years. In years past this site was contracted out, but Tri-County Staff has completed the work for this site since 2021. The target species is Meadow Hawkweed, but other listed noxious weeds are also treated. Each year, Meadow Hawkweed is reduced in known populated areas, that of which allows Tri-County to expand inventory further outside the riparian area. In 2023 we were able to inventory more of the south side of the creek, found in 2021, and expand our inventory/treatment area farther upstream. We found additional hawkweed points and put out a total of 1.5 acres of herbicide. This is a slight decrease to 2022's 3.44-acre herbicide application. We suspect the decrease in population is attributed to herbicide application levels for 2022, as well as earlier site visitation in comparison to years past. Meadow Hawkweed is a relatively easy plant to kill; however, difficult to find if in small quantities. When left untreated it will spread and quickly take over meadows and forest understory. Meadow Hawkweed is an "A" listed species in Union County meaning that it is under mandatory control. This project also incorporates infestations upstream on The Umatilla National Forest and the small private parcel funded by Oregon State Weed Board. Everything downstream is monitored and treated by Tri-County and partners for Meadow Hawkweed and other EDRR species all the way down the Grande Ronde River to the confluence with the Snake River.

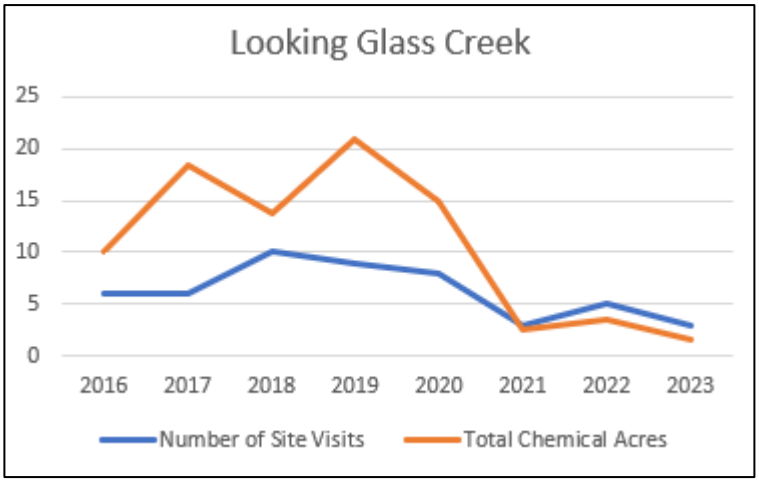


Figure 22. CHEMICAL ACRES AND SITE VSISTS 2016-2023 AT THE LOOKINGGLASS CREEK PROPERTY

McCoy Meadows

Albee Road Spray Service spent several days backpacking the riparian, and UTV spraying the uplands for Leafy spurge on McCoy Meadows. The last two years have provided weather suitable for consistent treatment timing. OWEB has consistently funded the treatment of Leafy Spurge with the help of landowners along the Upper Grande Ronde and tributaries. Leafy Spurge is a "A" listed species in Union County and all Leafy Spurge sites in the county are treated annually. We hope to continue to treat more net acres in the future to lower the Leafy Spurge population county wide.

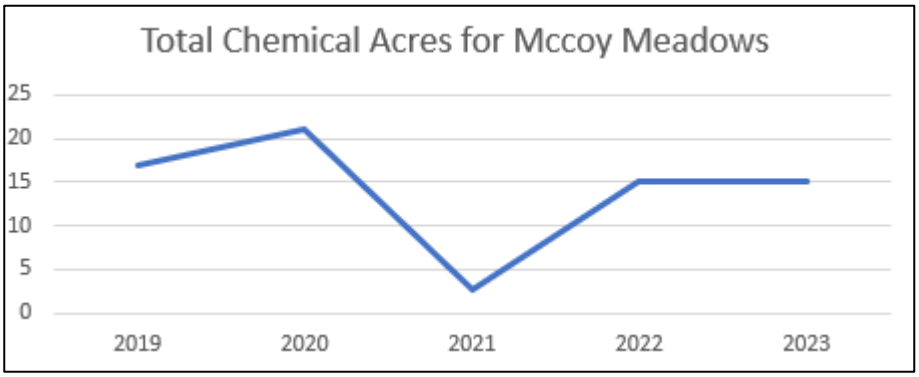


Figure 23. TOTAL CHEMICAL ACRES SPRAYED AT MCCOY MEADOWS DURING YEARS 2019-2023

Birdtrack Springs

We prioritized this project for the last several years due to increased site visits and machinery usage. A large portion of our time is spent on weeds that are not necessarily noxious but are "eye sores". These weeds include Annual Mustards, Stinking Chamomile, Mullein, etc. All spraying is done with a backpack, except for the use of atv's to shuttle herbicide, to precisely treat the desired weed species present. The high priority weeds at Bird Track Springs are Leafy Spurge and Knapweeds, but both are only found in small quantities. Treatment acres decreased in 2022, but as expected a slight increase occurred in 2023 due to climate allowing increased Leafy Spurge populations. We suspect slight increases in treatment acres are to continue in the future. We coordinate carefully with the forest service crews that are treating the adjacent forest lands to make sure there is no overlap and that similar results are found.

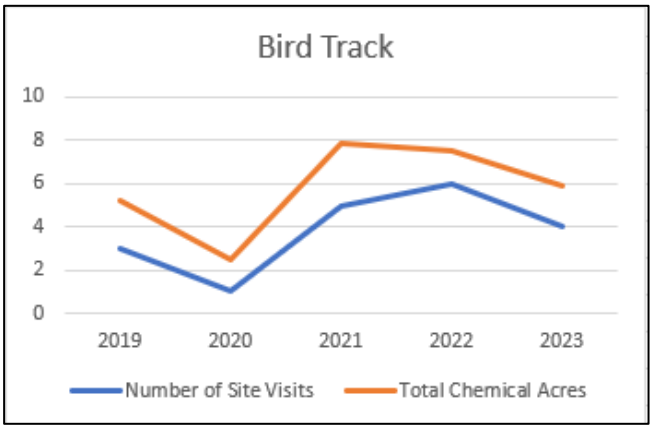


Figure 24. GRAPH OF TOTAL CHEMICALS ACRES TREATED AND NUMBER OF SITE VISITS FOR YEARS 2019-2023 AT BIRD TRACK SPRINGS

Southern Cross

This site has improved tremendously over the last seven years. In the beginning the focus of this project was to address the weeds in disturbed areas. It has now changed to maintenance of county listed species such as Whitetop, Scotch thistles, and Starthistle. These weeds have been reduced, but there is a large seed source from the historic uses of the property. In 2021, the 10-acre starthistle patch was sprayed aerially. Tri-County has been monitoring the Yellow Starthistle site for the last two years and will continue to do so in the future. No increases in Yellow Starthistle populations have been observed. Union County Weed Control has prioritized Scotch Thistle and Whitetop and has notified all landowners in the county that they need to control these weeds by delivering door hangers and sending out letters. We feel that the small decrease in herbicide application in comparison to last year can be attributed to lower traffic on the site and consistent precipitation levels. Overall, the project site continues to show success with herbicide application.

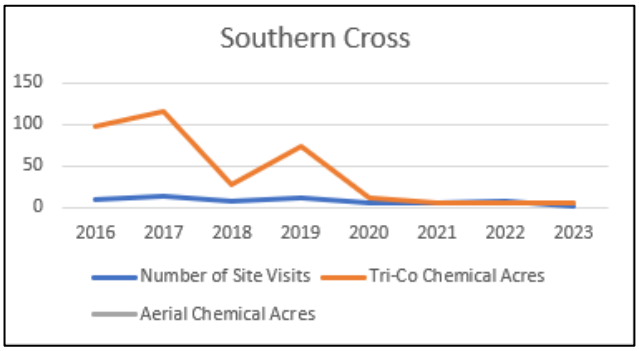


Figure 25. GRAPH OF TOTALL CHEMICALS ACRES SPRAYED AND NUMBER OF SITE VISITS FOR YEARS 2019-2023 AT SOUTHERN CROSS

CC37

This site has very few noxious weeds, but the landowner complains about the Annual Mustards and Bedstraw climbing the fences. To maintain a positive relationship with the landowner, we make sure to treat the property every year. Last year's flood activity allowed for increased herbicide treatment acres. This year's precipitation exhibited milder levels causing a decrease in weed populations. Based on past treatment patterns, we suspect an increase of herbicide application in 2024. If complaints from the landowner persist in the future, it will become important to address the weeds outside the easement, and make sure they are being treated as well. At this point the main seed source is coming from surrounding fields.

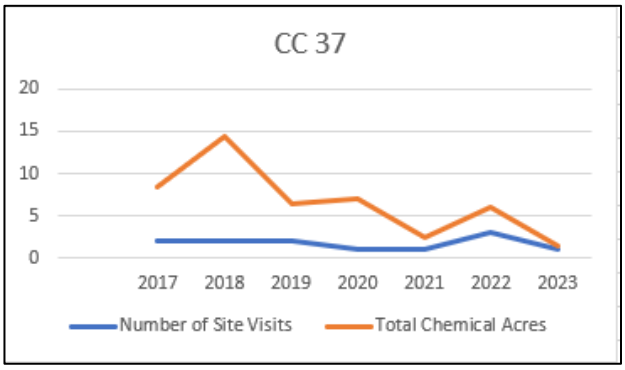


Figure 26. GRAPH OF TOTALL CHEMICALS ACRES SPRAYED AND NUMBER OF SITE VISITS FOR YEARS 2019-2023 AT CC RIVER MILE 37

Longley Meadows

This site had known leafy spurge, Spotted Knapweed, and Oxeye daisy infestations from treatments in 2020 and years prior. No treatments were completed in 2023 due to Longley Meadows Project revegetation efforts.

Identify and Select Projects

The following table illustrates restoration projects CTUIR is sponsoring and/or partnering on. See the following link for improved viewing(2024-2028 Projects). Project planning and design of individual projects are in various stages of development and completion schedules are estimates. See notes for current project status. Atlas prospectuses have been completed and approved for the Middle Upper Grande Ronde River, Meadow Creek McCoy Meadows, Lookingglass Creek and Catherine Creek RM 42 projects and are in development for the Grande Ronde River Ranch Meadow Creek Dark Canyon project. Specific project objectives and outcomes will be formalized during the project development process and tiered to the Atlas and project specific scope, site condition, and constraints.

CTUIR GRANDE RONDE WATERSHED RESTORATION PROJECT SCHEDULE 2023 TO 2028						
Project Title	**Description**	**Limiting Habitat Condition**	**Prioritized Actions**	**Status**	**Construction (Fiscal Year)**	**Notes**
Catherine Creek RM 42 Passage (CTUIR Adult Collection Facility) (45.1127.49/-117.4947.21)	Project is located along Catherine Creek at River mile 42 and includes CTUIR adult weir collection facility and ODFW screw trap. 80% Design includes new steep passage fish ladder.	Fish passage	Fish Passage	Prospectus development, scoping, and development of engineering assistance subcontract solicitation	2025-2026	60% design completed. HIPIV and ODFW passage review underway. Environmental compliance ongoing, initiate Section 106 survey.
Lookingglass Conservation Property Floodplain Restoration (45.4452.58/-117.5428.13)	Project areas is located on conservation property acquired under CTUIR/BPA Accord. Project includes 3 miles of mainstem Lookingglass Creek which completely channelized and entrenched. Lookingglass watershed is a cold water refuge supporting reintroduced spring Chinook (Catherine Cr stock), ESA summer steelhead and bull trout. Conceptual restoration is a Stage 0 approach	Floodplain, channel form, pools, side channel, structural complexity, sediment, temperature, riparain/wetland condition	Valley reset, channel fill, floodplain reconnection, pools, side channels, wetlands, and riparian restoration, wood/bioenginering additions for complexity.	Project Atlas Prospectus complete and approved. Schedule data collection, surface development using 2020 LIDAR data, hydraulic modeling and concept development.	2025-2026	60% design complete. Initiate Section 106 project survey summer 2024. Geotech Section 106 concurrence complete.
Grande Ronde River Ranch Floodplain Restoration (45.303432, -118.282769)	Project is located on the Grande Ronde River between Longley Meadows and Bird Track Springs Projects on the former Bear Creek Ranch.	Floodplain, channel form, pools, side channel, structural complexity, sediment, temperature, riparain/wetland condition	Floodplain restoration, pools, side channels, riparian/wetland	Scoping and development of proposed action underway, landowner coordination, preparation of GRMW stepwise process and prospectus. BOR providing techncial BOR assistance.	2026-2027	Landowner coordination to develop project underway. 15% concept completed. Initiating prospectus and delivery to GRMW through stepwise process. Initiating design, envrionmental compliance strategy, and project scheduling pending agreement with landowner.
Grande Ronde River Middle Upper Gravel Augmentation (45.0919.78/-118.2233.45)	The approximate 8 mile project reach has been treated with large wood and boulder additions in 2 phases (2018 and 2023). Gravel augmentation is proposed to augment limited gravel supply and prmote floodplain and off channel habitat.	Floodplain, channel form, pools, side channel, structural complexity, sediment, temperature, riparain/wetland condition	Gravel augmentationt to compliment recent large wood and boulder additions and promote geomorphic diversity.	Project Atlas Prospectus complete and approved. Ongoing data collection, review, concept planning, gravel quantity and size investigations.	2026	Develop and finalize gravel augment designa nd construction plans. NEPA to be completed by USFS in 2025. USFS to stockpile gravel along project reach during summer 2024.
Upper Grande Ronde Complex (Vey Meadow, Tailings Reach) (45.0334.13/-118.1712.00)	Multiple project elements in partnership with WWNF. Includes passage assessment and development of habitat enhancement design. Multiple project elements and phases.	Floodplain, channel form, pools, side channel, structural complexity, sediment, temperature, riparain/wetland condition	Passige planning, Floodplain restoration, pools, side channels, and riparian/wetland.	Passage assessment underway. Vey meadows 30% design in development.	2024 (Vey), 2026-2028 (Upper Reaches)	Finalize designs and construction plans for Vey Meadow project. Finalize action plan to remediate passage obstructions in Woodley/Tailings reach.
Meadow Creek McCoy Meadows Floodplain Restoration (45.1548.72/-118.2352.58)	Approximate 350 acre floodplain in lower Meadow Creek watershed with over 3.5 miles of Meadow, McCoy, and McIntrye Creek. Permanent conservation easement under CTUIR ownership. Previous projects (1997 and 2010) initiated uplift from channelized condition but short of achieving objectives. Valley reset approach to restore floodplain hydrology.	Floodplain, channel form, pools, side channel, structural complexity, sediment, temperature, riparain/wetland condition	Valley reset, channel fill, floodplain reconnection, side channels, wetlands, and riparian restoration, wood/bioenginering additions for complexity.	Project Atlas Prospectus complete and approved. Ongoing data collection, review, concept planning, groundwater well monitoring, stage data collection, remote sensing data capture to calibrate hydraulic model.	2027-2028	Update hydraulic modeling with 2020 LIDAR data. Project reach construction may be combined into single season per USFS. Project is part of Meadow Creek watershed planning effor with WWNF in cooperation with multiple partners.
Dark Canyon Wood Additions (45.639.81/-118.2253.94)	Project protected under permanent CTUIR/BPA conservation easement. Approx. 2.5 miles of Dark Canyon and 0.5 miles of lower Meadow Creek.	instream structural complexity, riparian condition	Large wood, pool development, riparian	Prepare and submit Atlas project prospectus. Initiated project planning and design.	2027-2028	Design project and schedule with other helicopter projects for efficiency and decreased project costs.

Table 4- LOOK FORWARD PROJECT LIST FOR THE NEXT FIVE-YEAR PERIOD (FY 2024-2028)

Catherine Creek RM 42.5 Passage Improvement & Facility Improvement (CTUIR Adult Collection Facility) – 2023-2024

The project is located along Catherine Creek at River mile 42 and includes CTUIR adult weir collection facility and ODFW screw trap (Figure 27). Project intent is to provide year-round fish passage for all life stages of concern regarding metal picket weir on Catherine Creek utilized to direct adult fish into ladder and collection facility. The existing weir and collection facility is effective for adult fish capture, enumeration, and support for the Chinook supplementation program. However, the weir and fish ladder do not meet current NMFS passage criteria. The Denali ladder exceeds velocity criteria. Upstream juvenile passage is adversely affected by the velocities through the weir and uncertain through the ladder. Juvenile fish rearing in valley reaches may be negatively affected by struggling to migrate upstream to find cold water refuge during summer periods.

Specific objectives for the facility include:

- Meet State and NMFS fish passage criteria.
- Minimize passage delay and injury.
- Ability to operate in icy conditions.
- Non-obtrusive passage during non-trapping (August – February).
- From March 1 – May 1, passively enumerate adult summer steelhead with efficiency >95%.
- From May 1 – July 31, trap, handle, and enumerate adult Chinook and steelhead with efficiency >98%.
- Ability to handle adult Chinook from May 1 – July 31 to:
- Collect data: length, sex, record marks, and natural or hatchery origin determination.
- Collect hatchery brood stock.
- Mark adult Chinook.
- Collect genetic samples.
- Remove surplus hatchery origin adult Chinook.
- Ability to handle adult Chinook under electro-anesthesia with minimal stress on fish and personnel.
- Ability to hold fish for 24 hours.
- Incorporate antenna equipment in fish way to detect and interrogate PIT tags on adult and juvenile Chinook and steelhead.
- Incorporate equipment for safe and efficient loading of adult Chinook into transportation vehicles in-water as much as possible.

Project planning and design was initiated in August 2022 following selection and contract award of River Structures, Inc for engineering services. Work included field survey (topographic data, wetlands evaluation, facility condition), hydraulic modeling, scoping with project team to refinement of objectives, development of 15%, 30, and 60% design, HIPIV, and ODFW passage review. Design is proceeding to 80%. Environmental planning and permitting is being initiaed. Final design and construction documents are scheduled for November 2024. Schedule for final design will be determined, but anticipate a 2024 completion date.

Figure 27. CATHERINE CREEK RM 42 PASSAGE IMPROVEMENT & FACILITY IMPROVEMENT VICINITY MAP

Lookingglass Conservation Property Floodplain Restoration – 2024-2025

The Lookingglass Creek Fish Habitat Enhancement Project is located in Atlas BSR UGR1 in the Grande Ronde River Basin along Lookingglass Creek between river miles 4 to 6 and is bordered by Umatilla National Forest System Lands along the western boundary. The CTUIR acquired the property in fee title through the CTUIR-BPA Accord land acquisition program in 2018. The project reach sits at an elevation of approximately 2,800 feet with contributing watershed area of 95 mi2, which is predominantly spring-fed, and snowmelt driven. Most of the basin is forested (over 90 percent) and has very little

development (less than 0.1 percent estimated impervious area) (USGS 2014). The property and resource values are protected by a permanent Bonneville Power Administration conservation easement.

The long-term rehabilitation vision (CTUIR's River Vision) for the Lookingglass Creek Fish Habitat Enhancement Project is to remove risks to native fishery resources associated with non-native fish in constructed ponds, restore the historic floodplain and morphological, ecological processes that support suitable spawning and rearing habitat for spring Chinook salmon, summer steelhead, Pacific lamprey, and bull trout. Fish habitat suitability and capacity uplift potential is significant. Juvenile salmonid rearing habitat, adult spawning habitat, and riparian-wetland habitat would benefit from restoration and enhancement (wood placement, channel and side channel reconstruction, wetland and riparian restoration, and floodplain reconnection). Activating the floodplain and utilizing the previously constructed floodplain ponds would significantly improve juvenile rearing habitat for summer and winter. CTUIR Chinook redd surveys document extensive spawning use of the of the project area despite habitat limiting factors (degraded habitat quantity and diversity, lack of large complex pools, large substrate, lack of large wood, and backwater habitat) excess fine sediment, lower summer flows, predation, alterations of the hydrologic function, and the channel being disengaged from the floodplain and elevated water temperatures (Huntington, 1993; NPCCa, 2004, GRMW 1995, WWNF 2004). A *Stage 0* design approach is also being considered.

Wolfe Water Resources was subcontracted by CTUIR to provide engineering design services in September 2022. Design work accomplished during reporting period including topographic and field surveys, development of hydraulic model, concepts, and alternatives, refinement of objectives, 15% HIPIV presentation, and development of draft Basis of Design Report, Construction drawings and specifications, refined Area of Potential Effect (APE), and bridge inspection. The design team is finalizing the 60% design in preparation for additional HIPIV review and initiated coordination with CTUIR Cultural Resource Program to prepare for summer 2024 survey. Preferred restoration alternative is a valley reset approach in artificially confined reaches and enhancements to reaches that are naturally evolving into an anastomosing channel network. Design subcontract was extended with design completion expected in Fall of 2024.

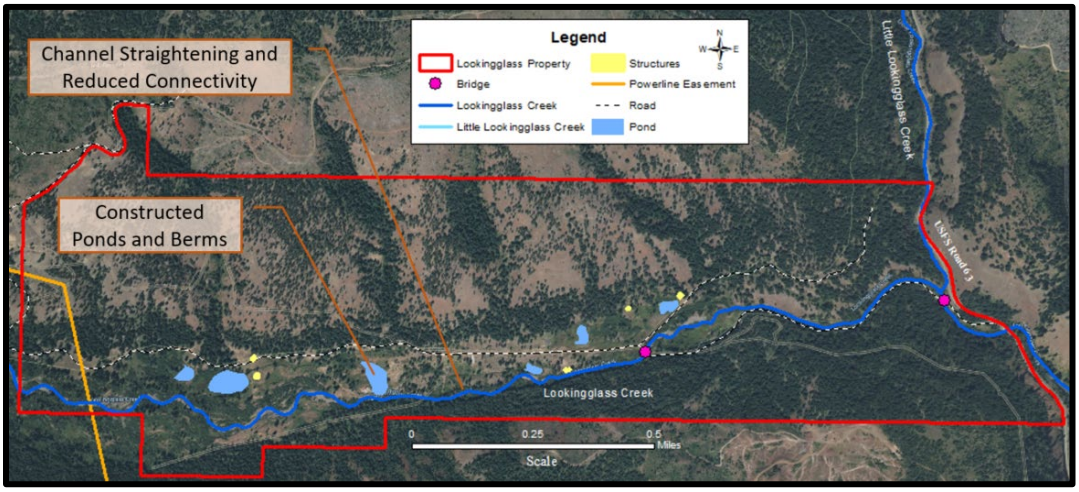


Figure 28. LOOKINGGLASS CREEK FISH HABITAT PROJECT CURRENT CONDITION MAP

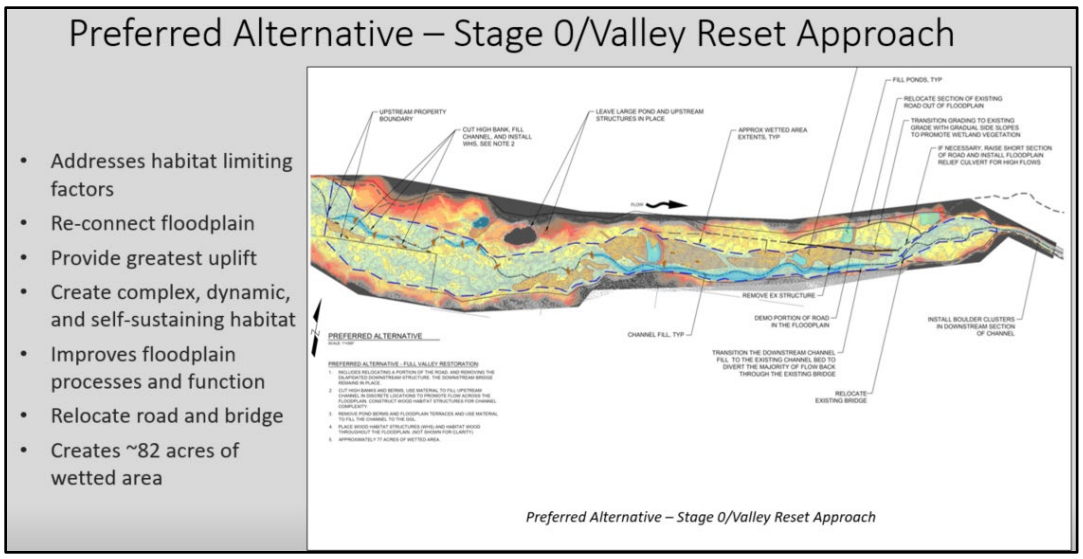


Figure 29. LOOKINGGLASS CREEK FISH HABITAT PROJECT PROPOSED CONDITION

Meadow Creek Dark Canyon Wood Additions – TBD

The Meadow Creek Dark Canyon project is located within the Cunha Ranch permanent conservation easement near the confluence of the Grande Ronde River and encompasses approximately 2.5 miles of Dark Canyon Creek and approximately 0.5 miles of Meadow Creek. Initial construction occurred in 2010 and included the installation of instream log jams and boulders along sections of Meadow Creek and Dark Canyon Creek and the removal of an old railroad grade disconnecting the floodplain along Meadow Creek. Future planned actions include installation of additional large wood structures to increase habitat complexity and promote floodplain.

McCoy Meadows Floodplain Restoration – TBD

The McCoy Meadows Conservation Property owned by the CTUIR is in Union County about 20 miles southwest of La Grande, Oregon, near the confluence of Meadow Creek with the upper Grande Ronde River. The property encompasses about 450 acres of historic wet meadow habitat with nearly 2.9 miles of lower Meadow Creek, 3.3 miles of McCoy Creek, and 0.5 miles of McIntyre Creek. The Project area has had several prior phases implemented. Phase 1 (upper McCoy meadow) in 1997, Phase 2 (lower McCoy meadow) in 2000-2002, Meadow Creek wetland enhancement in 2006, and McCoy Creek enhancements in 2010.

A process based (stage 0/valley reset) approach is being applied to the conservation property to promote an anastomosing network of channels and wetlands that frequently flood (Cluer and Thorne, 2013). This approach would create more complex, dynamic, and self-sustaining habitat and improve fluvial processes and function such as floodplain connectivity, retention of fine sediment and spawning gravels, increased pool depths, and diversified habitat. Stage 0 Habitat and Ecosystem Benefits include:

- Habitat - Multiple channels, islands and broad floodplain provide access to rich palette of diverse habitats in proximity and refugia across a wide range of flood events. High water table, deep pools, and continuous hyporheic flow provide drought refugia in the multiple channels. Channel margins evolve semi-continuously to expose tree roots.

- Biota - Multiple, complex, dynamic channels that are connected to an extensive floodplain, and which interact with groundwater support large numbers of different species. This provides for the highest possible biodiversity (species richness and trophic diversity), proportion of native species, and 1st and 2nd order productivity (Thorp, et al., 2010).

- Resilience and Persistence - Physical and vegetative attributes and functions stemming from their complexity, connectivity, and diversity act to attenuate floods and sediment pulses, making habitat and biota persistent and highly resistant to natural and anthropogenic disturbances including flood, drought, and wildfire.

- Water Quality - High capacity of multi-channel network to store sediment and cycle nutrients and other suspended solids produces exceptional water clarity. Dense, diverse proximal vegetation provides abundant shade which, together with efficient hyporheic flow, is highly effective in ameliorating temperatures.

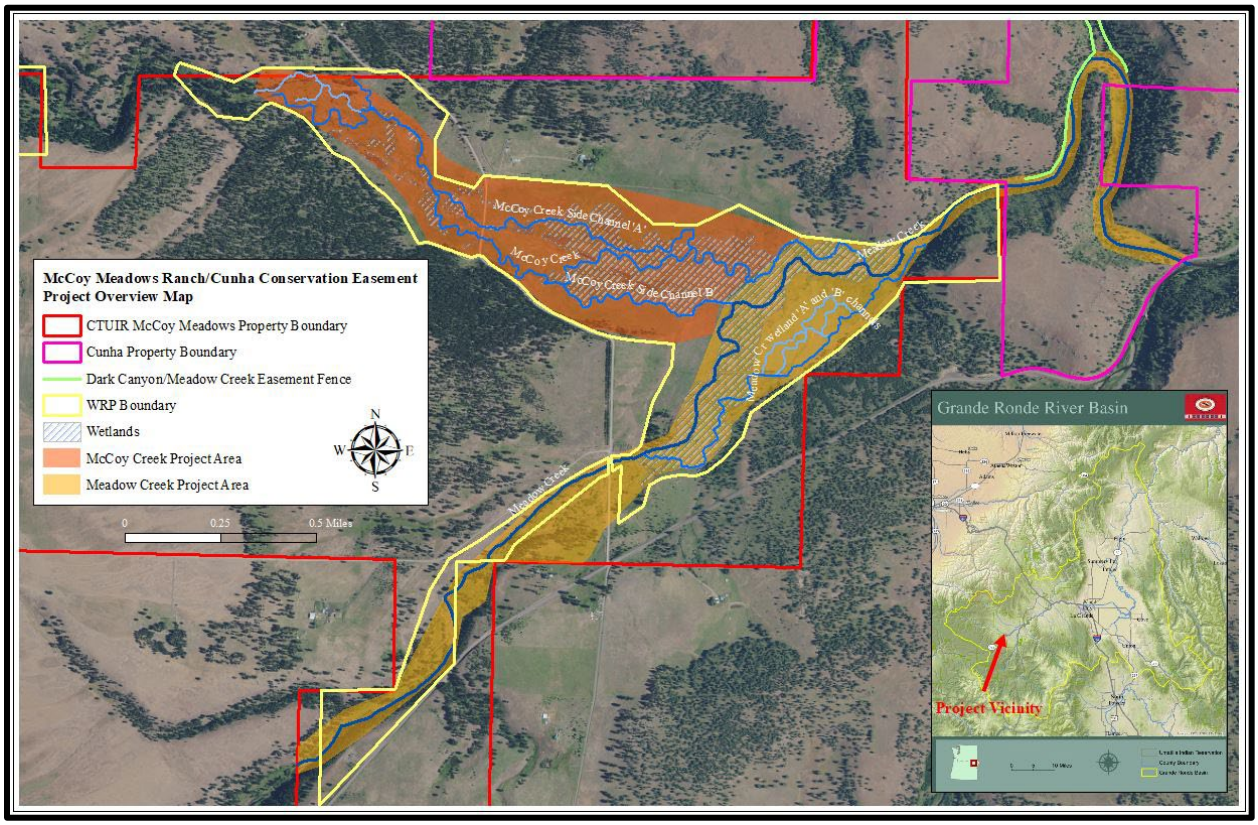


Figure 29. MCCOY MEADOWS RANCH/CUNHA CONSERVATION EASEMENT PROJECT OVERVIEW MAP

Grande Ronde Sub basin Monitoring & Evaluation

Monitoring and evaluation (M&E) of individual projects is conducted either independently by the CTUIR or jointly with project partners, Fish Habitat Enhancement Biological Effectiveness Monitoring 2020 Annual Progress Report (project #2009-014-00; BPA contract #71934) depending on the project.

M&E efforts include annual drone imagery collected by the GRMW including aerial video and Digital Terrain Model/Ortho imagery, annual photo-points, time lapse cameras at select locations, installation and maintenance of water and air temperature probes, stream channel cross sections and longitudinal profiles, pebble counts, juvenile fish population and habitat surveys, stocking/census surveys on re-vegetation efforts, and groundwater monitoring. Public tours, workshops, and presentations of individual projects will continue to be conducted. These activities provide for the discussion of various approaches, restoration techniques, successes, failures, and ultimately adaptive management.

The following are descriptions of the various M&E components of the project followed by project specific monitoring results and trends.

Groundwater Monitoring

Groundwater wells (piezometers) were installed on Forest Service and private property in November 2017 in the Bird Track Springs and Longley Meadows fish habitat enhancement project areas (Figure 31 & Figure 32), following direction from Bureau of Reclamation (BOR) geologists (Lyons & McAfee, 2017). This action was taken as part of a larger monitoring effort in collaboration with restoration co-managers from the Pacific region and Grande Ronde Basin.

In addition to monitoring wells that will capture water levels and groundwater temperatures, 17 level loggers were installed along channel margins in the Bird Track Springs Project to monitor surface water discharge/stage to evaluate changes to the hydrology and temperatures associated with fish habitat enhancement activities.

The following report and analysis will cover data associated with the groundwater levels and temperatures at Bird Track Springs and Longley Meadows projects. Data collected in the first year of observation is included in a discussion of planned surface water discharge monitoring sites. Collaborating partners will discuss a broader analysis including surface water temperatures in annual reports and ongoing thermal refuge studies.

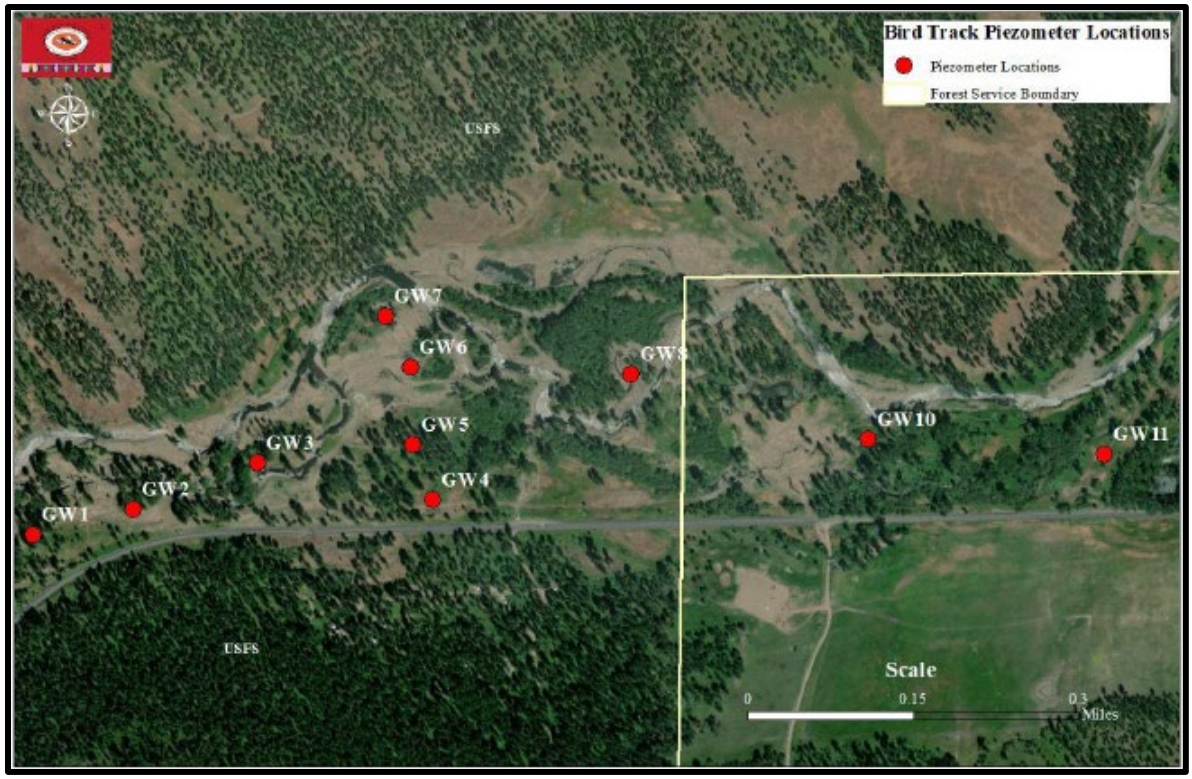


Figure 30. MAP OF GROUNDWATER PIEZOMETER LOCATIONS AT BIRD TRACK SPRINGS AND JORDAN CREEK RANCH

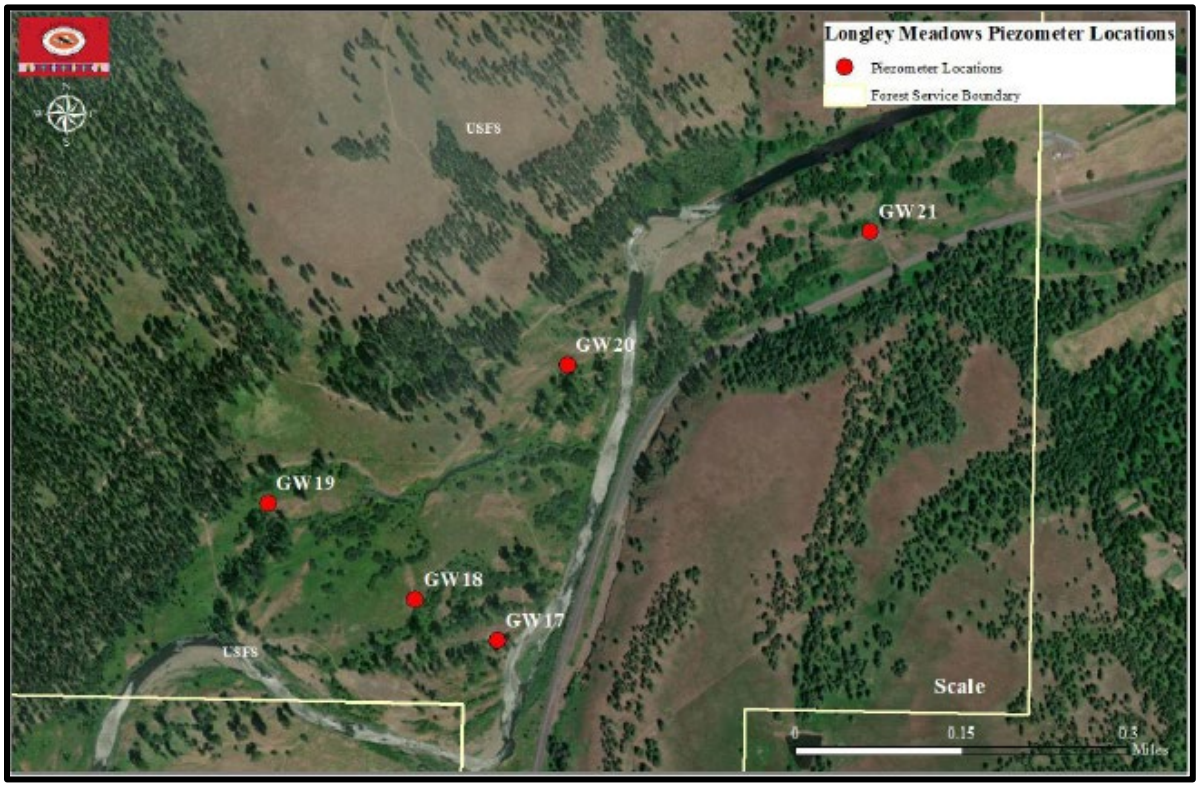


Figure 31. MAP OF GROUNDWATER PIEZOMETER LOCATIONS AT LONGLEY MEADOWS

Monitoring Goals & Objectives

The goal of monitoring is to evaluate the benefits to salmonid species listed on the Endangered Species act and restoring first foods according to the River Vision (Jones et al., 2008) that occur in the project areas. Objectives include: 1) monitoring changes in groundwater elevation and groundwater temperature, 2) monitoring changes in stream temperature and elevation/discharge, and 3) monitoring the presence and quantity of thermal refuge and associated fish use. These efforts will be part of a larger monitoring and evaluation plan and fishery resource monitoring effort.

Fish salvage efforts during the two phases of the Bird Track Springs project have demonstrated the presence of juvenile rainbow trout/steelhead (*Oncorhynchus mykiss*), Pacific Lamprey (*Entosphenus tridentatus*) and Western Pearl shell freshwater mussels (*Margaritifera falcata*). Despite the limited habitat and cold water refuge these species persist in a degraded environment. Restoration of hydrology and thermal heterogeneity at Bird Track Springs and Longley Meadows will increase the available habitat for threatened species on the Endangered Species act and First Foods for the CTUIR.

Results

Average daily fluctuations in water level were plotted against real-time discharge data from the gauge located near Perry, Oregon, operated by the Oregon Water Resource Department for the period between January-2018 to November-2022. Additionally, monthly water levels were graphed with corresponding groundwater temperatures measured over the same period. For consistency, well data are reported in metric units of Celsius and meters. For the purposes of this initial evaluation and clarity, well data were grouped by proximity and project area, although it should be noted there may be many ways to interpret the following data, which will be available through the Central Data Management System (CDMS) website operated by the CTUIR.

Bird Track Springs

The following graphs are organized with Bird Track Springs project wells 1-11, followed by Longley Meadows project wells 17-21. There are data patterns in common with all well sites that will be mentioned briefly, followed by a more detailed discussion of smaller groups of wells at each project site. Peaks in the average daily discharge measured at the Perry stream gage site correspond to increases in water elevation at all well sites for both project sites. However, there is a difference in the range and amplitude following the peaks in discharge between individual wells and project sites. The duration of increased water level elevation (shallow) occurs between January and June with the lowest elevations (deep) being observed from July to December. Groundwater temperatures are inversely related to water elevations, with coolest temperatures occurring during the highest water elevations and the warmest water temperatures occurring in the lowest water elevations.

It is worth mentioning that groundwater data collected from Bird Track Springs wells 1-11 between 2018-2019 may exhibit anomalies influenced by certain project construction activities. Year 2 construction began in early May 2019 and ended in November. In-water activities such as bypass channel activation, channel de-watering and reclamation, or pumping water out onto the floodplain could account for some wells exhibiting noticeable fluctuations in groundwater elevation otherwise unassociated with any natural surface flow events. In addition, Longley Meadows wells 17-21 between 2020-2021 were similarly affected by nearby project construction activities. In the following data plots the two far left grey columns that occur in 2018 and 2019 represent the in-water work windows during BTS project construction that potentially influenced groundwater levels in wells 1-11.

The remaining two far right grey columns that occur in 2020 and 2021 depict the in-water work windows during Longley Meadows project construction and may have some influence on groundwater elevations in wells 17-21.

In July 2023 groundwater piezometers were retrieved and shipped back to the manufacturer for battery replacement. Up until this date the loggers had been continuously measuring hourly groundwater elevation and temperature since their initial deployment in summer 2017. 2023 groundwater measurements shown in the following plots display data up through July when loggers were retrieved.

The first three wells (GW 1-3) are in the upper portion of the Bird Track Springs project area in the vicinity of side channel 1 & 2 (Figure 33). GW 3 (blue) has the lowest groundwater elevation of this group during 2018 and most of 2019, but quickly rises to the ground surface beginning late summer 2019 where it remains the highest groundwater elevation well in this group to present. The sudden increase and persistence in elevation correlates to GW 3 proximity to side channel 2, which was not fully activated during 2018-2019 construction until September 2019, precisely when we see a near-vertical 0.5-meter uptick towards ground surface elevation. Other vertical increases in the data can most likely be attributed to initial spring ice melt and subsequent high flow events. Groundwater elevation at GW 1 remains the furthest from ground surface (deepest) and exhibits the shortest vertical amplitude range between lowest summer and highest spring groundwater elevations compared to other wells in this group. A possible explanation is that GW 1 is situated upstream of the upper-most project construction boundary. Constructed entrances to Side-channels 1 and 2 are downstream of GW 1 location and would have minimal expected influence on elevating groundwater levels within the existing floodplain upstream of these locations. Groundwater elevations at GW 1 could be useful as a “control” against “treated” well locations within project-activated floodplain and side channel networks.

The greatest range in seasonal max-min temperature was observed at GW 2 (18°C in Aug-19 down to 2°C in Feb-20 (Figure 34). Proximity to side channel 2 may explain the extreme temperature range due to a shorter sub-surface distance between the well and seasonally influenced surface water. Additionally, groundwater at GW 2 seasonally rises and falls earlier than the two other wells in this group. This trend is likely also explained by GW 2’s closer proximity to side channel 2. The two remaining wells (GW 1 and 3) are further from main channel or side channels and exhibit more muted temperature extremes and delayed onset of seasonal rises and dips, possibly due to a greater buffering distance of sub-surface substrate between these two wells and surface water.

GW wells 4-7 represent a north-south transect with the new main channel alignment directing flows north of GW 7 (Figure 35). Additionally, GW 6-7 exist within a lowland swale network that is charged with groundwater through a blind channel diversion from the right bank of side channel 2 just upstream from where it rejoins the main channel. This may be a good area to direct attention for a more intensive thermal refugia study proposed by BOR given the potential to alter the groundwater table and how the new channel alignment and off channel swale networks may influence the transect. GW 4 has the highest baseflow groundwater elevation between 2018-present despite it being farther away from the existing channel (Map Figure 31 & Figure 32). It is possible that a significant portion of groundwater at GW 4 location originates from a small draw that drains the north face of a tall ridge within Bird Track Springs Campground, south of highway 244. Compared to GW 5-7, GW 4 does not seem to respond to April-May seasonal peak discharges with similar high amplitude increase in groundwater elevation; it appears to peak at around 0.5 m below ground surface. Another interesting observation, when comparing neighboring GW 4 with GW 5 after peak flows decline into May, is the large difference in

groundwater elevations (approximately 1.25 m difference) when geographically these wells are the closest to each other among all BTS wells. Similarly to the observed increase in groundwater elevation at GW 3 following side channel 2 activation, GW 6 also exhibits a sharp increase in groundwater elevation corresponding to the Oct-19 activation of the blind channel swale network that envelops this well location. During spring 2023 peak hydrograph, groundwater elevation at GW 5 increased from around 2.5 meters below floodplain surface to within a half meter from the surface, more so than the other three well locations along this transect. This was likely due to an above average volume of water overflowing side channel 2 during spring melt-off and flowing through historic scrolls in proximity to GW 5.

GW 6 had the greatest range in temperature beginning with Aug-19 maximum, decreasing 14°C into Feb-20, then climbing again to the same average max temperature in Aug-20 (2.2-16.1°C-Figure 36). And again in 2021 GW 6 temperatures decreased significantly more than the other three wells going into winter, then rising significantly higher going into summer compared to the other three wells on this transect. Similarly to GW 3, the seasonal temperature swings may be due to increased interaction with surface water from side channel 2 that is diverted into the blind channel swale complex.

Wells 8-11 represent the downstream portion of the project area and have the most sustained high-water elevation of the Bird Track Springs wells (Figure 37). Each of these three wells exhibited instantaneous increases in groundwater elevation during peak surface flow events. GW 10 groundwater elevations have remained above those at GW 8 and 11 since wells were installed in 2017. Its location lies immediately offset the main channel bank at a sharp 90-degree meander bend in line with thalweg trajectory. The relatively high groundwater elevations recorded at GW 10 may be the result of main channel surface water encountering the sudden change in river direction and continuing into the sub-surface substrate of the bank. Comparing 2020-2021 data for these wells shows that overall, in 2021 these wells recorded lower groundwater elevations, possibly resulting from less extreme spring melt flows and lower than average main channel flows in summer 2021. The most downstream well, GW 11, lies adjacent to side channel 10 and appears to be trending lower in groundwater elevation with a record low elevation of 2 m below ground surface in summer 2021. In 2020, a large ponderosa tree fell across the entrance to side channel 10. The tree itself does not seem to impede flows into the side channel but may have slowed water resulting in sediment deposition occurring at the entrance which may be decreasing summer low flows inside channel 10.

During summer 2023 field visits to lower Bird Track Springs reach it was observed that the main channel is currently experiencing head cutting near the rock weir where side channel 10 rejoins the main channel. The downcutting in channel bed elevation could be responsible for the observed decrease in groundwater elevation at GW 11 as water stored in the floodplain drains to lower elevations.

The dramatic increase in groundwater elevation measured at GW 8 (sustained for several months above ground surface) is likely due to piezometer battery malfunctions. It was around this time that all BTS-Longley loggers were retrieved and sent off for batter replacement.

Average temperature min-max range is the greatest at GW 10 (2.5-17°C Feb-20 to Aug-20, and again Feb-21 to Aug-21) suggesting that groundwater in this location may originate from nearby hyporheic exchange with seasonally influenced main channel surface water (Figure 38). Conversely, GW 11 is located furthest from the main channel compared to the other two wells in this group and exhibits the most buffered temperature trends: no extreme cold dips in the winter and a relatively low summer high temperature, only fluctuating between 6-12°C annually. Construction activities such as dewatering,

channel reclamation, bypass channel construction, and pumping water onto floodplain associated with construction in the summer and fall of 2019 appears to have affected some readings at GW 8 & 11. However, GW 10 is positioned near a project reach completed in 2018 and therefore exhibits a relatively stable and predictable groundwater fluctuation regime while 2019 construction activities were happening elsewhere.

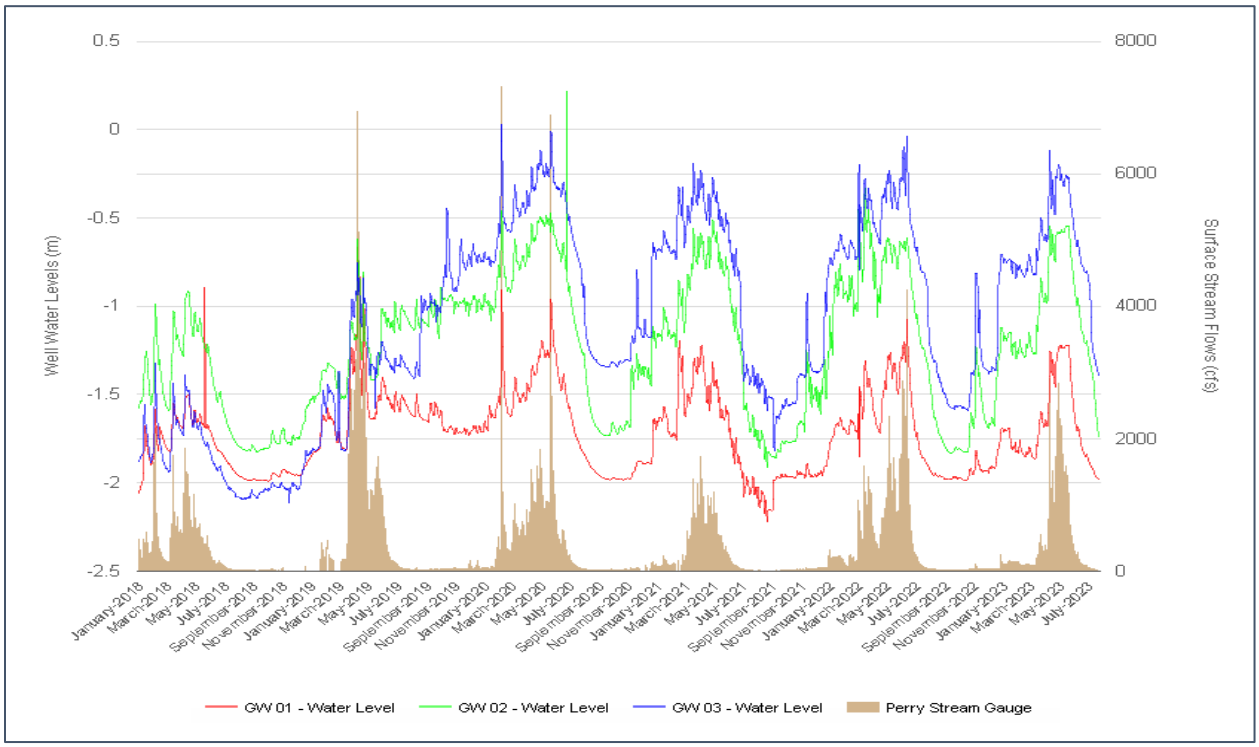


Figure 32. AVERAGE DAILY GROUNDWATER LEVELS FOR WELLS 1-3 AT BTS AND DISCHARGE AT PERRY GAUGE, JAN-18 TO JUL-23

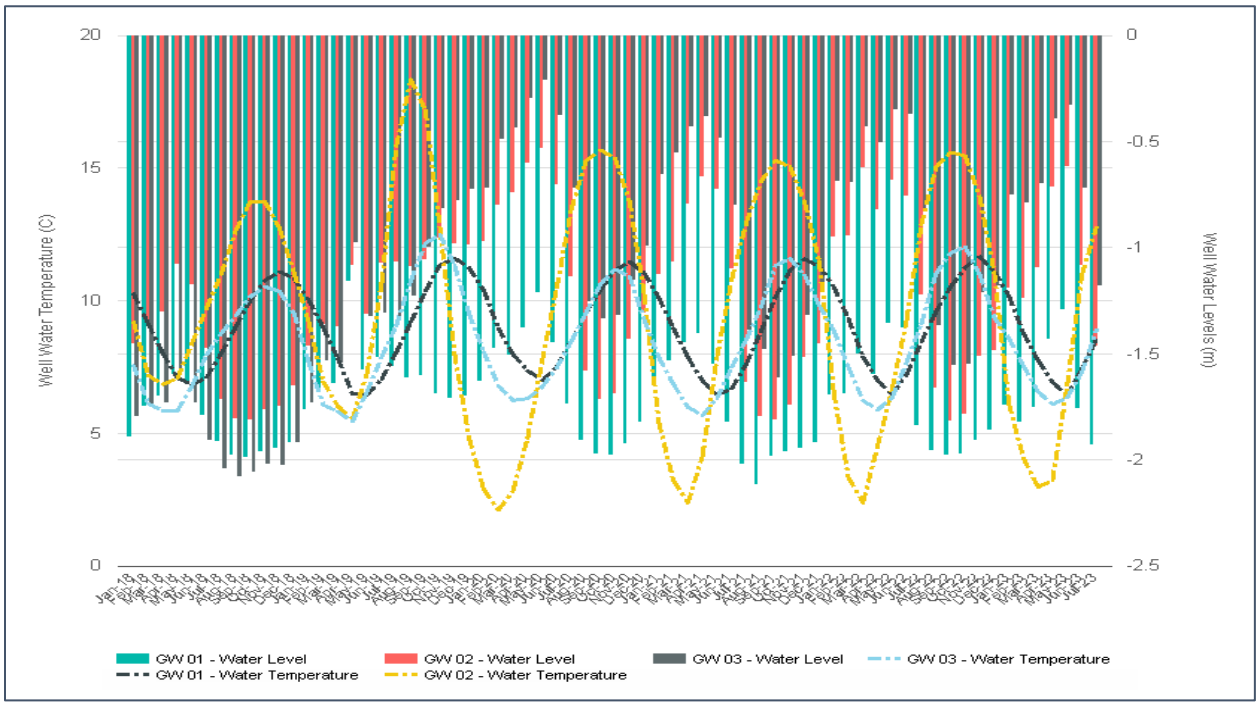


Figure 33. MONTHLY AVERAGE GROUNDWATER LEVELS AND TEMPERATURE FOR WELLS 1-3 AT BTS, JAN-18 TO JUL-23

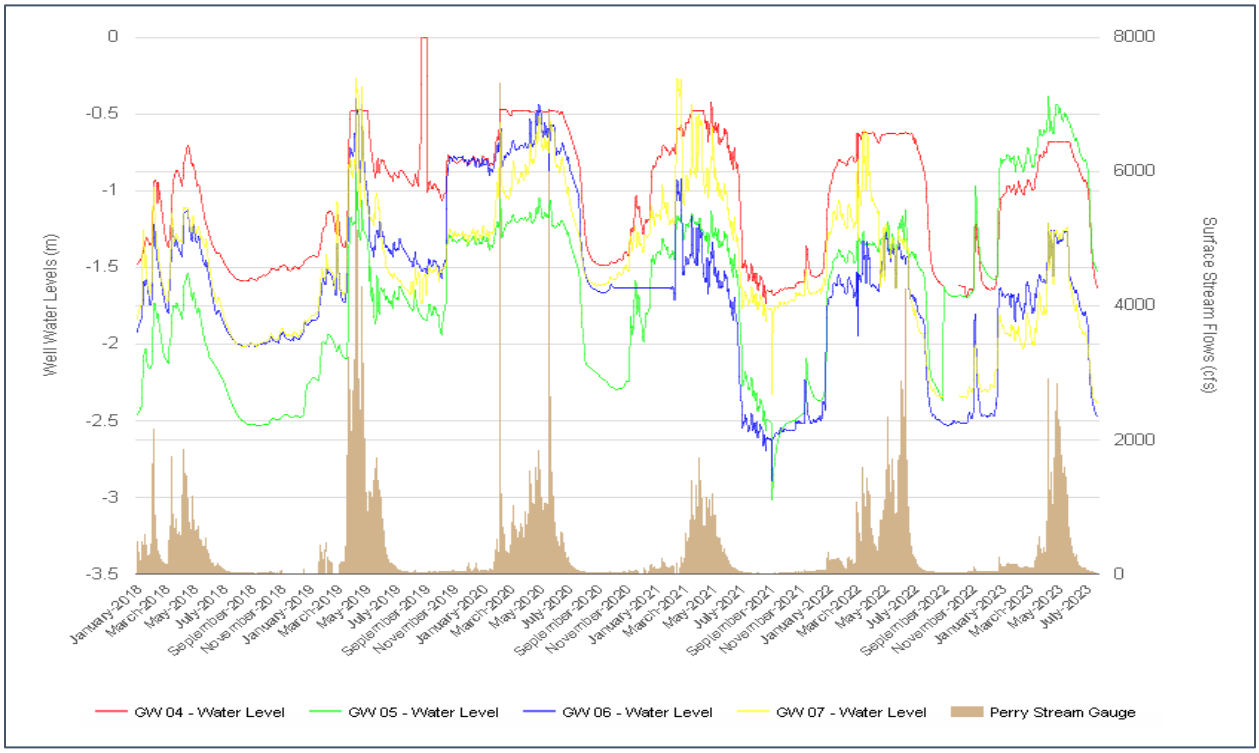


Figure 34. AVERAGE DAILY GROUNDWATER LEVELS FOR WELLS 4-7 AT BTS AND DISCHARGE AT PERRY GAUGE, JAN-18 TO JUL-23

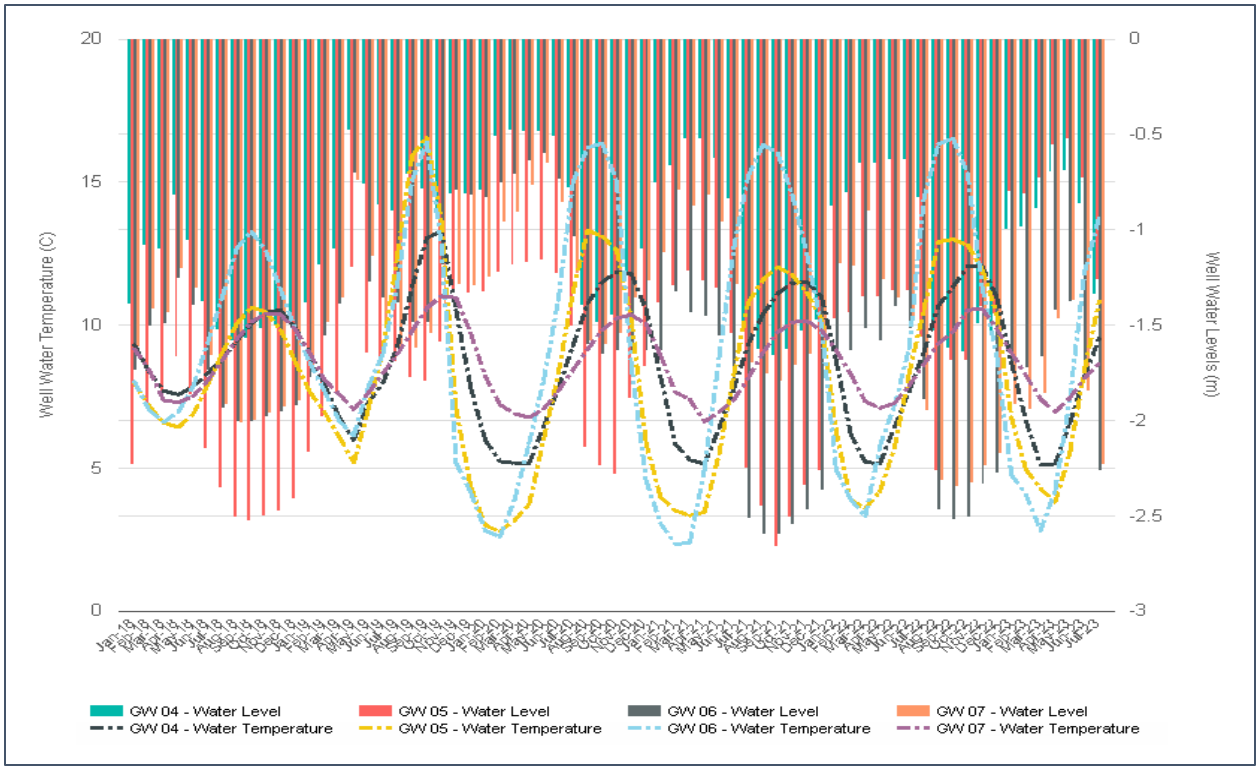


Figure 35. MONTHLY AVERAGE GROUNDWATER LEVELS AND TEMPERATURE FOR WELLS 4-7 AT BTS, JAN-18 TO JUL-23

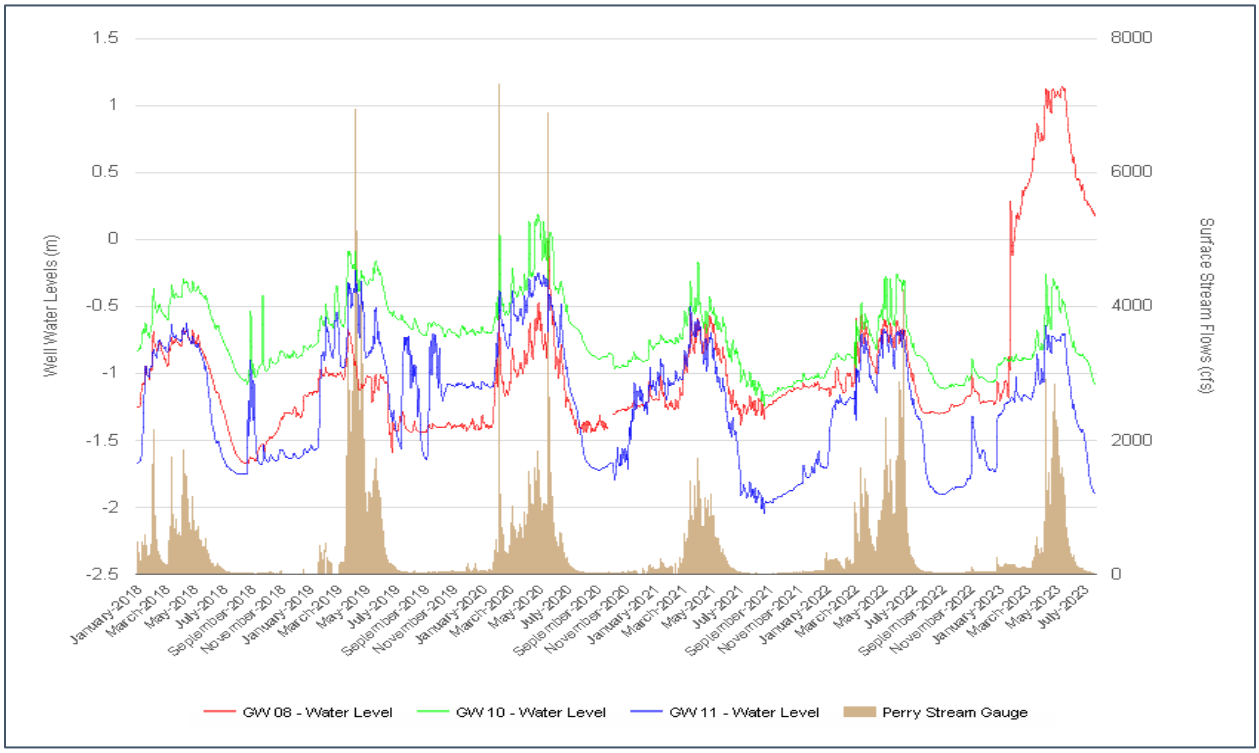


Figure 36. AVERAGE DAILY GROUNDWATER LEVELS FOR WELLS 8-11 AT BTS AND DISCHARGE AT PERRY GAUGE, JAN-18 TO JUL-23

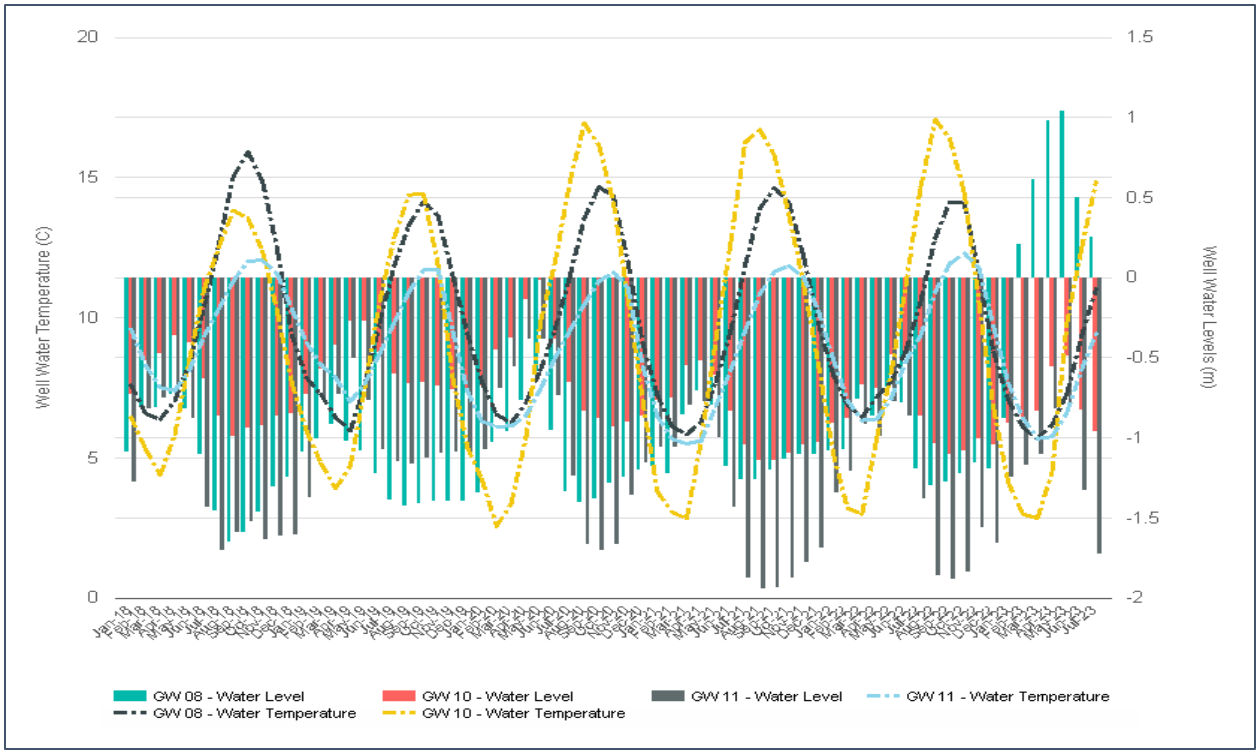


Figure 37. MONTHLY AVERAGE GROUNDWATER LEVELS AND TEMPERATURE FOR WELLS 8-11 AT BTS, JAN-18 TO JUL-23

Longley Meadows

Wells 17-19 represent the upstream portion of Longley Meadows Fish Habitat Enhancement Project, orientated in a northwest transect (Figure 39). Interestingly, the closest well to the river (GW 17) exhibits the lowest water elevation, and the well furthest from the river (GW 18) recorded the highest groundwater elevation (Map Figure 32). In fact, GW 18 water elevation leading up to peak flows in spring 2018 and 2019 was the same distance below the meadow surface as GW 17 reached at its peak. Interestingly, the amplitude of groundwater elevation increase during spring peak flows is greater for GW 19 in relation to GW18 and exhibits a higher maximum peak elevation at or slightly above (overland flow) the meadow surface. GW 17 records from summer-fall 2022 show a noticeable, sustained increase in groundwater elevation during baseflow conditions, although it still ranks lowest compared to GW 18 and 19 which maintained groundwater elevations around 0.75 meters below meadow surface during the same period.

These three wells exhibited fairly similar average monthly seasonal temperature ranges pre-project, with GW 18 having experienced a slightly greater range of temperature between winter lows and summer highs (approximately 4.0-14.0°C) (Figure 40). In 2022, however, groundwater temperatures recorded at wells 17 and 18 measured noticeably cooler in the spring (1-2°C), increasing to around 17°C in the summer. Likely, the proximity of these two wells to newly constructed side channel and modified main channel resulted in more extreme seasonal high and low temperatures due to shorter path that surface water must travel underground to reach these two wells.

The downstream portion of Longley meadows has two wells (GW 20-21; Map Figure 32). Groundwater at GW 20 during pre-project (2018-2020) spring-summer-fall months maintains an elevation around -2.0 m relative to meadow surface. Post-project groundwater elevation at this location in 2022-2023 shows a

slight rise toward meadow surface. Groundwater elevation at GW 21 was perched slightly higher around -1.65 m during the same pre-project time span but does not appear to have risen post-project. Figure 41 below shows that when the Grande Ronde River experiences peak spring flows groundwater elevation at GW 20 exhibits a higher corresponding amplitude surge and maximum elevation (-2 m to 0 m) compared to GW 21 (-1.65 m to -0.25 m). This pattern is likely due to GW 20 proximity to a shallow ephemeral scroll that activates during spring snowmelt, whereas GW 21 sits along a fairly deep cut side channel that infrequently floods out of its banks.

Groundwater temperature measured at GW 21 consistently ranges from a seasonal low of around 5°C in February up to a summertime high around 12°C in August for years 2018-2020 (Figure 42). Spring-summer groundwater temperatures at GW 20 are consistently about 1-2°C cooler compared to GW 21. During fall-winter months groundwater temperatures at these two wells are about the same. Seasonal max-min temperatures at GW 21 exhibit a slight lag of about 2 weeks relative to summertime highs and winter low temperatures at GW 20. Similar to previous groundwater well discussions, well locations closer to active surface flow channels tend to exhibit groundwater changes sooner and with greater amplitude with respect to changes in the hydrograph than those wells which are further set back from active channels.

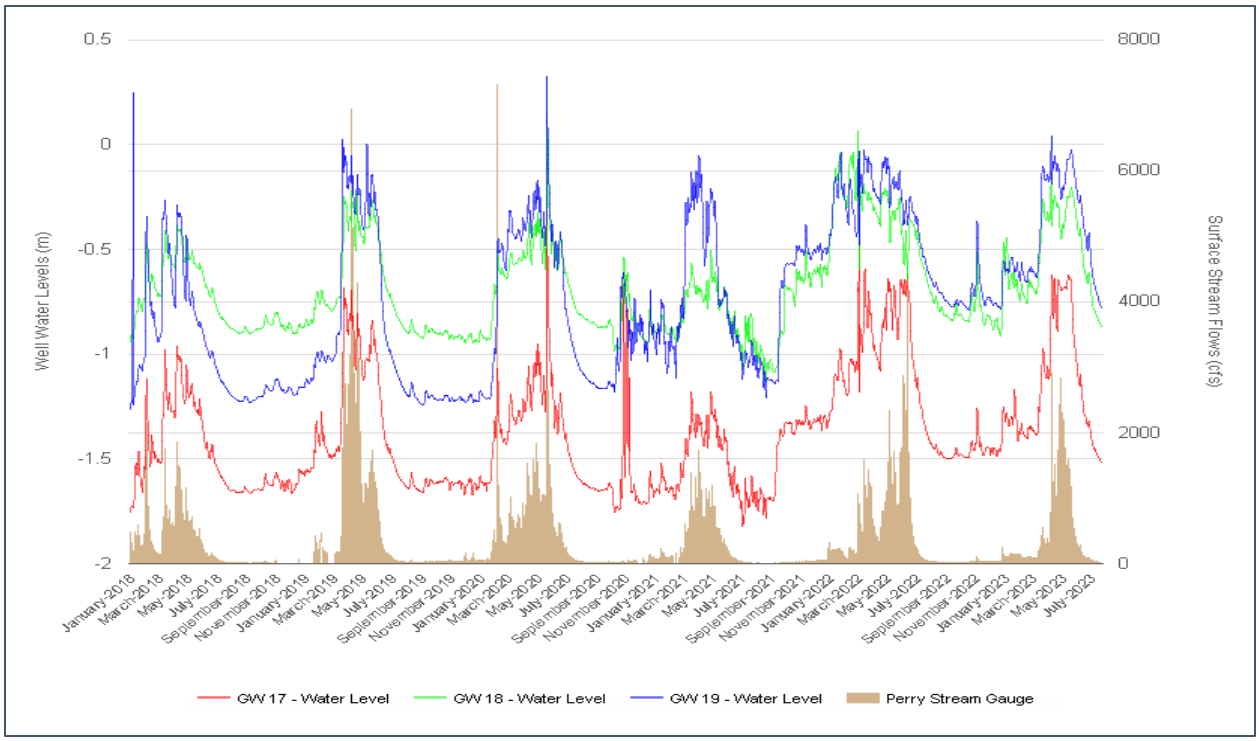


Figure 38. AVERAGE DAILY GROUNDWATER LEVELS FOR WELLS 17-19 AT LM AND DISCHARGE AT PERRY GAUGE, JAN-18 TO JUL-23

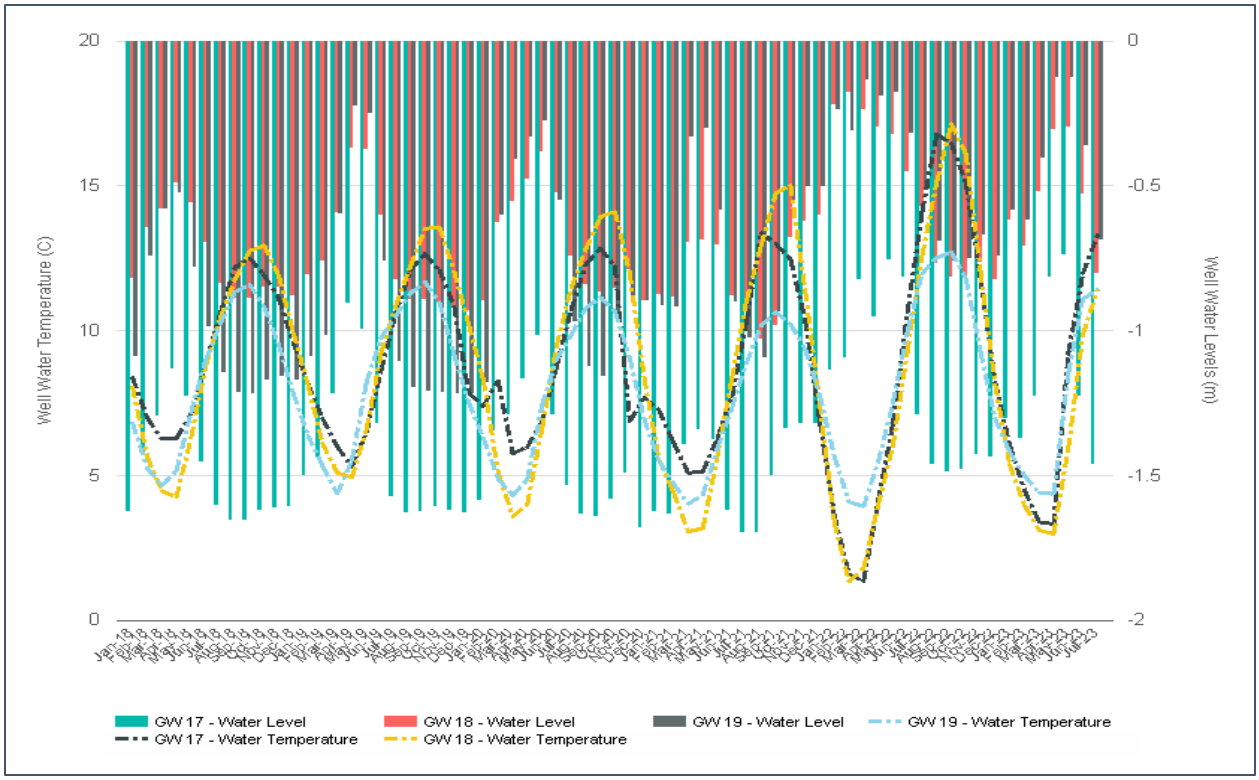


Figure 39. MONTHLY AVERAGE GROUNDWATER LEVELS AND TEMPERATURE FOR WELLS 17-19 AT LM, JAN-18 TO JUL-23

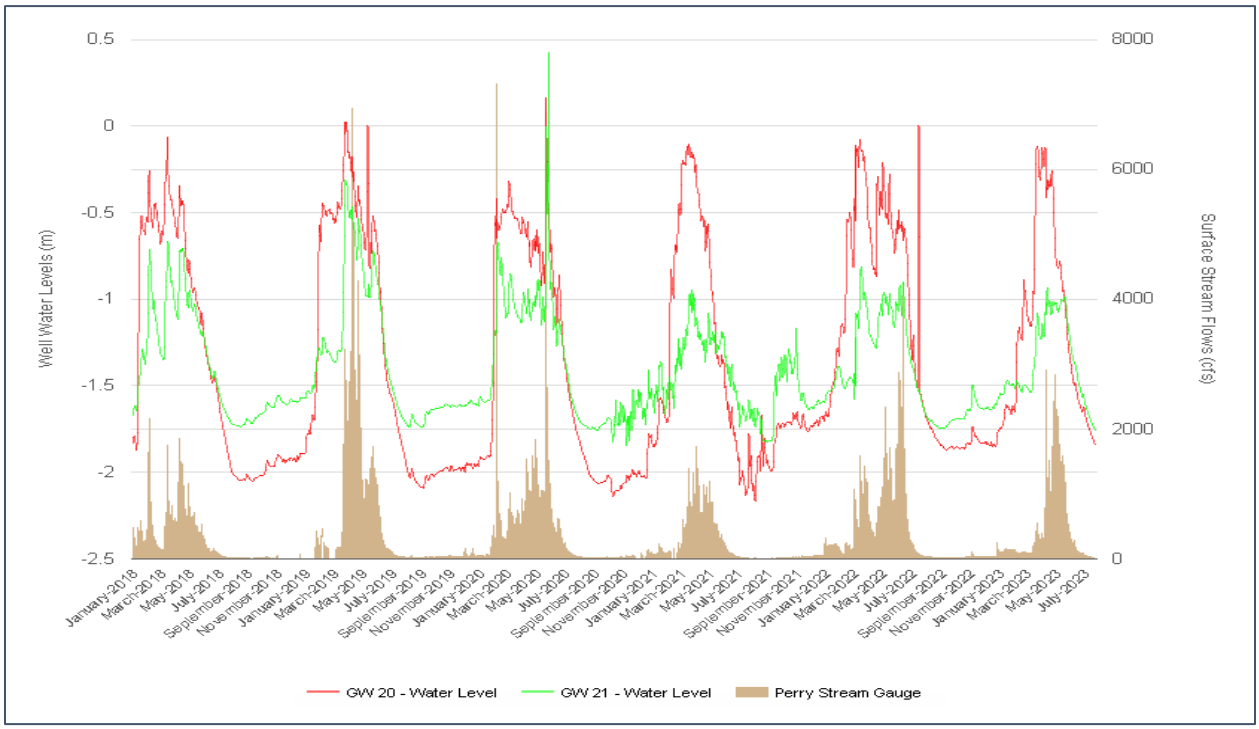


Figure 40. AVERAGE DAILY GROUNDWATER LEVELS FOR WELLS 20-21 AT LM AND DISCHARGE AT PERRY GAUGE, JAN-18 TO JUL-23

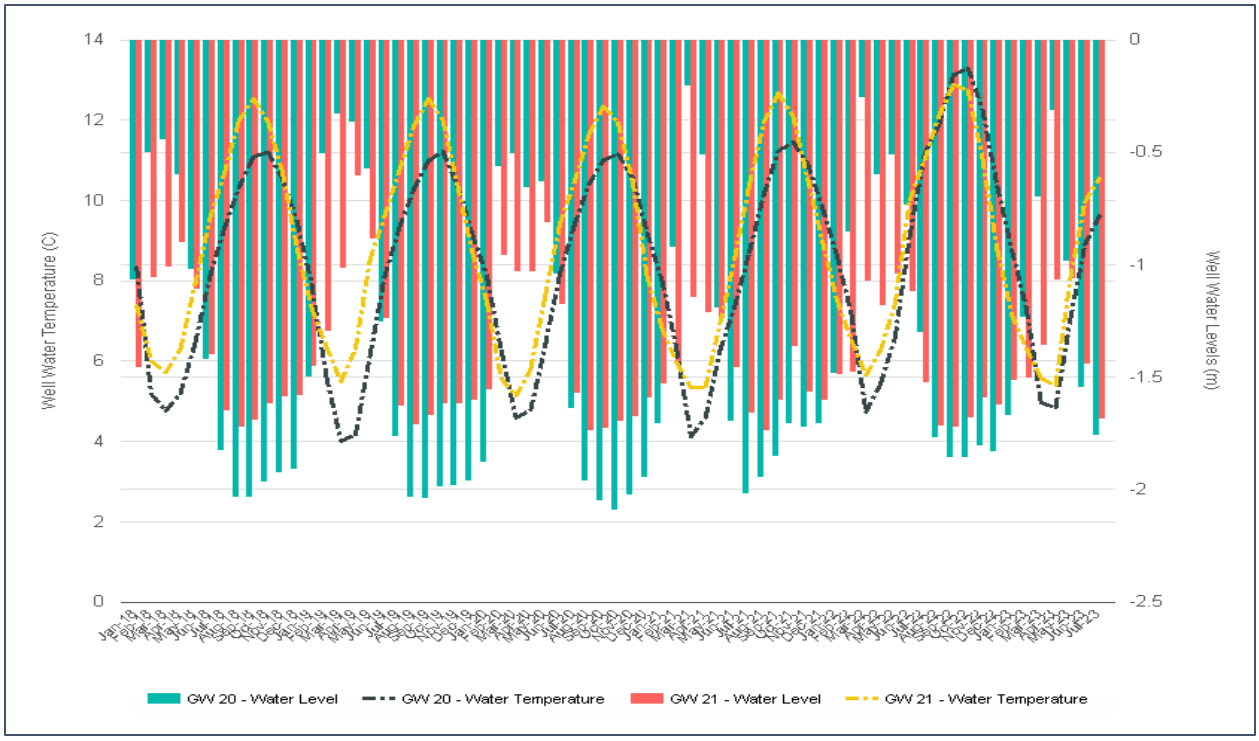


Figure 41. MONTHLY AVERAGE GROUNDWATER LEVELS AND TEMPERATURE FOR WELLS 20-21 AT LM, JAN-18 TO JUL-23

2023 Water Temperature Monitoring

Temperature dictates the distribution and abundance of individual species across many spatial and temporal scales. Unfortunately, as anthropogenic climate change advances and temperatures warm, aquatic communities in rivers and streams will be altered and forced to find thermally suitable habitat. Linear networks such as streams and rivers are often fragmented by anthropogenic perturbations, which greatly impacts aquatic communities (Isaak et al. 2012). Thus, the need for floodplain and stream restoration, especially thermal regime restoration (Johnson 2004). Thermal restoration is dependent on restoring floodplain hydrology and channel morphology that promotes water storage, hyporheic functions, and restoration of riparian and wetland vegetation. Floodplain attenuation contributes to hyporheic lag, providing cold water refuge during summer and warm water refuge during winter.

It is important for fisheries managers to have a better understanding of thermal regimes in river and stream networks. Understanding the temperature variability in river streams will allow managers to evaluate changes in water temperature on aquatic habitat restoration projects. The CTUIR efforts include thermal dynamics associated with floodplain reconnection, restoration of natural channel morphology, and riparian and wetland communities. The goal of the temperature monitoring effort is to obtain data and to assess whether restoration actions are improving the summer and winter altered thermal regime.

Methods

38 Tidbit Waterproof Data Loggers temperature were deployed within the Grande Ronde Basin and its tributaries (Rock Creek: 4 probes, Grand Ronde: 17 probes, Dark Canyon: 2 probes, Meadow Creek: 1 probe, and Catherine Creek: 14 probes). See Figure 43 for an overview of monitoring locations. Pendant

64K probes are housed in a metal tube that is anchored to the streambed and cabled to a post or tree on the bank, while Tidbit v2 probes can be installed in the aforementioned manner or housed in a PVC bushing and cap and installed with underwater epoxy.

Data loggers are programmed to record at one-hour intervals with a ± 0.2°C over 0°C to 50°C (±0.36°F over 32°F to 122°F) level of accuracy and are deployed early summer depending on flows and are left within their monitoring location until early winter. The CTUIR focuses on having a consistent monitoring period from early June to the end of October. This monitoring period records crucial summer temperatures and early winter temperatures and provides the CTUIR data to assess if restoration efforts are improving the summer and winter thermal regime.

Temperature data is transferred to the CDMS, which gives the CTUIR natural resources staff a single place to house various data types. Within CDMS, temperature data is QA/QC'd and then exported to .csv files for data analysis.

We conducted basic exploratory data analysis to look at the distribution of data, mean, min, and max for each monitoring probe. Summary statistics were calculated for each probe that include number of days deployed, max temperature, hours of exceedance of the Oregon Department of Environmental Quality's (DEQ) lethal limit of 25°C, and the preferred salmonid core cold temperature range of 10°C to 15.6°C, which is also the preferred temperature range for juvenile Chinook salmon.

Diurnal fluctuations in water temperature were also plotted to show the variability in temperatures. We plotted the seven-day average daily maximum (7DADM) for selected probes that bracket stream restoration project areas. We also can determine restoration effectiveness by assessing if there is a reduction of the number of hours at or above 25°C (lethal limit) and increasing number of hours within the 10°C and 15.6°C (core cold temperatures for salmonids).

Grande Ronde

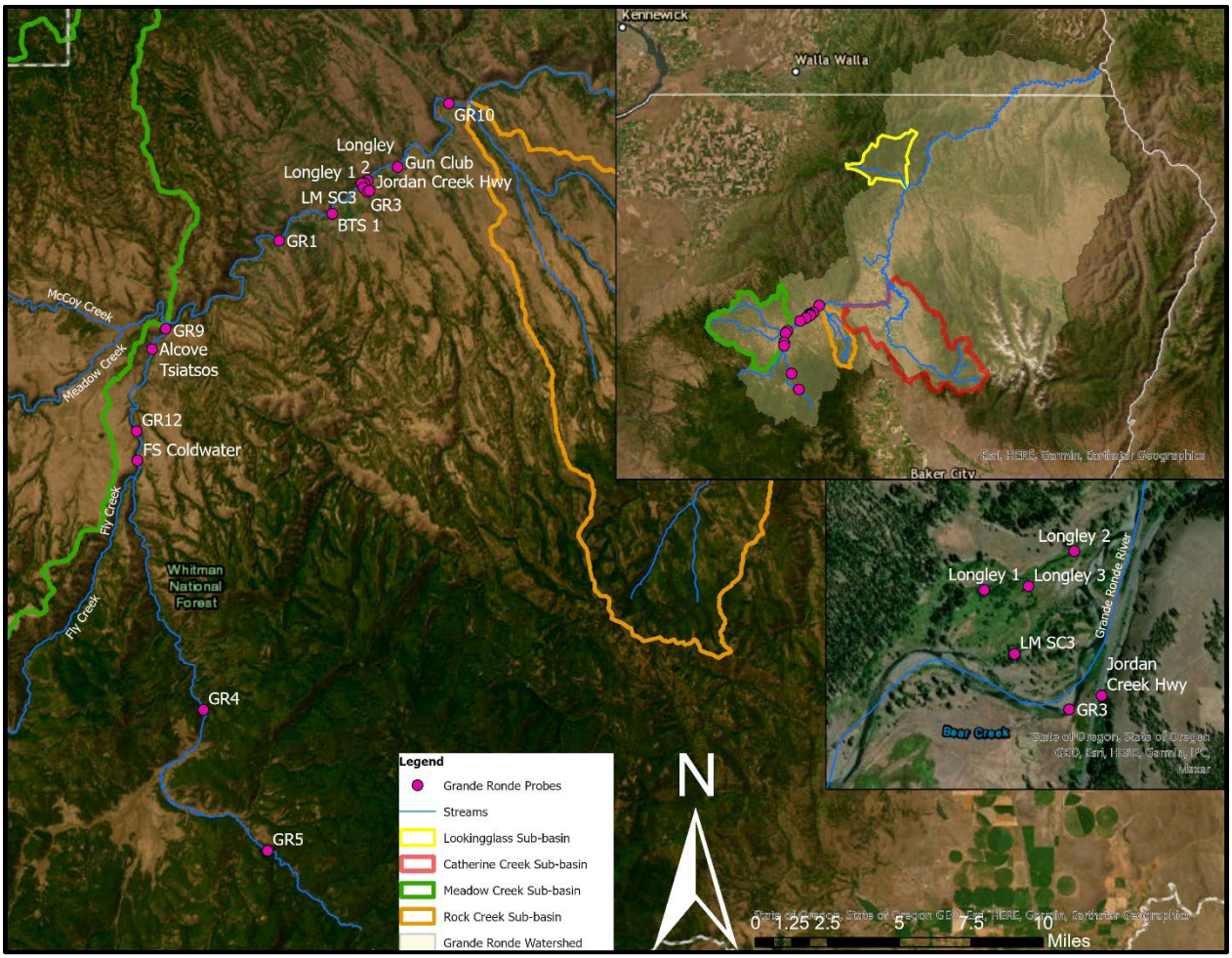


Figure 42. MAP OF TEMPERATURE PROBE LOCATIONS ON THE UPPER GRANDE RONDE RIVER

The CTUIR and Grande Ronde Basin partners implemented fish habitat improvements along the Grande Ronde River (Bird Track Springs and Longley Meadows) on private and public land river mile (RM) 142-146. One of the primary objectives of fish habitat enhancement projects is to restore thermal heterogeneity to stream temperatures within project reaches, resulting in an improved altered summer and winter thermal regime. Traditionally, this has been monitored by installing temperature loggers upstream and downstream of a project reach and monitoring pre and post project construction to detect changes in stream temperatures related to restoration activities and to see if the thermal regime is improving for fish populations. In addition to monitoring main channel temperature flows above and below a project, temperature loggers are also deployed within adjacent off-channel water features to monitor groundwater influenced habitats. Temperature records comparing mainstem locations to groundwater influenced habitats have indicated the importance of identifying existing pockets of cold-water inputs, expanding them, and/or mimicking the processes that cause them and applying those actions elsewhere within the project to create thermal refugia for fish to wait out lethal mainstem summer temperatures, as well as maintain open water habitat free of anchor ice during winter low temperatures.

Water quality at the Bird Track Spring Project has been monitored by installing temperature loggers upstream and downstream of the Project reach. The purpose is to determine if there are noticeable

differences in river temperatures between where water enters the Project reach (GR1) compared to temperatures as water leaves the Project reach (BTS1). In addition, temperature data from before and after project construction is analyzed and plotted to detect changes in temperatures possibly related to restoration activities and to see if the thermal regime is more suitable for fish populations. Furthermore, researchers with the University of Idaho were monitoring temperature at 10 large pool and side channel confluences as part of a groundwater/floodplain interaction study.

In Figure 44, data collected in 2023 comparing the two temperature loggers that bracket the project reach are shown. 7DADM temperatures recorded downstream of the project reach appear to be slightly cooler than water temperatures above the project reach.

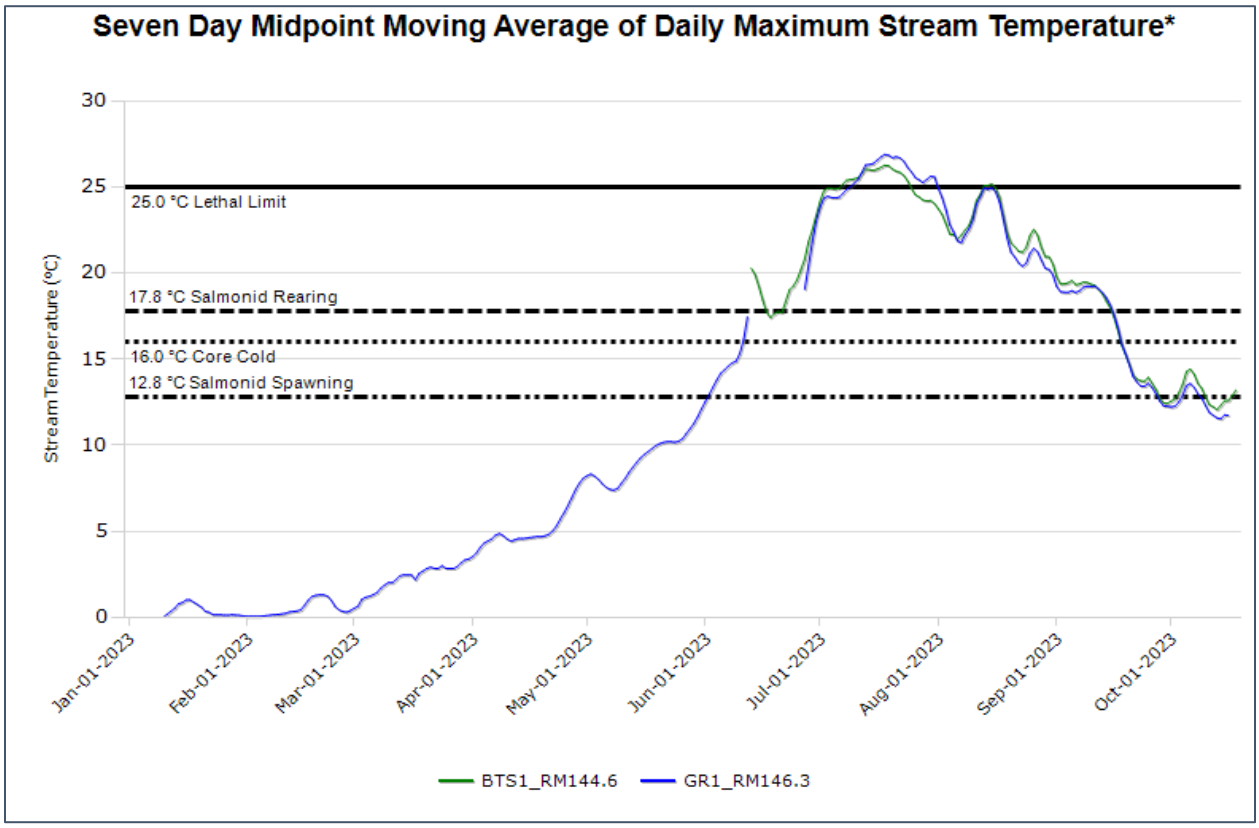


Figure 43. 7DADM TEMPERATURE BRACKETING BIRD TRACK SPRINGS PROJECT REACH, JAN-OCT 2023

University of Idaho graduate students, working with CTUIR staff, deployed 10 temperature loggers during summer 2023 to monitor deep pools and groundwater influence on main channel temperatures. Figure 45 compares 7DADM temperatures recorded at the most upstream and most downstream deep pools within the project reach. For the entire duration of the 2023 summer monitoring period the downstream pool remained noticeably cooler than the most upstream pool; downstream pool exceeded 25°C lethal limits much less frequently than the upstream pool. The study suggests that physical processes occurring downstream of the upper most logger within the project area may be increasing cold groundwater infiltration and seeping into main channel deep pools.

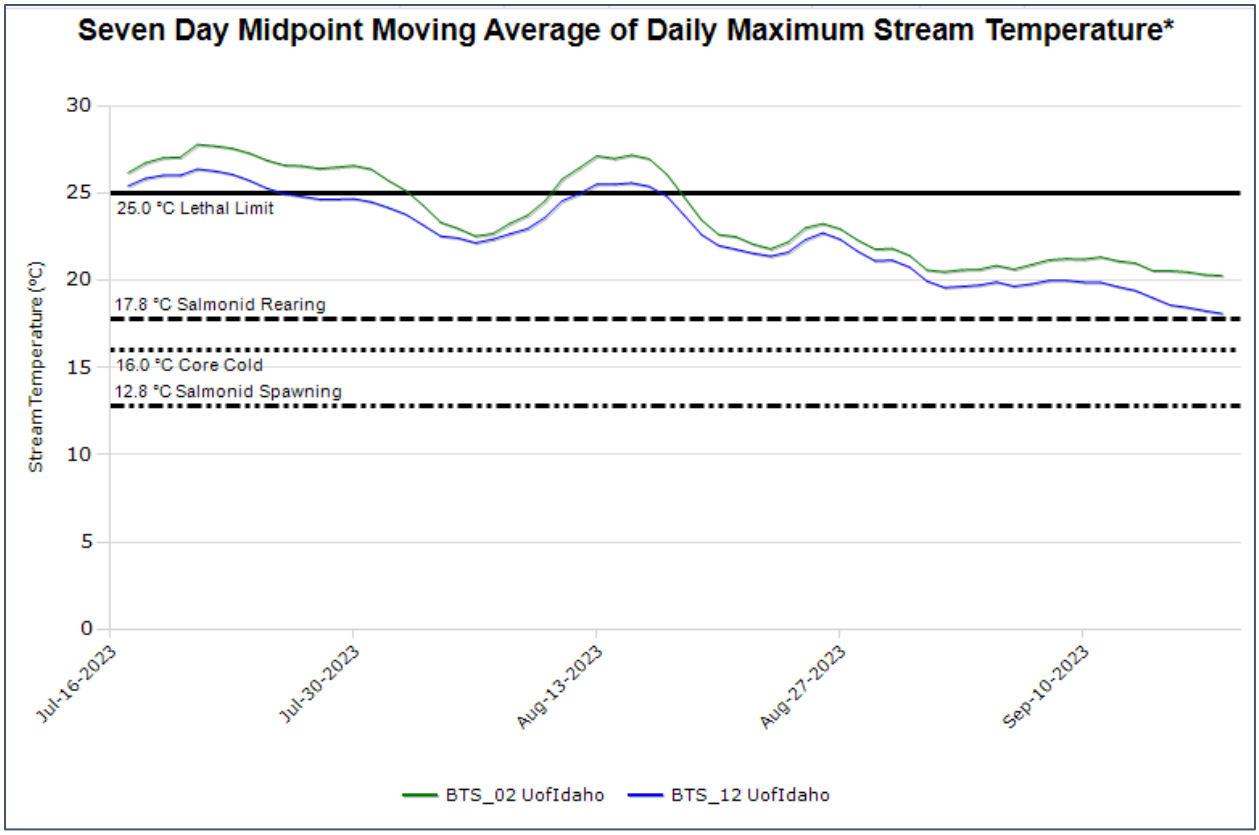


Figure 44. 7DADM TEMPERATURE COMPARING LARGE POOLS AT BIRD TRACK SPRINGS PROJECT REACH, JUL-SEPT 2023

In 2023, Figure 46 and Figure 47 below show hourly and average daily temperature data from one main channel logger (Green) compared to three additional loggers located in a nearby alcove, spring, and side channel. The main channel logger recorded daily maximum temperatures at or above the lethal limit (25°C) during much of the July-August window. In comparison, the other three loggers during this same time recorded temperatures that never exceeded 15°C and remained significantly below main channel temperatures throughout summer months. The hourly temperature data shows diurnal fluctuations between daytime highs and nighttime lows. Main channel temperatures appear to fluctuate much more between daily highs and lows compared to much more muted off main channel temperatures due to greater groundwater influence that buffer temperature extremes in these locations. The importance of these off-channel areas is vital because they provide thermal refuge for heat-sensitive salmonids rearing, migrating, and spawning, as well as cold water inputs to warmer main channel habitats.

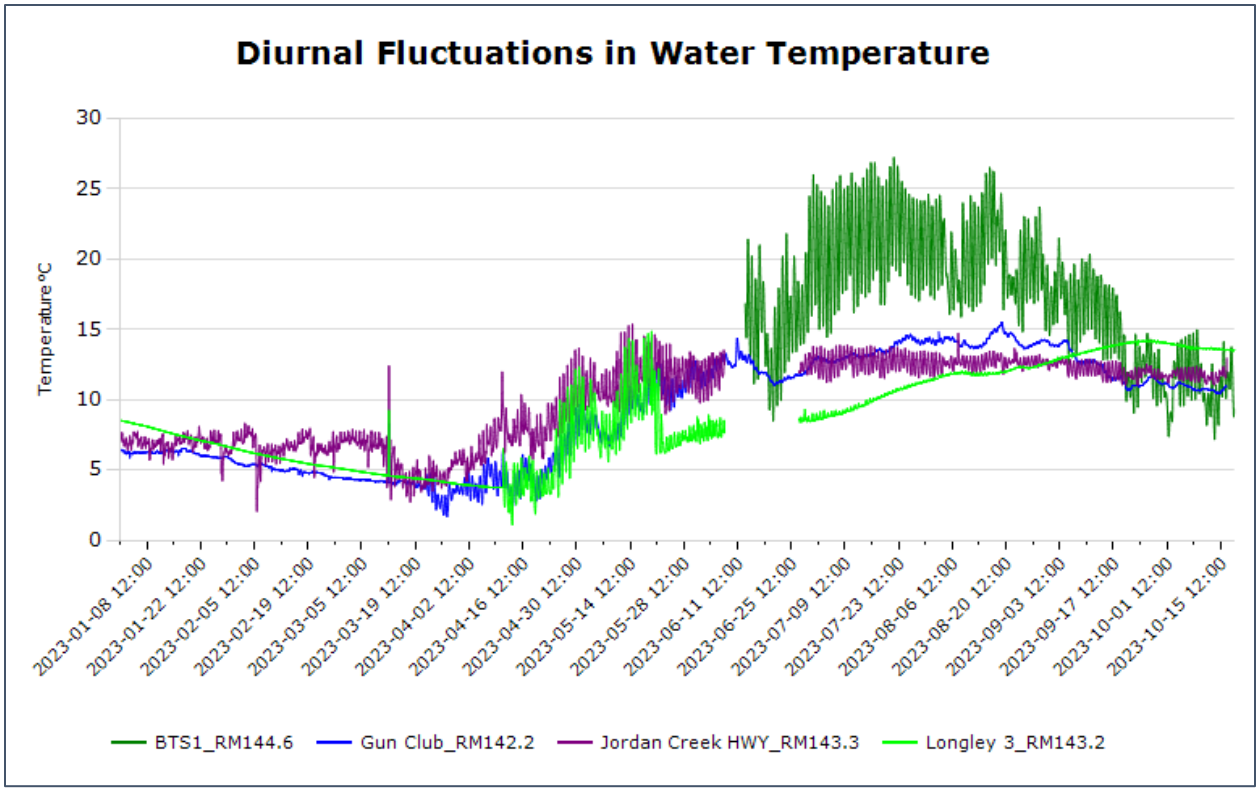


Figure 45. MAIN CHANNEL AND OFF-CHANNEL HOURLY TEMPERATURE COMPARISON, JAN-OCT 2023

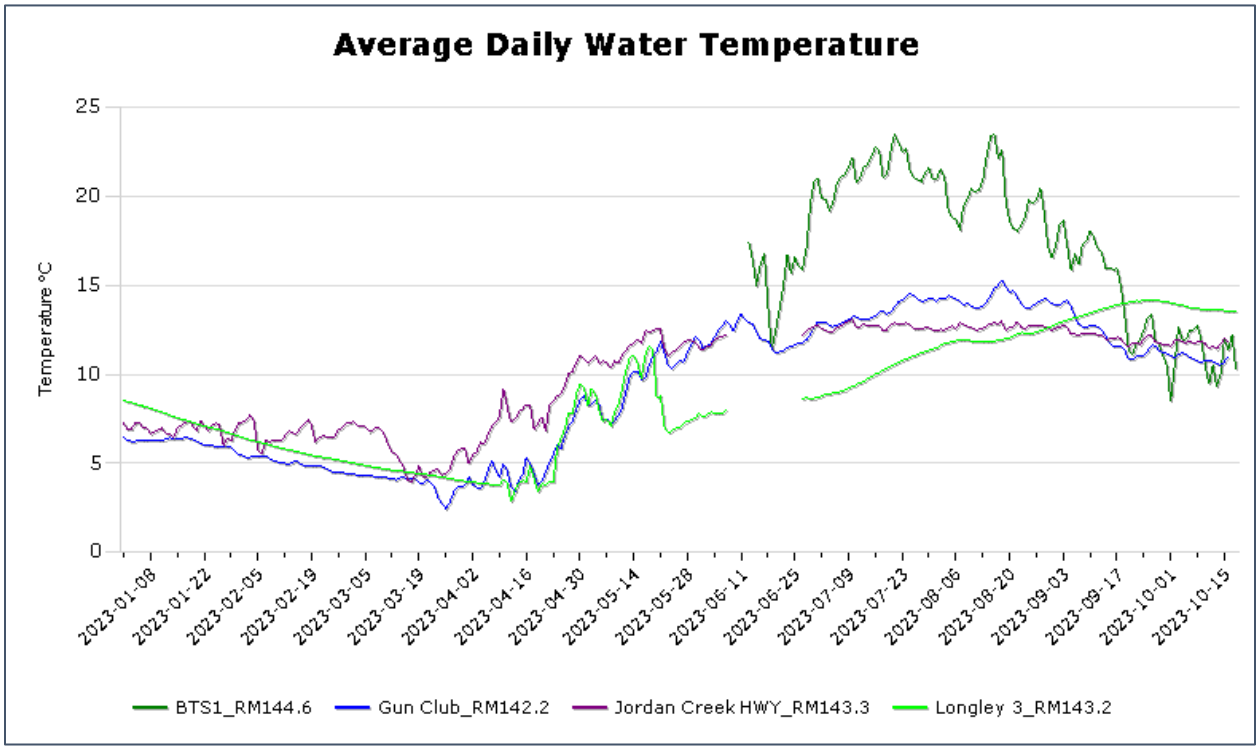


Figure 46. MAIN CHANNEL AND OFF-CHANNEL AVERAGE DAILY TEMPERATURE COMPARISON, JAN-OCT, 2023

A large, privately owned mountain meadow complex in the headwater reaches of the Grande Ronde River was bracketed with temperature probes above (GR5) and below (GR4) (Figure 43). This cattle-grazed meadow system, mostly void of riparian vegetation and shade, is a key chinook spawning reach for salmon returning to the upper subbasin. Temperature loggers at these two locations on US Forest Service Property were deployed in June 2023 and recorded summer-fall stream temperatures (Figure 48 & Figure 49).

Data recorded below the ranch property show not only higher temperatures but also more pronounced diurnal fluctuations between daytime high and nighttime low temperatures compared to the logger location upstream of the property. Average daily maximum temperatures exceed the lethal limit for salmonids for the entire month of July, as measured downstream of the ranch, whereas temperatures recorded above the ranch remained within the ideal salmonid rearing and spawning window during the same period.

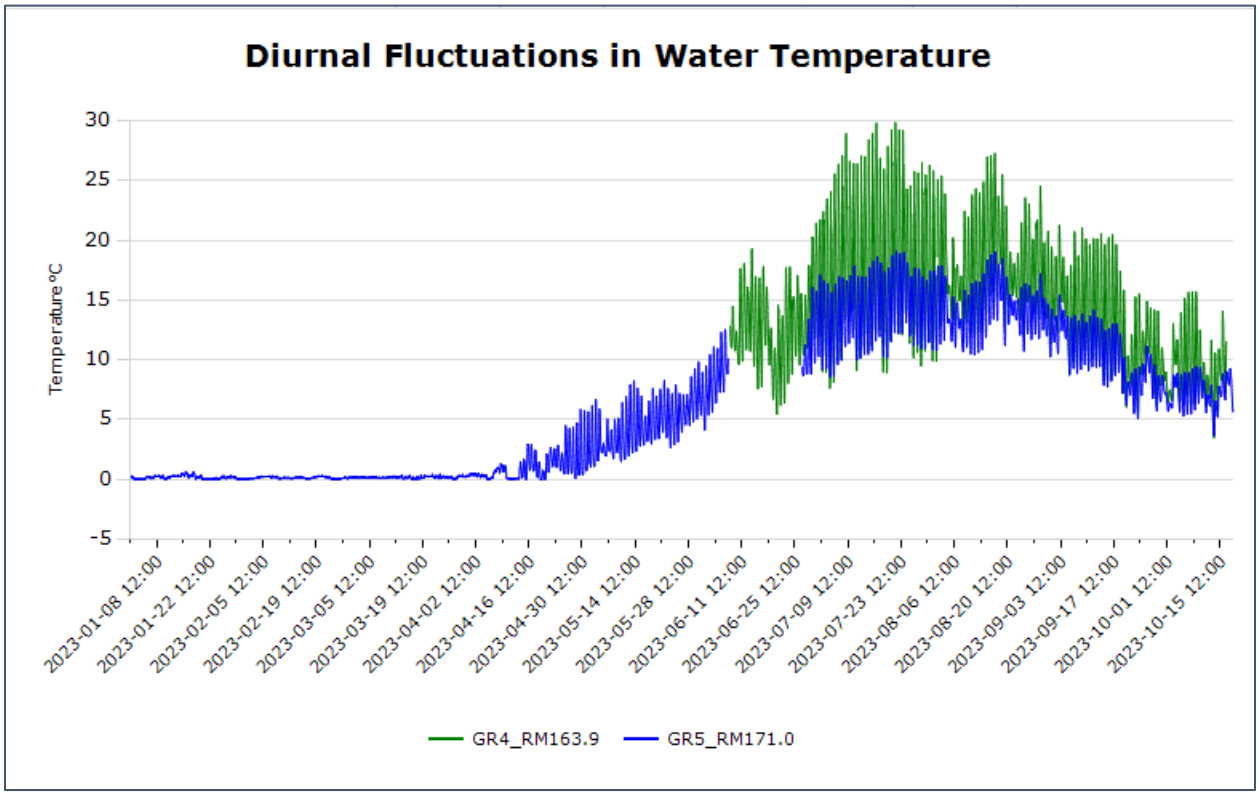


Figure 47. HOURLY TEMPERATURE COMPARING SITES ABOVE AND BELOW VEY MEADOWS RANCH, JAN-OCT 2023

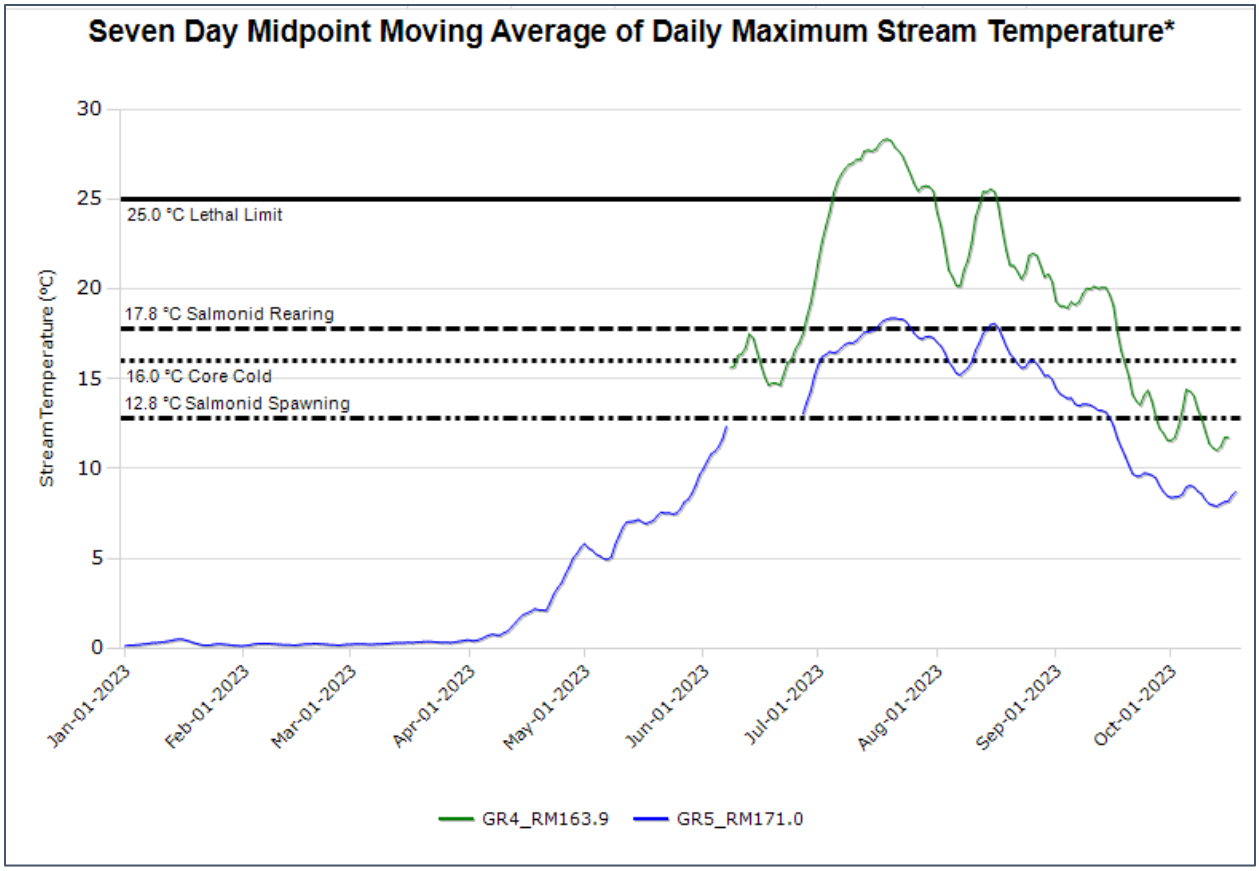


Figure 48. AVERAGE DAILY TEMPERATURE COMPARING SITES ABOVE AND BELOW VEY MEADOWS RANCH, JAN-OCT 2023

Meadow Creek and Dark Canyon

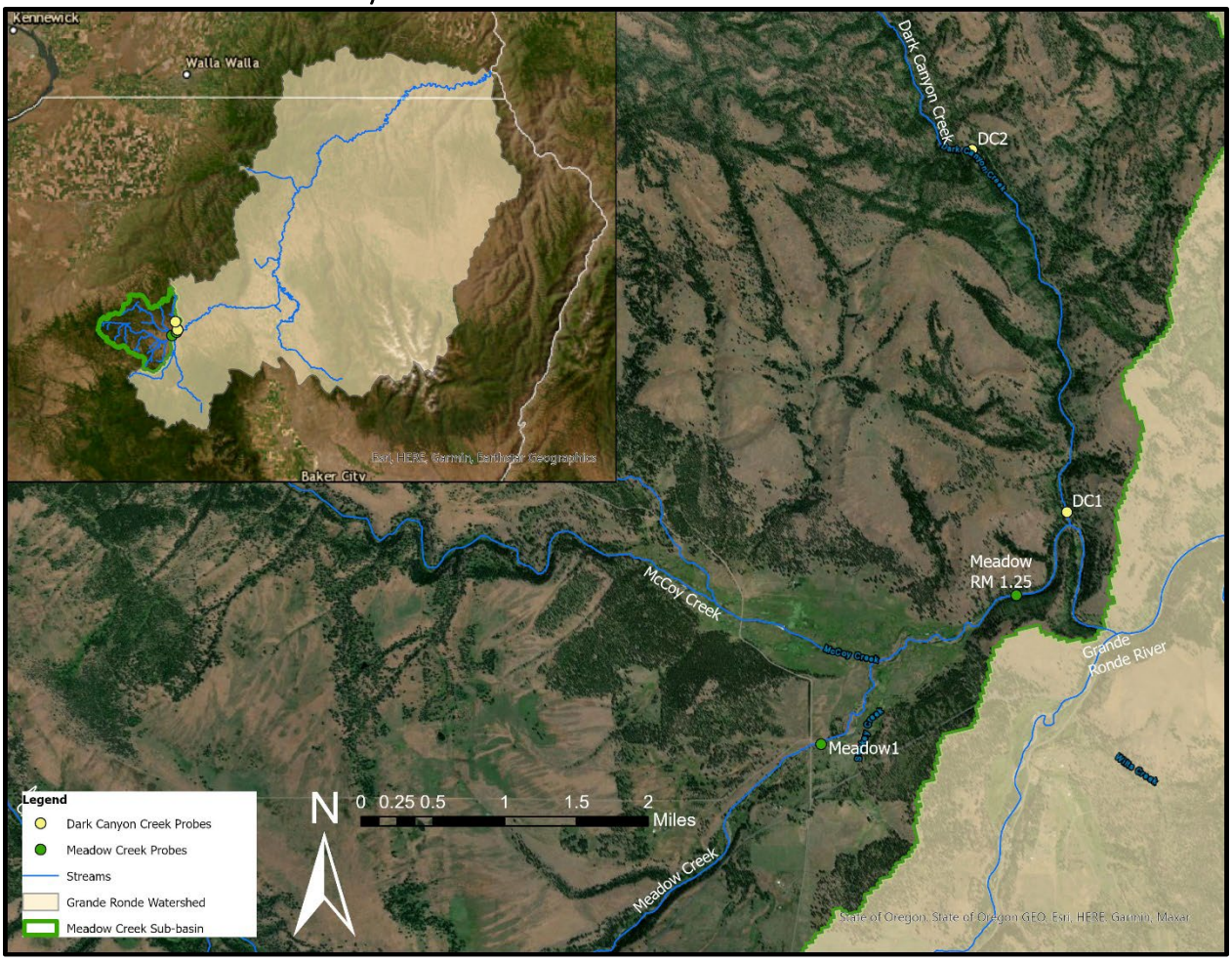


Figure 49. MAP OF TEMPERATURE PROBE LOCATIONS ON MEADOW CREEK AND DARK CANYON CREEK

The Dark Canyon Creek project area, located in the Meadow Creek watershed, is bracketed by an upstream temperature probe on the USFS boundary at RM 1.9 and a downstream probe 0.06 mi. upstream from the confluence with Meadow Creek. In 2023 both Dark Canyon probes exhibited corrupted files for early season downloads but recorded productive temperatures for salmonids in August-September. This indicates that Dark Canyon likely plays an important role as a thermal refuge for salmonids during summer months when mainstem Meadow Creek temperatures exceed lethal limits.

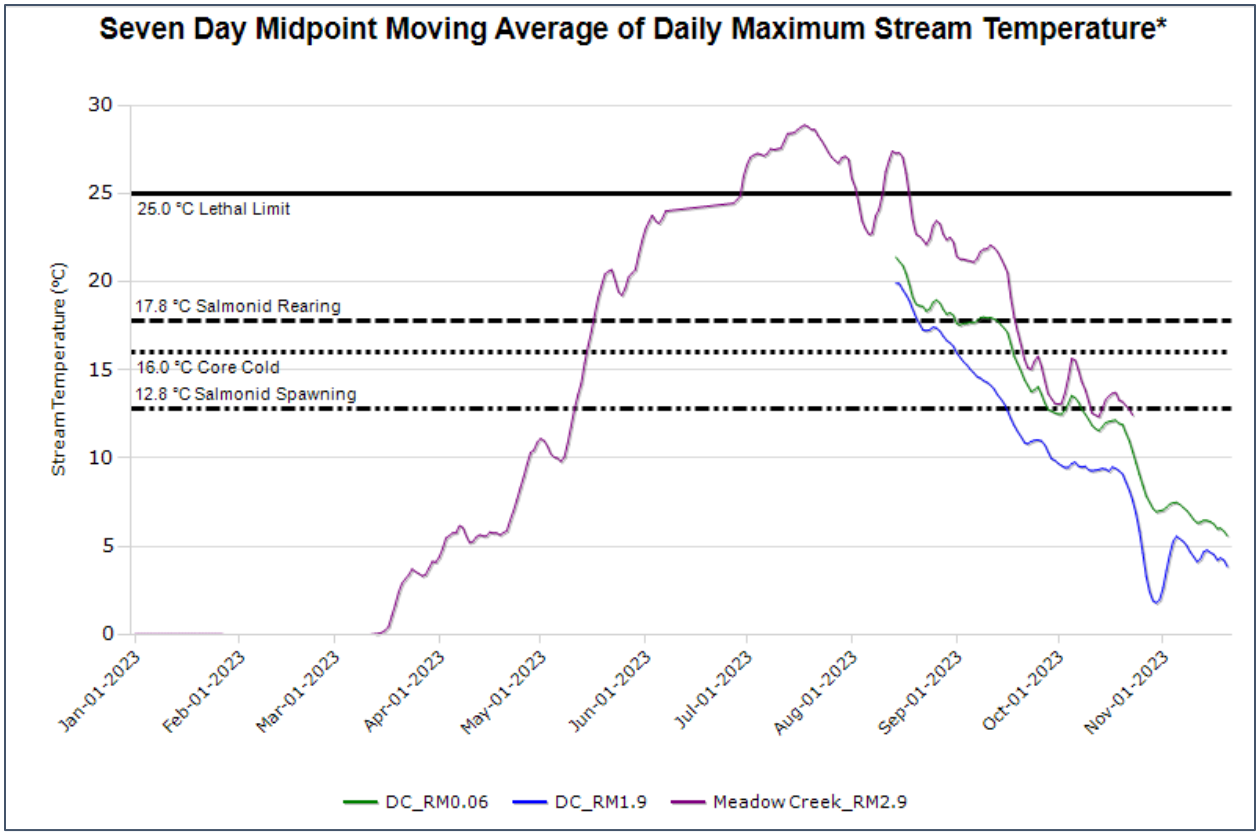


Figure 50. 7DADM TEMPERATURE AT DARK CANYON CREEK AND NEARBY MEADOW CREEK, JAN-NOV, 2023

Rock Creek

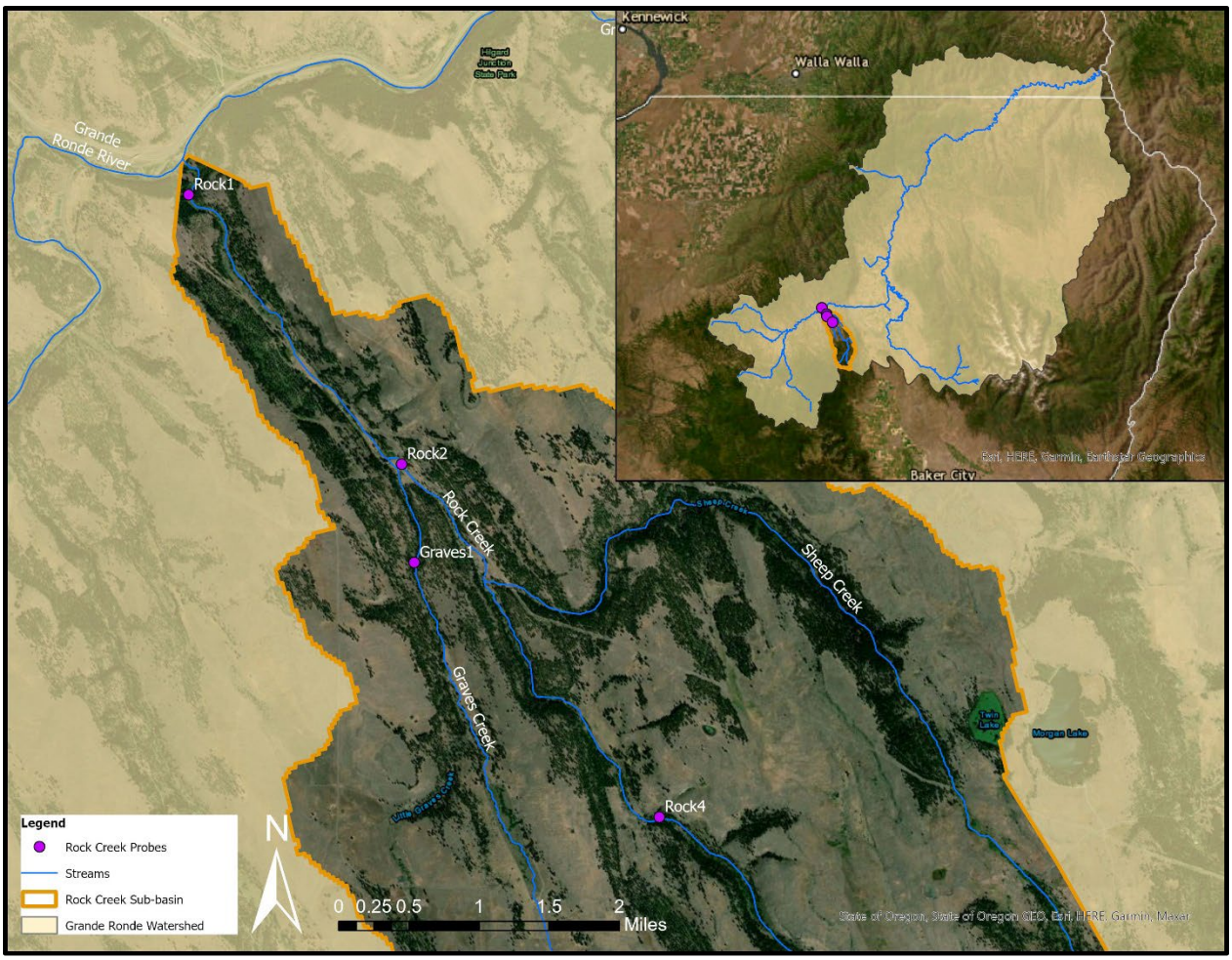


Figure 51. MAP OF TEMPERATURE PROBE LOCATIONS ON THE ROCK CREEK PROJECT

In Figure 53 below, 2023 surface water temperatures at the most downstream Rock Creek probe (blue) are plotted against the probe located on its tributary, Graves Creek (green). Due to corrupted download files Graves Creek data is only available beginning in August, and the Rock Creek logger experienced malfunction in July. An annual pattern has been observed in previous years' data where in early summer Graves Creek pools become disconnected as surface flows dry up. The pool where Graves Creek probe is located, when disconnected, is maintained by cool groundwater seepage. The probe location on mainstem Rock Creek remains connected to warmer surface flows for the duration of the summer. Further monitoring is needed to measure dissolved oxygen levels in pools that remain disconnected for prolonged periods, and whether those DO levels are sufficient for salmonids using the pools for summer thermal refuge.

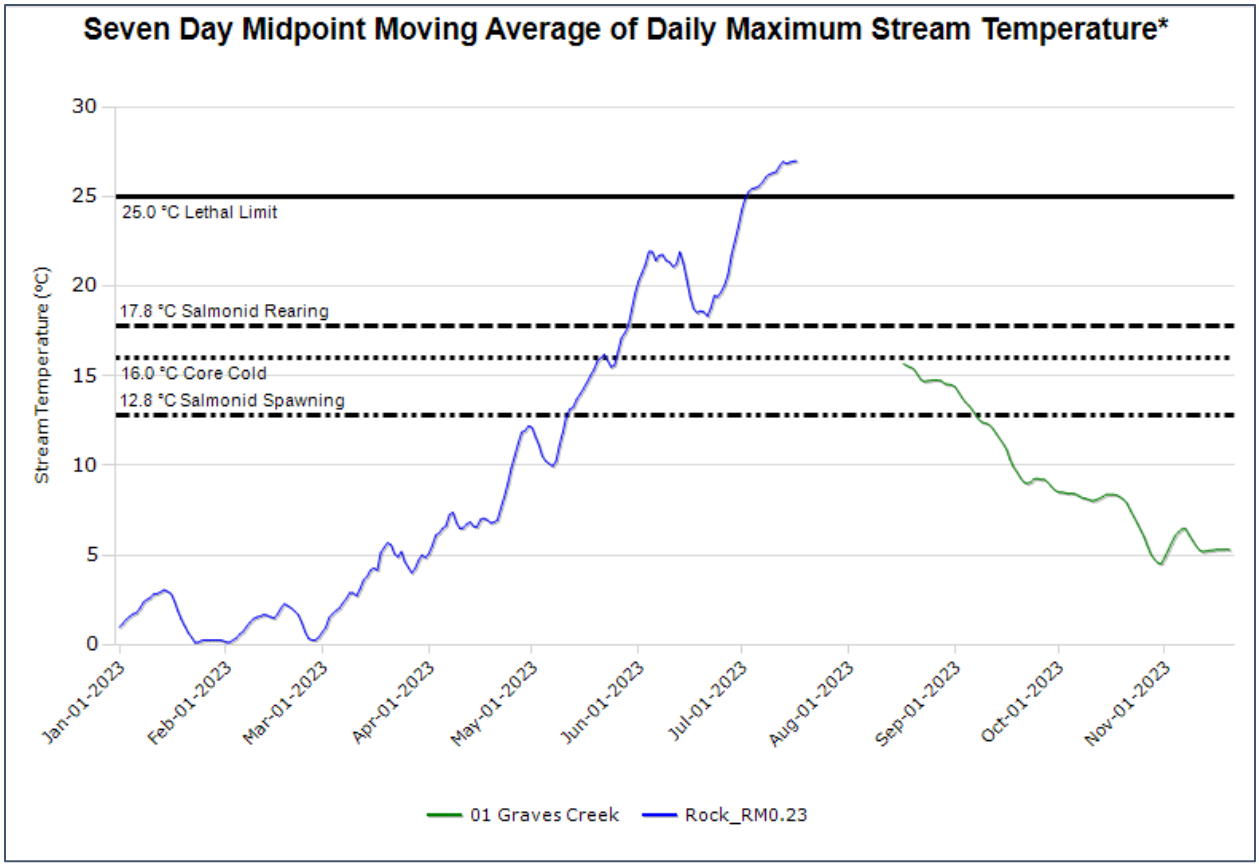


Figure 52. 7DADM TEMPERATURE AT ROCK CREEK AND GRAVES CREEK TRIBUTARY, JAN-NOV 2023

Catherine Creek

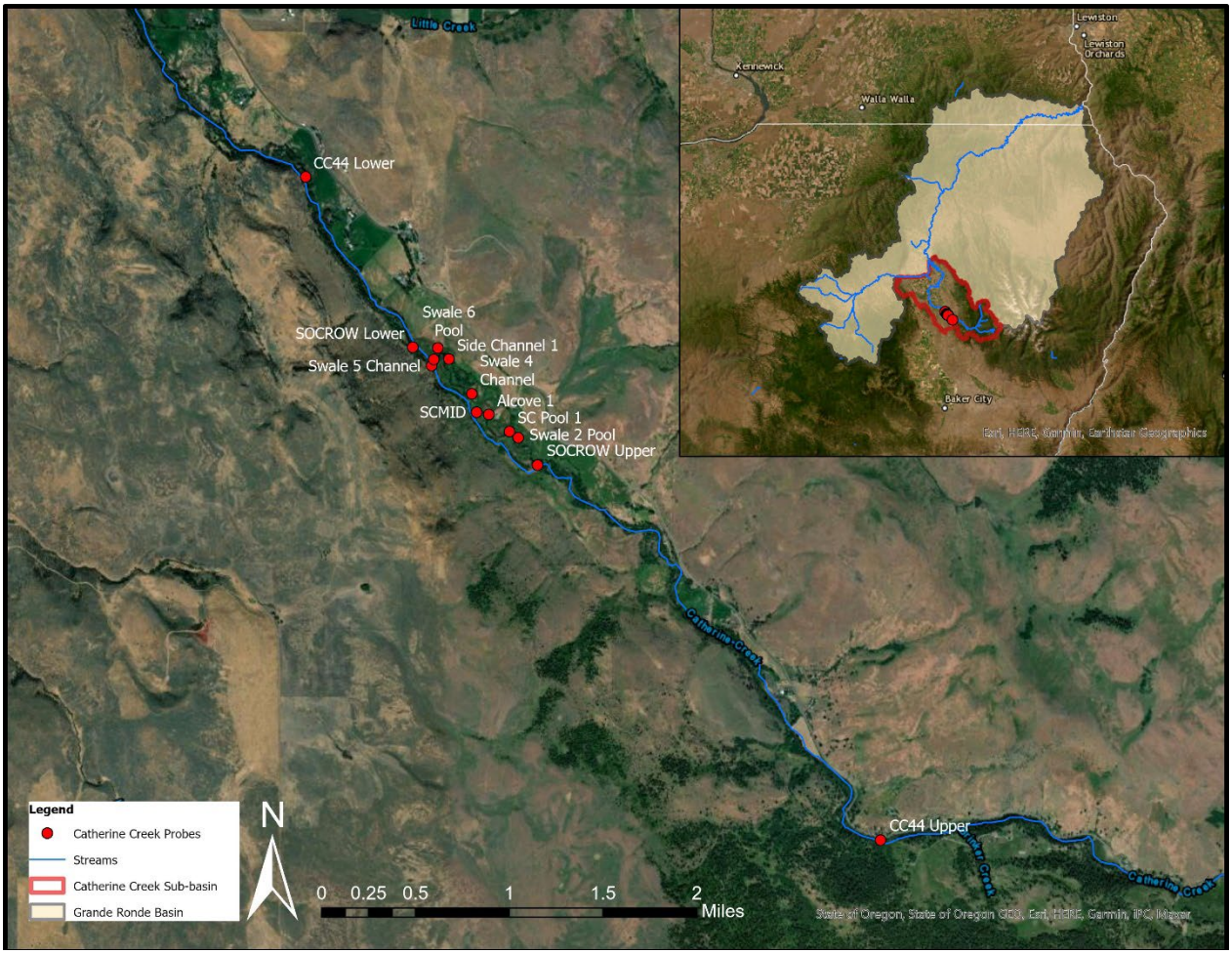


Figure 53. MAP OF TEMPERATURE PROBE LOCATIONS BRACKETING CC44 FISH HABITAT ENHANCEMENT COMPLEX ON CATHERINE CREEK

Stream temperature monitoring efforts on Catherine Creek consist of 14 temperature probes at mainstem and off-channel locations between RM 41.5 and RM 45.4 that bracket the CC44 Fish Habitat Enhancement complex. One probe was deployed at the most upstream extent of the CC44 reach (CC44Upper) to monitor water temperature as it enters the project area, and another probe was deployed at the downstream extent of the project reach (CC44Lower). Comparing records from 2012-2023 for these two locations show that temperatures do not greatly differ between the upstream and downstream sites. CC44Upper, however, consistently records slightly cooler stream temperatures compared to CC44Lower that brackets the most downstream project extent. There are approximately four miles between the upper and lower-most probes, which might explain the temperature difference; it's possible that stream temperatures increase slightly moving downstream into lower elevations and further from its cold snowpack source. Also, there are channelized stretches of Catherine Creek upstream of the lowest probe with poor riparian conditions that allow larger solar inputs that may contribute to the warmer temperature records.

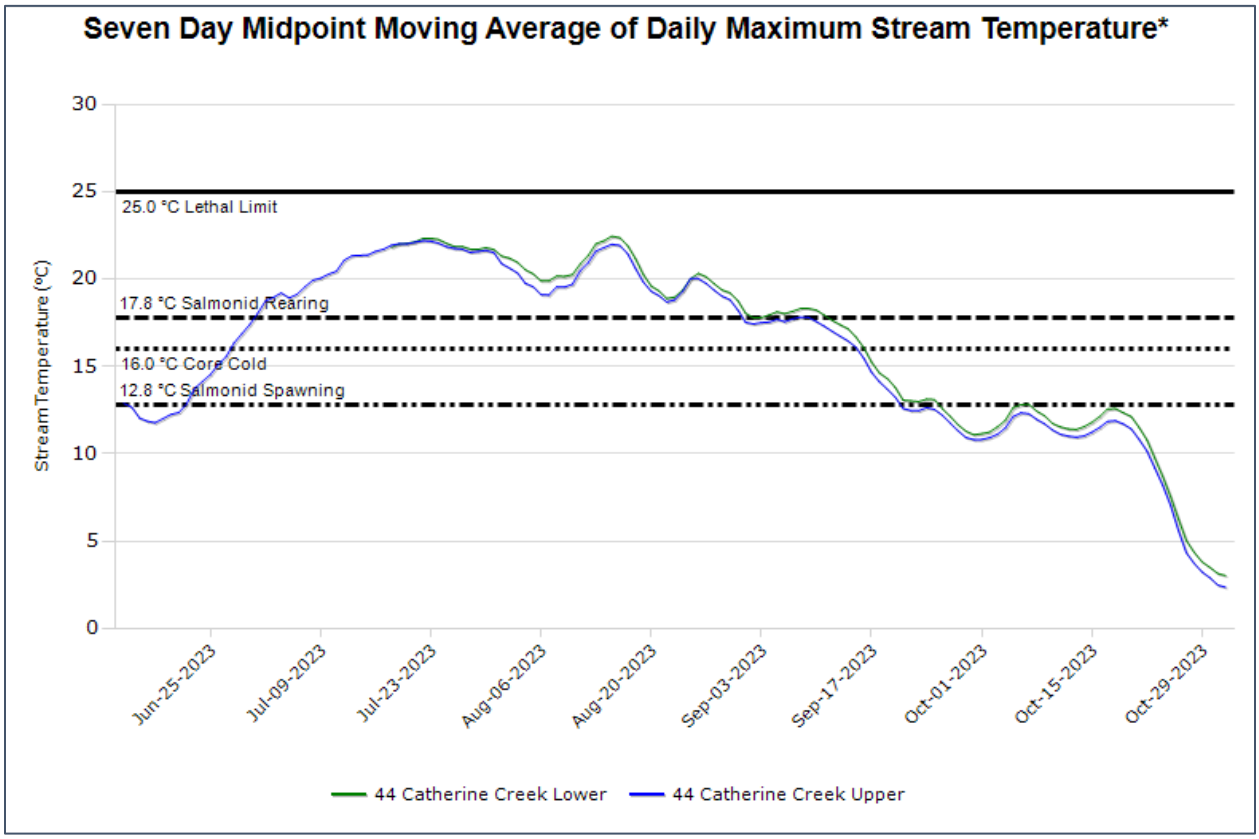


Figure 54. 7DADM TEMPERATURE BRACKETING CATHERINE CREEK RM 44 PROJECT REACH, JUN-OCT, 2023

The majority of stream temperature monitoring on Catherine Creek occurs within the Southern Cross project area where in 2023 there were 12 probes deployed. Of these, five were deployed into the main channel, one in a side channel, and the remaining six in off-channel floodplain swales and pools, and a backwater alcove. In Figure 56 below one main channel probe (blue) is plotted against two probes located in off-channel habitats (purple and green) during the 2023 deployment period.

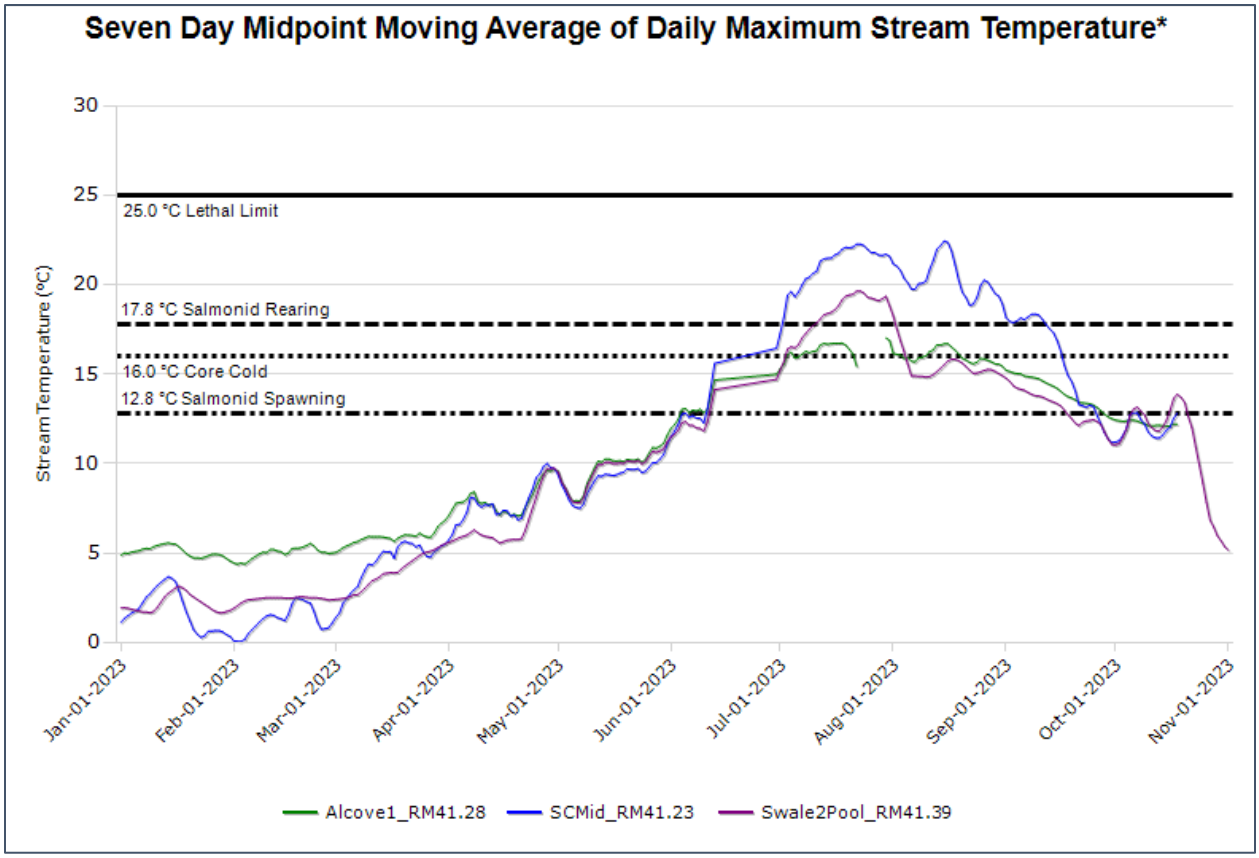


Figure 55. MAIN CHANNEL AND OFF-CHANNEL 7DADM TEMPERATURE COMPARISON AT CATHERINE CREEK, JAN-NOV 2023

In 2023 main channel probe SCMid and off-channel Alcove1 and Swale2Pool probes were left deployed over winter (Figure 56). In addition to recording significantly cooler summertime temperatures, the two off-channel locations show that when overwinter temperatures are lowest and the main channel freezes at 0°C that groundwater remains above 0°C, preventing anchor ice from forming and expanding open water habitats for fish and their macroinvertebrate food sources. Hyporheic exchange of groundwater with surface water at these off-channel locations increase areas of thermal refuge in the summer with the input of cooler water, and during extreme cold in the winter provides relatively warm water to maintain open water habitats.

No Catherine Creek probes recorded temperatures at or above lethal limits, and all probes spent between 34-88% of their deployment period in water within optimal salmonid core-cold temperature range. Off-channel probe locations recorded cooler maximum seasonal temperatures and spent higher percentages of their deployment period in core-cold temperature range compared to their main channel counterparts, as was similarly observed throughout the greater Grande Ronde Subbasin. And like the Grande Ronde, plotting the mainstem probes against off-channel probes demonstrates the importance of access to channel margin habitats because of the thermal refugia they provide for salmonids.