



Case Study by CART



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Bird Track Springs Habitat Restoration on the Upper
Grande Ronde River

A Case Study on Restoration
August 22, 2023



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Introduction

A two-mile reach of the Upper Grande Ronde River in eastern Oregon, known as Bird Track Springs (BTS), has been dramatically altered from its historic condition by decades of human activity. The historically complex, well-connected, multi-threaded river channel in this unconfined valley has been modified into a simplified, single-thread river. The altered river and floodplain lack diversity, large pools, and the water quality necessary to support critical life stages for native fish, including salmon and steelhead.

Three species of salmonids are found in the Upper Grande Ronde: the Snake River spring/summer Chinook (*Oncorhynchus tshawytscha* pop. 8), Snake River Basin Steelhead (*Oncorhynchus mykiss* pop. 13), and Bull Trout (*Salvelinus confluentus*). All three are listed as Threatened under the Endangered Species Act due to multiple anthropogenic factors at varying life stages including habitat degradation in freshwater tributaries like the Upper Grande Ronde.

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) hold treaty-reserved and traditional rights for hunting and fishing throughout the Grande Ronde Basin. Salmonids are part of their traditional 'First Foods' and are one of the five First Food resources (Water, Salmon, Deer, Cous, and Huckleberry) upon which the CTUIR river management program, River Vision, is based ([Jones, K. L. et al. 2008](#)). The decline in fish populations has had a direct impact on the traditional foods, culture, and lifestyle of the CTUIR.

In 2018-2019, the CTUIR, along with the Bureau of Reclamation (Reclamation) and the U.S. Forest Service (USFS), implemented a large-scale river restoration project in the BTS area. This multi-year project was designed to create a complex, multi-threaded river corridor that is well connected to its floodplain and provides both deep pools and slower flow velocities needed as refuge for salmonids. Rather than addressing only river conditions, the BTS project encompasses the entire valley ecosystem, from floodplain and riparian forest to riverbed and channels.



Key Issues Addressed

Throughout the Northwest, decades of hydroelectric projects in the Snake and Columbia River Basins have caused migrating native salmonid populations to decrease from an estimated 16 million in the late 19th century to less than two million in recent years ([NW Power and Conservation Council](#)). Under Congressional oversight beginning in the 1980s, as well as in

response to the listing of several of these species on the Endangered Species list, federal and regional partners including the Northwest Power Council, Reclamation, and the U.S. Fish and Wildlife Service have implemented conservation measures over many years to support salmonid populations by increasing fish passage and improving habitat around dams. Regional conservation priorities have shifted in recent years to include headwaters such as the Upper Grande Ronde, where degraded conditions affect all stages of the species' life cycles.

In the Upper Grande Ronde, trapping of beaver, logging and splash damming, grazing, railroad and road development, as well as construction of dikes and levees have resulted in a channelized river disconnected from its historic floodplain. Juvenile salmonids spend their first year in tributaries where they grow and build up energy reserves needed for the completion of their out-migration to the Pacific Ocean. In a complex, well-connected river system, habitat includes pools with cover, side channels, alcoves, in-stream wood, and shallow floodplains. These habitats are dynamic and naturally created, in part, by deposits of woody material from riparian forests during high spring flows and beaver dams that slow flows and disperse water over the floodplain. Complex habitats have been declining in the Upper Grande Ronde watershed since the widespread removal of beaver in the 1800s. Since the 1940s, pool numbers within the watershed have decreased by 73%.

Extreme cold and hot temperatures create additional conditions of stress in the simplified single-thread channel. In the winter, wide, shallow depths easily develop ice that limits available habitat and super cools the water, slowing metabolism and growth of juvenile salmonids. In the summer, wide, shallow depths heat the water rapidly, creating potentially lethal conditions for salmonids.

Previous Upper Grande Ronde restoration projects that introduced natural infrastructure such as woody debris and other hydraulic structures (rock weirs) into the river did not produce strong results because the project scales were too small. The structures provided only localized temporary improvements and, as a result, the river remained channelized and disconnected from the floodplain.

Project Goals

- Enhance the BTS river system's complexity by reconnecting historic floodplain and side channel networks and increasing instream and floodplain structural diversity using natural infrastructure such as large wood complex additions to develop a diversity of riffle, run, pool, glide, and alcove habitat.
- Improve quality and quantity of suitable habitat for target salmonid species at all life stages by:

- Increasing number and quality of 'large' pools in the main and side channels
- Decreasing the potential for ice formation, creating conditions for more open water refuge in winter
- Creating and enhancing channel margin slow water areas in the main and side channels
- Create self-sustaining in-channel water movement that supports restoration of the river into a stable, multi-thread pattern with relatively narrow, deep channels between vegetated islands.
- Reinvigorate self-sustaining, diverse native plant communities along channel margins and across the floodplain, including patches associated with beaver colony activity.

Image Caption: *Lower project area showing large pool habitat and floodplain wood structures. Courtesy of Cardno.*



Project Highlights

BEYOND SALMONIDS

The habitat improvement benefitted a variety of freshwater species, including resident trout, Pacific lamprey, whitefish, and freshwater mussels, all important to the CTUIR.

- **Right Place for Restoration:** Since 2018, projects in the Grande Ronde watershed have been selected using the Restoration Atlas, a central database that synthesizes maps and biological surveys related to limiting factors, life history requirements, biologically significant reaches, and habitat restoration opportunities. This database helps project partners prioritize restoration areas. Bird Track Springs was identified for its geomorphic potential (ability for Earth surface processes, such as movement of air, water, and ice, to shape landscapes). On this stretch of the usually canyon-confined Upper Grande Ronde, the river flows through a wide unconfined valley. An unaltered river in unconfined reaches tends to be lower sloped with more sediment deposition and can offer more complex habitat options. Therefore, restoring the BTS stretch to a more natural state consistent with pre-20th century conditions provides a nature-based solution to increase refuge for salmonids at several life stages.
- **Developing the Design:** The design team consisted of biologists, a geomorphologist, and hydraulic engineers. Project staff used field surveys, geomorphic assessments, LIDAR imaging, and local knowledge of habitat types that best support and sustain salmonids to determine what landscape-scale alterations to implement in the BTS reach. Reclamation engineers used Auto-CAD CIVIL 3-D and hydraulic modeling to develop a proposed conditions surface model that would achieve floodplain inundation, channel flow partitioning, and improved hydraulic habitat conditions. They also used those models to analyze sediment transport conditions and risks to

infrastructure, property, and recreation. When the design was in place, the team staked out proposed alignments in the field to adjust for unique features and to protect existing features on the landscape.

- **On-the-Ground Construction:** The project team implemented the restoration design in 2018 and 2019. The contractor re-shaped the river's alignment into an island-braided channel form by constructing approximately 5,000 feet of new main channels and 10,000 feet of new side channels. The construction also re-connected approximately 150 acres of floodplain to the river. The construction contractor built new river channels to include riffle-pool sequences and hundreds of wood structures all to increase channel complexity, improve rearing habitat for juvenile fish, and increase bank stability. There was extensive revegetation work after the construction was completed, including the planting of over 15,000 native trees and shrubs and overseeding of 24 acres of native grasses.

Image Caption: *Mid-construction large-pool wood structures and roughened edge. Courtesy of the Confederated Tribes of the Umatilla Indian Reservation.*



Lessons Learned

Scale matters in habitat restoration projects in the Pacific Northwest because salmonid recovery projects need immediate results to make a difference in their population declines. Previous, smaller-scale restoration efforts using natural infrastructure such as woody debris at BTS produced localized temporary improvements, but largely failed to address key

limiting factors for Upper Grande Ronde salmonids. This large-scale effort has the potential to not only provide temporary habitat uplift but to provide conditions that allow the basin hydrology, geology, and biology to continue to sustain habitat and transform this reach into the functioning river-wetland corridor that was historically present.

The multi-step, multi-modal design process for the BTS project worked well. The CAD surface depicted in the hydraulic model of the channels and floodplain area was accurate, and the new channels have stayed intact even with large flood events in 2020 and 2022. Monitoring efforts suggest the water is cooler in deep pools and it is better spread throughout the floodplain during spring floods. Partners see the BTS restoration as a demonstration project of how large-scale river restoration can be successfully implemented through cooperative efforts.

Estimating quantities in large-scale river restoration projects is difficult. Balancing earthwork cut/fill volumes with discrepancies in existing surfaces, finished grading, and compaction effects resulted in a lack of material to fill/narrow the existing channel. Designers had to change the project grading in several areas to account for lack of fill material. Additionally, source woody material is irregular, so it can be hard to meet design parameters in practice. At BTS, most of the wood purchased was larger than the design called for, resulting in an excess quantity of material. Other examples of natural infrastructure, such as modular, low-tech wood structures like beaver dam analogs and bank

protection features, would allow for more flexibility in adjusting to conditions on the ground.

Flood events uprooted plantings. Two 50-year flood events in the spring and summer of 2020 washed away a lot of the newly installed vegetation. Some of this could have been mitigated with different depths of channel construction, but some of it is an expected part of the floodplain restoration process. Planting and revegetation efforts could have likely been more successful if performed a season or two after construction. Creating hydraulic conditions that maximize water surface elevation during baseflow can also improve survival in drought conditions.

Image Caption: Nearby Upper Grande Ronde River beaver dam and lodge. Beaver have begun recolonizing the project site. Courtesy of the Confederated Tribes of the Umatilla Indian Reservation.



Next Steps

- Apply lessons learned from the BTS project to future projects in the Upper Grande Ronde including focusing design on greater connectivity of floodplain and anastomosing channels (creating semi-permanent in-channel islands) during all seasons, and reducing wood deposits along stream banks to allow for natural geomorphic process.

- Continue to monitor and evaluate project outcomes including physical habitat condition, floodplain connectivity and morphology, vegetative response, baseflow and thermal changes, beaver recolonization, and fish surveys through the CTUIR Department of Natural Resources.

Image Caption: *Bird Track Springs site midway through construction. Courtesy of Grande Ronde Model Watershed.*



Resources

August 2023 Case Study Handout

Collaborators

- [Bureau of Reclamation](#)
- [Confederated Tribes of the Umatilla Indian Reservation](#)
- [US Forest Service, Wallowa Whitman](#), La Grande Ranger District
- [Grande Ronde Model Watershed](#)
- Jordan Creek Ranch

Funding Partners

- [Grande Ronde Model Watershed](#)
- [Bonneville Power Administration](#)
- [Oregon Watershed Enhancement Board](#)

Resources

- [Bird Track Springs Fish Habitat Enhancement Project FY 2019 Final Report](#)
- [Basis of Design Report: Final \(100%\): Bird Track Springs Habitat Improvement Project](#)
- [Grande Ronde Model Watershed. 2017. Bird Track Springs Fish Habitat Restoration](#)

- Jones, K. L., G. C. Poole, E. J. Quaempts, S. O'Daniel, and T. Beechie. 2008a. [Umatilla River Vision](#). Confederated Tribes of the Umatilla Indian Reservation, Mission, Oregon, USA.
- Quaempts, E. J., K. L. Jones, S. J. O'Daniel, T. J. Beechie, and G. C. Poole. 2018. [Aligning environmental management with ecosystem resilience: a First Foods example from the Confederated Tribes of the Umatilla Indian Reservation, Oregon, USA](#). *Ecology and Society* 23(2):29.
- [CTUIR Presentation: First Foods & Cultural Context of Elk](#)

Photo Gallery

- [Photo Album and Credits](#)

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Image Caption: *Top dressing pool bend structure with additional large wood. Courtesy of the Confederated Tribes of the Umatilla Indian Reservation.*

More Information on CART