Working with Beaver to Restore Salmon Habitat

ARTICLE · JANUARY 2013

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Working with **Beaver to Restore Salmon Habitat**

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Study Overview

A threatened population of steelhead in Bridge Creek, Oregon is limited by degraded stream conditions (Pollock et al. 2012). By reconnecting portions of this **incised** channel with its former **floodplain**, we hoped to improve habitat conditions for steelhead.

Restoring connections between a **channelized** stream and its floodplain can increase **habitat complexity** in both the stream and its associated **riparian** zone (Pollock et al. 2007). However, conventional stream restoration techniques can be disruptive and quite costly. Large volumes of fill must be moved and graded with heavy equipment, exposing large areas of bare ground that require extensive re-vegetation effort (Pollock et al. 2012).

In 2009, we began a study to restore channelized streams by encouraging a local beaver population to build longer-lived dams (Pollock et al. 2012). Bridge Creek is a 710-km² watershed draining northwesterly into the lower John Day River. At present, its beaver population is small, with growth impeded by short-lived dams.
beaver colonies would gradually aggrade the incised reaches of Bridge Creek enough to raise the alluvial water table and reconnect the stream to its former floodplain. Therefore, encouraging long–lived beaver dams would be a cost–effective method to produce measurable improvement in riparian and stream habitats, and subsequently in abundance of native steelhead.

Our objective is to help beaver build dams that will last long enough to lead to the establishment of stable colonies. If this can be accomplished, the beaver dams should promote enough aggradation to reverse channel incision. Such a reversal would yield a number of ecosystem improvements for steelhead and other species.

Methods

Natural beaver dams are expected to be transient features on the landscape, expanding and contracting, coming and going as ponds fill with sediment and dams become less functional for beaver.

Even abandoned beaver dams reduce erosion and help retain sediment, increasing the diversity and complexity of stream habitats.

Our design was to saturate four distinct reaches of Bridge Creek with beaver dam support structures. This would allow the existing population to pick and choose from several structures in different locations, any of which could be built upon and maintained as their own dams.

We first identified four pairs of geomorphically similar reaches within the Bridge Creek drainage. Then, for each pair of reaches, we assigned one as a control to be left unrestored and the second as a treatment reach for restoration. We identified two
additional reaches as positive controls within the watershed to monitor steelhead populations.

Finally, we selected Murderers Creek, an additional tributary to the John Day River, as a control watershed to compare steelhead populations outside of the study drainage area.

By monitoring these streams, we are testing the hypothesis that longer-lived dams will allow the Bridge Creek beaver population to establish stable, multi-dam complexes to support a healthy and persistent colony. Aggradation will then take place in slack-water ponds created by these dams, promoting reconnection with the floodplain.

Our simple, low-cost treatment was to install wooden fence posts at 0.5–1 m intervals across the channel (which is now terraced) and its potential floodplain surface. Fence posts were untreated Lodgepole pine and were 2 m long by 7–10 cm in diameter.

Fence posts were stripped of bark, and one end was sharpened using a chainsaw. Each post was set with a hydraulic post driver to a height equivalent to the crest elevation of an active beaver dam. At depths of 1 m or less, the post tops were set close to

Post line provides a site where beaver can build a stable dam but creates little or no geomorphic change if not used by beaver.
the level of adjacent terraces. At greater depths, posts were set within 1 m of the channel bed and were cut down if necessary.

Five variant installations were used:

1. Post line
2. Post line with wicker weave
3. Starter dam constructed of a post line with wicker weave and sealed with clay
4. Reinforcement of an existing active dam with a post line
5. Reinforcement of an abandoned dam using a post line with wicker weave

Active beaver dams were stabilized with post lines, as were any abandoned dams with significant structure remaining. Post lines with no other reinforcement were placed in sites where conditions were suitable for a dam, but there was minimal risk if no aggradation occurred. These structures would have no geomorphic function unless adopted by beaver as building sites.

Therefore, a post line with wicker weave was the most
frequently used type of structure and could be installed with only the criterion that aggradation would increase channel inundation of the adjacent terraces.

Starter dams were used least frequently and were chosen based on these more stringent criteria:

- Incision of the surrounding bank was no more than 1–1.5 m so that additional dams would have a reasonable chance of stability
- Backwater from the pond would provide access to soft banks above the dam that would make suitable lodges
- Adequate food and building supplies were available (wood and riparian vegetation)
- There was no existing beaver colony within 300 m

Research Products and Future Work

Stream incision is a widespread problem that results in substantial degradation of both aquatic and riparian habitats. Mechanical restoration of incised streams is expensive. Although incised streams may return to an aggraded condition naturally over time, this process can take centuries. Our study provides evidence that some incised streams can begin to aggrade more quickly through the use of flow
obstructions that reduce stream power, allowing sediment to accumulate on the streambed and floodplain while also reducing bank erosion. Beaver and vegetation are essential to this accelerated recovery.

Our most successful structure for beaver dam assistance has been the post line with wicker weave. Beaver readily adopt them, but even when not used by beavers in the short-term, these structures invoke the following geomorphic responses:

- Increase in stream sinuosity
- Increase in number of ponds, scour pools, and bar-forced pools
- Flow is directed away from eroding cut banks
- Progression from a single dam to a dam complex is encouraged through provision of stable sites for future dam construction

We are assisting a small, extant beaver population to restore geomorphic, hydrologic, and ecological function in the Bridge Creek drainage. By helping beaver create stable colonies, which will aggrade the incised reaches of Bridge Creek, we are achieving measurable improvement to riparian and stream habitats. These improvements should translate to increased abundance of steelhead.

Initial monitoring of steelhead density and survival has been encouraging. We will continue monitoring to assess the geomorphic and biological changes occurring at individual structures and reaches. Continued monitoring will allow a full assessment of restoration effects from beaver dam support structures and will guide us in modifying our structure design as needed to continue these improvements.

Acknowledgements

Funding for this project was provided by the Bonneville Power Administration (Project 2003-017) and by the National Oceanic and Atmospheric Administration. Bridge Creek is an Intensively Monitored Watershed under the Northwest Fisheries Science Center’s Integrated Status and Effectiveness Monitoring Program. Special
thanks to the Princeville Office staff of the Bureau of Land Management, who helped us to carry out the experiment on lands under jurisdiction of the U.S. Department of the Interior.

References


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