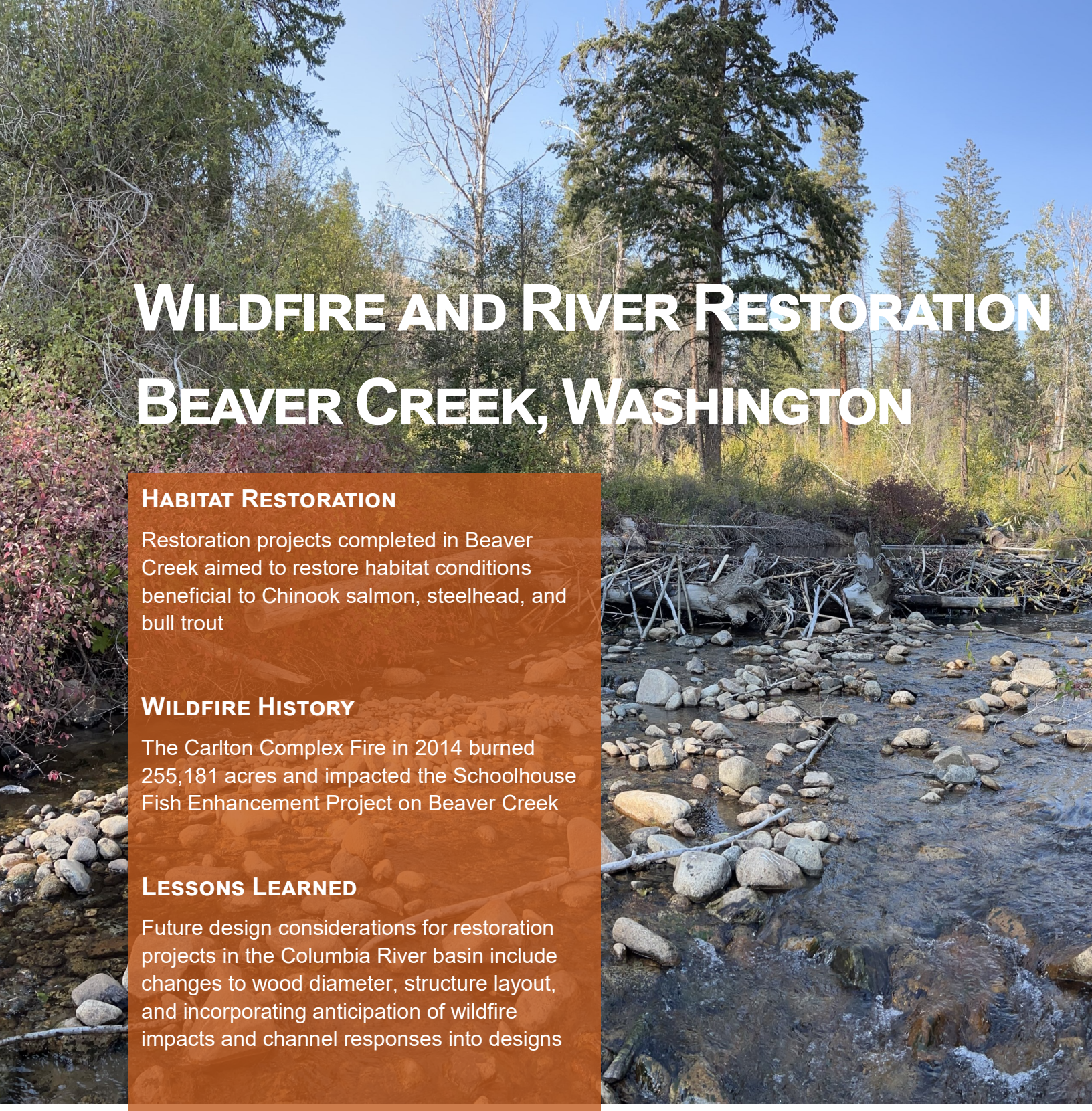


Wildfire and River Restoration
Beaver Creek, Washington

Habitat Restoration

Restoration projects completed in Beaver Creek aimed to restore habitat conditions beneficial to Chinook salmon, steelhead, and bull trout

Wildfire History

The Carlton Complex Fire in 2014 burned 255,181 acres and impacted the Schoolhouse Fish Enhancement Project on Beaver Creek

Lessons Learned

Future design considerations for restoration projects in the Columbia River basin include changes to wood diameter, structure layout, and incorporating anticipation of wildfire impacts and channel responses into designs

Rio ASE

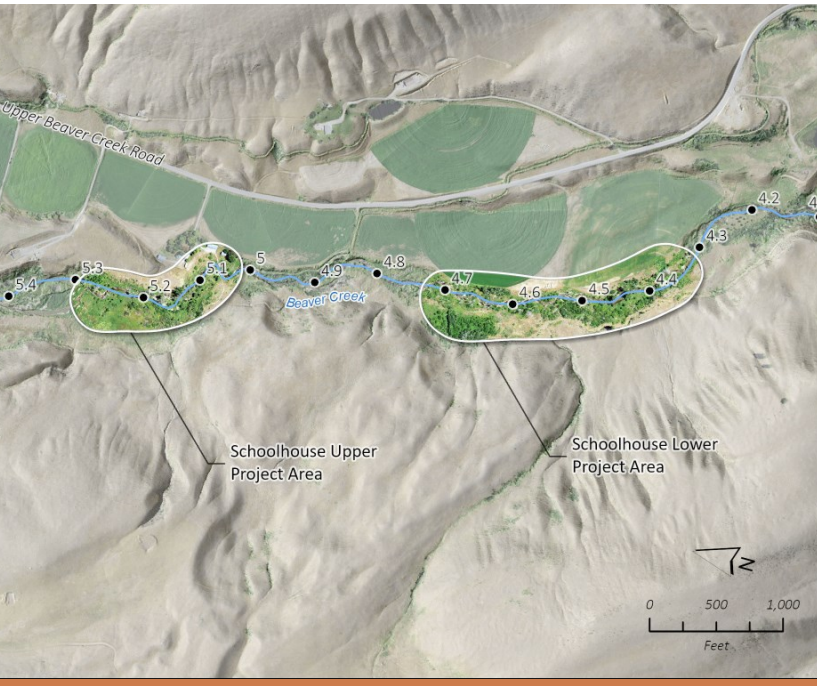
inter·fluve

Fire and Restoration Case Studies

July 2023

Case Study Purpose

Wildfires have impacted river restoration projects throughout the Columbia River Basin. Lessons learned from case studies can inform future restoration designs and identify opportunities to enhance river corridor resilience to wildfire disturbance cascades.



Study Area

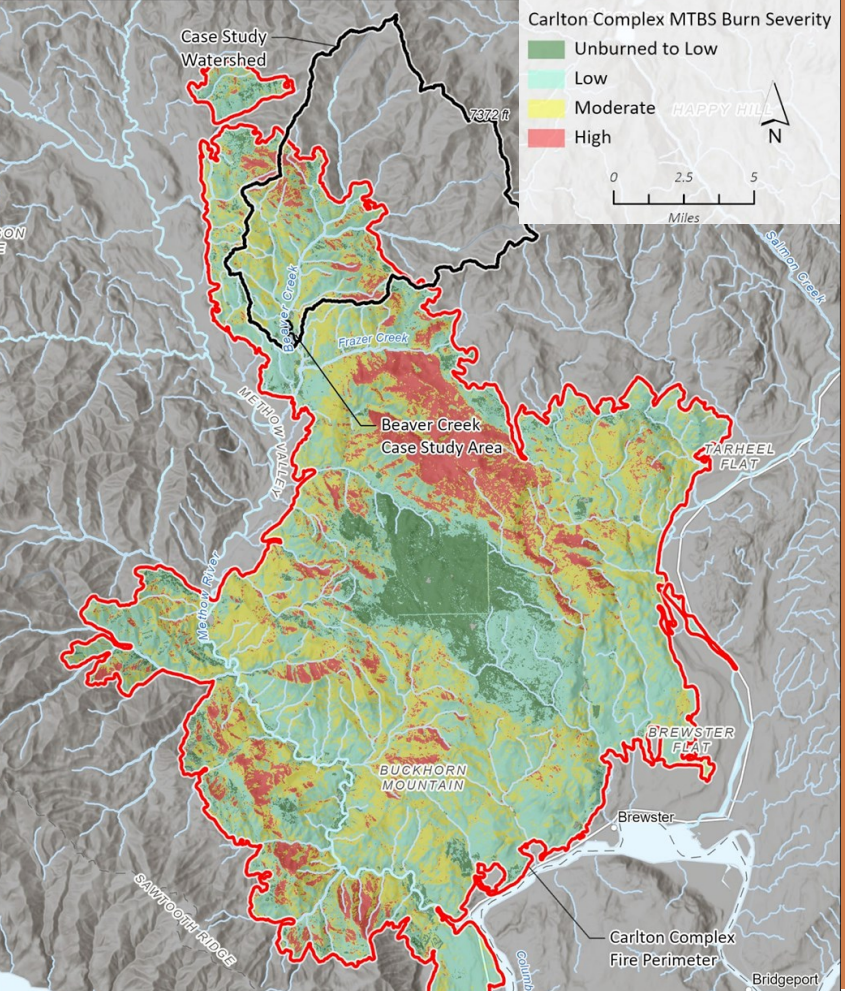
Beaver Creek is a tributary to the Methow River, joining the Methow about 5 miles downstream of the town of Twisp in northern Washington State. Development and resource extraction in the watershed have resulted in degraded conditions for Endangered Species Act-listed and endangered species including Chinook salmon, steelhead, and bull trout. The Case Study is located at the Schoolhouse Fish Enhancement Project, which spans from about river mile 4.3 to 5.3 and has two distinct reaches delineated: the Upper and Lower Project Areas.

Habitat Restoration

The goal of the Schoolhouse Fish Enhancement Project on Beaver Creek was to restore habitat conditions that are beneficial to Endangered Species Act-listed fish species, including Chinook salmon, steelhead, and bull trout. These species spend one or more year in freshwater streams during their life cycles and rely heavily on quality freshwater habitat. Restoration projects throughout Beaver Creek aimed to address ecological concerns and improve habitat conditions to support salmon recovery goals.

The primary habitat enhancement strategy of the Schoolhouse Fish Enhancement Project was to use imported large wood material to create wood structures in the channel. These structures enhanced deep pools and cover habitat for salmonid species throughout the project areas.

In the Lower Project Area, large wood structures were installed to scour new pools, maintain existing pools, and provide cover habitat. In the Upper Project Area, a more varied design could be implemented. A prior channel avulsion was filled and the inlet was plugged with a log structure to restore flow to the more complex abandoned channel. As with the Lower Project Area, log jams were created to scour new pools and maintain existing pools, while also providing crucial cover habitat during all flows. Construction of both project areas was completed in the summer of 2013.



Wildfire History

The Carlton Complex Fire started on July 14, 2014, from lightning strikes and eventually burned 255,181 acres of federal, tribal, state, and private lands. It is the largest single wildfire in recorded history in Washington state.

- 42% of the Beaver Creek Watershed burned (36% upstream of the case study area)
- 12% of the burn in the Beaver Creek Watershed was moderate to high severity
- 40% of riparian areas in Beaver Creek burned
- 16% of the riparian burn was moderate to high severity
- The burn generated an18-fold increase in sediment yield potential
- Based on a 25-year, 1-hour storm, there is a predicted 1.5-fold to 13-fold increase in flow in Beaver Creek

Wildfire Effects on Restoration

The Carlton Complex Fire burned the recently constructed Schoolhouse Fish Enhancement Project, directly burning some of the constructed log jams and 36% of the contributing watershed. While the fire was still active, a large rainstorm in August 2014 caused a 5-year flow event on Beaver Creek at the Schoolhouse site and triggered numerous debris flows into drainages that feed into Beaver Creek and resulted in exceptionally high sediment loading in the project site. Another storm in 2017 resulted in flows that were likely amplified by the burned condition of the watershed. The event caused substantial channel migration and avulsion.

The direct and indirect effects of the Carlton Complex Fire that were observed at the project site include:

- Burned riparian area, including native and planted vegetation (Sites B, C, D, E, K, and H)
- Post-fire sediment loading and channel avulsion (Sites A, H, and I)
- Burned log jam structures (Sites C, D, E, and K)
- Post-fire slash accumulation at all project sites

Wildfire Effects, Continued

Post-fire processes observed in 2014 at restoration sites where the subreach bed and banks were flatter, less efficient at sediment transport, and composed of alluvial deposits were seen again in 2017, indicating that these channel segments may be more vulnerable to channel expansion or avulsion. Restoration sites with channel boundaries partially composed of boulder lag deposits, steeper channel slopes, and excess sediment transport capacity were more stable and resilient to post-fire sediment loads and adjacent riparian burn.

Lessons Learned

Large wood structures were the primary habitat enhancement strategy in the Schoolhouse Fish Habitat Enhancement project, with the goal of creating the conditions needed to scour new pools and deepen existing pools. The outcomes of structures impacted by the Carlton Creek Fire can inform future habitat restoration projects in the Columbia River Basin.

- While large diameter wood in large wood structures was burned, enough remained after the fire to maintain structural integrity, provide bed scour, and collect post-fire slash that restored burned cover habitat
- Structures that projected well into the channel and at low elevation were more resistant to fire
- Structures in steeper reaches with boulder lag deposits were more resilient to elevated post-fire sediment loads and recovered habitat function by collecting slash to replace wood lost to fire
- Dynamic channel responses can be expected in the first few years post-fire; structures in depositional reaches of fire-prone project are more likely to become buried or abandoned
- Areas with broad valley bottoms, low elevation floodplains, and robust riparian communities can be expected to burn less severely and regenerate quickly.

Additional Information

To learn more, read the full report: Rio ASE and Inter-Fluve. 2023. Wildfire and River Restoration: Case Studies from the Methow River Watershed. Prepared for U.S. Bureau of Reclamation, Boise, Idaho.

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