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Clackamas River



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by US Army Engineer Research and Development Center



Clackamas, Oregon, United States

Reclaiming a river corridor for native wildlife. A tributary of the Columbia River and famous for the quality of its fishing, the Clackamas holds an important place in the history, culture, and economy of the Pacific Northwest. However, large-scale beaver removal, logging, mining, overgrazing, and urban development disconnected the river from its floodplain and left it bereft of its historic populations of fish. Following a 40-kilometer assessment of the lower Clackamas River in 2003, a group of partners, including Portland General Electric and Metro, a regional governance agency, began extensive habitat restoration efforts to help threatened and endangered salmonids. By 2016, the work had reconnected over 60 hectares of main-stem floodplain and reconnected and restored 330 meters of tributary habitat. A pair of projects created dynamic and deformable side channel and floodplain habitats for juvenile coho (*Oncorhynchus kisutch*), Chinook (*O. tshawytscha*), and steelhead (*O. mykiss*) salmon by blending a process-based approach with engineered solutions. A third project, the River Island Project, reclaimed an abandoned gravel mine on the Clackamas River while restoring its confluence with

Goose Creek. Each project has included extensive monitoring to evaluate project success and now shows recovering salmon runs and native habitat.

Article cover: Pools and riffles in the restored river. (Photo by Inter-Fluve)

Producing Efficiencies

The two side channel restoration projects designed and created off-channel habitats with structure added from engineered logjams. Jam design followed U.S. Army Corps of Engineers and U.S. Bureau of Reclamation guidelines for watershed restoration practices, ensuring the project was ecologically and economically sustainable. Additionally, by relocating the material locally, the team reduced costs for all three projects from \$30–\$50 per cubic meter to \$8. The savings allowed a four- to six-fold increase in the amount of material the team could use to reshape the channel's habitat.

Using Natural Processes

Dams upstream influence the river's hydrograph and transport of sediment, so relying on natural wood loading or channel processes to restore the river corridor was not possible. Instead, the designers installed more than 3,000 pieces of large wood throughout the project sites to mimic the conditions of the Clackamas River from over 100 years ago. These features emulate the debris and mature vegetative conditions occurring in natural floodplain areas. The designs used vertical logs to ballast large wood structures in place. These vertical elements help anchor other logs while also hydraulically mimicking the roughness of a forested floodplain.





Strategically placed large wood in side channels mimic naturally occurring debris in the floodplain.

(Photo by Inter-Fluve)

Broadening Benefits

The Lower Clackamas River is a recreational playground for the Portland Metro Area. Therefore, in addition to the project's environmental benefits, rafters, boaters, fishermen, hikers, and campers visiting Barton Park and Milo McIver State Park benefit—a recent survey found over 400 watercraft users per hour enter the river. This project is also a valuable contribution to the engineering profession because it shows how a large-scale remediation effort is possible when engineers take a creative approach to returning natural physical and biological processes to a historically highly altered site.



Describing the restoration of the Goose Creek tributary at a site visit.

(Photo by Inter-Fluve)



Juvenile salmonids in the restored river.

(Photo by Inter-Fluve)

Promoting Collaboration

The majority of funds for the River Island project came from a voter-approved bond and levy to improve water quality and restore wildlife habitat. As a result, public outreach and stakeholder communication were critical components of the project, from initial planning to project completion. During the two-year design phase, Metro coordinated and hosted six public meetings to keep the local community informed. And since completion, Metro has hosted four tours for stakeholders and neighbors to see the positive results.



Juvenile salmonids seeking shelter in the woody debris.

(Photo by Inter-Fluve)



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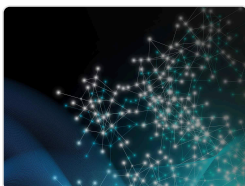
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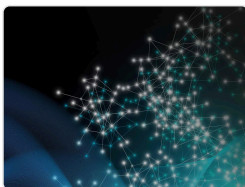
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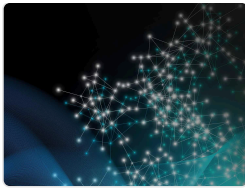
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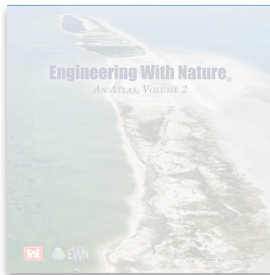
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