

# Elwha River Fisheries and Ecosystem Restoration

Conditions in the Elwha River watershed have been monitored by the Lower Elwha Klallam Tribe and their partners to gauge ecosystem response to the removal of the Elwha dams. Six years following dam removal, there have been positive responses for chinook, steelhead, coho, bull trout and Pacific lamprey but pink and chum salmon have yet to show a response. The return of sand lance and smelt, which are important prey items for juvenile salmonids has also been observed. River otters and American dippers, closely tied to ecosystem health, are expected to be positively impacted by the return of salmon. It is estimated that, to date, over 4 million cubic yards of sediment has been deposited in the Elwha delta since the removal of the dams.

On Aug. 26, 2014, detonation of explosives at the former Glines Canyon Dam site obliterated the final remnants of that structure and re-opened the upper watershed of the Elwha River to salmon for the first time in 102 years. On Sept. 2, one week later, the first chinook salmon were observed migrating beyond this site into more than 40 miles of pristine habitat now available to them within Olympic National Park. This was the culmination of 22 years of planning and 3 years of deconstruction

associated with the removal of the 33 meter Elwha Dam (RM 4.9) and the 66 meter Glines Canyon Dam (RM 13.6).

Researchers from the Lower Elwha Klallam Tribe and their partners with Olympic National Park, United States Geological Survey (USGS), National Oceanic and Atmospheric Administration (NOAA), University of Washington, Sea Grant and other entities have been actively monitoring a multitude of biological and physical conditions in the Elwha River watershed

to gauge ecosystem response to the removal of the Elwha dams. This work includes water quality monitoring, sediment transport and deposition monitoring, beach and delta topographic studies, numerous studies to assess adult and juvenile salmonid population responses, wildlife population response, estuarine fish and invertebrate studies, vegetation sampling, intertidal sampling, and subtidal SCUBA surveys.



Mike McHenry, Lower Elwha Klallam Tribe

A smolt trap on Little River (one of three within the Elwha River valley).



Tiffany Royal, NWIFC

Setting up SONAR camera for enumeration of adults.

## Monitoring of Salmon Response

The tribe is conducting long-term population level monitoring of the response of salmon to dam removal. These efforts were initiated in the mid-2000s and the tribe is using a fish in-fish out model to monitor populations before, during and after dam removal. This life history approach requires enumeration of returning adults, juvenile abundance and smolt out-migrants.

Because Elwha restoration involved the release of large amounts of sediment that had accumulated over 100 years in two reservoirs, there also has been an emphasis on how that sediment impacted

habitat over time. Six years after dam removal, the story is still unfolding as the river recovers and fish access different habitats that have not been occupied in more than a century. The overall goal of the project is to recover all salmon populations to naturally sustainable, fishable levels.

Only six years following dam removal, the tribe has seen positive responses for chinook, steelhead, coho, bull trout and Pacific lamprey. Populations that were at very low levels when the project began, such as pink and chum salmon, have yet to show a response.

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## Monitoring of Wildlife Response

In connection with removal of the Elwha dams, the tribe's wildlife division is collecting baseline data on select species of river-dependent wildlife.

Specifically, river otters and American dippers are closely tied to ecosystem health and are expected to be positively impacted by the return of salmon and their associated marine-derived nutrients to the Elwha ecosystem.

The primary objective is to collect information on how otters and dippers use the river to meet their spatial, habitat and dietary needs. To fulfill this objective, the tribe is capturing and tagging otters and dippers, and collecting biological samples to conduct stable-isotope analysis of marine-derived nutrients.



Mike McHenry, Lower Elwha Klallam Tribe

Tagging juvenile fish.

## Subtidal SCUBA Surveys

Tribal biologists have been assisting in USGS led subtidal dive (SCUBA) surveys along the Elwha nearshore from Freshwater bay to the base of Ediz Hook since 2011.

This study, initiated in 2008, involves monitoring sediment-related changes to subtidal habitats that may be associated with the removal of the Elwha dams. The USGS has estimated that, to date, more than 4 million cubic yards of sediment have been deposited in the Elwha delta since the removal of the dams. This represents approximately 15% of the sediment estimated to have been stored behind the Elwha dams.

The dive team identifies algae, macro-invertebrates and fish along 40 meter tran-

sects at depths of 20 to 60 feet. In addition, physical characteristics such as grain size, slope and light penetration at the sea floor also are recorded.

Interestingly, the physical presence of the large sediment plume created by the release of fine sediment from the former Elwha River reservoirs appeared to have a more pronounced effect on habitat during the first two years after dam removal than actual deposition along the sea floor at most study sites. The lack of light penetration through the sediment plume prevented or delayed the regeneration of large, dense kelp "forests" once observed at most of the subtidal dive sites.

As expected, the monitoring sites in

closest proximity to the mouth of the river have received the greatest contribution of fine sediment. Of the 15 established Elwha nearshore monitoring sites, all have had some degree of fine sediment deposition from behind the former dams. Five of these subtidal sites have been completely buried, resulting in a marked transition from a heavily cobbled to a sandy substrate that is more conducive to bivalves and other soft substrate inhabitants. The tribe also has noted the return of sand lance and smelt, which are important prey items for juvenile salmonids. The site nearest the river mouth is now buried in more than 10 meters of fine sediment.

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Ian Miller, Washington Sea Grant

Newly constructed engineered logjams in the lower Elwha River. The structures are designed to split flows, activate new side channels, create pools and sort gravel.

## Floodplain Restoration

While scientific research has dominated early headlines emerging from dam removals on the Elwha, the tribe also has been conducting comprehensive floodplain restoration actions in the lower river, downstream of former Elwha Dam site.

Prior to dam removal, the 5-mile lower Elwha River reach provided the only available habitat for Pacific salmon following construction of the Elwha Dam in 1913. This habitat became increasingly degraded over time as sediment and wood necessary to support habitat-forming processes was

blocked by the dam. Habitat was further degraded over time by human activities including floodplain logging, removal of logjams, and channelization.

Indeed, prior to dam removal, the lower Elwha had lost almost all of its spawning habitat, had very few side-channels for a river of its size, had lost most of its historic estuary, and supported limited natural salmon populations.

Beginning in the late 1990s, before it was even clear that dam removal would occur, the tribe began efforts to restore floodplain habitat in the lower river.

The restoration strategy involved four tools: 1) the removal of abandoned flood control dikes in the floodplain, 2) the insertion of engineered logjams in the mainstem, 3) addition of free wood in side-channels and 4) floodplain revegetation. Over time and with increasing experience conducting restoration in a large river, the project grew in scale and complexity. While initial restoration actions were focused on simply providing salmon with a refuge while awaiting the possibility of dam removal, later restoration efforts focused on design that would be com-

plementary to dam removal and the expected changes to follow in the lower river.

In 2014, both dams had been removed and the Elwha was restored to a free flowing river. A 15-year lower river floodplain restoration effort had resulted in the construction of 50 engineered logjams, the removal of four floodplain dikes, three side channels loaded with large wood, and the planting of 400,000 native trees and shrubs.

In 2021, an additional 24 logjams will be constructed in a 0.5 mile reach of the river.