



Columbia Fish Recovery Update: Regional Partnerships, Historic Agreements, “On the Ground” Actions

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It's been an eventful year for Columbia Basin fish recovery. Throughout the Pacific Northwest, progress is taking place on all aspects of the salmon and steelhead lifecycle.

Federal agencies, states and tribes have reached historic agreements to implement hydro, habitat, hatchery, and harvest actions to help fish. New scientific findings are pointing to the best ways to put fish on the path to recovery. Hundreds of local stakeholders have completed long-term recovery plans that will protect and recover naturally spawning fish.

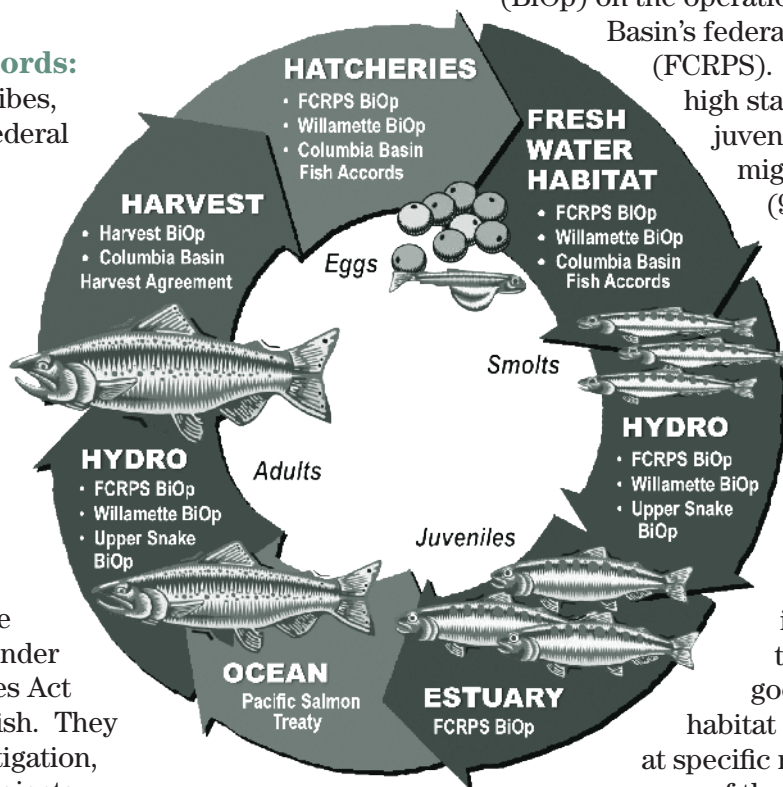
Columbia Fish Accords:

Since May 2008, five tribes, two states and three federal agencies have signed the Columbia Basin Fish Accords. These historic agreements are intended to put hundreds of habitat restoration and hatchery actions into effect.

The new Accords commit 10 years of funding for these projects to improve the survival of fish listed under the Endangered Species Act (ESA) and non-listed fish. They set aside 30 years of litigation, acknowledging that projects at the dams and on the ground will help fish. Fish Accords with additional partners are under active negotiation.

Columbia River Harvest Agreement: Also in May 2008, federal, state, and tribal governments reached unprecedented agreement on a new 10-year Columbia Basin harvest management system. This agreement establishes a sliding scale for harvest actions based on fish abundance, allowing more harvest in years of abundance and reduced harvest in low years. This agreement is reflected in NOAA Fisheries 2008-2017 Harvest Biological Opinion.

Hydro System Biological Opinion: Also in May, NOAA Fisheries issued its biological opinion (BiOp) on the operation of the Columbia Basin's federal hydropower system (FCRPS). The FCRPS BiOp sets high standards for survival of juvenile salmon and steelhead migrating through the dams (96% average survival for spring migrating fish and 93% for summer migrating fish) on the Columbia and lower Snake rivers. It calls for improvements to both the structure and operations of the dams to reach those standards. The BiOp targets survival improvements where they can do the most good, identifying specific habitat improvements aimed at specific needs of the fish. Many of these habitat projects will be carried out by tribes and states through the Fish



Agreements in place to support actions across the salmon and steelhead life cycle.

Accords. The BiOp also includes an evaluation of mitigation hatchery facilities and recommendations for improvements.



Upper Snake Biological Opinion: The Bureau of Reclamation operates 12 federal projects in the upper Snake River basin whose primary purpose is to store and release water for irrigation and flood control. Although none of the 13 ESA-listed Columbia River salmon and steelhead stocks are found in the upper Snake River basin, these upstream water operations influence stream flows below Hells Canyon Dam, where there are listed fish. The upper Snake actions build on more than a decade of collaboration between the Nez Perce Tribe, the State of Idaho, municipalities, irrigators, and other interested parties in water rights and operations to benefit listed fish.

NOAA Fisheries released its biological opinion on Reclamation's upper Snake River project operations on May 5, 2008, in addition to a comprehensive analysis of all the actions included in the upper Snake, FCRPS, and harvest biological opinions.

Willamette Biological Opinion: In July 2008, NOAA issued another BiOp for the 13 dams in the Willamette Basin. The Willamette BiOp calls for federal dam operators to improve ways to get fish upstream of the dams to high-quality spawning habitat and investigate passage alternatives for juveniles. It also requires water temperature and hatchery improvements.

ESA Recovery Plans: All of these actions contribute to long-term healthy and sustainable fish runs. For the ESA, recovery means that naturally spawning fish are abundant and productive. With recovery comes the potential for delisting, or removal from the ESA list.

The federal government and the federal dams are important players in recovery efforts. But recovery is much broader than that. Throughout this year, hundreds of citizens from local salmon recovery



Tribal and federal leaders display the signed hide commemorating the historic Fish Accords. Pictured, from left to right: Colonel Steven Miles, past Northwest Division commander, U.S. Army Corps of Engineers; Antone Minthorn, Chairman, Confederated Tribes of the Umatilla Indian Reservation; Mike Marchand, Chairman, Confederated Tribes of the Colville Indian Reservation; Ralph Sampson, Chairman, Confederated Tribes and Bands of the Yakama Nation; Tim Personius, Deputy Regional Director, Bureau of Reclamation; Steve Wright, Administrator, Bonneville Power Administration; Ron Suppah, Chairman, Confederated Tribes of the Warm Springs Reservation of Oregon; and Fidelia Andy, Chairwoman, Columbia River Inter-Tribal Fish Commission and Yakama Nation Fish and Wildlife Committee. (BPA photo)




boards, state fish and wildlife departments, tribes, and other state and local stakeholders have moved the region closer to that goal by completing recovery plans and beginning their implementation. NOAA's recovery plans incorporate locally developed plans into larger regional plans for salmon and steelhead in the interior Columbia basin, the Snake River basin, the Oregon coast and Puget Sound areas.

Recovery of the fish will take years of concerted effort by all of these dedicated Northwest citizens. Even as the region embarks on these recovery actions, there are encouraging signs.

In 2008, more than 550 Snake River sockeye returned to their spawning grounds in Redfish Lake – 900 miles from the mouth of the Columbia. This is by far the largest return since counts began in the 1970s and is mostly attributed to ocean conditions.

Other runs of protected fish are also improving: Snake River spring/summer Chinook, fall Chinook and steelhead are all close to or surpassing their 10-year averages. In 2008, a spring Chinook harvest was opened in Idaho for the first time in 30 years. And in the upper Columbia region, NOAA Fisheries authorized a 10-year permit for recreational fisheries in the middle and upper Columbia River and several tributaries based on collaborative efforts with local groups.

Today, with the Fish Accords, BiOps and recovery plans completed or nearing completion, and with greater region-wide agreement and participation than ever before, real recovery actions can take place “on the ground” for Columbia Basin fish. In this update, we describe the proposed Middle Columbia Steelhead Recovery Plan; the active implementation of the Upper Columbia Salmon and Steelhead Recovery Plan; and the emerging action plan to protect Pacific lamprey in the Columbia Basin. 

Recovery Plan Update

Salmon & Steelhead Recovery Planning

Salmon and steelhead are treasured icons of the Pacific Northwest. They are important to our environment, economy, and culture. In the Columbia Basin, 13 species of Pacific Northwest salmon and steelhead are listed under the Endangered Species Act (ESA).

The ESA requires NOAA to develop recovery plans for listed species. For the ESA, recovery means that the species is naturally self-sustaining over the long term, no longer needs the protection of the ESA, and can be “delisted.” A recovery plan provides a roadmap for communities seeking to secure the long-term benefits of healthy watersheds and rivers for salmon and steelhead. It helps organize people, processes, and resources for biologically effective actions – to address key “limiting factors” and improve fish survival across the lifecycle. Recovery planning is a collaborative effort that draws on the collective knowledge, expertise, and actions of communities and partnerships.

What is in a Recovery Plan?

- ◆ An explanation of fish biology
- ◆ Recovery goals & criteria for species health
- ◆ An assessment of current status, limiting factors & threats
- ◆ Recovery strategies & site specific actions to improve survival
- ◆ Estimates of time & costs to implement actions
- ◆ Research, monitoring & evaluation to track progress

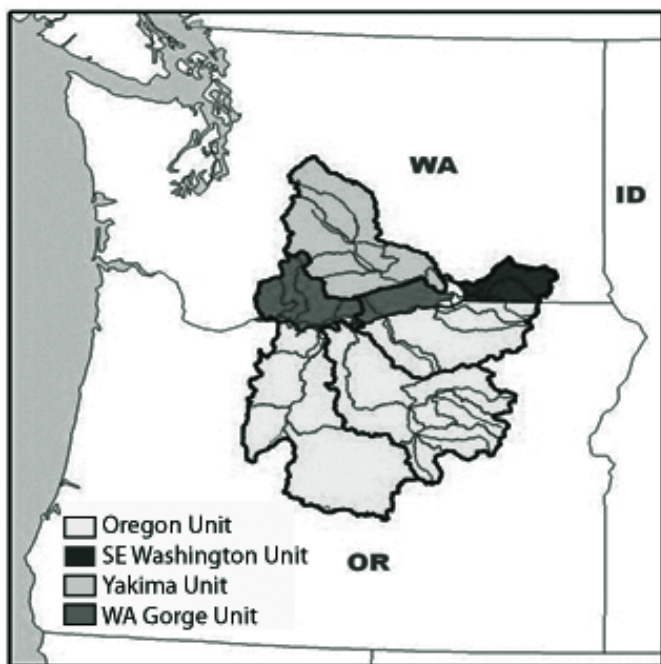


Middle Columbia Steelhead Proposed Recovery Plan

The proposed ESA Recovery Plan for the Middle Columbia River Steelhead was released by NOAA on September 24, 2008 for public review and comment.

Middle Columbia River Steelhead Status

Under the ESA, Middle Columbia steelhead status is assessed in terms of four characteristics: abundance, productivity, diversity, and spatial structure/geographic distribution of populations found in the major population groups.



Middle Columbia Steelhead Recovery Plan Management Units. NOAA 2008.

Of the 17 populations of middle Columbia River steelhead, four are at high risk, while ten are at moderate risk. Three populations, the North Fork John Day, Deschutes Eastside, and Fifteenmile Creek, are considered healthy. The recovery plan focuses on actions to improve the survival and ensure long-term productivity of the species.

Middle Columbia Action Plan – All Hs

The proposed plan summarizes information from four locally developed “management units”

encompassing middle Columbia River tributaries and *habitat* in Washington and Oregon. The species plan also uses information developed by NOAA Fisheries to address conditions in the Columbia River mainstem and estuary that affect all Middle Columbia steelhead: the *Hydro* Module, which summarizes effects of the FCRPS and other mainstem dams and the Estuary Module. For *hatchery* effects, the plan relies upon hatchery and genetic management plans and Artificial Production for Pacific Salmon (Appendix C of Supplemental Comprehensive Analysis, NOAA Fisheries 2008 FCRPS Biological Opinion). For *harvest*, it refers to the 2008-2017 Columbia River Harvest Agreement for mainstem fisheries, and fisheries management evaluation plans for tributary fisheries. In this way, the plan considers actions across the steelhead lifecycle.

Factors Limiting Steelhead Survival

The major factors limiting the health and abundance of middle Columbia River steelhead populations are:

- ◆ Degraded tributary habitats
- ◆ Impaired fish passage in the mainstem Columbia River and tributaries
- ◆ Hatchery-related effects
- ◆ Predation/competition/disease

Strategies for Recovery

The recovery plan proposes actions to reduce or mitigate the limiting factors and threats to steelhead survival throughout the life cycle. Under each of the following strategies, the plan includes a menu of specific actions, many of which are already being considered and implemented.

Tributary Habitat

Protect highest quality habitats, maintain existing unimpaired healthy watersheds, and restore habitat conditions through passive and active measures.

Hydrosystem

Improve juvenile and adult steelhead migratory passage and survival in the Federal Columbia River Power System.

Hatcheries

Improve hatchery management to minimize impacts of hatchery fish on naturally produced steelhead. Supplement natural production where appropriate.



Predation

Reduce predation on steelhead in the Columbia River and estuary.

Harvest

Maintain low-impact fisheries, increase harvest of hatchery strays.

Coordination

Coordinate research and planning within the range of the middle Columbia River steelhead.

Learning Over Time

Monitoring and research will be needed to support adaptive management and allow managers to make sound decisions for the future. As actions are taken and the results monitored, new information will help us learn what works best for the fish.

For more information on the Middle Columbia Steelhead Proposed Recovery Plan, visit:

<http://www.nwr.noaa.gov/>, or contact Lynn Hatcher by email at lynn.hatcher@noaa.gov



How do recovery plans fit with NOAA's 2008 - 2018 FCRPS BiOp?

The FCRPS BiOp includes actions that would make significant contributions to recovery, and its actions are congruent with this recovery plan. But, there are several important distinctions:

- ◆ A recovery plan is far broader in scope than the FCRPS BiOp. The recovery plan addresses all threats and identifies actions in all Hs – including tributary and estuary habitat; hatchery; harvest; and tributary and mainstem hydropower – actions that together could lead to recovery of the species. The FCRPS BiOp provides for those actions that the FCRPS action agencies – Bonneville Power Administration, U.S. Army Corps of Engineers, and Bureau of Reclamation – have authority to implement.
- ◆ However, recovery plans and the FCRPS BiOp rely on the same biological information and use similar analytic methods to target their actions. For this reason, the biological opinion, the various Columbia Basin recovery plans and the Fish Accords should result in complementary and consistent programs aimed at restoring ESA listed fish.
- ◆ A recovery plan timeline is generally longer term, until recovery is achieved, which could take 25 to 100 years. The FCRPS BiOp covers FCRPS agency actions for a 10 year period.
- ◆ Implementation of recovery plan actions is voluntary, whereas the FCRPS action agencies are obligated to implement the actions required by the FCRPS BiOp.

The Upper Columbia Action

The Upper Columbia Salmon and Steelhead Recovery Plan

Adopted on October 9, 2007, the plan is being implemented by regional partners, including federal agencies, states, tribes, local governments, and public utility districts. Numerous actions are underway to improve habitat, hatchery, harvest and hydro aspects of the salmon life cycle. Some of these actions are being funded by the federal dam



Upper Columbia Salmon Recovery Board members, from left: Commissioner Bud Hover, Okanogan County Salmon Recovery; Julie Morgan, Executive Director; Paul Ward, Yakama Nation Salmon Recovery; Bill Towey, Colville Confederated Tribes; Commissioner Ron Walter, Chelan County Salmon Recovery, Commissioner Mary Hunt, Douglas County Salmon Recovery. Photo by UCSRB.

operators under the terms of the FCRPS BiOp and Columbia Basin Fish Accords with the Yakama Nation and the Colville Tribe, in coordination with the Northwest Power Planning Council. Other projects are being funded by Chelan, Douglas, and Grant County Public Utility Districts under the terms of settlement agreements and hydro operating licenses. Additional actions are being funded by NOAA, U. S. Fish and Wildlife Service (FWS), and other federal agencies under various resource protection programs such as the Pacific Coastal Salmon Recovery Fund and the FWS fish passage program. And even more projects are being funded with state and local funds and initiatives.

Implementation of the Upper Columbia Recovery Plan is being overseen by the Upper Columbia Salmon Recovery Board (UCSRB), a private non-profit entity recognized by the Governor's Salmon Recovery Office. The UCSRB Board of Directors consists of elected officials or designates from Chelan, Douglas, and Okanogan counties, the Colville Tribe and the Yakama Nation.

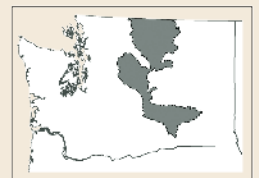


Fishing and Fish Recovery can go hand-in-hand

For two years, NOAA Fisheries the Washington Department of Fish and Wildlife, and local upper Columbia River watershed groups and citizens collaborated to identify fishing opportunities in the upper Columbia basin that are consistent with the recovery of spring Chinook salmon and steelhead. In August 2008, NOAA Fisheries authorized a 10-year permit for recreational fisheries in the middle and upper Columbia River and the Wenatchee, Entiat, Methow, and Okanogan rivers based on these collaborative efforts.

The permit includes 10 separate fisheries addressing multiple species (from sockeye and Chinook salmon to bass, walleye and whitefish) and areas (Columbia River at its tributaries; Wenatchee, Entiat, Methow,

and Okanogan rivers) that provide a wide array of angling opportunities for the public. Actions to protect listed salmon and steelhead include gear restrictions, limiting the times and locations of fisheries, and education on appropriate ways to minimize impacts on listed fish.



Nevertheless, a small number of protected salmon and steelhead will inevitably mix with unlisted hatchery fish and other species and be caught by anglers in some of the fisheries. However, they can be distinguished from non-ESA-listed fish and must be released without being removed from the water.

The permit includes standards to specify hook-and-release mortality levels that will not jeopardize

What's happening on the ground

Restoration of White River Oxbow, Okanogan-Wenatchee National Forest

Bends in a meandering river – called oxbows – are important because they slow down the water flow and create variability in available habitat. To reclaim an oxbow on the White River, the U. S. Forest Service removed a turnpike and associated culverts that have been in place for nearly 30 years. This project effectively restores floodplain and river function, and provides refuge for fish and wildlife species.

Previously, overland flow from the mainstem to the floodplain was blocked by the turnpike. Upon removal of the turnpike, however, upper Columbia spring Chinook and Columbia Basin bull trout have once again gained access to more than 1.4 miles of formerly blocked habitat.

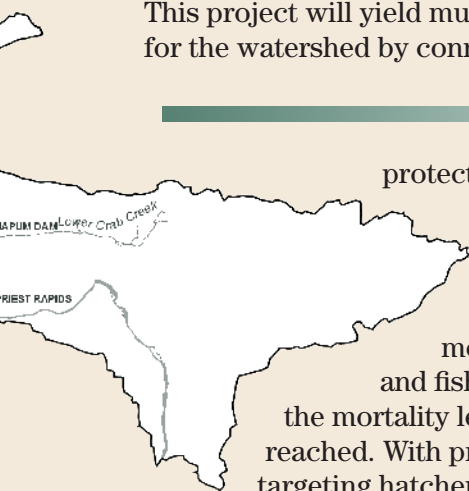
This project will yield multiple ecosystem benefits for the watershed by connecting off-channel rearing



Restored flood plain on the White River. Photo by UCSRB.

and resting areas, reducing the road density along the riparian corridor, attenuating flood flows downstream, and restoring the natural function of the river and floodplain.

The National Fish and Wildlife Foundation, Washington Salmon Recovery Board, and Chelan Douglas Land Trust are key partners in this effort. Thanks to this collaborative effort, water flowed into and out of the oxbow for most of the 2008 summer.



protected salmon or steelhead.

The Washington Department of Fish and Wildlife is required to monitor hook-and-release mortality during the season, and fisheries must close when

the mortality level for each fishery is reached. With proper state monitoring, targeting hatchery fish could actually benefit protected wild stocks by reducing

the number of hatchery fish that stray into streams and breed with wild-origin salmon, weakening those natural stocks.

The joint effort among federal agencies and local citizens has resulted in fishing opportunities that are consistent with the Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan.



The Confederate Tribes of the Colville Reservation are testing several techniques to selectively harvest hatchery-origin summer Chinook. The techniques are expected to ensure high survival for released wild fish including sockeye, steelhead and natural-origin summer Chinook salmon. The 2008-18 FCRPS BiOp has measures to explore selective fisheries. Photo by Colville Tribe.

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Upper Columbia Actions (continued)

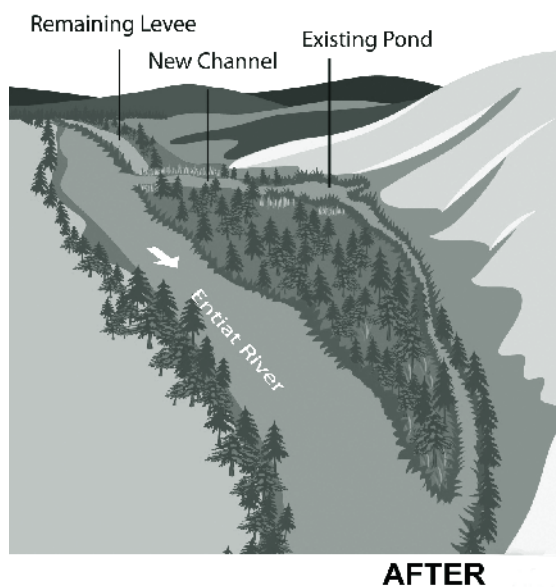
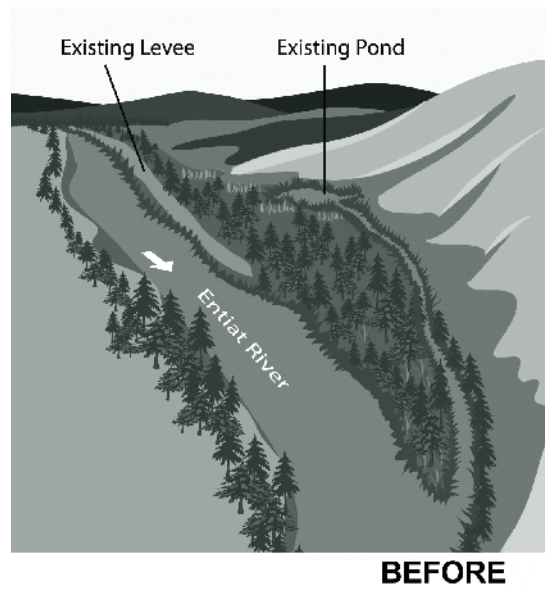
Harrison Side Channel Reconnection Habitat Project

Natural meanders, pools, and side channels in the lower Entiat River once provided ample habitat where salmon and steelhead returned from the ocean and spawned. This habitat also was a living nursery where insects and larvae thrived, providing food for the juvenile fish. A protective canopy of trees and vegetation kept the water relatively cool and screened the young fish from predators until it was time for them to swim to the ocean.

The Entiat River flooded many farms and homes in 1948. Soon afterwards, the U.S. Army Corps of Engineers dredged about nine miles of the river channel upstream from the confluence with the Columbia River and constructed levees to prevent future flooding.

These actions reduced flooding on the main-stem of the river. But they also eliminated about 90 percent of the natural meanders, pools, and side channels so important to the adult and juvenile salmon and steelhead. This habitat reduction limits the natural production of Entiat River salmon and steelhead.

A number of rock weirs and other features have been installed to improve pool habitat in the main-stem of the lower Entiat River over the last few years. But there are few opportunities to improve meander and side-channel habitat. The recently completed Harrison side channel project is the first and largest of several actions planned to increase salmon and steelhead side-channel habitat in the lower Entiat River. Before the Harrison project was built, ground water fed a pond that slowly flowed through an old meander to the river. With completion of this project, the river was reconnected to the pond by removing about 180 feet of levee and constructing 125 feet of new channel. Now, water from the Entiat River flows freely through the old meander and provides a steadier, more reliable source of water. With the levee partially removed, high flows in the Entiat River can move into the meander, slowing and spreading these flows on the floodplain with minimal flood risk for existing farms or homes.



Drawing by Reclamation.

This project conforms to the Upper Columbia Salmon and Steelhead Recovery Plan which was developed with local, state, and federal input to identify ways to protect and restore salmon, steelhead, and bull trout. Chelan County Natural Resources Department worked with landowners for more than two years to make this project happen. Reclamation designed the project and Washington Salmon Recovery Board provided construction funding.



Upper Columbia Actions (continued)

Blackbird Island Steelhead Acclimation Pond

Good spawning habitat in the Wenatchee River is ready for adult steelhead. To encourage adults to return there, the Icicle Chapter of Trout Unlimited is sponsoring a project near the town of Leavenworth, Washington, in cooperation with the City of Leavenworth, the Washington Department of Fish and Wildlife, the Yakama Nation, the Colville Confederated Tribes, the FWS, NOAA's National Marine Fisheries Service, and Chelan Public Utility District. Trout Unlimited plans to rehabilitate two old barrow pits created in the early 1900s by the Lamb-Davis Lumber Company and previously connected to the Wenatchee River. The goal of the facility is to hold hatchery-reared, endangered upper Columbia River steelhead at the Blackbird Island Pond in Wenatchee River water for a sufficient time for them to "imprint" on their spawning location, a process that typically takes one to two months. The project is consistent with the Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan developed by local citizens.

Steelhead are now raised in a hatchery upstream of Rocky Reach Dam on the Columbia River, and then transported for annual release into the Wenatchee River. For the past few years, monitoring has suggested that 40-70% of the hatchery-raised steelhead destined for the Wenatchee River have imprinted to water upstream of Rocky Reach Dam, and are not returning to the Wenatchee River.



Adult Steelhead male.

Adult steelhead returning to the Wenatchee will be able to spawn naturally and support a natural population. In some years, when ESA goals are exceeded, these fish may also provide recreational fishing opportunities and benefits for the local community. 🐟



Good spawning habitat for steelhead is ready in the Wenatchee River. Photo by Dan Davies.



What has three large teeth, no paired fins, jaws or bones, existed well before the dinosaurs and lives in the river and the sea?



It is a Pacific lamprey and they are often referred to by Native Americans on the Columbia River as “eels.” The adults have a round, thin, and flexible body, they are very smooth to the touch and can be dark bluish-gray or dark brown in color. The lamprey can reach 30 inches in length and weigh more than a pound. Its mouth is down-turned and adapted for sucking and clinging to rocks, which is important for conserving energy while negotiating swift currents. Compared to salmon they are relatively poor swimmers, but they still can travel great distances in a short time.



A Pacific lamprey is shown close up, attached to a rock in a river. Photo provided by USFWS.

Lamprey once were abundant throughout the Columbia River basin in the same areas as salmon, with numbers in the millions. Their rate of decline is greater than salmon, and now just a few thousand migrate over Bonneville Dam each year. They are culturally important to indigenous people throughout their range, and play a vital role in the ecosystem as food to mammals, fish and birds, for nutrient cycling and storage, and as a prey buffer for other species.

Lampreys spend most of their life in stream substrates as a small, non-parasitic worm-like animals. They live five to seven years in stream sediments, feeding on algae, diatoms and other small organisms. After this period they begin to mature and migrate out to the ocean. Pacific

lamprey mature into adults during their ocean residence and are parasitic on larger fish and marine mammals.

After two years or so, they swim back to freshwater, where they spawn in areas similar to salmon. They die after spawning, returning their sea nutrients to the stream for other species’ benefit.

Pacific lamprey face a variety of threats at all stages of their life, including artificial barriers to migration, poor water quality, predation by nonnative species, stream and floodplain degradation, loss of estuarine habitat, decline in prey, ocean conditions, dredging, and dewatering. These factors have led to their decline.

Conservation interest in Pacific lamprey has grown in recent years, with increasing attention from tribes, federal and state agencies, and others.

Fish and Wildlife Service Pacific Lamprey Conservation Initiative

The FWS introduced the Pacific Lamprey Conservation Initiative in February 2008.

According to Howard Schaller, Project Leader of the FWS Columbia River Fisheries Program, expected outcomes from the plan include:

- ◆ an enhanced description and tracking of current knowledge of Pacific lamprey life history, biology, and habitat requirements
- ◆ identification of Pacific lamprey populations, and their current distribution, abundance, and population structure
- ◆ a range-wide map of historical and current Pacific lamprey distribution
- ◆ description of threats and reasons for decline
- ◆ identification and implementation of a strategy for restoring Pacific lamprey populations
- ◆ a comprehensive Pacific lamprey education program.



U.S. Army Corps of Engineers plan for passage at dams

The Corps is developing a ten-year plan for addressing lamprey passage at mainstem dams. The plan is intended to work in concert with the treaty tribes' Columbia Basin lamprey restoration plan.

The Corps is putting greater emphasis on passage improvements for lampreys at its dams. This includes structural and operational measures to improve adult lamprey passage into and through fish ladders, and more aggressive research to enable improvements for both downstream passage of juvenile lampreys and additional upstream passage improvements.

Tribal Initiatives for Lamprey

Under the 2008 Columbia River Fish Accords, the tribes are pursuing a number of actions to help Pacific lamprey.

The Columbia River Inter-Tribal Fish Commission tribes have developed the Tribal Pacific Lamprey Columbia Basin Restoration Plan. The tribes propose to restore the species to numbers adequate for tribal use and ecological health of the region. The plan identifies the need to achieve

improvements in dam passage efficiencies and survival as of primary importance. Only about 50 percent of adult lamprey successfully pass a single dam. Improving dam passage will require a set of operational and structural modifications to existing dams. They include the use of 24-hour video counting, installation of lamprey passage systems, altering existing fishway structures to prevent trapping and facilitating entry into ladders, reducing velocity barriers, reducing/eliminating juvenile impingement on screens, and reducing fishway flows at night.

The plan also calls for improving tributary and mainstem habitat for young and juvenile lampreys, and includes detailed subbasin plans by each tribe for achieving these goals.

The tribes have been implementing lamprey translocation from Corps dams to upper river tributaries. Adults have successfully spawned in these areas and juvenile recruitment has been documented, but whether adults will return from these juveniles is still unknown. Translocation is an interim, emergency measure, until dam passage rates can be significantly improved.

The tribal plan also requires a consistent, coordinated public education and outreach program.



Tribal members harvest lamprey at Willamette Falls. Culturally vital and known as "eels" to Native Americans, the tribes are pursuing a number of actions to help Pacific lamprey, under the 2008 Columbia River Fish Accords. Photo provided by the Columbia River Inter-Tribal Fish Commission.



Pacific Lamprey Life Cycle

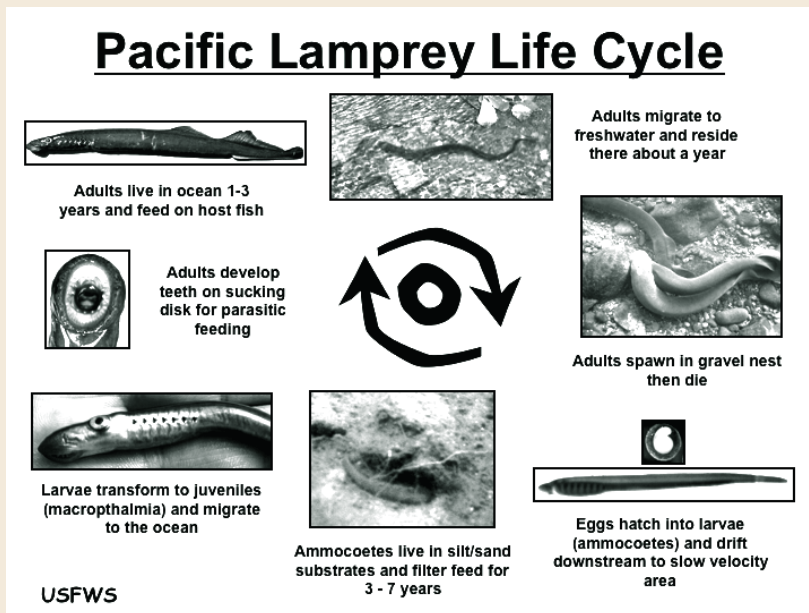
After one to three years in the ocean, adult lamprey return to freshwater to spawn. It's believed that adults are attracted to spawning areas by pheromones released by juvenile lamprey. Both male and female lampreys construct nests by digging, using rapid vibrations of their tails and by moving stones with their suction mouths. During its ocean phase of life, the Pacific lamprey is a parasite on larger fish and marine mammals.

Lampreys enter the freshwater rivers and streams from February to June; spawning takes place the following spring when water temperatures are between 50 and 60 degrees Fahrenheit. They ascend rivers by alternating swimming and attaching their oral discs on rocks to rest.

Spawning takes place between March and July in low-gradient sections of stream, with gravel bottoms. Adults typically die within 3 to 36 days of spawning, after depositing about 100,000 to 200,000 extremely small eggs in their nest.

The young (ammocoetes) hatch in 2 to 3 weeks and drift downstream to low velocity backwater or eddy areas where sediments are soft and rich in dead plant materials. They quickly burrow into the sandy, silty bottom where they filter the sediment and water, eating microscopic living plants (mostly algae and diatoms) and decaying plant material.

The ammocoetes will stay burrowed in the sediment for five to seven years, moving periodically downstream to new areas. After a five-month metamorphosis, triggered by unknown factors, they emerge as juveniles (*macrophthalmia*) averaging 4.5 inches long. Then during high water periods in late winter or spring the macrophthalmia migrate to the ocean. Their range extends from Hokkaido Island, Japan, and around the Pacific Rim, including Alaska, Canada, Washington, Oregon, Idaho, and California to Punta Canoas, Baja California, Mexico.



For more information

- ◆ FWS - For more information on the FWS Lamprey program, contact Howard Schaller at (360) 604-2500. Their Web site is http://www.fws.gov/pacific/Fisheries_sp_habcon/Lamprey/index.html.
- ◆ CRITFC – For more information on the Columbia River Inter-Tribal Fish Commission's lamprey program, contact Bob Heinith at (503) 731-1289. Their Web site is <http://www.critfc.org>.
- ◆ Corps – For more information on the Corps' Northwestern Division efforts in lamprey passage at hydropower dams, contact Rock Peters at (503) 808-3723.

For more information on Salmon and Steelhead Recovery efforts in the Pacific Northwest, visit: <http://www.nwr.noaa.gov/>



For more information on the Recovery Implementation Science Team, visit <http://www.nvfsc.noaa.gov/trt/index.cfm>



If you would like to sign up for an electronic newsletter with the latest salmon recovery news, send an email to : SalmonRecoveryBulletin.nwr@noaa.gov