U.S. Fish & Wildlife Service

Klamath Basin Newsletter

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In This Issue:

Notes from the Field Supervisors / 1
Rumble in the River / 2
Watershed Action Plan / 3
Sycan Oxbow Restoration / 4
Saving Suckers Together / 5
Large Wood and Logjams / 6
Hotelling Gulch Restoration / 7
We are Klamath: *Nick Hetrick* / 8
Keeping an Eye on Klamath Fish / 9
Species Spotlight: *Pacific lamprey* / 10
Finding Fishers: Karuk Team / 11
Yurok Tribe Restoration Project / 12
Two Women Tracking Turtles / 13

Fish and Aquatic Species Edition

Notes from the Klamath Basin Field Supervisors

The Klamath River Basin reaches across more than 12,000 square miles of farms, ranches, private timber holdings, national forests and Tribal lands. Beginning with the lands and turquoise waters in the upper reaches of the Sprague and Williamson rivers of southern Oregon, the Klamath River extends down rocky, scrub-forested canyons, joining the Shasta, Scott, Salmon and Trinity river valleys, to the majestic redwood forests of the California coast. The Basin is home to many iconic species of fish and wildlife.

Working to conserve the diversity of this region's flora and fauna, the U.S. Fish and Wildlife Service Ecological Services Program has three field offices in the Klamath River Basin. Under a unified One Basin approach, staff in the Klamath Falls, Yreka, and Arcata field offices collaborate with numerous State, Federal, Tribal, and private partners to recover endangered, threatened, and at-risk species.

In this issue dedicated to the Klamath Basin, you'll learn about unique, longstanding partnerships with local Tribes to preserve culturally important species and habitats. We focus on collaborative efforts with the Klamath Tribes to recover the Lost River (c'waam) and shortnose (koptu) suckers through larval collection efforts, with the Karuk Wildlife Team to survey for fisher in the Tribe's ancestral territory, and with the Yurok Tribe and Green Diamond Resource Company to restore floodplain rearing habitat for fish and native amphibians.

With humor, we highlight the very serious and somewhat hostile competition for habitat that occurs between native and non-native species, such as the threatened bull trout and invasive brook trout in the Upper Sprague River. And we focus on collaborative efforts to restore ecosystem processes and improve water quality throughout the Basin while building resiliency to climate change effects.

You'll also read about critically important efforts to monitor the vital signs of the Klamath River and its fish species, such as the threatened coho salmon. For over three decades, a team of fish experts in our Arcata office have used rotary screw traps to keep a finger on the pulse of the Klamath River and its native fish species. These large wire-mesh traps look like cement mixers floating on the river. The results are invaluable science for multiple partners across the Basin.

Finally, we again focus on the excellent work of the young scholars provided to us through the national Directorate Fellowship Program. This past season we hosted two young women who courageously navigated 63 miles of the Klamath River to survey for northwestern pond turtle, a species that is currently being evaluated for listing under the Endangered Species Act. The enthusiasm of our Fellows helps us remember why we entered the field of conservation. Their passion is infectious!

Please enjoy this Basin-wide look at what we're up to. We look forward to collaborating with each of you to conserve the Basin's wonderful fish, wildlife, plants and habitats.

Dan Blake, Field Supervisor
Klamath Falls Fish and Wildlife Office

Jenny Ericson, Field Supervisor
Yreka Fish and Wildlife Office

Tanya Sommer, Field Supervisor
Arcata Fish and Wildlife Office

Rumble in the River

In the fictional world of trout wrestling, one of the most uneven matchups would pit non-native brook trout (*Salvelinus fontinalis*) against native bull trout (*Salvelinus confluentus*). When squaring off in their aquatic 'ring,' the invasive 'brookies' are river ruffians, outcompeting the native bull trout by eating all the food and hogging the best shelter. Brook trout are also opportunists and are known to spawn with bull trout.

A year ago, such a fish face-off occurred in the Upper Sprague River watershed north of Klamath Falls, Oregon. The Klamath Falls Fish and Wildlife Office received reports of brook trout in tributaries of the river where none had been previously documented.

Nolan Banish, former fish biologist in the Klamath Falls FWO and coordinator for the Klamath Bull Trout Recovery Unit, was troubled by this discovery. Quick action was necessary to prevent a hostile habitat takeover.

"Brook trout are known to flex their muscle in bull trout territory," said Banish. "They displace bull trout and will hybridize with them to the point that bull trout are no longer producing purebred offspring."

Brook trout are native to the eastern United States and were introduced into the Klamath Basin in 1925 where they quickly inhabited local native trout streams.

Once abundant in the Western U.S., bull trout today occur in less than half of their historic range and are no longer found in California. In the Klamath River Basin, bull trout occupy about 20 percent of their historic range.

Bull trout are very picky fish: they prefer cold water, 48° F or less, clean spawning substrates, and streams with riffles, deep pools, undercut banks and large logs. In 1999, the Service listed bull trout as a federally threatened species due to loss of habitat and diminishing populations, in part from competition with non-native brook trout.

Before biologists could assess the recent Sprague River 'invasion', they had to modify their field survey protocol and receive authorization to work during the pandemic.

Sampling began in late summer 2020 starting with tributaries along the North Fork Sprague River. Brook and hybrid trout were removed, and genetically pure bull trout were returned to the creeks. The hybrids were about three years old, indicating brook trout had been there at least that long. Since there are no barriers preventing brook trout from re-entering these tributaries, the Service plans to increase monitoring efforts to prevent future fish invasions.

The subsequent South Fork survey was a different story. On one tributary, the team found a large illegal campsite. The creek had been dug out in several places and impounded with wood and plastic to create a series of deep pools.

"These were fishing holes to hold brook trout that had been caught in the river and released in the pools, where they mingled with resident bull trout," said Banish.

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Top: A hybrid brook-bull trout estimated to be 3 years old when caught in the Upper Sprague River. Courtesy: Oregon Department of Fish and Wildlife (ODFW)

Left: One of a series of illegal impoundments created as makeshift fishing ponds on a tributary of the South Fork Sprague River. Trees had been cut and sheets of plastic placed to form dams, effectively blocking fish passage upstream. Courtesy: ODFW

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"We found plastic pipes for holding fishing poles along the bank and webs of fishing line littering the site."

The Service and the Oregon Department of Fish and Wildlife helped the landowner clean the site, post signs prohibiting bull trout fishing, and scheduled patrols of the area by Service and state law enforcement officers.

Because of angler reports and quick response by agencies, the trout have retreated to their respective corners of the river, resulting in a draw for this round of the trout bout.

"By continuing sampling and removal efforts on Sprague River tributaries I'm fairly confident further hybridization between brook and bull trout can be prevented," Banish said.

- Susan Sawyer, Klamath Basin public affairs officer

Right: Fish biologists Nolan Banish, center and Travis Ciotti use an electric stunner to search a tributary of the Sprague River for invasive brook trout in native bull trout habitat. Courtesy: ODFW

Watershed Action Plan: Upper Klamath

In the spring of 2021, Upper Klamath Basin watershed restoration efforts took a big step forward with the release of a new planning resource developed in collaboration with multiple partner groups and organizations.

Land use practices and a changing climate have led to a decline in water quality, fish and wildlife populations, and riparian and aquatic habitat in the upper Basin. For many years, coordinated plans or strategies have been needed to prioritize and implement actions to restore upper Basin ecosystem processes and function.

The Upper Klamath Basin Watershed Action Plan satisfies this need and includes a reach-scale watershed condition assessment, meaning that each three mile-long stream or river reach is included in the plan. These assessments prioritize stream reaches for restoration based on the degree of impact or impairment.

The Plan includes guidelines for implementing various restoration activities and provides guidance for developing monitoring programs tied to quantifiable restoration objectives.

Left: Upper Klamath Lake where the Klamath River originates. The new Watershed Action Plan will help agencies prioritize and coordinate plans to restore important ecosystem function in the Upper Klamath Basin. Credit: Megan Skinner/USFWS

Finally, the plan outlines an adaptive management process to refine condition assessments, recommended restoration actions, and monitoring approaches as new information becomes available. Participation in and use of the plan is voluntary.

A team of local restoration professionals developed the plan, representing the Service, Trout Unlimited, the Klamath Watershed Partnership, the Klamath Tribes, the Oregon Department of Environmental Quality, The Nature Conservancy, and the North Coast Regional Water Quality Control Board of California.

The Service is grateful to these many partners for their valuable work on this project.

- Megan Skinner, water quality specialist, Klamath Falls FWO

Sycan River Oxbow Restored

High in the forest above Summer Lake, the Sycan River begins to wind its way southwest before joining the Sprague River near the town of Beatty, Oregon. The uppermost 59 miles of the Sycan River are designated as Wild and Scenic, which by law protects the river's "*outstandingly remarkable ... values ... for the benefit and enjoyment of present and future generations*."

However, in the lower Sycan River, channelization, levies, the removal of riparian buffer vegetation, and grazing have taken their toll over time. As a result, the amount and quality of the habitat, species presence and abundance, and water quality have declined. Natural river features like oxbows slow water down and help improve these conditions.

The Sycan Oxbow Reconnection Project pulls together multiple partners to restore nearly eight acres of wetlands and reconnect a half mile stretch of river to the flood plain.

This project brings back the oxbow, a feature that occurred in this stretch historically and will improve water quality while creating habitat for both migratory birds and aquatic species, including the ESA listed Lost River and shortnose suckers.

In 2017, the Klamath Falls FWO Partners for Fish and Wildlife Program (Partners) began discussions with Taylor and Becky Hyde, owners of the Yannix Ranch, about restoring the Sycan Oxbow. Once the Hydes were on board, Partners reached out to the Klamath Tribes and Ducks Unlimited to collaborate on technical details to restore and improve the overall scenic quality of this section of river.

Beyond the habitat restoration partnership, this project provides an exciting opportunity to study how suckers use riverine habitats. Once the reconnection is established and restoration work complete, the Service will release captive-reared suckers into the oxbow.

These fish will carry an internal passive integrated transponder, or PIT tag, which allows biologists to track and monitor their movements. The PIT tags will help us understand whether the suckers remain in the oxbow, how they use the habitat if they remain, and whether they migrate to and from the oxbow.

The Partners Program is working closely with sucker recovery and rearing experts at the Klamath Falls FWO to answer these questions. Project implementation is ongoing, and all phases are slated for completion in 2022.

- *Tyler Hammersmith, Partners biologist, Klamath Falls FWO*

Top: Satellite image shows the oxbow reconnection site on the Sycan River in eastern Klamath County. Courtesy: GoogleEarth

Above: Drone image showing the oxbow reconnection site. The project also includes riparian vegetation restoration. Courtesy: Cascade Stream Solutions

Left: The project also created two ponds that will remain wet year-round, making it a suitable habitat for aquatic species even in drought years. Credit: USFWS

Saving Suckers Together

The Sucker Assisted Rearing Program (SARP) began in 2015 raising Lost River (*Deltistes luxatus)* and shortnose suckers (*Chasmistes brevirostris)*, known to the Klamath Tribes as c'waam and koptu. SARP is progressing toward its goal of releasing at least 60,000 fish annually into the Upper Klamath Basin.

To help maintain genetic diversity in these reared populations, staff from the Klamath Falls FWO and the Klamath Tribes collect larvae from the Williamson River each spring using a variety of nets and methods.

Several weeks after suckers begin spawning in the Williamson and Sprague rivers, larval suckers begin emerging from the gravel in the evenings, drifting downstream to the lake. At daylight, the tiny larvae seek refuge in shoreline vegetation. They repeat this process over and over until they reach Upper Klamath Lake.

To capture drifting larvae, Tribal staff set large stationary drift nets in the evenings. The nets are checked the next morning by Service staff, who also use dip nets along the river edges and boats to deploy drift nets in the lake to ensure as many larval suckers as possible are collected for rearing.

Following collection, larval fish are divided between the Tribe and the Service and transported to nearby hatcheries. The tiny fish are slowly acclimated to the new water and given treatments to rid them of external parasites.

After four weeks of intensive rearing, the juvenile suckers are placed in nutrient-rich rearing ponds where they live for up to eighteen months, about the time needed to reach their target length of 200 millimeters (eight inches).

Compared with their wild counterparts, fish in captivity reach this size six to eight months sooner than if they remain in the lake.

Once the suckers reach target size, they receive a tracking tag and are released. A small portion of each cohort is held back for future rearing efforts.

The SARP brings hope for a future that continues to include the federally endangered Lost River and shortnose sucker. The Klamath Falls FWO looks forward to continuing this effective collaboration with our Tribal partners in recovery efforts for the c'waam and koptu.

-Mark Yost, supervisory fish and wildlife biologist Klamath Falls FWO

Top: Klamath Falls FWO bio-tech Michelle Jackson uses a plankton drift net to capture larval suckers.

Above: Sucker larvae at a few weeks of age.

Left: Drift nets hang off Modoc Road bridge over the Williamson River to collect tiny sucker larvae as they drift downstream. All photos credit: USFWS

Restoring Streams with Large Wood and Logjams

Trees that naturally fall into forested rivers and streams are called "large wood" and are key components of diverse and complex aquatic habitats. They help maintain the physical and biological components of rivers.

Physically, large wood creates pools, deepens existing pools, controls sediment, stores organic matter, and can help river channels reconnect to their floodplains.

Biologically, large wood increases food availability and spawning habitat for fish such as salmon and steelhead and provides slow water refuge and cover from predators. It also creates basking sites for reptiles like the western pond turtle and amphibians such as the foothill yellow-legged frog, as well as perching sites for many species of birds.

Since Europeans began settling the west, large wood has been removed from rivers and streams to facilitate navigation, control floods, allow for the floating of timber, and improve recreational opportunities. Wood was even thought to block the passage of migratory fish and taken out of rivers.

Timber harvest has also decreased the amount of large wood available to riverine systems. Over time, wood removal has simplified the structure of rivers and streams and degraded habitat for fish and other aquatic species.

To restore rivers and streams that lack this structure, restorationists are using a technique known as **wood loading** to add large wood into these riverine systems. The size and type of large wood or structures used (e.g. logs, root balls) is dependent on the size of the river or stream, the availability of large wood, and the objectives of the restoration effort.

In smaller streams with a forested riparian corridor, it is easy to use simple techniques like strategically falling trees into the stream. Restorationists can leave felled trees in place or wedge them between other trees and rocks using heavy equipment or hand tools such as pulleys and cables to keep them from moving, a technique called "soft anchoring."

In larger streams, rivers with greater flows, or in areas closer to bridges, roads or other infrastructure, restorationists can use carefully engineered logjams that are more securely anchored. In these situations, logs or groups of logs are partially buried into the stream bed or bank and often ballasted with large boulders or secured to each other with hardware.

Sometimes, in areas that are not accessible by heavy equipment or where streamside trees are lacking, helicopters deliver and place large wood into rivers and streams.

While natural sources of large wood are essential for maintaining high quality fish habitat over time, strategically placed large wood can provide the crucial first step in restoring structurally diverse aquatic habitats.

- Dave Johnson, Yreka FWO fish and wildlife biologist

Top: In larger systems or areas adjacent to bridges and other infrastructure, logs may need to be buried into the stream bank or bed and ballasted with large rocks to securely anchor them in place. Credit: Dave Johnson/USFWS

Below: In smaller creeks, trees can simply be felled directly into the creek or anchored against creekside trees to reduce their mobility during high flow events. Credit: Dave Johnson/USFWS

Hotelling Gulch: Restoring Access for People and Fish

The Salmon River, the second largest tributary to the Klamath River, contains the last wild runs of spring Chinook salmon in the Klamath Basin. The river is also home to Pacific lamprey, steelhead, Coho salmon, Pacific giant salamanders, freshwater mussels and many other species. Bounded by the Marble Mountains, the Russian Mountains, and the Trinity Alps, the watershed is unique because it is largely undeveloped and sparsely populated.

Near the Klamath National Forest's Hotelling Campground, a small stream runs under the road and into the South Fork of the Salmon River. For decades, the waters of that stream, known as Hotelling Gulch, passed under the road through two small metal culverts. During large storm events, these culverts were unable to handle the high runoff and the road would flood, washing out one of the few access points for the local community.

Hotelling Gulch's undersized culverts also prevented aquatic species from accessing almost a mile and a half of cold, clean water. Like a garden hose, the narrow pipes would pressurize under high flows. Certain fish, particularly juveniles, lack the swimming power needed to navigate upstream through such turbulent waters so were blocked from using the rest of the tributary during higher flows. In the summers, the streamflow would go below ground, drying the channel. This was a result of legacy mining activity that relocated the stream away from its original path.

For many years, the Salmon River Restoration Council, the Yreka FWO, the U.S. Forest Service, the California Department of Fish and Wildlife, Siskiyou County Public Works, the Karuk Tribe, and the Klamath Bird Observatory worked together to find a solution to keep the road from washing out and to allow aquatic species access to Hotelling Gulch.

In the fall of 2020, after a close call with the Red Salmon Complex wildfire, the twin culverts were removed and replaced with a channel-spanning bridge that now accommodates both storm flows and fish passage. The channel was moved back to its original location, providing year-round stream flow. Additionally, tree root wads, deep pools, and small rock features were incorporated into the channel design to increase habitat complexity for aquatic species, and native vegetation was planted for streamside shade and to stabilize slopes.

Over the next few years, on-site monitoring will occur for fish, birds, plants and water quality. Project partners are working hard to ensure the lessons learned will continue to inform future restoration projects. The ultimate goal is to increase quality and habitat availability for aquatic species in the Klamath Basin.

Mel Van Scoyoc, Habitat Restoration Coordinator of the Salmon River Restoration Council remarked how fish can now escape the main channel of the South Fork Salmon River during winter storm events, finding refuge in the calmer waters of Hotelling Gulch.

"In the hot summer months, fish will be able to access the Gulch's cold water," said Van Scoyoc. "We found that fish immediately moved from the mainstem Salmon River into the lower temperature water at the mouth of the Gulch once the project was completed."

The Salmon River watershed has limited areas that provide both winter and summer habitat in the same location. Enhancing and creating this habitat reduces the need for fish to expend precious energy searching for more suitable locations, allowing them to remain healthier and more resilient during varying environmental conditions.

- Serena Doose, Yreka FWO fish and wildlife biologist

Above: A new channel-spanning bridge was constructed to replace inefficient twin culverts in Hotelling Gulch. Credit: USFWS

Left: Twin culverts under the old road were too small to handle high runoff and prevented juvenile fish from moving upstream. The road was also damaged by the high flows. Credit: USFWS

We are the Klamath: *Meet Nick Hetrick*

Meet Nicholas J. 'Nick' Hetrick, Fish and Aquatic Conservation (FAC) Program Leader in the Arcata Fish and Wildlife Office of northern California.

The youngest of three boys, Nick was raised on his family's farm and ranch near the border of southeastern Oregon and Idaho.

"While I'd like to think I wanted to be a cowboy, astronaut or Olympic athlete when I grew up, my brothers and I agreed we didn't want to become farmers or ranchers," said Hetrick. Even though he had no desire to carry on the family tradition, he recognized and appreciated the positive aspects of a rural lifestyle.

"My father was an avid outdoorsman and some of my best memories are our incredible adventures in the Frank Church River of No Return Wilderness," Hetrick recalled. "When I realized I could actually make a living studying fish in places like this, my career path was set."

Hetrick attended Idaho State University on an academic and athletic scholarship in wrestling, which he learned as a matter of survival because his brothers wrestled competitively.

After graduating with a degree in Ecology, Nick worked on fisheries research crews in northern Montana and British Columbia before completing a Master's degree from the University of Idaho.

Nick then worked several jobs, mostly in remote locations like West Yellowstone, Wyoming, King Salmon, Alaska and Powell, Idaho, always following his passion for working with native cold-water fishes. As his career advanced, Nick was influenced by three supervisors who helped guide his path.

"I am forever grateful to LaVerne Smith, Margaret Gorski and Dr. Ted Bjornn, each of whom left lasting positive impressions on me," Hetrick said. "They collectively taught me to reach for the stars, to go big with conservation ideas, and most importantly, stay true to the science."

Hetrick joined the Service as a fish biologist in a fly-in only village in Bristol Bay, Alaska. "I initially didn't give the job announcement much thought, but my wife Stephanie was totally jazzed about it. It became the adventure of a lifetime."

Nick and his family made their most recent move to Arcata 17 years ago. As the FAC program lead, he provides technical support to agency and Tribal managers. He compiles data on fish populations, fish disease, and habitat availability for fish, in addition to developing decision models and predictive tools.

"As a supervisor, a lot of my focus is supporting a brilliant team of scientists," said Hetrick. "I'm also managing grants and agreements and I am dealing more with Klamath water issues, so my work days are pretty full."

One of the most rewarding work projects for Hetrick has been the proposed removal of four dams on the lower Klamath River, the largest such effort in American history. This has given him a new perspective in working with others.

"I've discovered the various stakeholders - farmers, commercial fishers, and tribal members -have a lot in common," Hetrick said. "They share a deep love and respect for nature and an independence offered by their unique lifestyles. Focusing on similarities rather than differences can make any partnership possible."

At this point in his career, Nick feels the most satisfying part is to see and encourage the passion and drive in younger members of his team, as they step up and take on new challenges and experience their own success.

Because of this commitment to his team, Hetrick received the 2020 national Science Leadership Award at the North American Wildlife and Natural Resources Conference last March. The award recognizes supervisors who empower their staff to accomplish scientific work and who champion the use of science in conservation decision-making. Well deserved Nick!

- Susan Sawyer, Klamath Basin public affairs officer

Above: In his free time, Nick enjoys exploring the Klamath Basin by boat and fishing any chance he gets. Courtesy: Nick Hetrick

Left: When it comes to water, Hetrick is not afraid to dive in, leading his team by example. In Alaska, Nick played a key role in developing methods for remote operation of salmon weirs, much of which is still in use today. Credit: USFWS

Keeping an Eye On Klamath River Fish

For thousands of years, Native American Tribes have lived in the Klamath Basin, thriving in harmony with the lifelines of the region, its rivers. The Klamath Basin's natural resources balanced the needs of its residents. However, as pressures on resources increased, that balance became disturbed and many aquatic resources, including salmon, are now increasingly scarce.

When our bodies are weak, we turn to a doctor to monitor our health. Similarly, given the current state of the river, a team of fish experts and biologists have been collaborating for over three decades to monitor the vital signs of the river and its fish species.

The Service has a mission to work with others, to conserve, protect and enhance fish, wildlife, and plants, and their habitats for the continuing benefit of the American people. To fulfill this mission, the Arcata FWO has been working shoulder to shoulder with the tribes of the Klamath Basin, the California Department of Fish and Wildlife, and other partners to keep a finger on the pulse of the Klamath River's native fish.

When driving down the road you may notice what appear to be cement mixers floating in the Klamath River and its tributaries including the Shasta, Scott, Salmon, and Trinity rivers. In fact, these are fish traps that help biologists track the vital signs of fish.

The fish trap, called a rotary screw trap, has a large wire-mesh cone with four spiral-shaped baffles that spin with the river current. As the cone spins, the baffles scoop water and gently deliver fish to a cool and safe live box where they await inspection by biologists.

The traps allow biologists to count and examine young fish as they make their way downstream to the ocean, providing a 'window' for biologists to determine the species and numbers of fish, how healthy they are, and how they respond to river conditions. For instance, fish are observed at multiple sites as they move downriver over time, allowing biologists to observe growth. This series of observations also provides the data needed to model the population size and survival of juvenile salmon within the river system.

Biologists monitor this information to understand fish needs in relation to changing environmental conditions, thus improving managers' ability to make informed decisions regarding the Klamath River and its aquatic resources.

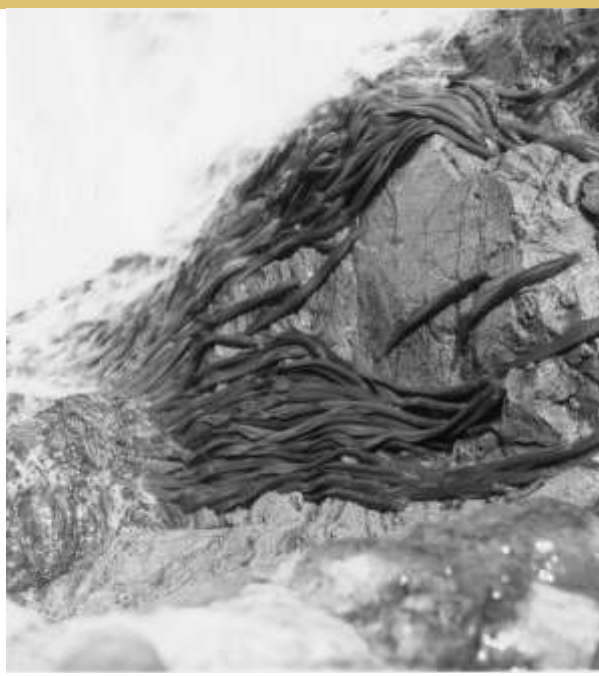
- Tyler Wallin, Bill Pinnix, Damon Goodman, fisheries biologists, Arcata FWO

Top: Juvenile Fall chinook salmon (Oncorhychus tshaawytscha) from Iron Gate Hatchery are marked with a temporary orange dye to help biologists calculate the efficiency of rotary screw traps at capturing fish.

Above: Fisheries technician Aliah Guerrero sorts through vegetation and debris while searching for fish captured in the rotary screw trap on the Klamath River near Yreka, CA.

Left: Aaron Bachelier, fisheries technician at the Arcata FWO, on a rotary screw trap in the Klamath River, sorts fish collected in the live box. All photos credit: Tyler Wallin/USFWS

Species Spotlight: Pacific lamprey



The Pacific lamprey (*Entosphenus tridentatus*) belongs to a primitive group of fish that resemble slippery eels with no jaws or fish-like fins. Lampreys have a round sucker-like mouth filled with lots of teeth, and use breathing holes instead of gills.

"Lampreys are scary-looking to some people, plus they're slimy and active at night," said Damon Goodman, former fish biologist with the Arcata FWO. "These characteristics cause many people to view lampreys as blood-suckers or fear them latching on like leeches."

In reality, lampreys help clean rivers, deliver nutrients from the ocean to fresh water systems, and they are culturally important to many river-based Tribal communities. The Yurok, Karuk, and Hoopa Valley tribes rely on lamprey runs in the Klamath River to sustain them. However, in California, Pacific lamprey numbers have declined sharply in the past decade.

Threats to Pacific lamprey survival include structures impeding their upstream migration as adults, low water, high temperatures, and predation. Biologists from the Service have coordinated with northern California tribes and other partners in hopes of preventing the need to list Pacific lamprey under the Endangered Species Act.

Pacific lamprey spawn between March and July in similar habitats to salmon. Both sexes construct the nests, often moving stones with their mouths. After eggs are deposited and fertilized, the adults die within a month. When the eggs hatch, tiny lampreys the size of an eyelash drift downstream where they burrow, grow and live as filter feeders for up to seven years. When lamprey emerge as juveniles, they develop eyes and teeth over several months and become free swimming, migrating to the ocean where they become adults.

Adult lamprey live up to three years in the ocean, where they parasitize whales and fish such as Pacific salmon. They are eaten by sharks and sea lions. Lamprey have been caught in the Pacific Ocean up to half a mile deep and over 60 miles from shore.

When about two feet long, adult lamprey stop feeding in the ocean and migrate back to fresh water between February and June. They use their sucker mouths to attach to rocks as they propel upward and forward often out of the water to navigate past obstacles such as waterfalls. Moving at night helps them avoid predators such as bald eagles, river otters, bears and raccoons. Pacific lamprey can live in fresh water for up to a year before spawning, thus renewing their unique circle of life.

- Susan Sawyer, Klamath Basin public affairs officer

Top left: Adult lamprey migrate from the ocean to fresh water when they are between two and three years of age. Credit: USFWS

Above: Before dams, Pacific lamprey navigated past waterfalls, such as this on Hayfork Creek in 1963, to reach their freshwater spawning grounds. This is done by attaching their sucker mouths to rocks and heaving their nearly 2-foot long bodies upward and forward. Courtesy: Damon Goodman

Left: Damon Goodman, formerly of the Arcata FWO, now with California Trout, Inc. enters data from a nighttime lamprey sampling effort. Credit: John Heil/USFWS

Finding Fishers: Karuk Wildlife Team

This past spring the Karuk Wildlife Team, in collaboration with the Yreka FWO, hiked and bushwhacked up steep cliffs, trails, and gullies while carrying stinky lure and raw chicken. Their objective: set camera traps on trees baited with meat attractants, to catch the elusive fisher (*Pekania penanti*) moving through the landscape.

The fisher is a weasel-like, tree-climbing carnivore that only lives in mature forests with sufficient understory and canopy cover. Fishers were recently listed as endangered in the southern Sierra Nevada, though data is still being collected to learn more about risks to the Klamath Basin populations in California and Oregon, which may have higher resiliency to threats.

The Karuk people used and still use fishers, or 'Tatkunuhpiithvar' (pronounced "taut-coo-new-pee-th-wad"), as a cultural resource, including as traditional quivers for arrows. As it is a descriptive language, this name directly translates as "*the one that moves around with stooped shoulders*" which aptly describes how fishers move through the forest.

In the spring, males travel widely to find females. In fall, young fishers can travel over 20 miles to find new territories. Because they require contiguous patches of high-quality forest habitat, fishers may face greater risks when traveling through fragmented landscapes with little cover.

Biologists at the Yreka FWO and the Karuk Tribe wanted to know if fishers would travel through lower-quality habitat and fragmented forest. The team used a connectivity model created by the Conservation Biology Institute to select study sites with potential barriers between sections of high-quality habitat.

These travel "pinchpoints" include the Klamath River, recently burned areas in the Marble Mountains, and major roads, where fishers may be exposed to predators and where good habitat is lacking. Understanding the obstacles fishers can or cannot cross can help the Service and the Tribe prioritize areas for conservation action, to preserve genetic diversity and increase fisher population health.

Capturing and tracking fisher movements across the landscape is a challenge. The project tested several survey methods and recorded habitat quality across the study sites.

The Karuk Wildlife Team was eager to use their ample field skills as well as their intimate knowledge of the remote and rugged landscape within the Karuk ancestral territory to improve the project's success.

"The assistance from local tribal staff was crucial, as the Karuk ancestral territory encompasses some of the most arduous terrain," said Trevor Super, Native American Program Specialist in the Yreka FWO. "Without their local knowledge and experience, planning and implementation would not have been as successful."

The team detected fishers at multiple camera trap locations. Other native carnivores photographed included black bear, ringtail, grey fox, bobcat, and mountain lion. As analysis continues, some camera traps will remain in the field through the fall to photograph fisher dispersal, though the nearby McCash Fire may affect their travel.

The Yreka FWO looks forward to continued partnerships with the Karuk Wildlife Team, designing future projects based upon these results to better understand our local fisher populations.

- Anne Loggins, Yreka FWO fish and wildlife biologist

Above: A fisher is caught on a camera trap investigating a pungent scent lure. The cameras are monitored by the Karuk Tribe Wildlife Team. Courtesy: Karuk Tribe

Left: Karuk Wildlife Team member Jessica Conrad records data from a camera trap, visible on the large tree to the left, in the Marble Mountains fisher study area. Tribal partnerships are key to learning about and monitoring how fishers move within their habitat. Courtesy: Karuk Tribe

A Unique Partnership Leads to Restored Floodplain Habitat

For over 25 years, the Lower Klamath Restoration Partnership has been working to find innovative solutions to resource management issues between private landowners, Tribal interests, and public agencies.

Founded by the Yurok Tribe and the Green Diamond Resource Company, this collaboration facilitates watershed restoration planning and implementation in the Lower Klamath Sub-Basin. The Arcata Partners for Fish and Wildlife Program has been an active participant in these efforts over the years, including enthusiastically supporting new, innovative restoration approaches proposed by the Tribe.

Green Diamond has been the predominant landowner in the Lower Klamath Sub-Basin (downstream of the Klamath-Trinity River confluence) for several decades. The Yurok Tribe had to find win-win solutions that facilitate implementation of Tribal led watershed restoration that fits within Green Diamond's management objectives and highlights their commitment to supporting voluntary restoration on their properties. The Partnership's ever-growing collaboration and trust has led to implementation of innovative and effective, process-based stream, riparian and wetland restoration.

In the Lower Klamath Sub-Basin, extensive historical road networks constructed to support industrial timber operations have resulted in a number of impacts to native fish including increased sediment delivery, altered river hydrology, and fragmented habitat on low-lying floodplain surfaces. Therefore, addressing road-related impacts has been a priority focus of restoration efforts since the Partnership's inception.

Hunter Creek, a major tributary to the Klamath estuary, has several miles of these floodplain roads that support Green Diamond's operations. However, sections of these roads fragment and eliminate floodplains, which greatly impact natural stream processes and inhibit juvenile salmonids' use of vitally important off-channel habitats. Recognizing past impacts, Green Diamond has partnered with the Tribe to conduct extensive road upgrades and decommissioning.

Given the critical need to restore access to floodplain rearing habitat, the Tribe approached Green Diamond with an idea to relocate a portion of the main road adjacent to Hunter Creek, which blocked access to high priority floodplain habitat and flooded routinely during winter. Based on past successes, Green Diamond embraced this idea and agreed to allow the Yurok Tribe Fisheries Department and their partner Fiori GeoSciences to design and implement the project. Partners Program provided funding and permitting assistance, and with Green Diamond's approval, the project was implemented in 2019.

The Tribe realigned 900 feet of road away from the floodplain. In its place, they constructed 700 feet of side channel habitat and reconnected over two acres of floodplain habitat to Hunter Creek. They placed significant amounts of whole tree materials in the new side channel to provide habitat complexity and cover for fish and native amphibians.

Now teeming with frogs and salamanders, the site provides off-channel habitat as a refuge for juvenile Chinook and Coho salmon, steelhead, coastal cutthroat trout, and Pacific lamprey.

And Green Diamond's road no longer floods in the winter. With continued support from the Partners Program, phase two of the project is scheduled for construction in 2022 on a nearby stretch of the road.

- Dan Gale, Partners for Fish and Wildlife Program, Arcata FWO
- Sarah Beesley, Yurok Tribe Fisheries Program

Top: Relocated road (left) and the restored side channel and floodplain habitat (center) after project implementation.

Above: Floodplain logging road in Hunter Creek inundated by winter stream flows before project implementation.

Photos courtesy: Sarah Beesley/Yurok Tribe Fisheries Program

Two Women Tracking Turtles

This summer, the Yreka and Arcata FWOs coordinated a joint Service Directorate Fellowship Program (DFP) project. This nationwide Program provides opportunities for university students to complete 11-week projects, collaborating with Service offices. Fellows contribute valuable work toward accomplishing Service goals, while also networking and learning about future career opportunities.

The 2021 FWO joint project focused on the northwestern pond turtle, which is currently being evaluated for listing under the Endangered Species Act.

Courtney Randik, from New Jersey, and Stephanie Menjivar, from Southern California, brought their combined backgrounds in whitewater kayaking and competitive canoeing and their passion for herpetology and conservation to survey for pond turtles along the Klamath River.

They collected spatially explicit data on the turtles' occupancy and habitat, navigating Class I - III rapids and spotting 652 northwestern pond turtles along 63 river miles. Through teamwork and dedication, Courtney and Stephanie overcame obstacles from equipment malfunctions to political turmoil to natural disasters to get the job done.

Each has provided a personal reflection on their experience in the Klamath Basin.

Top: Courtney and Stephanie used their combined skills in whitewater kayaking to navigate the Klamath River searching for northwestern pond turtles.

Above right, right: Team Turtle soon learned that not all basking was alike: some only showed their noses while others grouped together on logs or rocks midstream.
Credit: Anne Loggins/USFWS

Stephanie's story: Stephanie Menjivar, shown below assisting Forest Service biologists measure a hatchling turtle, is a graduate student at California State University, Northridge. She is completing her Master's of Science in Biology by studying urbanization effects on frog calling behavior.

"I left city life and propelled myself into the adventure of a lifetime. The beauty of the rivers, mountains, and forests of Northern California and Southern Oregon left me in awe. It was remarkable to be in a team of women scientists dedicated to filling in missing data about at-risk turtles."

"Because of the severe drought ravaging California, water levels were low, causing unrecorded and scary rapids to appear unexpectedly. We survived the wilderness

and collected data through the combination of our teamwork and experiences. Courtney and I each focused on one side of the river while keeping each other within sight. By the end of summer, we were working in harmony.

During the hot days, we collected turtle data and conquered river rapids. In the evenings, we set up our tents and planned the next day over a warm, rehydrated dinner."

"With our skills honed, we emerged stronger and more confident. The teachings we received and bonds we made were transformative and empowering."

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Courtney's story: Courtney Randik, pictured at right, is a senior at Rutgers University in New Brunswick, New Jersey where she is majoring in Ecology, Evolution, and Natural Resources.

"I dove head-first, literally, into what the Klamath River had in store for us, growing in ways I never predicted."

"We saw how the world of wildlife conservation expanded beyond the Service, meeting enthusiastic professionals eager to help us. The visitors and tribal members we met on the river proved that we are closely connected to each other and nature."

"During the summer, we read a novel titled In the Land of the Grasshopper Song: Two Women in the Klamath River Indian Country in 1908-09*" by Mabel Reed and Mary Ellicott Arnold. As we progressed through the true story of these brave women we noticed parallels between our stories from the Klamath River over 100 years ago."*

"The growth we experienced through our journeys as women and scientists is a timeless tale. It was only possible with the collaborative effort of those who provided us guidance and the chance to excel."

While they learned about the Service and Klamath Basin ecology, Courtney and Stephanie gained indispensable knowledge about their own strengths and relationship to wildlife work.

"We made mistakes," Courtney reflected, "but by overcoming challenges, we unlocked wisdom and insight into how to form a cohesive team that can survive and thrive in one of the most remote areas in the country."

Courtney and Stephanie also helped live-trap and measure pond turtles with the Oregon Department of Fish and Wildlife and learned tribal history while collecting basket weaving materials with the Karuk Tribe.

The DFP team acknowledges Gina Glenne and Anne Loggins of the Yreka FWO, Jenny Hutchinson of the Arcata FWO, Don Ashton, Jamie Bettaso, Steve Gough, Erik Kenas, and the Arcata Fisheries and Aquatics Conservation team for their expertise and guidance; and Southern Oregon University for providing housing during their summer project.

- Annie Loggins, Yreka FWO fish and wildlife biologist
- Courtney Randik and Stephanie Menjivar, DFP Fellows

Above: Courtney Randik holds an adult northwestern pond turtle live-trapped at Squaw Lakes in Oregon. The Fellows were able to work with the Oregon Department of Fish and Wildlife on turtle research this past summer. Credit: Anne Loggins/ USFWS

Yreka FWO Newsletter Recognized!

In July, the Yreka FWO received a Bronze Award from the Association for Conservation Information (ACI) for the *Winter-Spring 2020:Reptiles and Amphibians Issue* of their semi-annual newsletter. The award was announced during the ACI Excellence in Communications live broadcast for the external newsletter category. The newsletter was up against 20 other entries from state and federal agencies, most with professional writers and graphics departments who do this type of work on a full-time basis.

The ACI awards provides a juried competition for state, federal, nonprofit and other entities to be evaluated on their conservation communications products, including brochures, articles, web sites, flyers, newsletters, photography and social media posts. This was the second year the Yreka FWO newsletter was selected for entry by the U.S. Fish and Wildlife Service. Entries from the prior calendar year are first submitted to the Service selection committee, who determine which will be sent to the ACI for judging by professional conservation communications experts in each category. The awards ceremony usually concludes the annual ACI conference held each July. However, due to the pandemic, the event has been held virtually the past two years. *Way to go team newsletter!*

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Front: Juvenile c'waam (Lost River sucker) at the Klamath Tribes hatchery facility. Courtesy Paul Wolf Wilson

Back: Adult Pacific lamprey. Credit: John Heil/USFWS

Note on COVID-19: The health and safety of our staff is our top priority and as such, the Klamath Basin Fish and Wildlife Offices continue to work remotely. We are responding to requests for information via email or phone. We appreciate your understanding. *Photos of people in these articles were taken while exercising strict COVID-19 precautions.*