

HOW A DYING RIVER WAS BROUGHT ROARING BACK TO LIFE

Since the removal of two dams on the Elwha River in the Pacific Northwest, salmon are spawning once again, animals large and small are returning to the river banks, and hundreds of acres of barren former lakebed are greening

BY MEGAN HILL

Rapid rewards: Today, the Elwha River flows freely through Olympic National Park.

Adorning the walls of Kim Sager-Fradkin's office at the Lower Elwha Klallam tribe are captivating images of mountain lions and river otters, sharp-toothed predators that patrol the banks of Northwest Washington State's Elwha River. But there's a more subtle shot, one that signals an important ecological change on the Elwha today. In it, a small, gray bird called the American dipper — with a round breast and twiggy legs that belie its stealth — dives underwater to snatch a snack: a bright orange salmon egg.

That image of the little bird, America's only native aquatic songbird, is one Sager-Fradkin, the tribe's wildlife biologist, hopes to see more frequently on the river, which courses in part through Lower Elwha Klallam tribal land.

Sager-Fradkin and her colleagues are studying the ramifications of the largest dam removal project in the history of the United States on everything from river otters to American dippers to salmon and beyond. For the past six years, the Elwha River has run its entire 45-mile course free of human-created impediments, from a snowfield in the mountains of Olympic National Park to the Strait of Juan de Fuca, a waterway separating Washington's Olympic Peninsula from Vancouver Island, in Canada.

But since the early 20th century, two dams — the Elwha, completed in 1913, and the Glines Canyon, built in 1927 — impeded the river. The hydroelectric dams, for much of that time, helped fuel the economy and powered the nearby community of Port Angeles — but at a cost. The dams were built without fish ladders, which provide a detour route for migrating fish to reach their spawning grounds.

Over time, the Elwha's fish populations dropped dramatically. In the Pacific Northwest, salmon are

a linchpin in a healthy ecosystem. They carry critical marine-derived nutrients from ocean to forest, fertilizing riverbanks with their bodies as they die and decompose after spawning. Numerous animals rely on them, forming a chain of predation that circulates these critical nutrients throughout the forest. While a few salmon remained in the Elwha, gathering for 100 years below the lower dam, they couldn't complete their migration, robbing much of the

forest of their contributions.

The 108-foot Elwha Dam and the 210-foot Glines Canyon Dam also blocked sediment from reaching the mouth of the river. Rather than forming a braided fan, which constitutes crucial habitat for shore birds, Dungeness crab, and mollusks like clams and oysters — and all the creatures that depend on them — the Elwha simply dove off a steep shelf into the strait. The dams also trapped the gravel salmon target for egg burying, and downed trees that form shelter for small mammals and migrating fish.

When the dams went up, water pooled behind them, creating two reservoirs: 267-acre Lake Aldwell, and 415-acre Lake Mills. The dams flooded the Lower Elwha Klallam Tribe's sacred creation site, the place they believe to be their very origin. The areas the tribe fished, clammed, and crabbed for generations disappeared. The fish they depended on for centuries were nearly wiped out.

In the last 100 years, a lot has changed on the Olympic Peninsula. Port Angeles no longer needs the dams' hydropower. And scientific



New beginnings: A member of the Washington Conservation Corps, an AmeriCorps program, plants native trees along the Elwha River.

DANITA DELMONT / ALAMY STOCK PHOTO; PHOTO BY NICK STEVENS PHOTOGRAPHY

knowledge of the widespread environmental impact has sharpened. After years of advocacy on the part of the tribe and environmental groups, demolition kicked off in 2011, with the final bits of concrete removed in 2014.

Since then, the river has gradually returned to a more natural state. Millions of cubic meters of sediment, once trapped behind the dams, now form new beaches and wetlands at the Elwha's mouth — creating new habitat in the process. The two former reservoir lakebeds — barren

moonscapes immediately after dam removal — are morphing into new forests thanks to a massive revegetation effort that involved planting more than 400,000 native plants across 59 species. Now, the hundreds of acres of gray, barren former lakebed are greening with young salal, salmonberry, cottonwood, big leaf maple, and other native plants.

The tribe's creation site, which many suspected had been lost to a century of river scouring, has been uncovered, along with a previously unknown, 8,000-year-old archaeo-

logical site — one of the oldest in the area.

Animals large and small — from voles to deer and cougars — are returning to the river banks, too. Sager-Fradkin's beloved dippers are faring particularly well, she says, based on studies of their diets and behavior. "Dippers that had access to salmon were 20 times as likely to have a second nest in any given year," Sager-Fradkin says. "They were larger bodied and they had higher survival. Within a year of dam removal, we were seeing increases in the marine-derived nutrient contribution to dipper diets."

The results are largely positive for salmon, too. The Elwha River, historically, was home to five species of salmon, plus steelhead trout — a salmonid species that similarly spawns in rivers but spends its adult life in salt water. Mike McHenry, a fisheries biologist with the Lower Elwha Klallam tribe, says the research results so far look promising for most species. Last spring, he and his team counted a record number of Chinook smolts — the term for a young salmon journeying from river to ocean. Summer steelhead runs also look to be rising. "And that's very cool, because there were essentially no summer steelhead when dam removal happened," he says. "The bar is pretty low from when the dams were in place. The natural production was minimal for almost every species."

And while the fish were blocked for 100 years from migrating more than five miles up the river, they've retained in their DNA the urge to spawn higher in the watershed. But the results aren't looking as strong for pink — once the most abundant fish on the river — and chum salmon, which may not be able to recover. Their numbers were already very low when the dams were removed — perhaps too low to rebound, though scientists are considering reintroduction efforts using stocks from nearby rivers.

Overall, though, the Elwha's

recovery is a bright spot for Northwest salmon, which otherwise face a grim future. The Pacific Northwest's once-legendary salmon runs in rivers up and down the coast are at critically low numbers. Without significant intervention like habitat restoration, dam removal, and the suspension or restriction of fishing, this iconic fish — and the complex ecosystems that rely on it — may be irreversibly doomed.

"What the Elwha can show, though, is that systems with dams on them can be recovered pretty rapidly if bold steps are taken," McHenry says. "And I think it holds a lot of hope for regional recovery if we can get our hands around that problem."

Humans have long sought to control and harness the power of rivers through dams. In the United States, particularly in the West, dam building hit its peak in the mid-20th century. There are around 90,000 dams today, serving an array of purposes — from generating hydropower to controlling floods to storing water. Many hydroelectric dams produce renewable, carbon-neutral power that doesn't emit greenhouse gases, the way coal does.

But renewable energy doesn't mean impact-free energy, and now many dams around the country are being reconsidered. Since 1912, 1,605 dams have been removed, with 99 taken down in 2018 alone, according to data from American Rivers, a nonprofit tasked with protecting wild rivers. There are around 50 active dam removal projects around the country, including in Michigan, Wisconsin, Minnesota, Maryland, Oregon, California, and elsewhere in Washington State.

Not all dams have grave environmental ramifications, though; taking down some that provide cheap hydropower and have relatively little environmental impact can mean a return to air-polluting, carbon dioxide-emitting coal power plants.

But at some point in a dam's life,



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Before and after: The goal of removing the Elwha dam is to restore the Elwha River ecosystem and its native fisheries.

the scales may tip toward removal. Dams must be recertified every 30 to 50 years, bringing them into compliance with new regulations — and those retrofits can be prohibitively expensive. For older dams, the high cost of maintenance and upgrades, as well as the environmental impact, outweigh their utility. In other cases, the infrastructure is no longer needed; American Rivers estimates that many, if not most, of the dams across the U.S. may be vestigial. Others are hazardous, posing drowning danger for swimmers and the potential for harming nearby communities if they fail.

Taking down a dam isn't a straightforward process. Often, political infighting hampers things, says Jim Waddell, a retired civil engineer with the U.S. Army Corps of Engineers and a public utility district commissioner in Port Angeles.

"There's so much built-in mania about how wonderful infrastructure is in general, especially dams, and especially in the West," says Waddell, who is a staunch advocate for the removal of four hydroelectric and navigation dams on the Lower Snake River in Washington State. The Snake, and the Columbia River it flows into,

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Scaling up: Tribe project biologist Ray Moses releases a coho into the Elwha River. Since the dam's removal, many species of salmon have returned on their own.

COURTESY NORTHWEST TREATY TRIBES

HENRY MEYER/NPS; PAUL COOPER

were once home to legendary salmon runs that are unrecognizably low today — and on the brink of disappearing altogether despite billions in government spending to boost fish numbers. Commercial and recreational fishing on the river have been extremely limited, and the region's Southern Resident killer whales, whose diets rely heavily on Chinook salmon from these and other rivers, are starving to death. Without intervention, they face extinction.

The advocacy group Waddell leads, Dam Sense, says the Lower Snake River dams operate at a financial loss and are no longer necessary for the hydropower and navigational uses they were built for. Dams like these, he says, are exorbitantly expensive to maintain compared with cheaper solar and wind power. And yet, rational discussions about removal devolve into “political mudslinging,” in which neither side of the aisle listens to the other.

“These dams are a waste of money, and that’s a crime for the whole country.” He says the money being

spent to maintain these dams should be rerouted to other critical civil engineering projects — dams included.

Today on the Elwha, visitors can walk to the two former dam sites. At Glines Canyon, the dam’s former spillway is now an open-air interpretive site perched 200 feet above the river. Below the spillway’s arching concrete buttresses, the Elwha roars in great blue-green torrents through a narrow, black canyon. Behind it, a dark swath of fern- and moss-filled forest meets bright green young trees planted where Lake Aldwell once pooled.

The Elwha isn’t a perfect rubric for dam removal everywhere. The upper river has long been surrounded by pristine forest — it sits within Olympic National Park, so it’s been insulated from development, which jumpstarted the ecological recovery. But restoration stories like the Elwha can serve as inspiration for other dam removal projects.

“The Elwha captured everyone’s imagination and shows that dam

removal works,” says Amy Kober, the national communications director at American Rivers. “It’s exciting on so many levels for the ecosystem. You’re seeing the benefits from insects to salt water, which shows how connected rivers are, and the benefits that have a domino effect outward. It’s inspiring people all around the country to ask questions about their rivers.”

In the years that followed dam removal on the Elwha, enthusiasm ballooned — seemingly everyone rushed to call the restoration a success. But scientists like the Lower Elwha Klallam Tribe’s Sager-Fradkin and McHenry say the success story isn’t so cut and dried.

“Restoration takes a long time,” Sager-Fradkin says. “People want to tell this story that the river is restored and move on. And it’s not quite as clear as that. Are there ever going to be salmon in this river where you can walk across their backs to get to the other side? I don’t know.”

After all, the world looks a lot different now than it did a century ago along the Elwha River — and beyond. Salmon, and the Elwha watershed’s other animal residents, are experiencing stressors outside of a damaged river ecosystem. So much has changed in all that time, and human impacts are felt far and wide.

So Sager-Fradkin isn’t one to get sentimental. She and her team will keep methodically recording the river’s progress, measuring a comeback that, however promising, is complicated by the impacts of the human footprint. She can’t help but smile, though, when she recalls spotting a black bear hunched over a salmon on the Elwha River. It’s another iconic Pacific Northwest image, another small signal of a river in recovery.

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MAJOR DAM REMOVAL PROJECTS IN THE U.S.

Klamath River, California and Oregon: Four hydroelectric dams — three in California and one in Oregon — are coming down on the Klamath River. The project will eclipse the Elwha River removal in scope and is expected to aid in salmon restoration. The timeline is in flux, but current estimates aim for a 2022 completion.

Nooksack River, Washington: A diversion dam on the Middle Fork Nooksack River has helped provide water for the city of Bellingham. But the dam blocks salmon migration, so the city has identified a new diversion farther upstream that negates the need for the dam. It will come down this year.

Pennsylvania: The country’s leading state in dam removal, Pennsylvania has two projects on deck: The Paper Mill Dam on Cacoosing Creek will be removed in summer and fall of 2020, and the Kehm Run Dam in York will come out in early 2020.

Musconetcong River, New Jersey: Three dam removal projects stretching into 2021 will help reconnect the Musconetcong River in New Jersey. They include the Bloomsbury Dam, Warren Glen Dam, and Asbury Dam. The projects are expected to help restore fish and wildlife habitat and improve water quality.