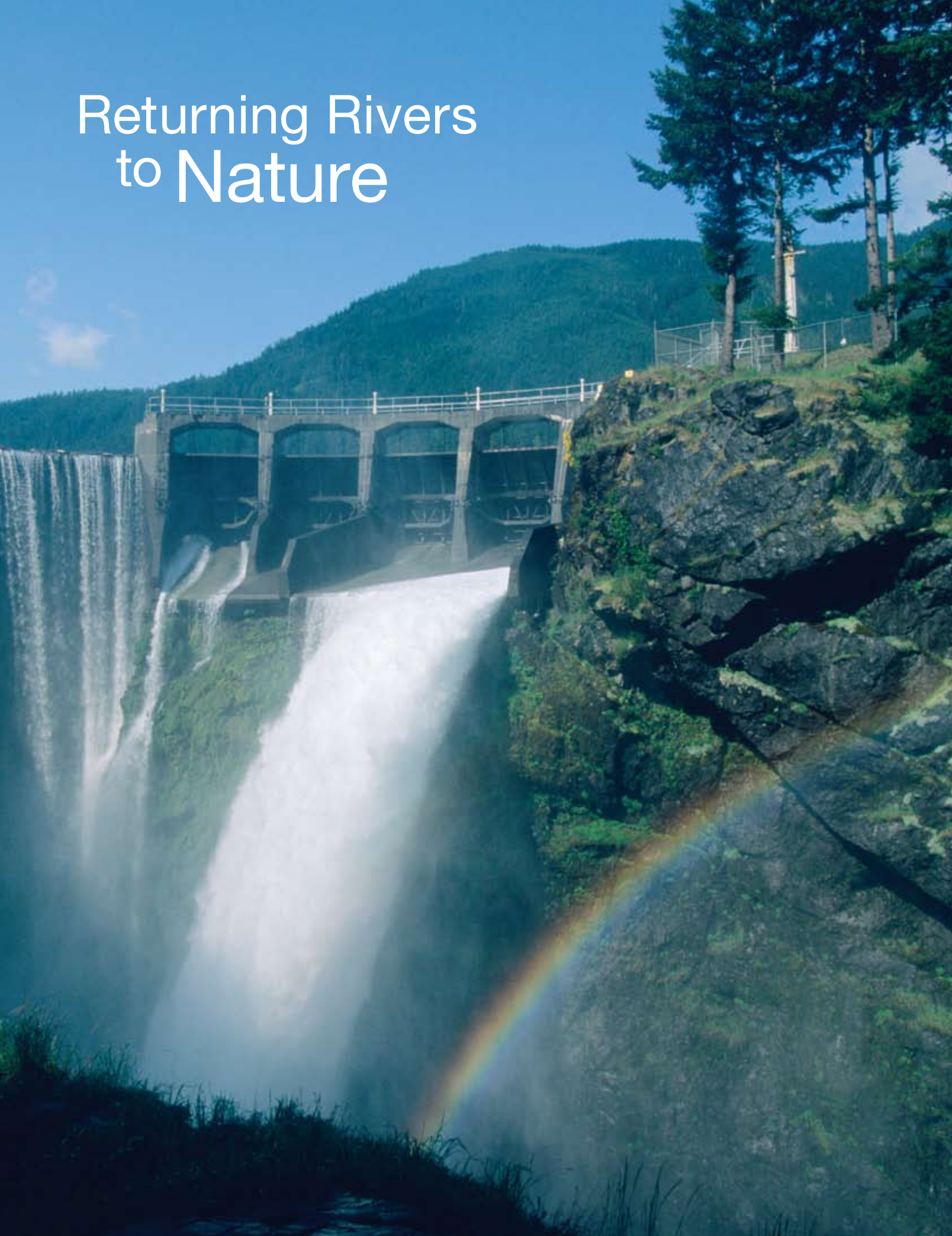


Returning Rivers to Nature



Renewal processes begin as aging and outmoded dams across the country come down | LESLIE FORSBERG

“PADDLE HARD!” shouts our rafting guide, Heather, as we plunge our paddles deep into the fast-flowing, teal-hued water of the Elwha River. I’m eyeing a couple of massive boulders that nearly block the flow, white water curling like grins around them. Flashing past the lichen-covered behemoths, we settle into calmer water, and I breathe in the moist, fragrant air.

Behind us, Carrie Glacier, atop 7,000-foot Mount Carrie, glows brilliantly in the sunlight, and Mount Fitzhenry pushes 6,000 feet above the river valley. The riverbanks are shaded by mossy-floored alder groves where Roosevelt elk often bed down at night, and massive bigleaf maple trees are layered with ferns and beardlike moss. Thick stands of sword ferns duel for space with salmonberry bushes and lacy vanilla leaf, whose spires of white blossoms create sparks in the dense emerald world.

The powerful Elwha, which flows 45 miles from the heart of Washington state’s Olympic Mountains north to the Strait of Juan de Fuca, anchors the largest watershed on the state’s Olympic Peninsula, and its waters nourish one of North America’s most spectacular places.

It’s also the setting for a spectacular new human enterprise—removing two sediment-blocking dams and returning the full length of the Elwha River to its unfettered state.

When the first chunk of concrete falls from the Elwha Dam in September, it will represent the greatest river-restoration project ever to take place in the United States. In succeeding months and years, demolition experts will slowly bring down the lower dam and its upstream neighbor, the larger Glines Canyon Dam, while environmental experts revegetate the newly exposed valley floor, and fisheries managers work to bring back what was once one of the most storied Northwest salmon runs.

“By freeing the Elwha we are freeing the entire watershed—70 miles of river and tributaries, the majority of it inside Olympic National Park,” says park spokesman Dave Reynolds. And once salmon are again able to reach ancestral spawning streams, after a century of being blocked by dams, their populations should return to historical levels.

WASHINGTON STATE’S ELWHA RIVER is a model for the long and detailed process of reviving the free flow of rivers. At left is the Glines Canyon Dam on the upper Elwha; and above is the Elwha Dam. Their removal will restore access to ancient salmon spawning streams.

THIS PAGE: ROB CASEY / GETTY IMAGES; FACING PAGE: KEVIN SCHAEFER / ALAMY



REMOVAL OF THE 125-FOOT-TALL Condit Dam (above) begins this fall. The century-old hydroelectric dam on the White Salmon River was built without fish ladders that would allow salmon and other species to migrate upstream. Removal of the dam will open up 33 miles of steelhead spawning habitat. Below, rafters float a natural stretch of the White Salmon.

THE THREE-YEAR, \$350 million dam-removal and river-restoration project is nothing short of mammoth, with dozens of governmental, conservation, Native and fisheries organizations heavily invested in its successful outcome.

A cofferdam will be built at the 108-foot-tall Elwha Dam, diverting the river's flow so that the original dam can be torn down. The 210-foot Glines Canyon Dam will undergo "notching," its concrete removed chunk by chunk. But those are just the more obvious steps. The massive sludge flow of sediment released from behind the dams will scour the riverbed as it moves downstream, so a new water filtration system has been built to supply drinking water to Port Angeles and fresh water to a newly opened, state-of-the-art salmon hatchery. To help speed restoration of the salmon runs, the hatchery will release young salmon into tributaries of the upper watershed. Once the river begins to return to its normal path, sediment layers many feet deep sloping down to the river must be replanted with native vegetation.

"The Elwha dams will represent the largest dam-removal project anywhere, both because of the size of the dams and because of the volume of sediment backed up in the reservoirs that will be released," says Gordon Grant, research hydrologist at the USDA Forest Service Pacific Northwest Research Station in Portland, Oregon. "It's an order of magnitude greater than any other such project, and the release of the sediment will be the single largest volume ever artificially introduced into a river."

Tim Randle, manager of the Bureau of Reclamation's

sedimentation and river hydraulics group, notes that the largest dam removed to date has been the Marmot Dam, on Oregon's Sandy River in 2007. However, it had less than 1 million cubic yards of sediment. The two Elwha dams combined have 24 times that: 24 million cubic yards of sediment, or nearly 2 million dump-truck loads. Dealing with a century's worth of accumulated sediment poses the greatest challenge for the project.

THE ELWHA RIVER SYSTEM, protected within the boundaries of Olympic National Park, is one of the best examples of an intact, protected temper-



JUSTIN BAILIE / AURORA PHOTOS



KEVIN SCHAFER / ALAMY

ate rain forest in the world. This sublimely scenic, emerald river valley offers hikers, rafters and day-trippers a glimpse of what this corner of the world looked like long ago.

While the landscape on my 6.5-mile raft trip from the Altair Campground, just below the Glines Canyon Dam, to Lake Aldwell, the reservoir of the Elwha Dam, feels natural and wild, in reality the river is not running its natural course. The Elwha Dam, which went online five miles from the river's mouth in 1913, changed the landscape by backing up water into Lake Aldwell. The dam was designed to provide power to the town of Port Angeles, which soon hosted one of the world's largest sawmills. The Olympic Peninsula's vast stands of hemlock forests became currency that spurred the economy of the entire region. In 1927, the Glines Canyon Dam, eight miles farther upriver, added to the power output.

Thousands of rivers were similarly harnessed in the first half of the 20th century. Many of the projects were vital to the growth of American enterprise, providing not only power generation, but irrigation water, drinking water reservoirs and flood control. The massive Grand Coulee Dam in Central Washington today provides some 7,000 megawatts of electricity, but it was originally designed to feed a system of canals that supplies irrigation water to more than 670,000 acres of the fertile, but arid, Columbia Plateau.

Today, many of the older dams have grown obsolete and are no longer able to justify their toll on the environment; many were built without fish ladders, blocking access to spawning streams and leading to massive declines in the numbers of returning salmon and other migratory fish.

Nearly a century after the first dam was installed on

the Elwha, the 19-megawatt output of the two dams served only a fraction of the power needs of Port Angeles. That energy came at a steep price: the decline of one of the most prolific salmon runs in the Pacific Northwest.

Long before European settlers arrived, the Klallam people thrived on the river's riches. The Elwha supported up to 400,000 salmon each year—coho, pink, chum, chinook and sockeye—which coursed into its vast network of tributary streams to spawn. The chinook returning to the river achieved legendary status: Historical records note 100-pound salmon.

"The elders used to talk about how you could walk across on the backs of the salmon that came here, not by the hundreds, but by the hundreds of thousands," says Lower Elwha Klallam Chairwoman Frances G. Charles.

In the century since the damming of the river, dwindling numbers of salmon have leapt from shallow, too-warm pools in futile attempts to scale the towering Elwha Dam. In the most recent count, only 3,000 fish returned to the lower reaches of the river.

The Elwha dams are among



JOSHUA.CHENOWETH@PS.GOV



TIFFANY ROYAL / NORTHWEST INDIAN FISHERIES COMMISSION

IN COMING YEARS, portions of the Elwha River currently under two reservoirs will appear much like the Lower Elwha shown above. Nurseries are currently raising species of native vegetation that will be planted in ground exposed by draining the reservoirs. A new Lower Elwha Klallam Tribe hatchery will release as many as 3 million fry annually into 65 miles of the free-flowing river to rejuvenate salmon runs.



CHARLIE MUNSEY / AURORA PHOTOS

THE WHITE SALMON RIVER in south-central Washington is already a playground for kayakers, rafters and fishers. Recreational enthusiasts say they look forward to new opportunities presented by removal of the Condit Dam.

many across the country that are being decommissioned and torn down to renew rivers' historic pathways and fish runs. The fact that much of this activity is happening now is a measure of the age of the dams and license-renewal reviews being undertaken by the Federal Energy Regulatory Commission. Most nonfederal hydropower dams in the United States fall under the purview of the FERC, which licenses them to operate for 30 to 50 years, and then subjects them to a relicensing review process that weighs the economic and cultural value of the power against the environmental impact the dam has on a river system. Many older hydropower dams in the country are up for relicensing, or soon will be.

The Elwha dams, however, are being taken out not as a direct result of FERC action, but pursuant to a 1992 act of Congress, the Elwha Act, which directed their removal. The law was the culmination of decades of controversy over the dams' value, the damage to the fishery and questions about jurisdiction, as the 1913 lower dam predated the 1920 Federal Power Act that gave the FERC its authority.

Despite the fact that FERC relicensing did not directly seal the dams' fate, many river advocates are hoping the overall Elwha story will influence future dam-removal campaigns. Throughout the nation, many dams are decaying. A large number of these structures, whether three-foot irrigation dams or the larger hydroelectric dams that powered the country's industrial

development, have outlived their original life expectancies or are today outmoded and unsafe.

A movement to remove obsolete, fish-blocking dams is now gaining momentum across the nation, says Amy Kober, senior communications director for American Rivers, a national nonprofit conservation organization that has directly contributed to the removal of more than 200 dams. This year that movement will reach a significant milestone: One thousand dams will have been removed in the United States.

"Just a decade ago, the concept of removing old dams was considered radical," Kober says. Today, thanks to scientific expertise; advocacy work by Native organizations, environmental groups and entire communities; and legislative support, it has become not only feasible, but practical. "It's an immensely significant number when you think of the miles and miles of rivers restored—and beyond restoring the rivers' health and wildlife, think what it



WHITNEY LITTLE

CELEBRATING THE ELWHA

When a ceremonial chunk of concrete is removed from the Elwha River Dam on Saturday, September 17, Port Angeles will mark the occasion with food, music and festivities at the City Pier, and restaurants throughout town will feature Elwha-themed menu items.

Earlier in the week, on Tuesday, September 13, the historic event will be commemorated with an evening of art, poetry and storytelling at the Lower Elwha Klallam Tribe Heritage Center.

Guided Elwha River watershed tours and boat tours of the river's mouth will also be available throughout the weekend of September 17–18.

For a complete list of dam-removal weekend activities, visit www.celebrateelwha.com. To plan a visit to Olympic National Park, see www.nps.gov/olym. —L.F.

means for communities, tribes, recreational users and businesses,” Kober says.

WHILE THERE IS no blueprint for removing dams as massive as those on the Elwha, the 1999 removal of the 24-foot-tall, 900-foot-long Edwards Dam on the Kennebec River in Augusta, Maine, has served as a model for the Elwha project and those on other rivers. It was the first time the FERC ordered the removal of a working hydropower dam after ruling that the benefits of a free-flowing river outweighed the benefits of the dam.

Like the Elwha Dam, the 1837 Edwards Dam blocked fish passage. The Kennebec watershed drains one-fifth of the state of Maine, and flows into an immense salt marsh estuary laced with tidal channels that nourish young fish. Prior to dam construction, the river system was a spawning ground for nearly every Northeastern species of anadromous fish—seagoing fish that spawn in rivers—including sturgeon and salmon.

Following the dam's removal, the fish have returned, notes the Natural Resources Council of Maine. Within the first decade, a run of 2 million alewives (a species of herring) returned to the river in what is likely the largest migration on the East Coast. The entire ecosystem, from eagles to ospreys to bears, is rebounding as the

river recovers. “The Kennebec's revival is a true wonder of nature,” enthuses former NRCM Executive Director Brownie Carson.

In the Pacific Northwest, the 47-foot Marmot Dam on Oregon's Sandy River, which generated hydropower for almost a century, was removed in 2007 by Portland General Electric. The Little Sandy Dam on the Little Sandy River was removed one year later. Today the entire river system again flows freely from the slopes of Mount Hood to the Columbia River at Troutdale, just east of Portland. For the first time since 1912, salmon and steelhead can freely access the entire Sandy River watershed.

The Sandy River is so named for good reason. The reservoir behind Marmot Dam was packed with 900,000 cubic yards of sediment swept down from the western foothills of the Cascade Range and

eventually blocked by the dam. Engineers raised concerns about the impact of releasing that much sediment into the river downstream from the dam, yet the result turned out to be the project's biggest surprise.

"We monitored how sediment was dispersed downriver," says PGE spokesman Steve Corson, "and we were astonished by how quickly the river recovered; today you can't even tell there was a dam there."

Yet another antiquated Pacific Northwest dam is slated for removal, to start just a month after the Elwha Dam removal begins. In October, the 125-foot-tall, century-old Condit Dam, on the White Salmon River, which flows into the Columbia just east of the Bonneville Dam (the last in the Columbia River mainline), will be removed. There was no accommodation for fish passage when the dam was built and it generates relatively little power, at just under 15 megawatts capacity.

Removing the Condit Dam will offer 14 additional miles of spawning ground for chinook and 33 for steelhead (which can swim farther upstream). The White Salmon River is hugely popular with recreational boaters—whitewater rafters and kayakers—and there's immense anticipation about what rapids will emerge when the river drops. "This is an incredible river renaissance," says American Rivers' Amy Kober. "And it's exciting that we'll be able to see the largest dam removals in history happening in Washington state."

THE REMOVAL of the Elwha River dams will take about three years, and in 2014 many eyes will be trained on the river as it begins to heal itself. The Elwha's salmon runs are expected to have returned to their historic abundance by 2039—marking a significant measure of the river's renewal.

The dam removal is a multipronged endeavor that is consuming many thousands of hours of research and fieldwork. It is also a very personal endeavor for me. I grew up on the Elwha River. My family's historic dairy farm lies on a bluff above the river; my great-grandfather, a British engineer, built the first covered bridge across

the Elwha, allowing for greater westward expansion. My father served on a citizen's board to determine the fate of the dams, and the river was a daily presence in the first 18 years of my life.

Back then, few could imagine that the river's legendary salmon might one day be able to return to their ancestral spawning streams.

Lower Elwha Klallam elder Adeline Smith, born in 1918, recalls trying to save the salmon as a child. "Every Sunday they would close the dam so the spillway would

"We don't like to see power facilities come out. But for this river and this story, it's time to do the right thing."

be practically dry, and you could see little fish lying in puddles," she says. "Us kids used to get buckets and put those little fry in them and put them in the main river. But you know, that really didn't make any difference at all, compared with all the minnows that didn't make it."

Up close today, the dams show their age; feathery maidenhair ferns grow out of cracks in the surface of the concrete; immense rusted hooks and chains hang from the ceiling of the power plant; and many of the gears and gadgets used to operate them, with patent marks from the late 19th century, wouldn't seem out of place in a Jules Verne story.

Inside the Elwha Dam's operations room in late May this year, the rumble of turbines was so loud that earplugs were mandatory. Seated behind an amazing array of ancient dials and knobs interspersed with computers, Elwha Dam hydro manager Kevin Yancy talked about the last days of power generation on the Elwha.

"I'm a hydro guy. We don't like to see power facilities come out. But for this river and this story, it's time to do the right thing. There's so much wind and other

green energy now,” he said. “If we can restore an incredible watershed, we’re eager for it to come out.”

Days later, on June 1, he threw a lever and the turbines wound down to a stop. Within seconds, the only sound was the river rushing over the spill gates.

No one is more eager for the dam to be removed than the Lower Elwha Klallam Tribe. Their ancestors relied on the river’s salmon for commercial, subsistence and ceremonial uses.

The words “Elwha Klallam” in the Klallam language mean “the strong people”—a strength demonstrated in the effort to bring about removal of the dams. Working with conservation advocacy groups, including the Audubon Society, Friends of the Earth, Trout Unlimited and American Rivers, the Klallam nation led the effort that resulted in Congress’ passing the Elwha River Ecosystem and Fisheries Restoration Act in 1992. In 2000, the federal government acquired both dams and turned them over to Olympic National Park, and the Bureau of Reclamation was assigned to temporarily manage the hydroelectric plants and draw up plans for removal of the dams.

The restoration project has diverse elements, including dam “deconstruction”—a cautious, measured approach, to reduce the odds of sediment moving downstream too quickly and further degrading the environment; a new fish hatchery; levee modification; water filtration; and revegetation. All these efforts, many of which must take place simultaneously, require an army of scientists and researchers, and a legion of volunteers to help return the river to its natural flow.

Much has already taken place. A new hatchery opened this past spring to ensure the survival of salmon once the dams come out and the massive sediment load starts moving downstream. Lower Elwha Klallam Tribe hatchery manager Larry Ward has been hard at work with crews, transferring fingerling salmon from an antiquated hatchery to the new, state-of-the-art hatchery where they’ll be safeguarded from the sediment flows.

“As the material comes downstream,

we’ll see more side-channel habitat; it will look more like the Hoh River, meandering through sandy deltas,” Ward says.

The big moment will arrive on September 17 this year, as the first chunk of concrete is removed from the Elwha Dam.

With the drawdown of water that has been impounded behind the dams, hundreds of acres of river bottom will begin to emerge from the reservoir bottoms. “We’ll expose 700-plus acres of land that’s been underwater for 100 years,” says parks spokesman Dave Reynolds.

Joshua Chenoweth, Olympic National Park botanist, based his master’s thesis on determining whether there might be cen-

**A new hatchery
opened this spring to
ensure the survival
of salmon once the
dams come out and
sediment starts
moving downstream.**

tury-old dormant seeds encased in the sediments that could sprout once revealed. He has concluded that whatever seeds there may be are buried deep in sedimentary layers and are no longer viable. Sediment trapped behind the Glines Canyon Dam is 40 to 60 feet deep. Even with the river carrying a heavy load of sediment downstream once the dams are out, much will remain, and the residual sediment will dry into steep, thick terraces of sandy material. The newly exposed landscape will be barren and open, with harsh sun exposure. Getting plants to grow here will be an immense challenge.

At the Matt Albright Native Plant Center near the Olympic Peninsula town of Sequim, plant propagation specialist David Allen tips the contents of a brown paper sack into his hand, forming a tiny mound of seeds as fine as sand grains. These are goat’s beard, an herbaceous perennial; there are about 800,000 of the seeds in a

single pound. These seeds and others collected from alongside the Elwha are being planted and propagated in a greenhouse that overflows with growing plants. Once the reservoir levels drop sufficiently, Allen and a cadre of volunteers will hand-plant 400,000 shrubs and trees, a cornucopia of up to 80 plant species. Among them will be ocean spray, Nootka rose, lupine, salmonberry and thimbleberry, Douglas and grand firs, bigleaf and vine maples.

Many of the plants will produce flowers and fruits that will attract birds, which will continue reseeding the riverbanks naturally after humans have ceased their efforts.

As the river returns to a serpentine course, revealing land that lay dormant at the bottom of the reservoirs for a century, there is one feature that the Lower Elwha Klallam tribe is hoping will be revealed.

“There was a rock along the river, a sacred rock,” says elder Adeline Smith. “I wouldn’t know how to explain it, but if you were a native, you would understand. Young men had to go to the rock and seek what they were going to be. The rock had a hole in it, and when a young man put his hands in the hole, whatever he pulled out was how he was going to live. Maybe he would be a good hunter, maybe he would be a good fisherman, maybe he would be the leader of the tribe,” she says.

WHEN I WAS YOUNG, my hand tucked inside my grandmother’s knobby hand, we would walk alongside the river, searching for what she called “lucky rocks”—smooth, rounded gray rocks encircled with a white band. I always thought the river stones’ luck was destined to settle upon me. Little did I know I’d live to see it spread much farther.

When the last pieces of the dams are removed, the Elwha, which has murmured quietly as it has sought its way through a series of reservoirs and turbines over the last century, will find a new voice—the deep, strong baritone of a river carving its own path, calling a new generation of salmon home. ▲

Leslie Forsberg is a freelance writer living in Seattle’s Ballard neighborhood