

A Century of Economic and Ecological Trade-offs on the Elwha

GOING FULL CIRCLE

BY LISA MEOLI

Humans have been intrinsically linked to the Elwha River watershed for at least 3,000 years. Based on its geography, the Elwha was the prototypical Northwest wilderness river, serving as a conduit for Pacific salmon to reach spawning habitat in the

Olympic Mountains. Yet salmon could not access the 70 miles of traditional spawning habitat for over a century because of two dams constructed in the early 20th century. The damming of the Elwha River, as well as the logging required to create the dams, brought about a profound shift in the magnitude

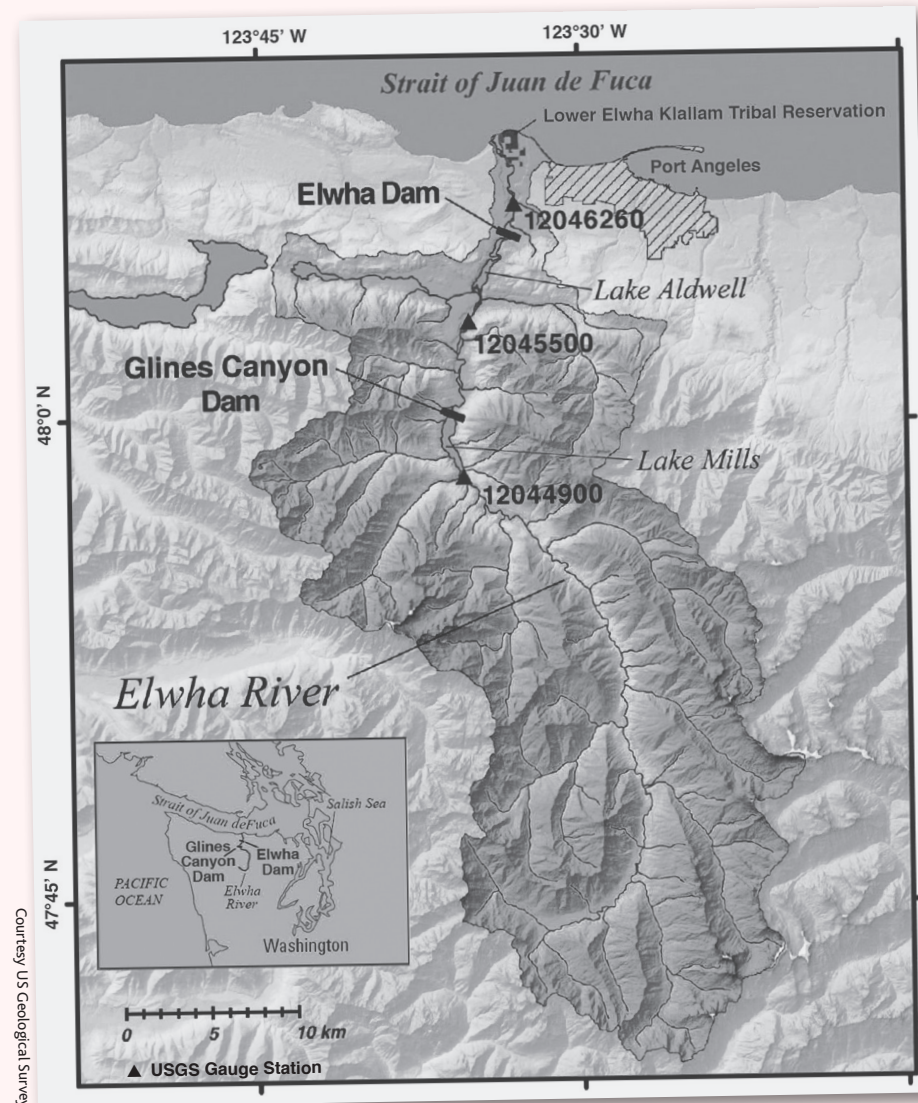
and type of human exploitation of the river—until 2014, when the Elwha again ran free.

The transformation can be tied to Thomas T. Aldwell, principal shareholder of the Olympic Power and Development Company. Aldwell is known for developing the Elwha and Glines Canyon Dams, which went on line in 1913 and 1927, respectively. The dams and their impoundments drowned out land populated with native flora and fauna and blocked vital fish passages. Pipelines carved unnatural paths through the surrounding forests and waterways. The prioritization of electric power over natural resources was good for local economic development, but it had serious negative environmental consequences, particularly with respect to salmon and other anadromous, or spawning, fish. By the 1970s, after years of mismanagement and a dwindling community need for the power source, people were calling for removal of both dams.

Both the early 20th-century dam construction and the 21st-century dam removal have had significant ecological and societal impacts. The story of human interaction with the Elwha is circular in nature, providing a provocative case study of how temporal human decisions—wise or not—shape our environment and reflect our changing values.

LEFT: Map of the Elwha River watershed and surroundings.

FACING PAGE: Elwha Dam powerhouse and spillway during construction, c. 1910.



Bert Kellogg Photograph Collection, North Olympic Library System

The Elwha River watershed on Washington's remote Olympic Peninsula includes much of the interior of the Olympic Mountains inside Olympic National Park. The Elwha headwaters are completely within the park, in some of the most pristine wilderness in the continental United States, and flow north into the Strait of Juan de Fuca.

The Elwha River watershed was formed by the last ice age's Fraser Glaciation event, which occurred between 25,000 and 10,000 years ago. When the 5,000-foot-thick glacial ice retreated from the Puget Sound lowlands, it had carved out the modern landscape, including the Elwha River, flowing from the nearly 8,000-foot elevation of the Olympics to the strait. With an area of 321 square miles, the Elwha River is the largest watershed in the Olympics and the most important river system for

salmon and other species of anadromous fish on the Olympic Peninsula.

River hydrology is controlled by two peak-flow seasons, first during early winter precipitation and then after snowmelt in the spring. The US Geological Survey, which has continuously monitored annual streamflow since 1918, indicates that 78 percent of annual peak flow occurs between November and January.

Historically, the Elwha River was regarded as the most prolific fish-producing stream on the Olympic Peninsula. Prior to dam construction, the Elwha supported healthy populations of all native species of anadromous salmonids, including Chinook, coho, chum, pink, and sockeye salmon; steelhead trout; sea-run cutthroat trout; Dolly Varden or sea-run native char; and bull trout.

To the people of the Klallam Tribe, the river was the center of culture and economy. To this day, both river and

salmon are viewed by tribal members as central to their way of life. As Beatrice Charles, a Lower Elwha Klallam elder, described the connection in 2002: "We were told that the salmon belonged to us, it was given to us by our maker. It was part of our culture . . . our way of life." Three bands of the Klallam Tribe live on the northeastern corner of the Olympic Peninsula: the Lower Elwha Klallam, Jamestown S'Klallam, and Port Gamble S'Klallam. The Lower Elwha Klallams, traditionally named "nux-klay-um" or "Strong People," form the northernmost band of the tribe that has long lived along the Elwha River. They traditionally relied on salmon and local cedar forests for most of their subsistence resources. Port Angeles harbor was the site of two major Klallam villages situated in the center of the 13 Klallam settlements distributed along the southern shore of the Strait of Juan de Fuca.



The Port Angeles waterfront, c. 1915, two years after the Elwha Dam came online.

Written accounts of the pre-dam fishery are limited. Tribal oral history includes great details about the salmon as their main food resource. While some individual accounts from early white settlers are extensive and detailed in certain respects, they had surprisingly little to say about the native community, suggesting that positive interactions were limited. Aldwell, who was called the Port Angeles “town historian” for more than five decades, had a keen eye for detail about natural settings and described many local events in his writing, but his focus was primarily on the town, economic opportunities, and his investments. He scarcely made any mention of the native community.

After Aldwell’s initial encounter with the Klallams upon his arrival in the “wild frontier town,” he reported that 200 to 300 Indians were living and camping on the beach along the waterfront area of the harbor. He described the Klallam people in his autobiography, *Conquering the Last Frontier*: “Most of them had large canoes, handhewn [sic] from logs, and some practically lived in their canoes. They wore fancy costumes, especially the brides and grooms. The Indians made their living

principally by fishing.” Klallam oral histories agree with Aldwell, and tribal members have recounted stories of salmon by the thousands thriving in the Elwha River.

The Klallam way of life was dramatically affected by the arrival of Euro-Americans, who were primarily interested in logging the old-growth forests. They eventually dammed the river to facilitate their industry. Accounts of poor sanitary conditions, mortality associated with disease and alcohol abuse, and the need for education and farming paint a negative picture of general decline in the native culture that is typical of a community being overwhelmed by new arrivals. Aldwell and white settlers in general seemingly did not realize or were not much concerned about the impacts their logging activities and dams would have on the Klallam people’s way of life.

Port Angeles was initially named “Puerto de Nuestra Señora de los Ángeles” by Spanish naval lieutenant Francisco de Eliza y Reventa, who had arrived from Mexico in 1791. European settlers and the Klallam people coexisted until January 26, 1855, when the Treaty of Point-No-Point was signed by Washington’s territorial governor, Isaac Stevens, and leaders of the Klallam, Chimakum,

and Skokomish Tribes. According to the treaty’s terms, the Klallams retained their hunting and fishing rights at the usual and accustomed places—that is, the Elwha River and surrounding forest—but ceded ownership of the land and agreed to relocate to a reservation set aside at the mouth of the Skokomish River, approximately 100 miles to the south.

For a people who had a strong identity with the Elwha River, this represented an almost unimaginable move. The town of Port Angeles and the logging operations on which the local economy was based expanded to include most of the traditional hunting and fishing grounds promised in perpetuity to the tribe.

In 1857, Angus Johnson became the first recorded permanent white settler in Port Angeles. By the 1860s, enough settlers had arrived to formally organize the townsite. Early commerce focused on trade with the Hudson’s Bay Company post across the strait in Victoria, British Columbia, 17 miles north. When the US Customs operation was transferred from Port Townsend to Port Angeles in 1892, an economic boom took place as a result of the sudden demand for goods and services by ships passing through customs.

The town’s economic development was temporarily impeded by its status as a federal military reservation, created

by executive order in 1862. The reserve began at Ediz Hook and extended east to Ennis Creek. By 1894 the federal government opened the reserve for public sale, and the lots were auctioned off to squatters.

Thomas Aldwell’s vision for the future of the Elwha River was very different from that of the Klallam people. The aspiring young entrepreneur saw an opportunity to harness the river’s energy to power the growing economy of Port Angeles. A Canadian by birth, he arrived from Ontario in 1890 and quickly became known for his energy and ambition. His autobiography makes it clear that he appreciated nature, but more than the natural beauty of the river, he valued the potential impact the development of dams could have on Port Angeles. He states, “There is something about belonging to a place. You want to control more and more of it, directly or indirectly.” In his view, “Land was something one could work with, change, develop.”

Immediately after his arrival, Aldwell purchased what he could afford of the town lots that were open for settlement. He had a talent for identifying economic opportunity and organizing others to exploit it. When he first staked his claim in the canyon, he had a vision of the dam, and he spent two decades acquiring land and arranging, secretly, to finance its construction. Aldwell persuaded the community of Port Angeles that the Elwha River was a source of cheap power and recruited the necessary investors to make the vision a reality—a remarkable feat, given the remote location.

In 1894, Aldwell met R. M. Brayne, an Oregon pulp mill owner, who was interested in developing a power site. Brayne agreed to purchase half interest and provide funds to purchase the three miles above the canyon necessary for flooding when the dam was constructed. On October 1, 1910, Aldwell and George A. Glines, a Canadian financier, finalized a partnership to fund and construct the first dam on the Elwha River. Aldwell was then ready to form the Olympic Power

and Development Company; he secured financing through a Chicago-based investment firm, Peabody, Houghteling and Company, and hired an engineering firm, L. L. Summers and Company, to begin work on the dam.

The ecological impacts of controlling the river became immediately apparent during construction. A *Seattle Daily Times* article dated September 11, 1911, stated:

Fishing in the upper Elwha River was not up to its usual high standards owing to the failure of the Olympic Power Company, which is constructing a power plant on that turbulent mountain stream, to comply with the state law requiring the installation of a fish ladder when a stream is dammed. Angling on the lower reach of the river, however, is very good, and some large rainbows and Dolly Varden trout have been caught.

On October 31, 1912, while still under construction, the dam blew out, sending a torrent of water and debris downriver. The Klallams received no warning. Luckily, there were no fatalities. The few native residences that remained along the river were flooded, and the power company did not provide any compensation for these losses. Olympic Power rebuilt the dam, and Aldwell’s attention turned to the daunting task of building transmission lines east and south across the difficult terrain of the Olympic Peninsula. Initially, the turbines at Elwha Dam produced far more power than Port Angeles and the surrounding towns required. Power was transmitted via a single-circuit, 60,000-volt line on wooden poles, running from the Elwha Dam powerhouse east along the coast to Port Townsend, then across Hood Canal via a low voltage submarine cable. The terminus of the 76-mile-long line was the Puget Sound Naval Shipyard in Bremerton, where Olympic Power had a tenuous power supply contract with the government. Despite many fights for right-of-way and cancellation of the navy contract in favor of alternative generators, Aldwell persevered and managed to convince

White settlers seemingly did not realize or were not much concerned about the impacts their logging activities and dams would have on the Klallam people’s way of life.

the navy to contract with him as a secondary power provider.

On February 13, 1914, Port Angeles celebrated completion of the Elwha Dam and its impoundment, Lake Aldwell. The design of the hydroelectric dams did not include any provision for fish passage, despite state laws established in 1890 that required them. Washington State Fish Commissioner Leslie Darwin agreed to waive the fish ladder requirement if Aldwell would construct a hatchery below the dam as mitigation. The hatchery was constructed in 1915 but closed in 1922 due to poor management and failure to sustain salmon populations. This was a scenario being played out across the Northwest. In his book, *Finding the River: An Environmental History of the Elwha*, Jeff Crane states, “Regardless of failure, this pattern of accommodation and compromise would continue to symbolize the attempted management and eventual destruction of the salmon fisheries through the rest of the 20th century.”

By 1914, Aldwell and the Olympic Power Company were making plans for a second dam. However, in early 1916 financial pressures from the cost of dam construction began to weigh on Peabody, Houghteling and Company and Olympic Power. The latter was reorganized and the Northwestern Power and Manufacturing Company purchased all assets. In 1919, after several failed attempts to sell the company, the Elwha Dam was sold to a subsidiary of Crown Zellerbach Corporation (formerly Washington Pulp and Paper Company), the largest pulp mill in Port Angeles.

Local demand for power prompted construction of a second dam 13 miles upriver from the first dam. The Glines Canyon Dam and its impoundment, Lake Mills, was completed in 1927. Affordable local power from the Elwha and Glines Canyon Dams was a chief reason Port Angeles was able to survive the Great Depression. As the economy rebounded and population growth resumed during World War II, demand for electricity grew. Eventually Crown Zellerbach required more power than the Elwha and Glines Canyon Dams could provide. By 1950, the company's pulp mill was consuming all the power generated by the both dams and buying more from Bonneville Power Administration, a large hydroelectric project on the Columbia River.

The unique resources of this area were nationally recognized even in the 19th century. In the early part of the century, Americans commonly viewed wilderness as something to be tamed and exploited for commerce. Few were concerned with preservation of wilderness in its natural state. Those attitudes gradually shifted

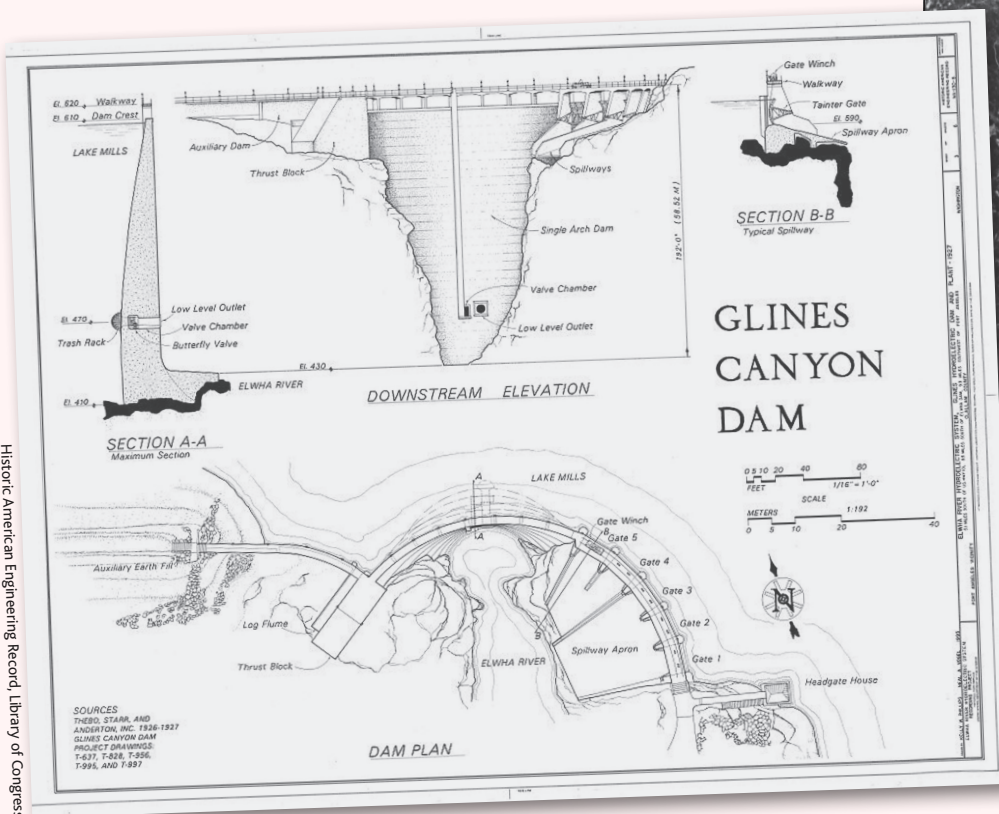
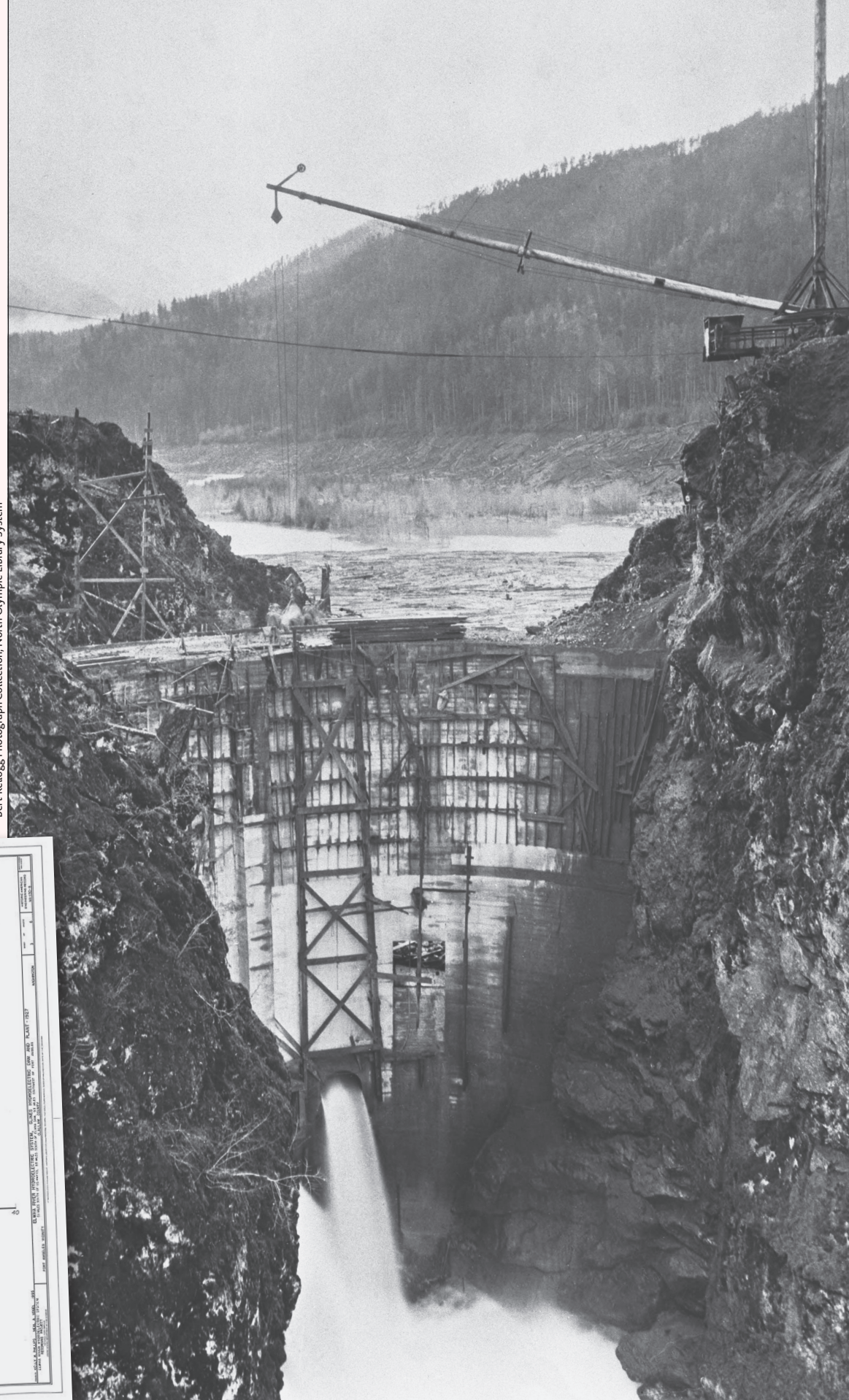
as people were encouraged by philosophers such as Henry David Thoreau and naturalists such as John Muir. Action to deliberately restrict resource exploitation and preserve wilderness in the public trust was not taken until the late 19th century, when the first national parks and national forests were established.

President Grover Cleveland designated the Olympic Peninsula's forested areas as the Olympic Forest Reserve in 1897, part of a conservation and management program that was a precursor to the National Forest system. In 1909, President Theodore Roosevelt designated a portion of the forest preserve as Mount Olympus National Monument, primarily to protect the dwindling habitat of Roosevelt elk, which were facing decimation from hunting pressure and timber harvesting. In 1935, US Representative Monrad C. Wallgren sponsored a bill to establish the Olympic Peninsula as a national park. Congress passed Wallgren's bill in 1937,

BELOW: Engineering drawing of the plan for the Glines Canyon Dam.

RIGHT: The Glines Canyon Dam under construction, c. 1927.

Bert Kellogg Photograph Collection, North Olympic Library System



Historic American Engineering Record, Library of Congress

authorizing the creation of Olympic National Park on June 29, 1938.

Olympic National Park includes significant areas of pristine temperate rainforest, coastal shoreline, the glaciated Olympic Mountains, and varied habitat types in between; it protects many native and endemic plant and animal species. Today, the park includes 922,650 acres of preserved and protected wilderness. Eighty-three percent of the Elwha River watershed lies within Olympic National Park. Glines Canyon Dam is also within the park's boundaries.

While the extent of Olympic National Park was in line with the eastern conservation movement at the time, it proved controversial for citizens of Port Angeles who were economically dependent upon the timber industry. The newly established park boundary encompassed a large portion of harvestable timber managed by the US Forest Service, straining the relationship between the National Park Service and the local community. Allowable annual cuts provided as a compromise were viewed by the people of Port Angeles as less than originally promised and not enough to support the local economy. Aldwell stated, "It is my belief that our Supreme Being created our forests and their valuable crops of timber for the purpose of maintaining man as well as for the purpose of amusing him and providing for his recreation."

The traditional culture of the Klallam Tribe proved incompatible with 20th-century industrial society. Although the dams were but a symptom of the deeper cultural conflict, to the tribe they became symbolic of native people's cultural displacement. In the early 1970s they sought a declaratory judgment from the US District Court to prohibit the state from banning Indian fishing in the lower reach of the Elwha River. The tribe insisted that 100 yards of the river was located on the reservation, but the Washington State Fisheries Department disagreed. During this time, the state implemented a complete closure of salmon fishing on the Elwha River to recover fish populations.

Early 19th-century Americans commonly viewed wilderness as something to be tamed and exploited for commerce. Few were concerned with preservation....

Tribes took the position that the state had no jurisdiction on Indian reservations possessing recognized treaty rights, and they instigated staged "fish-ins," acts of civil disobedience used by tribes all over the state to protest denial of treaty fishing rights. In 1972 the Klallams joined with other Washington tribes in filing a lawsuit against the State of Washington to regain their fishing rights. The lawsuit led to a historic ruling in 1974 by US District Court Judge George Boldt, which allocated 50 percent of the sustainable annual fish catch to treaty tribes. The Boldt ruling was appealed but eventually upheld by the US Supreme Court in 1979.

At the time of the Glines Canyon Dam's construction, Crown Zellerbach was required by the Federal Power Commission (now the Federal Energy Regulatory Commission [FERC]) to obtain a license. The commission issued a 50-year license for Glines Canyon Dam, setting the stage for a political fight over the dam's relicensing. Crown Zellerbach applied to the FERC to relicense Elwha and Glines Canyon Dams in 1968 and 1973, respectively. The Klallam Tribe adamantly opposed relicensing both dams. Because Glines Canyon Dam lay within Olympic National Park, the legality of relicensing was questioned. However, the FERC moved forward with its evaluation and environmental review to assess both hydroelectric projects.

The conservation movement supported dam removal, causing the FERC licensing process to be contentious and drawn out. By the 1980s, 12 major conservation groups opposed the relicensing

Management of the sediment accumulated behind the two dams was as great an engineering challenge as physical removal of the structures.

process. The groups argued that the Federal Power Act of 1920 and legislation in 1935 banned dams in national parks and would prevent the FERC from relicensing dam projects. The FERC argued that the cost of dam removal and replacement power would be greater than the economic return of a restored salmon fishery. Attempts to resolve FERC licensing issues led to litigation, delay, and expense for all parties involved. Since the FERC and the tribe could not agree, Congress eventually intervened, passing the Elwha River Ecosystem and Fisheries Restoration Act in January 1992, which mandated removal of the dams. President George H. W. Bush authorized the secretary of the interior to acquire and remove the dams and restore the Elwha River ecosystem and its native anadromous fisheries.

The political strife was far from over, however. Washington's senior senator, Slade Gorton, strongly opposed the project. Supported by the powerful hydro-power industry lobby, he was one of the Senate's most outspoken opponents of dam removal. Gorton used his power as chairman of the Senate Appropriations Committee to withhold funding for the removal of the Elwha and Glines Canyon Dams and threatened to continue doing so unless Congress would agree to revisions in the Endangered Species Act as it related to salmon recovery efforts on the Columbia and Snake Rivers. By

Sediment fanning out at the mouth of the Elwha River as a result of dam removal. It may take until 2021 for the sediment transport process to finish.

Tom Roorda photo



Roorda Aerial

2000, Gorton backed down and allowed the government to acquire and purchase the dams for \$29.5 million. It was not until 2010 that funding for dam removal was finally secured.

The lack of compelling economic benefit from the antiquated hydroelectric plants, the unique character and quality of habitat in the Elwha watershed, and a vision of a sustainable non-logging economy led to a slow consensus among local residents, conservationists, the National Park Service, and other stakeholders favoring removal of both dams. Removal of the Elwha dams is an unprecedented large-scale river restoration project, costing \$325 million. In a carefully orchestrated process, and after two decades of planning, concurrent removal of the Elwha and Glines Canyon Dams began in September 2011. On August 26, 2014, the final series of blasts brought the remnants of the Elwha Dam down.

Scientists have estimated that the dams trapped a staggering 21 million cubic meters of sediment, enough to cover the city of Seattle (83.8 square miles) in

a three-inch-thick layer. Management of the sediment accumulated behind the two dams was as great an engineering challenge as physical removal of the structures. In order to increase the rate of salmon survivability and other impacts below the Elwha Dam, removal required a staged drawdown strategy over a period of three years to control the release of fine sediment. After years of modeling, the Department of the Interior decided that demolition work would be halted during salmon migration and for two weeks for every 15 vertical feet removed from the dams. This allowed the river to slowly sweep sediment downstream. During the two-week shut-down period, biologists tagged and relocated salmon above the dams using a large fish trap.

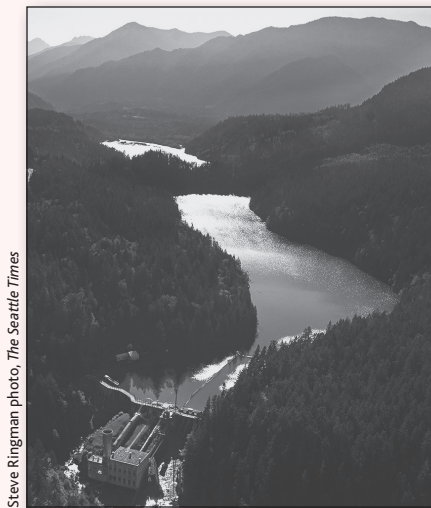
The sediment load has had short-term negative impacts to the river and marine environment. The sediment in the lower basin has filled in pools and gravel beds with fine sediments, degrading habitat and spawning areas. The release of fine-grained sediment also affects water quality, channel geomorphology, potential for flooding, habitat productivity, and coastal processes. Scientists have estimated that with anticipated recovery

rates of sediment transport regimes relative to background conditions, the process will take until between 2018 and 2021. The sediment has rebuilt riverbanks and gravel bars, and approximately 70 acres of new beach and estuary at the river's mouth. What was once only a kelp-covered cobblestone bottom is now mud and sand, which provides excellent habitat for Dungeness crabs, clams, and other species.

Just two weeks after the dams were removed, the first salmon returned to the upper watershed. It is still very early in the restoration timeline, but indications so far are positive with respect to recovery of the spawning fish populations. Anadromous fish species in Northwest rivers not only provide food and recreation, they also maintain ecological connectivity and nutrient transport from the marine environment to alpine habitats. Elimination of salmon and related species from the upper Elwha River watershed profoundly changed the entire ecosystem, as did their reintroduction.

While the salmon are already finding their way back to their ancestral spawning habitat, many of the former reservoir areas remain disturbed mudflats, with little biological activity. In the largest plant restoration project in park service history, scientists are giving nature a jump start to reclaim approximately 800 acres of land. Over a seven-year period they are planting over 500,000 pounds of native seeds and over 400,000 plants in the former Lake Aldwell and Lake Mills reservoirs.

Olympic National Park rangers have now turned the former dam sites into educational exhibits and interpretive centers. The Elwha River is opening up opportunities for recreational use that were not previously possible. Rafters, hikers, and other recreationists are navigating miles of new land and waterscapes. The National Park Service estimated that park use increased over 60 percent in 2015 alone. However, the river is a dynamic system that is constantly changing. Winter storms have caused flooding that blocked roadways,



Steve Ringman photo, The Seattle Times

ABOVE: View of the Elwha River and former Lake Aldwell before dam removal, 2010.

Steve Ringman photo, The Seattle Times

RIGHT: View of the Elwha River and former Lake Aldwell after dam removal, 2016.



made it more difficult to access some trailheads, and destroyed two popular campgrounds—Elwha and Altair.

Early ecological recovery on the Elwha River is happening much more quickly than originally projected. Scientists counted more than 4,000 Chinook salmon above the former Elwha Dam the first season after dam removal. In February 2016, Lynda V. Mapes, an environmental reporter for *The Seattle Times*, stated that “the middle river and tributaries went from no coho at all before dam removal, to producing approximately 32,000 outgoing salmon fry in 2014. Chinook red [spawning adult] counts are more than 350 percent and steelhead 300 percent from 2013 to 2015.” As the environment continues to heal itself, many birds and small and large mammals are thriving, including beaver, elk, and river otter. The Elwha story is an excellent example and proof-of-concept of how fast rivers can recover, given optimum conditions.

The Elwha shows that full dam removal is a viable option for many

aging dams. It is already influencing other proposed projects. Currently, plans are being made and federal approval is being sought to remove four large hydroelectric dams on the Klamath River in Oregon. If completed, this ambitious project will surpass the Elwha as the largest dam removal project in US history. The federal government is evaluating other large-scale dam removal projects on the Snake River to improve salmon restoration efforts in the Columbia River basin. The public debate and policy decision-making may be unique at every candidate dam removal site, but the Elwha precedent will influence environmental planning far beyond the Olympic Peninsula and its relatively small local human population. ☺

Lisa Meoli is an environmental historian at the environmental consulting firm Floyd|Snider and holds a master of arts degree in history. She is on the board of directors of the Magnolia Historical Society in Seattle.

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Henry Hewitt and Ezra Meeker in the Ferry Museum.

COVER: In 1939 President Franklin Roosevelt, a polio survivor, described the fight against the disease as a war: “I am very much in favor of war, the kind of war that we are conducting here at Warm Springs...the war against the crippling of men and women, and especially of children.” Perhaps inspired by this speech, illustrator John Falter superimposed the image of a young boy over the image of a soldier with his arm outstretched for this March of Dimes poster. An article beginning on page 6 recounts what happened when polio struck a small town in eastern Washington in 1955. (Washington State Historical Society, #1996.40.26)