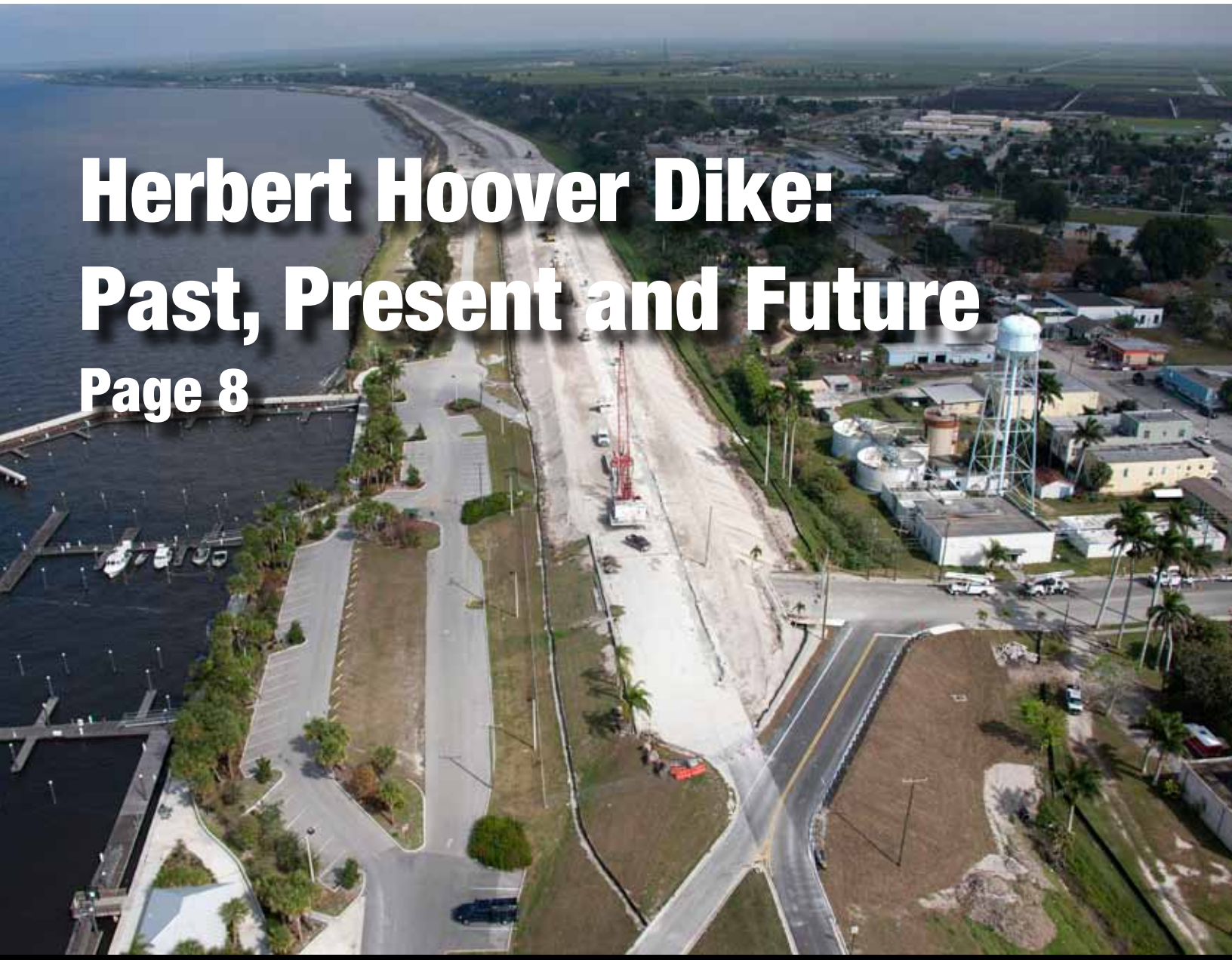
USSD
Dams & Levees
SPRING 2018 | ISSUE NO. 174
Bulletin of the United States Society on Dams



Herbert Hoover Dike: Past, Present and Future

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FEATURE

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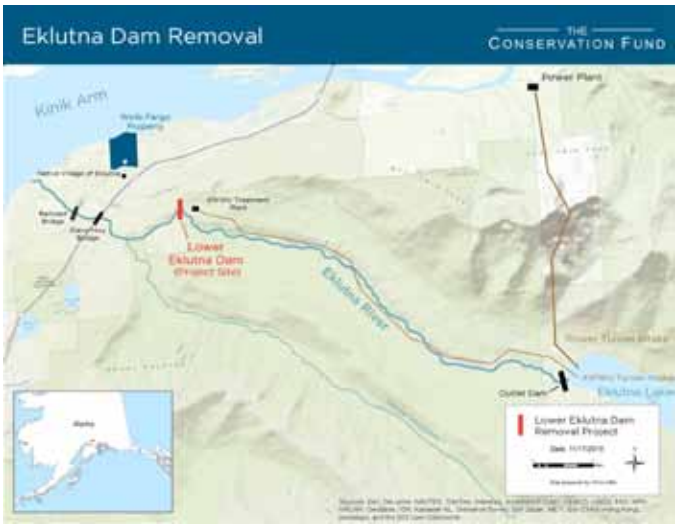
Facing the Challenges of Dam Removal in Alaska

The Conservation Fund has nearly completed the demolition of the long-abandoned Lower Eklutna Dam, near the native village of Eklutna, Alaska. The Lower Eklutna River Dam Removal Project is the most ambitious river restoration project ever attempted in Alaska.

The Lower Eklutna Dam was built in 1928 as part of Alaska's first hydroelectric project. Located in a dramatic 400-foot deep canyon, access to the dam site was a severe challenge during the construction (and demolition) of the dam. In construction, a tram cart delivered concrete down the cliff face to the workers below. This hardy crew worked throughout an entire Alaskan winter to complete the dam in a year's time.

The dam itself was a concrete arch whose dimensions were 70 feet wide, 100 feet tall and 9 feet thick at the dam base. This structure pooled and diverted water through a half-mile tunnel to a generating station nearby. Power ran by wire twenty miles south to Anchorage, providing the first reliable supply of electricity to this frontier settlement. The



Lower Eklutna watershed.

Lower Eklutna River Dam.

Lower Eklutna power project operated until the early 1950s when it was decommissioned and ultimately abandoned. Ownership of the dam remained in limbo until settlement of the Alaska Natives Claims Settlement Act conveyed the dam and all the surrounding land to the Eklutna Village Native Corporation.

The Eklutna River was once a prolific salmon-producing river that supported the Eklutna Dena'ina people, who located their village on Cook Inlet's Knik Arm near the mouth of the Eklutna River. Although the Native Eklutna people are still there, the salmon are greatly diminished, due to a succession of water diversions and hydropower projects which cut off water flow and fish passage in the Eklutna River. Repeated studies over several decades have recommended the removal of the Lower Eklutna Dam as an essential first step in restoring the Eklutna River.

400-foot crane and staircase into Eklutna canyon; native village of Eklutna in background.

Despite being decommissioned in the 1950s, the Lower Eklutna Dam survived the 1964 Alaska Earthquake (magnitude 8.2) with no signs of impairment. Though the dam remained structurally sound and showed no imminent signs of failure, the State of Alaska Office of Dam Safety had long-recommended its orderly removal. Because the structure was an orphaned, unmaintained dam upstream of three bridges, a major highway and a railroad, there was significant public safety benefit to removing the dam in a controlled manner rather than waiting for its ultimate failure.

Removing the Lower Eklutna Dam is the first step in a multi-phase restoration plan for the Eklutna River. The principal conservation outcomes that will result from removing the Lower Eklutna Dam are:

- Restore fish passage to a seven-mile reach of the Eklutna River.
- Improve spawning habitat in the lower Eklutna River for five species of salmon and Dolly Varden.
- Re-establish natural river functions in the lower Eklutna River.
- Re-establish habitat connectivity for fish and wildlife on the lower Eklutna River.
- Take a major step towards the recovery of the entire Eklutna River watershed.

While discussed for decades, The Conservation Fund began to actively pursue the dam removal in 2014. After identifying key partners, in collaboration with Eklutna Inc. (the Eklutna Native village corporation and landowner) and HDR (primary technical consultants for the project), the Fund initiated project scoping, baseline research, and assessment of construction methodologies in 2015. With necessary permits secured in 2016, site preparation was completed in fall of 2016. The 2017 work season saw the removal of 90% of the dam structure, the remainder of which should be entirely removed in the Spring of 2018. Site remediation and sediment management will continue in 2020. Negotiations for the restoration of in-stream flows and monitoring of spawning, turbidity and sediment transport will continue into 2020 and beyond.

Funding for the $7.5 million project was provided largely by The Conservation Fund, with additional financial support from the Rasmuson Foundation, the M.J Murdock Charitable Trust, the National Fish and Wildlife Foundation, the Open Rivers Fund of the Hewlett Foundation, Resources Legacy Fund, the Marnell Corporation, the Alaska Sustainable Salmon Fund, Patagonia, Orvis, Wells Fargo and the Alaska Community Foundation.

Where most major dam removals take decades to complete, this project has gone from concept to near-completion in only three years. The rapid advancement of the project is due in large part to the fact that most of the money came from private sources, short circuiting the lengthy delays that inevitably come with government funding. With a backlog of thousands of deadbeat dams that are slated for removal across the nation, this project serves as a model of efficiency and cost-effectiveness.

In addition to the funding challenges, there were severe technical challenges to the project. The Lower Eklutna Dam is located in a 400-foot deep canyon with sheer walls and no road access. Accessing the dam involved the installation of the state's largest crane with a 400-foot reach and construction of a dramatic 500-step aluminum staircase

Staircase into the Eklutna canyon.

into the canyon. An additional complication was working on and around the 70-foot-deep accumulation of 300,000 cubic yards of silt, sand, and gravel that had built up behind the dam following its abandonment in 1955. Combined with the tight confines of the canyon, these unstable and dynamic sediments required caution and creativity.

Concerns for the downstream infrastructure ruled out blasting the dam. Instead, a combination of fracturing with expansive grout and hammering with pneumatic jackhammers was used to break the dam down into bite-sized chunks. Sediment management techniques included 10-foot by 20-foot polycarbonate "tundra mats" to keep the machinery out of the LaBrea-tar like muck and a hydraulic mining monitor to move the sediment away from the work area.

Hydraulic hammering of the concrete to demolish the dam.

Removing the Lower Eklutna Dam has already provided significant economic benefits by creating over thirty jobs in construction, research and project management for Native Alaskans through the partnership with the Native Village of Eklutna and the Eklutna Native Corporation. Additional benefits to all Alaskans include the recovery of Cook Inlet king salmon and the potential restoration of a major sockeye salmon run just 30 minutes from Anchorage. Restored salmon runs will also help the endangered Beluga Whale with additional forage fish sources.

Although removal of the Lower Eklutna Dam will not by itself rebuild salmon runs to their historical levels, the mere presence of the dam has thwarted any other restoration efforts. The main limiting factor for salmon in the Eklutna River is very low water due to hydropower diversions. The Eklutna Power Project, a federal project further up the watershed from the Lower Eklutna Dam, diverts 90 percent of the water out of the Eklutna watershed into a tunnel that services a powerhouse located on the Knik River. The power producers, a consortium of three utilities, have long argued that releasing water into the Eklutna River is pointless as long as the lower dam remains in place.

Complete recovery of the Eklutna River will depend on the restoration of water flows back into the Eklutna River. The Eklutna Power Project is authorized under the 1991 Eklutna-Snettisham Agreement, which requires the Eklutna Power Project operators

Tundra mats in use to allow machinery to operate on unstable sediments.

to initiate mitigation for their impacts to fish and wildlife no later than 2022. The state and federal regulatory agencies that have jurisdiction over the Eklutna Power project have taken the view that sufficient water flows must be restored to the Eklutna River to mitigate for 88 years of water diversions. Taking all the water out of a salmon-bearing river is no longer an acceptable practice.

Beyond the significant conservation benefits that will result from removing the Lower Eklutna Dam, this project has greater symbolism. One reason Alaska still has abundant salmon is because we have mostly avoided the mistake of building dams on salmon-bearing rivers. At the Eklutna River, Alaskans are recognizing the problems created by an ill-considered dam and are collaborating to fix those problems. We hope this project will be a constant reminder to Alaskans that salmon and dams are generally incompatible.

A Member Responds

Leading by Example: Collaboration and Rigorous Science Required to Address Changing Needs

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Editor's note: The following is a response to the article by Brad Meiklejohn that begins on page 16. The views expressed are those of the author and do not necessarily reflect the view of USSD.

Brad Meiklejohn's article highlighting the challenges of the Lower Eklutna Dam removal in Alaska raises some important issues around the multitude of purposes dams have held over time; the economic, engineering, and environmental sustainability of our water infrastructure; and the role that collaboration and partnership serve in solving problems on our nation's waterways.

I commend the U.S. Society on Dams for publishing Mr. Meiklejohn's article. As stated in its strategic plan, USSD has four imperatives that inform its mission: Advocate | Educate | Collaborate | Cultivate. To accomplish its mission, USSD must take a leading role in 1) exchanging ideas; 2) providing thought leadership and technical expertise; and 3) leading by example when we engage in existing projects and in future projects initiated in this country's new era of infrastructure development.

These roles are not easily undertaken. There are numerous challenges, made more complex by myriad interests, "looking in the rear-view mirror," and attempting to integrate these failures and successes of our past into lessons learned. For example, while we don't dismiss the Lower Eklutna dam's effect on salmonid populations, we also know that many of our water infrastructure projects built in the late 1800s through the 1930s, like the Lower Eklutna, were developed to meet critical public needs including flood control, navigation support, water supply, and electricity. Anchorage was in a time of frontier settlement and in search of its first sources of electricity when it conceived of, and constructed, the dam. Shrouded in the conveniences of our modern society, it's fair to say that even with the best "rear-view mirror," it's impossible to bring into focus the full weight of those decisions.

What is clear, is that our societal needs today are different than they were 100 years ago — as are the range of values that we aim to satisfy when weighing the alternatives to meet those needs. Applying the lessons learned to address and to anticipate tomorrow's water infrastructure needs becomes more like three-dimensional chess because each group holds different views of successes and failures.

So how do we provide the leadership and technical excellence to address other projects like Eklutna? First, by articulating common ground. Recently, USSD and The Nature Conservancy (TNC) sought to define joint interests and facilitate collaboration to, "ensure that the nation's dams and levees are sited, operated, maintained and decommissioned in a way that meets the evolving needs of society." Discussions between the two organizations culminated in a 2017 Memorandum of Understanding. Like the Lower Eklutna dam removal process, USSD and TNC seek to discover common interests and then lead the technical experts toward resolution.

Second, we insist upon and support rigorous science in the design, engineering and construction of water infrastructure projects. We know significantly more today about the effects of infrastructure on the environment through the evolution of data collection methods and the body of quantitative and qualitative data. Armed with this knowledge, we can enhance the design, engineering and construction methods to consider the many interests involved in protecting the environments associated with our water infrastructure projects.

"Applying the lessons learned to address and to anticipate tomorrow's water infrastructure needs becomes more like three-dimensional chess because each group holds different views of successes and failures."

Finally, we lead by example. The Lower Eklutna case study highlights the chronic national issue of abandoned and obsolete infrastructure — that is, those projects that no longer serve their project purpose. Mr. Meiklejohn raises one solution to this issue through the concept of private/public partnerships. Developing these funding options is critical to moving projects forward, whether it be dam removal — as in the case of the Lower Eklutna dam — to a full/partial rehabilitation or repurposing of an existing dam or levee. It is incumbent on us through our technical expertise and leadership to think creatively about the potential for meeting multiple objectives with projects, and to encourage agencies, private partners, and non-governmental organizations with overlapping interests to participate.

I contend that exchanging ideas, providing thought leadership and technical expertise, and leading by example are not only roles, but the responsibility of all working in the water infrastructure world.

USSD is hosting its 2018 conference in Miami, Florida, April 30 – May 4. The conference theme is A Balancing Act: Dams, Levees and Ecosystems. Dams and levees have, and will continue to provide significant benefits to society. Many of our existing dams and levees are poised to provide additional benefit and solutions to some of our nation's future infrastructure, environmental, social, and economic challenges. USSD invites all to engage with us as we take on more responsibility for developing sustainable water infrastructure for future generations. USSD also invites you to review the white paper prepared by the USSD Committee on Dam Decommissioning, in 2015, Guidelines for Dam Decommissioning Projects, found on the USSD website at www.ussdams.org (go to Resource Center, then Publications, then White Papers).