Ecesis

California Society for Ecological Restoration *Quarterly Newsletter*

Dam Removal as a Watershed Restoration Action

by Ross Taylor[1]

The construction of dams for irrigation, power generation, industrial and municipal water supplies, and flood control was integral to the colonization and development of the western United States by people of European descent. Mark Reisner, author of *Cadillac Desert: The American West and its Disappearing Water*, delves into the story of a relentless quest for a precious resource: water. Reisner describes in great detail of western rivers diverted and dammed, of political corruption and intrigue, of billion-dollar battles over water rights, of ecological and economic disaster. Dam construction on big rivers like the Colorado and Columbia came about as public works projects to pull the United States out of the Great Depression. Columbia River dams produced copious amounts of electricity that produced enough aluminum for aircraft construction to win World War II. Dams and inter-basin transfers of water spawned the metropolis of Los Angeles and other larger western cities in the middle of what was once desert and nearly inhabitable. Taxpayer-funded dams and water projects fueled the development of corporate agriculture in California's Central Valley. In California alone, there are at least 1,500 known dams — about 1,000 of these are considered major dams and 55 of them have storage capacities at least 100,000 acre-feet. Capturing snowmelt

continued next page

[1]Ross Taylor & Associates (see *Meet the Guest Editor* on page 18). rossntaylor@sbcglobal.net

Above: Chinook salmon navigating Ishi Pishi Falls in the mid-Klamath River.
Photo courtesy Mid-Klamath Watershed Council ***http://mkwc.org***

Spring 2021 Volume 31, Issue 1

Guest Editor: Ross Taylor, Ross Taylor & Associates *rossntaylor@sbcglobal.net*

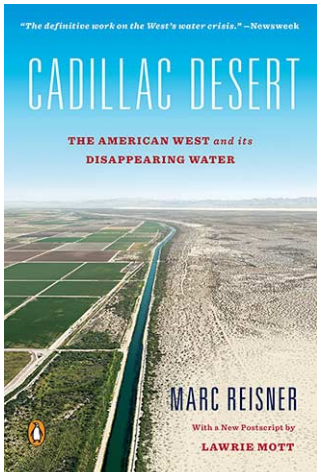
Managing Editor: Julie St John
Contributing Editor: James Mizoguchi

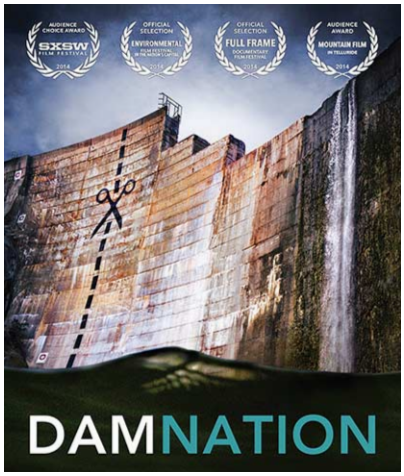
Ecesis is published quarterly by the California Society for Ecological Restoration, a nonprofit corporation, as a service to its members. Newsletter contributions of all types are welcome. See back cover for guest editors and a link to Guidelines.

Dam Removal as a Watershed Restoration Action *continued*

from the Sierras is crucial to how water is currently managed, distributed and utilized in California. Coastal rivers were also dammed in the early 20th century to provide water to numerous cities and municipalities along California's 840 miles of coastline.

The ecological impacts of dams are varied and profound. Blocking the upstream migration of fish species such as salmon, steelhead, lamprey, and sturgeon to spawning and rearing habitat is the most obvious impact; even at dams that were constructed with well-intentioned, yet dysfunctional, fish ladders. In addition to upstream migration impacts, dams create large reservoirs with warmer, slow-moving water that create problems for out-migrating juvenile salmonids. Reservoirs are also prime habitat for non-native fish species that predate on young salmon and steelhead. Dams disrupt a river's geomorphic processes, capturing sediment behind them, which leads to sediment-starved downstream channels that often experience severe down-cutting and incision. In many cases, dams disrupt a river's natural hydrograph, capturing peak flows that in an unimpaired system conduct the geomorphic work of scouring pools, depositing sediments on floodplains and maintaining groundwater levels for germination and growth of riparian vegetation. Finally, dams managed for water exports can impact the water quantity and quality requirements of native aquatic species residing in downstream channels.





Want to dive deeper? Cadillac Desert and Dam Nation are two excellent sources.

> …in some cases the costs of facilitating fish passage outweigh the dam's economic benefits, thus decommissioning and removal becomes a feasible choice

As recently as 30 to 40 years ago, the idea of removing a dam for fish passage and watershed restoration was considered out of the realm of feasibility. However, mindsets started to change as dams have aged, filled with sediment, or been deemed unsafe by regulatory agencies such as the California Division of Dam Safety. FERC relicensing processes have also required dam operators to address fish passage; in some cases the costs of facilitating fish passage outweigh the dam's economic benefits, thus decommissioning and removal becomes a feasible choice. The Patagonia-sponsored 2014 documentary *DamNation* brought national attention to the removal of dead-beat dams as a viable watershed and salmonid restoration action. Monitoring of recent large-scale dam removals on the Elwha, White Salmon, and Carmel rivers have documented the surprisingly quick responses of salmonid populations in recolonizing previously inaccessible upstream habitat, as well as the recovery of downstream geomorphic processes.

This issue of *Ecesis* profiles dam removal efforts in three California watersheds: the recent removal of a Napa River dam, the status and timeline of the highly anticipated removal of four Klamath River dams, and how an analysis of quantifying salmonid habitat upstream of Scott Dam on the Eel River is being utilized in weighing restoration options (including dam removal) during the FERC relicensing process of two Eel dams.

SER CAL

EVERY Day! ❊ Keynote ❊ Technical Session
❊ Panel Discussion ❊ Sponsors & Networking

Coming to Your Screen **Sep 13–17, 2021, 9am–1pm**
Call for Abstracts — Now through May 15
Early Registration begins June 30

We are seeking a *limited number* of Abstracts & Speakers on these topics:

❊ Fire ❊ Invasive Plants ❊ Restoration in Our Backyard ❊ Wetlands
❊ Diversity, Equity, and Inclusion in California's Restoration Community
❊ Cutting the Green Tape ❊ Data Collection & Monitoring ❊ Funding & Policy

Rise to the Challenge and Become an Annual Sponsoring Member for *Better Benefits Throughout the Year*

Thank you to all of our Annual Sponsors!

MT SHASTA:

Burleson Consulting, a Terracon Company ❊ Ecological Concern, Inc.
Habitat Restoration Sciences & Dudek ❊ Westervelt Ecological Services

SAN JACINTO: **Balance Hydrologics ❊ Hanford ARC**

LASSEN PEAK: **S&S Seeds**

MT. TAM: **cbec ecoengineering ❊ Recon Environmental ❊ Santa Clara Valley Habitat Agency**

Steelhead pair spawning on Pena Creek.
Will Boucher, California Sea Grant (CC by 2.0)

	Mt. Whitney	Mt. Shasta	San Jacinto Peak	Lassen Peak	Mt. Tam
Donation	**$3,000**	**$2,000**	**$1,500**	**$1,000**	**$500**
Membership					
# Members	6	6	5	4	3
Recognition					
Ecesis ad–size	4 issues–1/2 page	4 issues–1/4 page	3 issues–1/4 page	2 issues–1/4 page	1 issue–1/4 page
Website	Logo & hyperlink	Logo & hyperlink	Logo & hyperlink	Shared, in list	Shared, in list
Social media	Individually 4x/year	Individually 3x/year	Individually 2x/year	Individually 1x/year	Shared, in list

Plus comped registrations and the opportunity to promote your organization at SERCAL events

Sediment collecting above log structure creating spawning and rearing habitat for steelhead.

Removing Upper York Creek Dam and a Century of Steelhead Habitat Damage

by Brian Bartell[1] *Photos courtesy WRA*

In the late 1800s and early 1900s, dams were seen by settlers of European heritage as critical for taming the western United States, including California's rapidly growing Napa Valley. Just last year, 64 dams blocked 23 percent of the Napa River watershed (Manfree, Moyle, & Graham, 2020). In 1900, just outside a sleepy wine hamlet in California's Napa Valley, the 35-foot high Upper York Creek Dam was built to supply drinking water to the City of St. Helena and its surrounding vineyards (Davis, 2018). Now, over 100 years after it was built, and nearly 30 years after calls for its removal began, the dam is finally down.

A History of Habitat Degradation

The Upper York Creek Dam provided water to the City of St. Helena through the 1920s until its slow demise began. The negative effects of dams on waterways and their aquatic inhabitants are well-documented. The impact of the Upper York Creek Dam was perhaps most significant to the local steelhead (*Oncorhynchus mykiss*) population. For over 100 years, the dam completely blocked steelhead from accessing over 2 miles of high-quality spawning and rearing habitat in the Mayacamas Mountains east of the Napa Valley.

In addition to immediately shrinking the steelhead's habitat, the Upper York Creek Dam's effect on local sediment flow caused additional harm to the local steelhead over time. The reach of York Creek directly downstream of the dam gradually lost most of its sand and gravel-sized sediment, which steelhead depend on to create spawning beds (redds). Normally, winter rains produce high flows that naturally transport sediment through York Creek. The Upper York Creek Dam interrupted this natural sediment flow. While the upstream side of the dam collected sediment, downstream areas no longer received enough sediment to replace the losses. Years of flows without sediment deepened the channel downstream of the dam. Over time, the creek became disconnected from the floodplain during high flows. The large rocks that lined the sediment-starved channel lacked the gravel beds necessary for steelhead to create

continued next page

[1]Senior Restoration Designer for WRA, Inc. (see *Meet the Contributing Member* on page 8). bartell@wra-ca.com

Log structures, installed below dam, used existing trees harvested onsite.

Burned log structure with supplemental slash added by WRA.

Removing Upper York Creek Dam and a Century of Steelhead Habitat Damage

continued

functional redds. Now, in addition to losing miles of high-quality habitat upstream of the dam, the steelhead's downstream options were deteriorating, too.

In the early 1990s, a deadly release of fine sediment that had accumulated behind the Upper York Creek Dam was reported. The resulting slug, comprised of very small particles that can smother fish, was said to be several feet deep in areas and reportedly killed fish below the dam. In response, the California Department of Fish and Wildlife (CDFW) issued a court order requiring the City of St. Helena to remove the dam and accumulated sediment. While it was clear the dam's days were numbered, progress was slow. In 2004, the city removed a small concrete diversion structure approximately one-half mile below the dam. Four years later, the City began to remove some of the sediment accumulated behind the dam, and yet the dam remained in place. Then, in 2012, federal regulators got involved. NOAA Fisheries levied a $70 daily fine against the city for each day the dam remained.

Steelhead in the Napa Watershed

To understand why the calls for removal the Upper York Creek Dam were so loud is to understand the importance of tributary streams to the life cycle of steelhead in the Napa River. Central California steelhead, the anadromous version of rainbow trout, return to California's rivers to spawn after two to four years of feeding in the cold Pacific waters. Steelhead prefer the cold, clean water of tributary streams (Koehler, Napa River Salmon Monitoring Program Spawning Year 2006 Report, 2007), and normally spawn in creek areas with a gravel substrate (Napa County Resource Conservation District, n.d.). All too often, the tributaries essential to the survival of these fish contain barriers to migration, such as culverts, water diversions, and dams.

The steep decline in steelhead in the Napa River mirrors the pattern seen in countless other California rivers.

According to some estimates, the Napa River once saw runs of 6,000 to 8,000 steelhead on a yearly basis (Napa County Watershed Information & Conservation Council, n.d.). Today, fewer than 200 adults are believed to run up the Napa to spawn. The steep decline in steelhead in the Napa River mirrors the pattern seen in countless other California rivers. Even so, the Napa River is still considered to be a significant watershed for anadromous fish.

The Design Process

For eight years, the City of St. Helena worked with consultants and regulators to create a dam removal plan that would maximize ecological uplift. Early designs employed a form-based approach which would create a stable channel using log and rock structures. NOAA Fisheries rejected the design in favor of an approach that would remove the dam, but not all of the impounded sediment. They

continued next page

Removing Upper York Creek Dam and a Century of Steelhead Habitat Damage

continued

viewed the sediment, much of which is the optimal size for steelhead spawning, as a resource that should be allowed to return to the sediment-starved reach below the dam.

In 2019, the city engaged EKI, Inc., and WRA, Inc., to assist with the preparation of permit applications and final designs for the dam's removal. The team's waterway engineers and restoration designers worked diligently with the City, NOAA Fisheries, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, CDFW, and the San Francisco Regional Water Quality Control Board to create an approach that would notch the dam, remove a portion of the impounded sediment, and install 36 log structures in the downstream reach to trap sediment during future rainy seasons. Additional subconsultants modeled sediment flows and subsurface geology to ensure the final design would have minimal negative effects on downstream and adjacent areas.

Using the information gained from sediment modeling, the final design involved creating a 20-foot-wide notch through the dam. To prevent damage to the north side of the dam and the adjacent road during high flows, a rock wall was added to the design on the left channel bank through the notch. In addition, the design included a 20-foot-wide pilot channel through the impounded sediment. Over time, the pilot channel is expected to evolve into a riffle and pool-dominated stream channel favored by steelhead. The design left approximately half of the 48,000 cubic yards of sediment accumulated behind the dam to wash downstream overtime and feed the sediment-starved reach below.

Live willow pole clusters were installed along the pilot channel to encourage geomorphic complexity. Slash trenches, 30-foot long excavations across the channel, filled with a mix of branches and cobbles, were installed to catch sediment during less intense storm events. These trenches are expected to be washed out after one or two high flow events, minimizing the duration of high sediment volume flows to downstream areas.

Below the dam, 36 structures were installed using coast redwood (*Sequoia sempervirens*) and Douglas fir (*Pseudotsuga menziesii*) logs. These structures were designed to trap sediment and create suitable spawning habitat while raising the channel bottom to restore high flow connection with the historic floodplain. The logs used for the structures were harvested from the site and from a neighboring vineyard within the watershed to minimize the potential for introduction of the destructive *Phytopthora* pathogen. Slash, made of tree branches and shrubs removed during execution of the work, was

continued page 7

Low flow channel beginning to form in area of former reservoir.

Meet the Contributing Member: **Brian Bartell**

Occupation: Senior Restoration Designer for WRA, Inc.

County of residence or work: I live in San Rafael, but my projects take me all over the state. Right now, outside of the Bay Area counties, I have projects in San Bernardino, Los Angeles, Santa Barbara, Fresno, San Mateo, Napa, Sonoma and Butte Counties.

How long have you been a member of SERCAL? Three years, should have been longer!

What is the biggest benefit of your membership? As a restoration practitioner, I find that hearing about the successes (and failures) of others is invaluable. SERCAL's facilitation of sharing experiences and information is a huge benefit.

What do you like best about the SERCAL conferences? I look forward to the next in-person conference.

What is your specific discipline (or underlying education)? I am a landscape architect by education, but prefer to refer to myself as an ecological restoration practitioner.

What services do you provide for restoration in California, or what is your restoration passion? My passion lies in restoring habitat for Salmonids. A few weeks after moving from the east coast I saw my first Salmonid restoration project at Muir Beach. I immediately knew what I wanted to do for the remainder of my career. In addition to creek and floodplain restoration projects geared toward fish, I draw on 12 years of design/build experience to assess, design, implement, monitor and maintain seasonal wetland, alluvial fan, vernal pool, and riparian restoration projects.

How did you get into the field of ecological restoration? I spent my childhood exploring the streams and woods around my home in northern Maryland. As I grew up, so did my little town. Strip malls and housing developments sprouted from my boggy, wooded domain. I entered the landscape architecture field with high hopes of protecting the world's wild places. As reality slowly settled in, I decided that my energies were best focused on restoring the wetland, stream and forest resources that have been lost.

What is your favorite California native species? How about Genus? All of the mariposa lilies..

Any advice for others in the field of restoration? Get out in the field and look at your projects years and decades after they've been built. Time is a great teacher.

The newly constructed plane bed channel just after the Glass Fire swept through the site.

Removing Upper York Creek Dam and a Century of Steelhead Habitat Damage

continued from page 5

placed under the structures to improve their sediment retention capacity. Because many bridges are located downstream of the dam removal site, the log structures were strategically designed to use existing trees and boulders with steel anchors to prevent movement of the structures during high flows.

Removing the Beast

In July 2020, the City of St. Helena selected McCullough Construction, Inc., to complete the work, and the final permits for the project were issued. McCullough's fleet of excavators and trucks began the task of devouring the Upper York Creek Dam. Nearly 24,000 cubic yards of dam and sediment were hauled out. Up to 100 truckloads of soil made their way down Spring Mountain Road every day. The soil was hauled to several sites in the region to be re-used, and trees cut from the dam face and reservoir were stockpiled for use in building the downstream log structures.

Throughout construction, McCullough's persistence and innovation helped speed up the process. They worked with the city to maximize the limited space available on the site and proposed alternative construction methods to complete the work in an efficient manner. McCullough worked closely with the EKI/WRA design team and the Middletown Rancheria to make field changes to the log structure locations and placement to protect important cultural resources discovered during construction. The construction team, consisting of the City, McCullough, EKI, WRA, Green Valley Consulting Engineers, and Middletown Rancheria, worked together seamlessly to overcome project hurdles and ensure the work was completed per the design's intent and in compliance with all permits. By the end of September, the last of the log structures was placed and work began winding down.

> Despite low flows, riffles and pools are forming in areas where the dam and sediment were removed. The log structures immediately downstream of the dam have started trapping sediment, raising the channel elevation up three feet.

Fire

On September 27, 2020, just three days after McCullough had completed a substantial portion of the dam removal work, the Glass Fire ripped through the Napa Valley. The entire project area and surrounding watershed was scorched. The dam and former reservoir areas were largely untouched because of the recent vegetation removal. The log structures were a different story. All of the structures were affected to some degree by the flames. Nearly all of the slash had burned, and some of the structures had become

continued next page

Removing Upper York Creek Dam and a Century of Steelhead Habitat Damage *continued*

unstable. A team of WRA and EKI engineers and geomorphologists assessed each structure and quickly came up with a plan to secure the impacted structures and reduce risk to downstream bridges and properties. In December, a WRA biologist and the lead designer strategically placed branches and small logs to catch woody debris and restore the intended sediment trapping function of the structures.

Channel Evolution

Unfortunately, the 2020-2021 rainy season has not brought the rainfall that process-based designs hope for. Peak flows in York Creek thus far have been minimal, well below yearly averages. Despite the low flows, the channel is already evolving. Riffles and pools are forming in areas where the dam and sediment were removed. The log structures immediately downstream of the dam have started trapping sediment, raising the channel elevation up three feet. The spicebush, coast live oak, coast redwoods, and California bay have started to re-sprout. The Napa County Resource Conservation District will continue to monitor spawning and the geomorphic evolution of the site, with hopes that the future brings robust runs of steelhead returning to the clean, clear water of their ancestral home.

Upper York Creek Dam and reservoir cleared and ready for construction.

More information on the project can be found at https://www.cityofsthelena.org/publicworks/page/upper-york-creek-ecosystem-restoration-and-aquatic-habitat-enhancement-project

SER CAL

References

Davis, N. 2018. Cultural resource study for phase 1 of the Upper York Creek ecosystem restoration project. St. Helena: Michael Baker International, Inc.

Koehler, J. 2007. Napa River salmon monitoring program spawning year 2006 report. Napa: Napa County Resource Conservation District.

Koehler, J., and P. Blank. 2018. Napa River steelhead and salmon monitoring program 2017–18 Report. Napa: Napa County Resource Conservation District.

Manfree, A., P. Moyle, and T. Graham. 2020. Small dam, big deal: York Dam removed in Napa Valley. Retrieved from California Water Blog: https://californiawaterblog.com/2020/11/08/small-dam-big-deal-york-dam-removed-in-napa-valley/#:~:text=The%20recent%20removal%20of%20the,30%20years%20to%20accomplish%20removal.

Napa County Resource Conservation District. (n.d.). Steelhead Trout. Retrieved from Napa County Resource Conservation District: https://naparcd.org/steelhead-trout/#:~:text=The%20Napa%20River%20watershed%20is,steelhead%20population%20is%20250%2C000%20adults.

Napa County Watershed Information & Conservation Council. (n.d.). Fish. Retrieved from napawatersheds.org: https://www.napawatersheds.org/fish.

Algae in Iron Gate Reservoir. *Photo courtesy EcoFlight.*

Klamath Dam Removal Update — What's Going On?

by Mike Belchik[1]

At its heart, the Klamath Dam Removal project is a fish restoration project. The main purpose for removing these antiquated facilities is to restore the fish runs of the Klamath River. Not only will salmon have access to hundreds of miles of habitat, dam removal will also improve water temperatures, eliminate toxic algae blooms and byproducts from the lower river, and improve geomorphic function that is currently causing runaway fish disease problems. One of the ambitious goals of dam removal is to resurrect a now-extinct run of spring Chinook salmon that used to run to the upper Klamath Basin. Four of the six dams on the Klamath will be demolished, leaving two in place (Keno and Link River) that stand where natural rock reef features existed before those two dams were constructed. The dams slated for removal are (from top to bottom): JC Boyle, Copco 1, Copco 2, and Iron Gate Dam.

The current plans call for the simultaneous demolition of JC Boyle, Copco 1, Copco 2, and Iron Gate Dam starting January 1, 2023.

How did we get here?

A 2010 agreement known as the Klamath Hydroelectric Settlement Agreement (KHSA) nearly died due to congressional inaction for legislation enabling the United States to be the dam removal entity and contractor, but in 2016 the KHSA was amended. The amended KHSA called for the lower four dams to be transferred to a nonprofit corporation who would then remove the dams and go through the normal FERC process of filing, permitting, and license surrender. It appeared that dam removal was once again back on track. The signing was a big event at the mouth of the Klamath River, attended by the Governors of California and Oregon, the CEO of PacifiCorp, and Tribal officials. As part of the agreement, the newly formed nonprofit filed a "Transfer Application" with FERC that would transfer the facilities to the Klamath River Renewal Corporation (the dam removal nonprofit, or KRRC) for removal. On July 16, 2020, we received FERC's long-awaited answer, and it was "yes".

continued page 11

[1]Senior Water Policy Analyst for the Yurok Tribe (see *Meet the Contributing Member* on page 12). mbelchik@yuroktribe.nsn.us

Meet the Contributing Member: **Michael Belchik**

Occupation: Senior Water Policy Analyst for the Yurok Tribe.

County of residence or work: Klamath/Siskiyou bioregion from the high desert headwaters in Oregon, to the temperate rainforest redwoods at the mouth of the Klamath River and including all its tributaries. I live at the confluence of the Trinity River and the South Fork Trinity River near Willow Creek, CA.

How long have you been a member of SERCAL? 5 minutes

What is the biggest benefit of your membership? I'm looking forward to finding out as a new member,

What do you like best about the SERCAL conferences? Connection with like-minded people working on large-scale ecological restoration. Passing along hard-earned experience and knowledge to our next generation of restorationists and leaders.

What is your specific discipline (or underlying education)? My current title is Senior Water Policy Analyst. My former title was Senior Fisheries Biologist. My bachelors degrees are in Fisheries Biology and Oceanography. I do not have any graduate degrees, but I do have a PhD from the School of Hard Knocks.

What services do you provide for restoration in California, or what is your restoration passion? Bringing together the science, law, policy, media, business and politics required to bring about landscape-scale restoration. My primary life's work has been to un-dam the Klamath River and I have played a direct role in that from the very beginning. My superpower is being able to explain complicated science concepts to laypeople in a way that doesn't lose too much precision.

How did you get into the field of ecological restoration? Although I grew up in the city, I was always attracted to nature and wild places. I spent much of my youth wandering through the regional parks in the East Bay above Oakland, CA. Wanting more of this, I attended Humboldt State University and acquired bachelor's degrees in fisheries and oceanography in the early 1990s. After working as a seasonal tech in places like Chiloquin, OR, Orleans, CA and Salmon, ID, in 1995 I took a chance and took a job as a Senior Fisheries Biologist for the newly formed Yurok Tribe. I've been there ever since. The Yurok Tribe has an ecological restoration cultural framework, so I fit right in. My life's work has been Klamath dam removal and large-scale flow issues on the Klamath and Trinity Rivers.

What is your favorite California native species? Green Sturgeon; Madrone; Spring Chinook Salmon..

Any advice for others in the field of restoration? Think big. Small projects, while important, are less likely to add up to meaningful change. Address the core problem instead of the symptoms

Klamath Dam Removal Update — What's Going On?

continued from page 9

But there was a catch. And this catch nearly unraveled the entire agreement. FERC allowed the transfer but required PacifiCorp to remain on as co-licensee.

Why did this new requirement matter? PacifiCorp had stated clearly all along that it wished to have no connection or liability from dam removal. It didn't matter that KRRC had done a massive amount of work to identify and reduce risk; PacifiCorp saw this as a deal breaker. What ensued were frantic negotiations as all sides scrambled to save a deal teetering on the brink of collapse. Berkshire Hathaway, who owns PacifiCorp, became involved in a positive way. There were many Zoom meetings. The states of California and Oregon were involved right up to the governor's level. Lawyers worked on weekends.

On November 16, 2020, a press event was held to announce a new Memorandum of Agreement that cleared the way forward once again. Warren Buffett issued a statement calling for the timely removal of the dams, citing the impact to Native Communities.

> *"We appreciate and respect our tribal partners for their collaboration in forging an agreement that delivers an exceptional outcome for the river, as well as future generations," Berkshire Hathaway Chair Warren Buffett said in a statement. "Working together from this historic moment, we can complete the project and remove these dams."*

Dam removal is a complicated project; akin to building a large bridge, or an interstate freeway. There are a lot of moving parts. Engineering, biology, ecology, business, law, and politics all collide and interact in unpredictable ways.

Algae at Copco Reservoir. *Photo courtesy Stormy Staats/Klamath Salmon Media Collaborative.*

Where are we now?

The new MOA put dam removal back on track once again, although this hurdle, along with challenges related to acquiring other environmental clearances, have pushed the start date to January 2023. With the dam owner on board now in unequivocable terms, the pace of progress has quickened. The day of the November 2020 press event, KRRC and PacifiCorp filed new papers seeking to surrender the project.

continued next page

The signing of the 2010 Klamath Hydroelectric Settlement Agreement was a big event at the mouth of the Klamath River that was attended by the Governors of California and Oregon, the CEO of PacifiCorp, and Tribal officials.

Mouth of the Klamath River – An aerial view of the Klamath River where it flows into the Pacific Ocean.

Klamath Dam Removal Update — What's Going On? *continued*

The terms of the MOA call for the states of Oregon and California to step in as co-licensees during dam demolition instead of PacifiCorp, and each of the three parties have agreed to contribute $15m to safeguard against unlikely project cost overruns. In January 2021, a new license transfer application was filed to transfer ownership of the project license from PacifiCorp to KRRC, California, and Oregon. Just this month, the ESA consultation has reached a major milestone with KRRC, submitting a completed Biological Assessment to FERC to use, if it wishes, in the upcoming consultation of effects of dam removal to listed species.

Meanwhile KRRC has selected a main demolition contractor (Kiewit International, Inc.) and engineering plans are now at 100%. Preliminary work such as seed-gathering and pre-construction data-gathering has begun. Work will start soon on peripheral support projects such as the relocation of the Yreka city water supply pipeline, road and bridge upgrades, etc.

OK but what does this all mean?

Of all the various types of fish restoration projects, fish passage restoration is by far the most successful. And the Klamath Dam Removal will be the largest fish habitat improvement project ever completed. With the dam owners now 100% on board, progress has proceeded rapidly. Of course there are still nay-sayers who operate (mostly) on disinformation, but PacifiCorp has made it clear that this is a money-losing asset to them and they want out.

How will the dams be taken out?

The current plans call for the simultaneous demolition of (from top to bottom) JC Boyle, Copco 1, Copco 2, and Iron Gate Dam starting January 1, 2023. A midwinter initial reservoir drawdown and sediment discharge, while more challenging, allows for accumulated sediment to be released during the time of year when the river naturally has high suspended sediment levels, thus minimizing negative impacts to the ecosystem. Each dam will have its own removal process, but the general idea is to drain the water down, then take out the dam in midsummer. The sediment that has collected over the years will be discharged when the river cuts through the sediment deposits as it re-establishes its old channel form.

Fish reintroduction

Plans to reintroduce fish are in a state of flux right now. Oregon proposes to let steelhead reintroduce themselves. Although the agreement calls for Iron Gate Hatchery to be moved but remain operational for 8 years, its long-term fate is unclear. A vigorous debate is occurring right now about the need for more active measures such as active reintroduction, which stocks might be used if an active reintroduction strategy should be employed. The dams will fall, and the salmon will finally return home.

SER CAL

Figure 1 (*left*). Undergraduate students Ariel Dasher (left) and Erik Daniels (right) measure streamflow in Bear Creek, tributary of the upper mainstem Eel River. Figure 2 (*right*). A site visit to the upper Eel watershed on May 17, 2016 to assess fish passage conditions at Bloody Rock roughs on the mainstem. Pictured from left: Josh Fuller (NMFS), Alicia Hamman (FOER), Sam Kannry (Native Fish Society), Ross Taylor (Ross Taylor Associates), Tom Holley (NMFS), and Emily Cooper (HSU).

Habitat blocked by Scott Dam in the headwaters of the mainstem Eel River:

Is it enough to aid in recovery of steelhead trout and Chinook salmon populations?

by Emily J. Cooper[1]

Dams and diversions have long periled California's river ecosystems as anthropogenic water demand continues to grow. However, in recent years, dam removal has been an increasingly viable option for river restoration throughout the United States. Scott Dam of the Potter Valley Project in California's Eel River is an impassable barrier for native migratory fish including salmon, steelhead trout, and Pacific lamprey. With Federal dam relicensing underway, researchers demonstrated recolonization potential for upper Eel River salmonid populations by estimating the potential distribution (stream-km) and habitat capacity (numbers of juveniles and adults) for winter steelhead trout (*Oncorhynchus mykiss*) and fall Chinook Salmon (*O. tshawytscha*) upstream of Scott Dam. During 2016, a Humboldt State University graduate student, Emily Cooper, set out to collect stream habitat data in the upper mainstem Eel River throughout the Mendocino National Forest as part of her Master's Thesis project. Cooper conducted reconnaissance missions to assess river access and navigating rough roads, as well as three organized site visits with stakeholders, including HSU professor Alison O'Dowd, folks from California Trout, Friends of the Eel River, National Marine Fisheries Service, Sonoma County Water Agency, Pacific Gas and Electric, California Department of Fish and Wildlife, US Forest Service, McBain Associates, and Ross Taylor Associates.

Cooper, with the help of her ever-encouraging thesis advisor, Dr. O'Dowd, as well as intrepid undergraduate students Erik Kenas, Ariel

continued next page

[1]Restoration Ecologist, Yurok Tribe Fisheries Department (see *Meet the Contributing Member* on page 16). emily.cooper@humboldt.edu

Habitat blocked by Scott Dam in the headwaters of the mainstem Eel River

continued

Dasher, and Erik Daniels, surveyed 20 stream reaches totaling 13.2 stream-km using habitat-typing with physical variables important for juvenile salmonids (Figure 1). An area known as Bloody Rock Roughs was identified as a partial migration barrier and resulted in different scenarios of distribution and capacity for Chinook salmon and steelhead trout (Figure 2). During drier water years, we estimated that Bloody Rock Roughs would not allow access to habitat upstream, but during normal to wet water years access to the habitat upstream of the roughs should become available. After many nights spent camping in remote areas with no cell reception, Cooper had the data required for quantifying habitat suitable to salmon and steelhead. Reaches were categorized based on habitat variables collected in the field as well as combinations of stream gradient and drainage area using GIS to characterize the available habitat upstream of Scott Dam, to estimate potential distribution, and to model habitat capacity for each fish species. Estimated steelhead trout habitat included up to 463 stream-kms for spawning and 291 stream-kms for summer rearing; estimated Chinook Salmon habitat included up to 151 stream-kms for both spawning and rearing (Figure 3). Estimated numbers of returning adults, based on historical count data (1938 to 1975) from the South Fork Eel River, produced wide ranges for steelhead trout (3,241 to 26,391) and Chinook Salmon (1,057 to 10,117). An approach that first estimated juvenile habitat capacity and then used subsequent life stage survival rates yielded 1,281 (CV 56%) adult steelhead trout returning and 4,593 (CV 34%) adult Chinook Salmon returning. Variability in estimated numbers of returning adults reflects application of densities and survival rates from other populations, assumptions about salmonid productivity in response to potential spawning habitat capacity, residency and outmigration of early life-stages, summertime water quality conditions, and inter-annual hydrograph, marine, and population variability.

> Reconnecting the river's high-elevation headwaters would not only provide more upstream habitat, but it would also deliver more water, facilitate fluvial processes, and potentially change temperature regimes downstream, all of which may benefit fish.

continued next page

Meet the Contributing Member: **Emily Cooper**

Occupation: Restoration Ecologist, Yurok Tribe Fisheries Department

County of residence or work: Humboldt and Trinity

How long have you been a member of SERCAL? About a week.

What is the biggest benefit of your membership? SERCAL has provided me an opportunity to participate in their newsletter.

What is your specific discipline (or underlying education)? My work focuses on Pacific salmonid habitat in rivers and streams and linking hydrological and ecological processes in lotic environments. I have a Master of Science degree in Natural Resource Science from Humboldt State University, California.

What services do you provide for restoration in California, or what is your restoration passion? Salmonid habitat restoration in rivers and streams.

How did you get into the field of ecological restoration? I started off as a vegetation restoration intern at Grand Canyon National Park.

What is your favorite California native species? *Oncorhynchus mykiss*, steelhead trout!.

Any advice for others in the field of restoration? Remember that ecological response occurs in interconnected processes, so restoration goals cannot be limited to one species or biological function. Aim for the capacity for self-renewal.

SER CAL

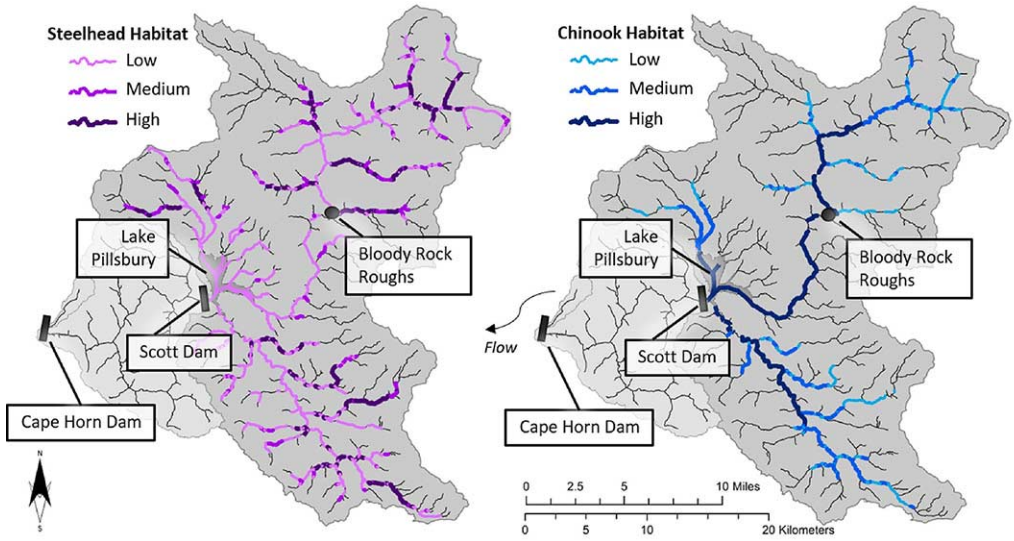


Figure 3. Potential extent of suitable habitat categories for steelhead trout (left) and Chinook salmon (right) upstream of Scott Dam in the Eel River, CA. Darker, thicker habitat streams represent higher suitable habitat relative to field measurements. Habitat upstream of Bloody Rock Roughs was not included in a distribution scenario where the roughs become impassable for upstream migration during very dry years. (NMFS 2016, USGS 2016a). Spatial reference: WGS 84, UTM Zone 10 North.

Habitat blocked by Scott Dam in the headwaters of the mainstem Eel River

continued

Compared to other studies that quantified or assessed habitat above Scott Dam, this study found more suitable habitat for both steelhead trout and Chinook Salmon (Figure 4). Reconnecting the river's high-elevation headwaters would not only provide more habitat upstream of Scott Dam to aid in population recovery, but it would also deliver more water, facilitate fluvial processes, and potentially change temperature regimes downstream, all of which may benefit fish. Such downstream effects were recognized by this study but are outside of its scope. This research was continued by Cooper and other scientists after Cooper's completion of her Master's Thesis (Cooper 2017) and later published in the Winter 2020 issue of *Northwest Science* journal (Cooper *et al.* 2020). This work was also featured in the documentary "A River's Last Chance" by Shane Anderson, a film about water resources and the fight for recovery of wild steelhead trout and salmon in the Eel River. As the dam relicensing process continues to this day, stakeholders continue to use the research by Cooper et al. (2020) as a reference for deciding whether to remove Scott Dam and how to continue use of the Potter Valley Project (which diverts Eel River water into the Russian River).

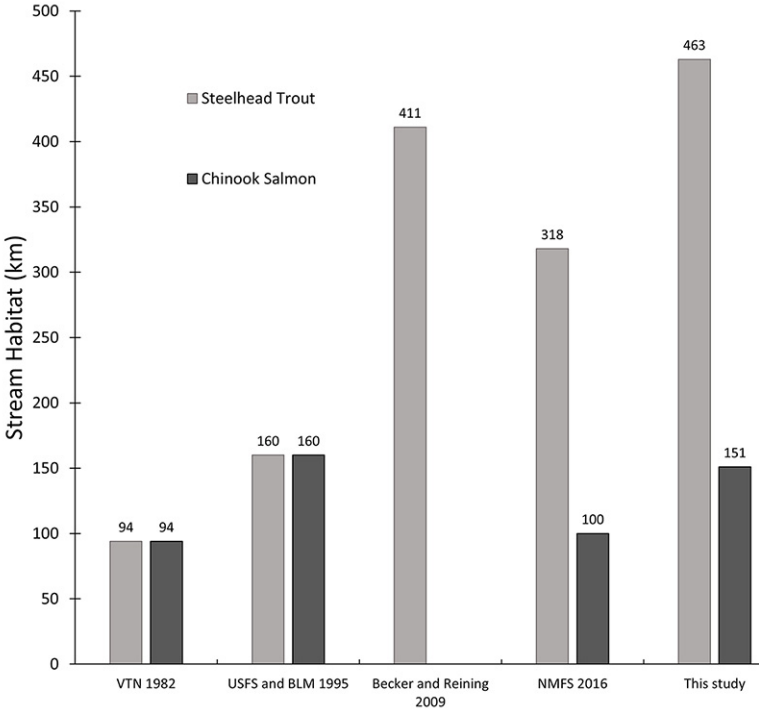


Figure 4. Quantified stream habitat (km) for steelhead trout and Chinook salmon upstream of Scott Dam from four other sources and Cooper et al. (2020).

SER CAL

References

Cooper, E.J. 2017. An estimation of potential salmonid habitat capacity in the upper Eel River, CA. Master's Thesis. Humboldt State University, Arcata, CA.

Cooper, E.J., A.P. O'Dowd, J.J. Graham, D.W. Mierau, W.J. Trush, and R. Taylor. 2020. Salmonid habitat and population capacity estimates for steelhead trout and Chinook salmon upstream of Scott Dam in the Eel River, California. *Northwest Science* 94:70–96.

[NMFS] National Marine Fisheries Service. 2016. Final Coastal Multispecies Recovery Plan for California Coastal Chinook Salmon, Northern California Steelhead and Central California Coast Steelhead. US Dept of Commerce, National Oceanic Atmospheric Administration, National Marine Fisheries Service, Santa Rosa, CA.

[USGS] US Geological Survey. 2016a. The National Map data download and visualization services. Available online at https://www.usgs.gov/core-science-systems/ngp/tnm-delivery (accessed October 2016).

Meet the Guest Editor: **Ross Taylor**

Editor's Note: Ross has been an active member of the SERCAL Board since 2009, chairing technical sessions at our annual conferences and coordinating some very popular issues of *Ecesis*. Thank you, Ross!

What is your Occupation and where do you work? Fisheries biologist — I own a small consulting firm.

County of residence or work: Humboldt; I also work in Mendocino and Mono counties.

How long have you been a member of SERCAL? Since 2010, but first presented at a conference in 2005. I have been a Board member since 2010.

What is the biggest benefit of your SERCAL membership? Meet new people and use information from other restoration disciplines that are applicable to fisheries/watershed restoration..

What do you like best about the SERCAL conferences? Networking, getting out of the pure fisheries-based field.

What is your specific discipline (or underlying education)? Salmon and steelhead/watershed restoration. Fish passage, fish relocation, biological monitoring.

What services do you provide for restoration in California, or what is your restoration passion? Fish passage assessments, fish relocation, biological monitoring, trainings and workshops.

How did you get into the field of ecological restoration? Graduate school at Humboldt State University — coastal stream management class and lab..

What is your favorite California native species? Coho salmon.

Any advice for others in the field of restoration? Find an aspect of restoration that is your passion and pursue it. Attend conferences, present at conferences, submit posters at conferences. Keep abreast of the journals pertinent to your field of expertise

SER CAL

SERCAL, the California Society for Ecological Restoration, is a non-profit membership-based organization dedicated to advancing the science, art, and practice of restoring native California habitats.

See what's new at www.sercal.org.

The Last Word: *Resilience*

"Ecological resilience is the capacity of an ecosystem to recover to its pre-disturbance composition, structure, and/or function over time." — *Hobbs and Suding 2009*

As scientists and restorationists we constantly face challenges while attempting to heal damaged landscapes and watersheds. Environmental disturbances triggered by events such as fires, storms, floods, or droughts are natural processes that constantly reset ecosystems, and in many cases, are beneficial in the long-term. Humans have taken environmental disturbance to a new level where periods for system recovery are infrequent, inadequate or completely missing.

Resilience, the ability to recover quickly or spring back into shape, has value in understanding how we can incorporate ecological resilience into restoration projects. For example, in the Mono Basin, watershed restorationists examined Rush Creek's pre-division hydrographs to develop a suite of flow regimes by water-year type to be released from a dam to mimic unimpaired hydrographs to fulfill a host of ecological processes, with the understanding that flows in wet years would create the ecological resilience to get through the unavoidable drought years. Ecological resilience or the capacity for self-renewal was a major objective in emulating Rush Creek's unimpaired hydrographs.

— *Ross Taylor*

SERCAL Leadership Team 2021

Board Officers

President **Allegra Bukojemsky**

Secretary **Cindy Thompson**

Treasurer **Geoff Smick**

Regional Directors

North Coast & High Desert (Alameda, Contra Costa, Del Norte, Humboldt, Lassen, Marin, Mendocino, Modoc, Napa, San Mateo, Santa Clara, Shasta, Siskiyou, Solano, Sonoma, and Trinity)

Geoff Smick *WRA, Inc.* smick@wra-ca.com

Ross Taylor *Ross Taylor & Associates* rossntaylor@sbcglobal.net

Isaiah Thalmeyer *Point Blue* ithalmayer@pointblue.org

Central Coast & Valley (Alpine, Butte, Calaveras, Colusa, El Dorado, Fresno, Glenn, Kern, Kings, Lake, Madera, Mariposa, Merced, Monterey, Nevada, Placer, Plumas, Yolo, Sacramento, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Santa Cruz, Sierra, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, and Yuba)

Thor Anderson *Burleson Consulting, Inc.* ta@burlesonconsulting.com

Allegra Bukojemsky *Westervelt Ecological Services* abukojemsky@westervelt.com

Will Spangler *Santa Clara Valley Habitat Agency* will.spangler@scv-habitatagency.org

South Coast & Eastern Desert Lands (Imperial, Inyo, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Diego, and Ventura)

Mauricio Gomez *South Coast Habitat Restoration* mgomez@schabitatrestoration.org

Jeannine Ross *KMEA* jross@kmea.net

Cindy Thompson *Habitat Restoration Sciences* cthompson@hrs.dudek.com

At Large Directors

Kari Dupler *RestorCap* karidupler@gmail.com

Jamie Silva *CA Department of Water Resources* Jamie.Silva@water.ca.gov

Lindsay Teunis *ICF* Lindsay.Teunis@icf.com

Affiliates

Liz Agraz *WRA, Inc.* agraz@wra-ca.com

Greg Andrew *Retired* AndrewEnv@aol.com

James Mizoguchi (Contributing Editor) *Triangle Properties* jmizoguchi@teichert.com

Cassie Pinnell *Vollmar Natural Lands Consulting* cpinnell@vollmarconsulting.com

Administrative Director

Julie St John julie.sercal@gmail.com

Mentzelia micrantha

You are crucial to the resilience of California's native habitats

Just like our floral first responders, SERCAL members make California's ecological systems healthy and whole again. In the three decades since SERCAL was founded (let alone, last year) so much — almost everything — has changed. Yet one thing remains constant: *The exceptional power we have when we work together.* We are grateful for all our members and want to recognize these individuals and businesses for their generous support in 2021:

Sustaining Businesses:

Edith Read **E Read and Associates** *Orange* ❊ Patrick Reynolds **Hedgerow Farms** *Winters* ❊ Robert Freese **Irvine Ranch Conservancy** *Irvine* ❊ Travis Gramberg **Koheid** *Costa Mesa* ❊ Cindy Tambini **Wildlands** *Rockland* ❊ Alisa Flint **OC Parks Natural Resources Team** *Irvine* ❊ Liz Agraz **WRA** *San Rafael*

Sustaining Individuals:

Philip Brownsey Environmental Science Associates *Sacramento* ❊ **Gina Darin** California Department of Water Resources *Sacramento* ❊ **Jason Drew** Nichols Consulting Engineers *South Lake Tahoe* ❊ **Robert Mazalewski** Consulting Horticulturist *La Mesa* ❊ **Ross N. Taylor** Ross Taylor & Associates *McKinleyville* ❊ **Emily Zefferman** Resource Conservation District of Monterey County *Marina*

California Society for Ecological Restoration
SERCAL

515 N Desert Stravenue, Tucson AZ 85711

ADDRESS SERVICE REQUESTED

FIRST CLASS
US POSTAGE
PAID
TUCSON, AZ
PERMIT 3341

Happy Spring-into-Action Everyone! Here's to a good year for us all and all the habitats in which we live.

Ecesis

Have you considered writing an article about a project you're working on? *Or on a topic that's been top-of-your-mind?* Or what about a photo essay of before and after? Take a look at the articles in this or past issues and you'll get a good idea of the spectrum of topics we cover.

Upcoming issues:

Publish	Due Date*	Guest Editor
Jun 2021	May 15	Mauricio Gomez
Sep 2021	Aug 15	Will Spangler
Dec 2021	Nov 15	Liz Agraz & Geoff Smick

*Contact Julie, James, or the Guest Editor (see all contacts, page 19) early to secure your spot. Find guidelines at www.sercal.org/newsletter

jobs events rfps

opportunity knocks at sercal.org