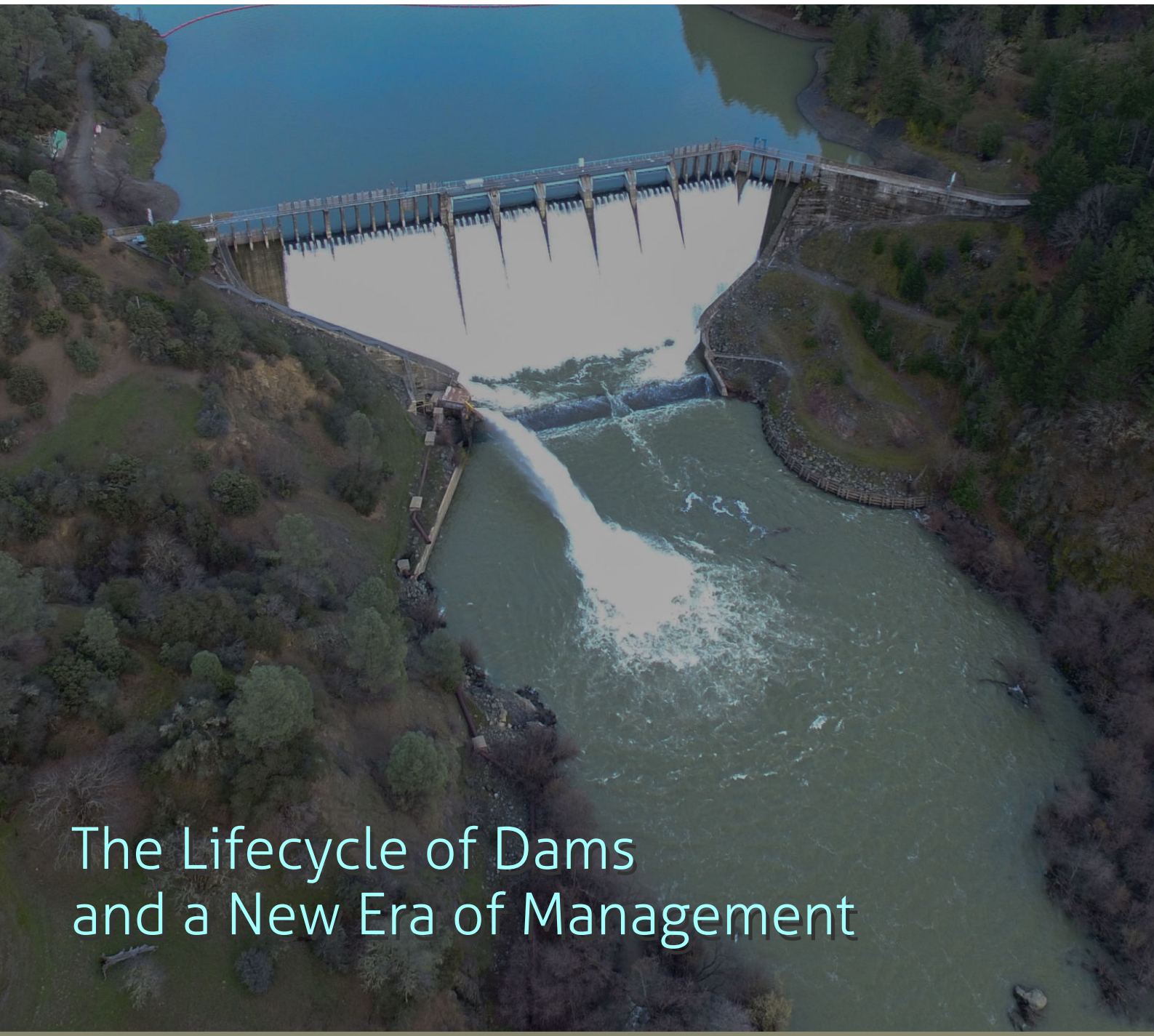
the current

abundant wild fish · healthy waters · better California

Fall 2016

CALIFORNIA TROUT

FISH · WATER · PEOPLE



The Lifecycle of Dams and a New Era of Management

McREDBANDS

DFW reintroduces rescued McCloud Redbands to their natal streams

PHOTO CONTEST

Announcing the winners of our 2016 contest in Reflections

A message to you

Our goal with each issue of *The Current* is to bring our stories and projects to life, with more images, videos and links... offering you a rich perspective on the work **your support makes possible**. We are thankful to you, our donors, who help us ensure that there will always be abundant populations of wild fish thriving in healthy waters for a better California.

REGULARS

REFLECTIONS

The Life (and Death) Cycle of Dams

Rivers play a major role in shaping California's landscape and how people use that land. Over the past century, more than a thousand dams have blocked, slowed or redirected California's rivers.

Our scientific understanding of river ecosystems has advanced tremendously since most of those dams were built, and it's now clear that dams have had tremendous adverse impacts on fish species communities and river ecosystems. While some dams continue to work effectively, others have outlived their usefulness. ***In reality, many dams warrant either a major overhaul or outright removal.***

California Trout is dedicated to supporting healthy river ecosystems in the interest of promoting resilient wild fish populations while also meeting the needs of people. One of the best opportunities for influencing the management of rivers is the Federal Energy Regulatory Commission (FERC) relicensing process. Every hydroelectric dam must apply for a new FERC license to continue operations every 30 to 50 years. CalTrout is currently engaged in that process for several major dams.

CalTrout applies the best available science to help evaluate the current costs and benefits of dams that are up for relicensing, and offer suggestions for opportunities to improve fisheries and water management. Addressing shortcomings in existing dams usually means improving fish passage and adjusting the management of flows. When appropriate, CalTrout advocates for dam removal.

FEATURE CONTRIBUTORS

Nina Erlich-Williams & Mary Derr

Nina and Mary work with Public Good PR, helping to promote CalTrout and our work since 2008.

Photo by Mike Wier

The Era of Dams: People Taming Nature

The era of modern dams began in the late 1800s, quickly showing that dams provide many useful services for people. They can generate hydropower, moderate river flows for flood control, and store water for agriculture and provisioning cities. Dam-created reservoirs also offer recreational opportunities, which bring economic benefits to local communities.

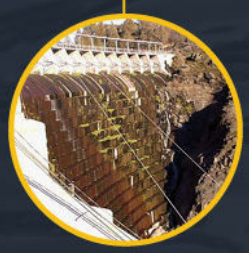
Unfortunately, dams always come at a dramatic environmental cost. Damming a river alters its physical structure, both upstream and down. ***On the most basic level, creating an impassable barrier on a waterway prevents migratory fish like salmon and steelhead from accessing their natal spawning grounds.***

Blocking a river also traps large wood and gravel essential elements for spawning and rearing fish. The result is a river channel that is scoured and structurally less complex, and thus less suitable for fish and wildlife. Finally, coastlines are deprived of regular sediment deposits, degrading beaches and other coastal habitats.

Altering the volume and pattern of water flow below a dam can also drastically reduce water quality. The higher water temperatures that result from slowed flows directly correlate to lower concentrations of dissolved oxygen, which reduces fish survivability and can even wipe out entire populations. Warmer water temperatures can also cause harmful algae blooms.

1908 — 1st Potter Valley Project Dam completed (*Cape Horn*)

1916 — 1st Klamath River Hydropower Project dam completed (*Copco #1*)



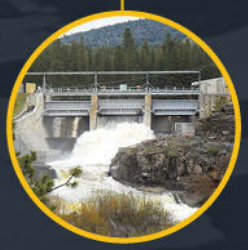
1921 — 2nd Potter Valley Project Dam completed (*Scott Dam*)

1925 — 2nd Klamath River Hydropower Project dam completed (*Copco #2*)

1935 — Federal Power Act (FPA) enacted: regulates non-federal hydropower projects

1947 — Matilija Dam completed

1958



3rd Klamath River Hydropower Project dam completed (*J.C. Boyle*)

1964 — 4th Klamath River Hydropower Project dam completed (*Iron Gate*)

1968

Oroville Dam completed on the Feather River, the tallest dam in the U.S. One of the first major dams to give major consideration to environmental protections.

Most dams were built before we understood the devastating effects they could have on river systems. And most were built before laws such as the Endangered Species Act existed. The majority of California's dams were built with no opportunity for fish passage and for too long hatcheries were placed below dams as 'mitigation' for blocking upstream spawning and rearing habitat. Over time the science has made clear that, in most cases, hatcheries do more harm than good primarily due to diluting the gene pool of wild fish and reducing population resilience in the process.

Severely altered flows also impact rivers below dams. Too often, outdated flow regimes significantly degrade river and riparian ecosystems and fail to maintain healthy downstream habitat. Many dams operate under a cycle of capturing high winter flows and then releasing a steady minimum base flow from the dam throughout the spring, summer and fall. CalTrout advocates for dam management to better mimic a natural flow regime with winter peaks that clean spawning gravel and dynamic spring flows that gradually decrease to a healthy base flow.

Turning the Tide: Adding Nature Back Into the Mix

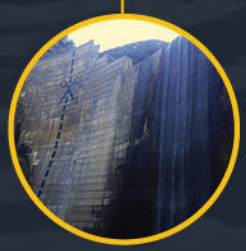
After more than half a century of dams blocking fish passage and altering stream flows, it became clear that dams were playing a key role in ecosystem and fish population collapse in watersheds throughout the United States. New laws passed in the 1970s, such as the Endangered Species Act and the Clean Water Act, helped to shift the discussion around managing natural resources to support native plants and wildlife while also maximizing beneficial uses for people.

1970 — Environmental Protection Agency (EPA) founded; California Environmental Quality Act (CEQA) adopted; National Environmental Policy Act (NEPA) adopted

1973 — Endangered Species Act adopted

1986 — FERC licenses must now give equal consideration to fish and wildlife populations and habitat protection, in addition to other aspects of environmental quality

1998 — Ventura County determines to remove Matilija Dam, process begins



Beginning in 1986, FERC mandated that dam management give equal consideration to fish and wildlife populations and habitat protection along with beneficial uses for people. Since that time, many old dams have been retrofitted to enable fish passage and flow management regimes have been updated to benefit wildlife with varying degrees of success. Even in dams with such retrofits in place, native fisheries often still struggle.

Improving, Not Removing, Some Dams

Fortunately, ecosystems do recover when dam management is done right. The Pit River in northern California is a success story of a hydropower project that has been updated using science-based recommendations, and is now successfully managed for a balance of human use (hydropower), healthy wild trout populations, and dynamic water flows.

The Lower Pit passes through a series of hydropower projects before reaching Shasta Reservoir. The various Pit River dams were built between 1925 and the mid-1960s. One big problem in this case was the flow regime, which at times would completely dewater sections of the river. Pit 3 dam is a great example. In the 1980's CalTrout advocated for a FERC license amendment to provide flows below Pit 3. At the time the flow releases below the dam were a startling 0 cfs! The license amendment was successful in providing 150 cfs to the river and the trout fishery quickly responded. In 2003 a series of Pit River dams went through the full relicensing process and again CalTrout successfully advocated for a flow regime that mimicked the natural hydrograph. Today, the Pit River is one of the best wild trout fisheries in the California while maintaining power generation and other beneficial uses.

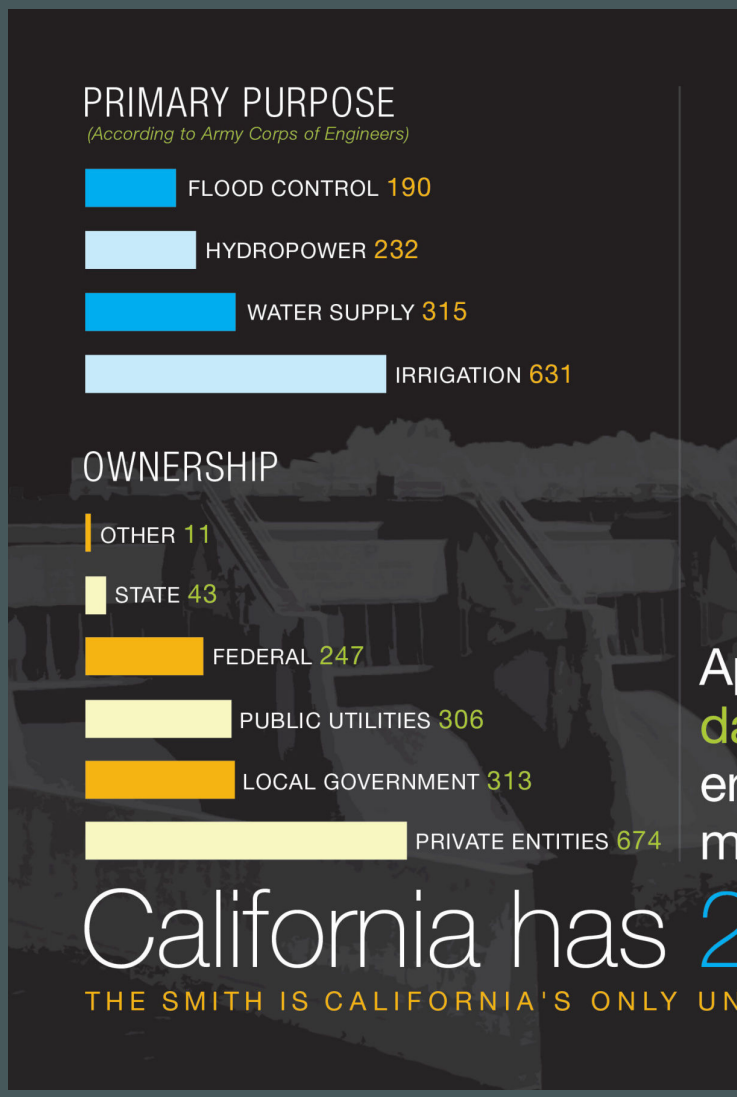
When, Whether and How to Remove a Dam

Sometimes FERC (or other controlling public agencies) determine that a particular dam is doing more harm than good. Even when dam removal is identified as the best path forward, the process is difficult and expensive. Sediment that builds up behind the dam, which can contain toxins like mercury, must be addressed. Water flows during the removal process must be managed to minimize harm to downstream habitat and to ensure that people and structures will be kept safe during and after removal. And the whole process takes time: once removal is identified as the best option, obtaining the necessary permits and funding, physically removing the dam, and restoring habitat can take years or more.

The Elwha River in Washington State's Olympic Peninsula is a dam removal success story. Two dams, the Elwha and Glines Canyon Dams, were removed between 2011 and 2014. A mere five years since dam removal began the river ecosystem has experienced a rapid recovery. Sediment has flowed downriver, recharging spawning beds and restoring the beach at the river mouth; vegetation is creating new riparian habitat on ground once covered by reservoirs; and fish and wildlife populations are rapidly rebounding. The first season after Elwha Dam was removed, more than 4,000 spawning chinook salmon were counted above the dam site, after 100 years of zero fish passage to the area.

The process of deciding when or whether to remove or improve an existing dam is always complex. CalTrout is currently involved in three different major dam assessment and removal projects across the state, each at different stages of the relicensing and/or removal process.

In southern California, there is a general consensus that Matilija Dam needs to come down and the complicated process leading up to removal has begun. In the far northern



reaches of the state, a broad group of stakeholders reached an agreement earlier this year to proceed with the removal of four hydroelectric dams on the Klamath River, which are now slated to come out. And along California's north coast, the PG&E-owned Potter Valley Project on the Eel River will file for FERC relicensing in 2017. Together, these three examples show how CalTrout leverages the best available science to advocate for healthy rivers and native fish.

FERC relicensing and other public processes provide excellent opportunities for CalTrout to advocate for science-based decision-making about how and whether to retrofit or remove dams in the state. We remain committed to starting first with what we know about how natural processes work to support fish and other native wildlife, and then to identifying the best path forward to benefit both fish and people.

pproximately 75% of Calif. ams were built before the nvironmental awareness ovement of the 1970s

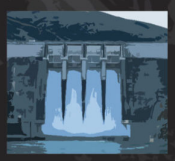
1250+ DAMS

fall under CA Department of Water Resources jurisdiction

130+ HYDROPOWER

PROJECTS (SOME INCLUDE MULTIPLE DAMS) ARE LICENSED BY FERC

Pacific Gas & Electric has 26 FERC licenses, along 16 river basins



THERE ARE MORE THAN 1400 DAMS IN CALIFORNIA

MORE THAN 1200 DAMS ARE OVER 25 FEET HIGH

AT 742' OROVILLE DAM IS THE TALLEST IN THE U.S.

20,000 miles of rivers and streams.

DAMMED RIVER FROM SOURCE TO OCEAN*

FERC Relicensing 101

The Federal Energy Regulatory Commission licenses all non-federally-owned hydropower projects. FERC provides public notice and considers input from all stakeholders, including the dam owner (usually an electric utility), various regulatory agencies, local governmental entities such as irrigation or flood control districts, conservation groups, and concerned citizens. The dam owner must study the effects of the dam's operations on public resources, and the dam must comply with federal and state environmental regulations. The health of native anadromous fish populations and other threatened and endangered species is often a primary consideration.

The project licensee (usually a utility) must notify FERC of its intent to seek a new license 5 years before the existing license expires. An approximate timeline might look like this:

YEAR 1: SCOPING PHASE

- All stakeholders suggest what studies are needed, different scenarios to consider.
- Participants determine who will provide funding for the process, identify funding strategies.

YEARS 2 & 3: DATA COLLECTION PHASE

- Field work, modeling, and other data collection is conducted.

YEARS 4 & 5: COMPLIANCE PHASE, LICENSE RE-ISSUE

- Stakeholders examine the different possible scenarios, for example:
  - Utility's operational alternative
  - National Marine Fisheries Service alternative
  - Conservation groups' alternative
- Stakeholders negotiate a settlement based on the various alternatives studied.
- The settlement goes through environmental review, including CEQA (California Environmental Quality Act) and NEPA (National Environmental Protection Act) compliance.
- FERC adopts the final determination. Might include re-issuing license, decommissioning or dam or ordering changes to dam management, such as flow regime or improved fish passage.

The Klamath River: Deadbeat dams to be removed

The Klamath River was once renowned among anglers for its steelhead. And since time immemorial, native tribes have depended on its abundant salmon and other native fish.

Klamath Dams Stats

History:

- Copco Dam #1 completed in 1916
- Copco Dam #2 completed in 1925
- J.C. Boyle Dam completed in 1958
- Iron Gate Dam completed in 1964
- FERC license expired in 2006, currently operating on annual license

Summary:
4 dams on Klamath River make up PacifiCorp's Klamath hydroelectric project; used for hydropower

Stakeholders:
Federal, state, tribal, farmers, conservation groups

Fish species affected:
Chinook salmon (spring and fall runs); sturgeon (green and white); Pacific lamprey; steelhead (winter and summer runs); coho salmon

Status:
To be removed in 2020

KLAMATH

With the construction of Copco Dam in 1916 came massive change. The four dams that make up the hydroelectric project are Copco #1 and #2, J.C. Boyle, and Iron Gate Dam. Iron Gate was the last of the dams to be built, in 1965, still before scientists fully understood the many ways that damming a river can disrupt the entire river ecosystem.

These dams block fish passage to the upper reaches of the watershed and create warm water conditions that have led to massive algae blooms and fish kills. The dams also produce a relatively small amount of electricity. Water allocation in the Klamath Basin has been controversial since the U.S. Bureau of Reclamation encouraged farmers

and ranchers to settle in the region by developing a complex drainage and irrigation system. Tensions between farmers and ranchers on one side and tribal members and conservationists on the other have run high for decades. The area is prone to drought, and it's generally recognized that demands for water in the region far exceed available supply in many years.

These tensions reached a pinnacle in 2001-2002. The federal government alternately prioritized keeping water in the river for fish, which left farms dry, and providing farmers with water, which led to a fish kill of 70,000 adult salmon. During these same years, the owner of the Klamath Hydroelectric Project, PacifiCorp, initiated the FERC relicensing process for the dams.

CalTrout, other conservation organizations, and tribes participated actively in the relicensing process. Ultimately, PacifiCorp determined that the likely most cost-effective option for addressing water quality and fish passage issues would be to remove rather than relicense the dams.

(continued on page 60)

Matilija Dam: How to pull the plug?

The case of Matilija Dam in Ventura County illustrates the complexities of dam removal. Built in the 1940s for flood control and irrigation water storage, it was condemned by the 1960s as being structurally unsound.

Matilija Dams Stats

History:
- Completed in **1947**

Summary:
Dam on Ventura River system; used for flood control and water storage for agriculture

Stakeholders:
Ventura County Watershed Protection District (owns the dam), Army Corps of Engineers, California Dept. of Fish and Wildlife, California Trout, Coastal Conservancy, Surfrider Foundation, Matilija Coalition, City of Ventura, Patagonia, USFWS, Stoecker Ecological, NOAA, Beach Erosion Authority for Clean Oceans and Nourishment (BEACON), several affected water districts

Fish species affected:
Southern California steelhead

Status:
Release sediment gradually, notch, eventually remove

The area behind Matilija Dam is now almost completely filled in with sediment, rendering the dam non-functional. It blocks historic runs of endangered Southern California steelhead, and causes the usual problems of high water temperatures, an altered flow regime, and most notably, problems with sediment throughout the lower watershed. The dam is owned by the Ventura County Watershed Protection District.

Southern California steelhead evolved to survive in warmer waters than other steelhead populations, making this a particularly valuable population to protect in times of climate change.

They are extremely endangered, with only an estimated 500 individuals remaining. Opening up access to spawning and rearing habitat above this dam will expand critical steelhead habitat to help bolster population numbers in the watershed and region.

All stakeholders involved agree that the Matilija Dam needs to come down. But removal will cost millions of dollars, and lack of funding has been a major impediment to action. Other factors, such as determining the best way to manage sediment release, the eventual need to modify downstream roads, levees and bridges, all add to the challenges of the undertaking.

Matilija Dam was notched twice in the 1960s and 1970s. Ventura County made the decision in 1998 to remove the dam altogether. Congressional approval for a preferred preliminary design was obtained in 2007, through the Water Resources Development Act of 2007, but was not funded. For almost 20 years a broad coalition of community groups and resource agencies have been working together to develop a comprehensive strategy to remove the dam and restore the river to its natural health.

This year stakeholders agreed to a plan that will create two uncontrolled orifices (with optional gates)on the lower wall of the dam, allowing sediment to be released and effectively transported. It is anticipated that a single ten-year event/storm could erode sufficient sediment from the upstream side of the dam so that dam removal would then proceed in a single phase during the dry season. Smaller flood events may require additional intervals to move the sediment, which may take 2-9 years longer.

(continued on page 60)

Photo by Mike Wier

The Potter Valley Project: Letting science guide the way

The Eel River, which originates in Lake and Mendocino Counties and flows through Humboldt County to the ocean, supports spawning populations of fall run Chinook salmon, summer and winter run steelhead, and coho salmon.

Potter Valley Project Stats

History:

- Cape Horn Dam completed in 1906
- Scott Dam completed in 1921
- FERC license expires in 2022

Summary:
2 dams on Eel River, upper dam creates Pillsbury Lake, water diversion to Russian River; used for hydropower, water storage for agriculture, water diversion for agriculture, recreation

Stakeholders:
Pacific Gas & Electric (PG&E) (owns the dams), Potter Valley Irrigation District, Sonoma County Water Agency, farmers, conservation groups

Fish species affected:
Fall run Chinook, winter run steelhead

Status:
At beginning of FERC relicensing process, alternatives being proposed; studies needed

EEL RIVER

Fish populations here are severely depressed. The Eel represents perhaps the greatest opportunity to restore a watershed to its former abundance of wild salmonids.

The Potter Valley hydropower project on the Eel River, owned by PG&E, consists of two dams – Scott and Cape Horn, a reservoir, and a diversion tunnel that sends water south to the Russian River watershed. The Scott Dam, which creates Lake Pillsbury and blocks 288 square miles of watershed, is the largest barrier to native salmonid habitat in the Eel watershed and likely the entire north coast.

The FERC hydropower license for this project expires in 2022, and PG&E is required to file notice to begin the relicensing process in 2017. This process presents a unique opportunity for CalTrout and other conservation organizations to steer the future of the Eel River toward robust fisheries and a healthy watershed. CalTrout has taken a leadership role in the Eel River, establishing the Eel River Forum.

To donate to projects like this **CLICK HERE**

This volunteer coalition of stakeholders and public participants prepared the Eel River Action Plan, released earlier this this year. The goal of the Forum is to build a constructive collaboration with PG&E and other stakeholders, including the Potter Valley Irrigation District and the Sonoma County Water Agency, and to take a proactive, science-driven approach to the relicensing process. CalTrout is currently working with Humboldt State University to conduct studies above Lake Pillsbury to assess the quantity and quality of habitat in the upper basin for salmonid spawning and rearing.

The historic salmonid populations in the Eel River are all listed as threatened under the Federal Endangered Species Act. Water throughout the Eel River is listed as impaired under the Clean Water Act for excessive sedimentation and high temperatures. The river's delta and estuary are also negatively affected by land conversion for agricultural uses, sediment issues, and water quality.

On the other side of the equation, the Potter Valley Project supports PG&E's green energy portfolio, making it a valuable asset to the company and its customers. The project also provides irrigation to farmers in two watersheds.

Only time will tell whether the right combination of funding and collaboration among stakeholders will make it possible to retain the Potter Valley Project dams in a manner that provides appropriate water flows and fish passage to support the recovery of native fisheries. CalTrout is closely involved in the evaluation and decision process, leading with the best available science and working collaboratively to find a way forward that benefits both fish and people.

WHAT THE SCIENCE SAYS

In this column we highlight important scientific publications, by CalTrout staff and others, that expand upon our understanding of the management or science regarding trout, steelhead and salmon in California.

By DR. ROB LUSARDI

CalTrout/UC Davis Wild & Coldwater Fish Research Lead

The Era of Dam Removal and

The construction of large dams and subsequent water supply and distribution implications in the western United States has been heralded as one of the greatest engineering accomplishments of the 20th century. The era of large dam building, however, has ceased. Instead, we are likely on the precipice of a new and equally impressive era: the era of dam removal. This may be the case particularly where dams (both large and small) are no longer economically viable, yet continue to have considerable ecological consequences. Dam removal, however, is in its infancy, and, as such, so is the science. In '1000 dams down and counting', O'connor et al. (2015) examine the general trends in the numbers of dams being removed throughout the United States (Figure 1) and track the science behind those removals. In particular, the authors examine recent literature regarding the geomorphic and biological response to dam removal and the potential for unintended consequences.

The key controls on a river's geomorphic response to dam removal are mostly

what to expect

related to (1) the volume of sediment trapped behind a dam (sediment supply), (2) the ability for flow to move that sediment (i.e., transport capacity), (3) sediment grain size (coarse vs. fine sediment), and (4) the rate at which a dam is removed (Grant and Lewis 2015). Sediment captured behind a dam can be particularly problematic during removal. For instance, approximately 28 million cubic yards of sediment was trapped behind Glines Canyon Dam on the Elwha River prior to removal. A tiered removal approach over several months allowed the river channel to continually adjust, carefully balancing the river's sediment load with current hydrological conditions. In turn, this elicited a series of downstream channel adjustments. Similarly, dam removal will also facilitate upstream (within river) channel development as the change in elevation above and below the prior dam crest encourages downcutting and further downstream sediment transport. In their review, O'connor et al. (2015) found that rivers are extremely resilient to dam removal, often responding quickly to changes in sediment supply.

Photo by Mike Weir

Preliminary Responses to Removal

Biological response, however, will likely take more time. O'conner et al. (2015) found that the initial response of animals to dam removal has been fairly fast (at least for mobile taxa), pointing to recent dam removals in Virginia, Maine, and the removal of two dams on the Elwha River in Washington. In those cases, migratory eel, lamprey, and Chinook salmon populations responded quickly to improved river connectivity, often colonizing upstream habitat within days or weeks of removal. Less understood, however, is the long-term trajectory of those populations. If spawning habitat was a limiting factor on production, we can assume that access to historical spawning habitat will improve population abundance (though this will take time). In some cases, fishes will return to a range of habitat types that haven not been accessible for decades or longer. These previously inaccessible habitat types promote different environmental selection pressures and, in turn, will promote life history diversity within populations. This is important because improved life history diversity will strengthen population resilience to random processes such as drought, fire, or many of the other disturbances that are anticipated to increase in frequency with the onset of climate change. Downstream habitat will also greatly be affected, particularly by the influx of sediment. In the case of the Elwha River, coarse sand has since blanketed the low gradient reaches of the Elwha River

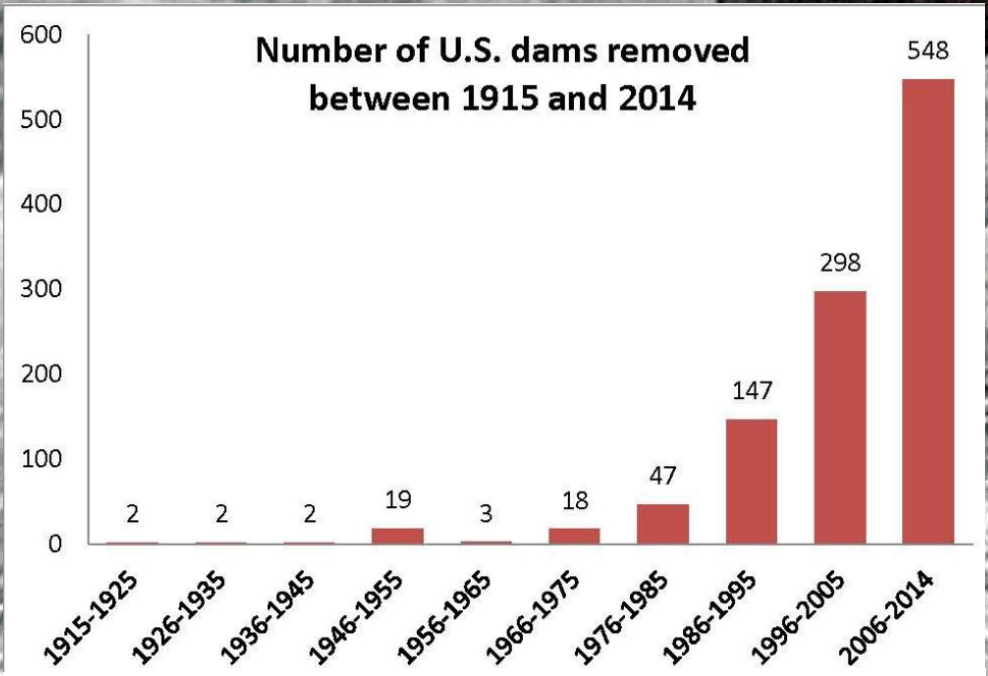


Figure 1. Data source: American Rivers. Modified from O'connor et al. 2015.

Delta, creating vital habitat for threatened fish, foraging birds, and marine predators.

Dam removal may also have unintended consequences. O'connor et al. (2015) points to a study conducted by Kornis et al. (2015) in which the authors document the removal of a small dam in Wisconsin. The findings suggest that, at least in the short term, there was greater overlap in the fish assemblage patterns above and below the dam after the removal. In particular, reservoir species historically precluded from upstream passage were now able to colonize upstream habitat. In some cases, those reservoir species reduced the abundance of pre-existing fishes above the dam, such as sculpin and stickleback. The authors also found, however, that downstream habitat changes elicited an important response: a reduction in warm water species and improvement in coldwater habitat. Additional consequences of dam removal include the potential for downstream transport of excessive nutrients, pollutants, or even disease. And as discussed earlier, there is also the potential for significant changes to channel morphology , including channel incision upstream into the reservoir or sediment aggradation downstream (both of which may be tempered by the rate of dam removal) with a host of potential biological consequences.

(continued on page 62)

Photo: Ed Homich

UC Santa Barbara Riparian InVasion Research Lab (RIVRLab)

RIVRLAB
RIPARIAN INVASION RESEARCH LABORATORY

Tom Dudley, Director
Tom's research examines the effects of non-native, invasive species in aquatic and riparian ecosystems, the mechanisms underlying invasion success and plant-herbivore interactions, and the restoration of invaded ecosystems for biodiversity enhancement and improved ecosystem function..

Adam Lambert, Project Director
Adam's research examines the effects of invasive species on natural communities, mechanisms of invasion, tri-trophic interactions, and biological control. He is also involved in large-scale restoration and monitoring projects in riparian systems.

RIVRLab's research addresses the effects of non-native species in riparian and stream ecosystems, particularly in western North America. They seek to understand the process of species invasions and how they alter biodiversity and ecosystem functions, but we also develop methods to better manage pest species and to restore native communities.

California Conservation Corp members clearing the invasive arundo donax or giant reed. Photo: Adam Lambert

The RIVRLab recently joined with California Trout to form a Cooperative Research Agreement for carrying out studies of trout and their habitats in the southern California region and to promote conservation measures that will benefit, in particular, the federally listed southern California steelhead trout. RIVRLab is affiliated with UCSB's Marine Science Institute (MSI) which has been involved in research involving California trout and the watersheds they inhabit almost since its inception in the 1970s.

MSI has conducted local studies of rainbow trout ecology in intermittent streams of coastal southern California, and other studies with native and non-native trout in the Sierra Nevada, particularly through UCSB's Sierra Nevada Aquatic Research Lab near Mammoth.

The MSI research group has consisted of Scott Cooper, John Melack, Roland Knapp, David Herbst and others, including the current RIVRLab director, Tom Dudley. Dudley previously led studies in the Golden Trout Wilderness Area of livestock impacts and habitat restoration in meadow streams sustaining the California State Fish. Information from that work provided part of the basis for litigation by California Trout to encourage the U.S. Forest Service to improve livestock grazing practices in the southern Sierra Nevada for enhancing trout habitat.

Dudley and RIVRLab project director Adam Lambert are currently focused on invasive species control and riparian restoration in coastal rivers, particularly the Santa Clara River, with emphasis on removal of invasive Arundo donax, or giant reed, which forms dense, highly flammable 6-meter tall stands across the floodplain. (For more on the giant reed removal, see this story in the Spring 2016 issue.) They are also actively restoring native cottonwood-willow riparian woodlands for wildlife conservation.

Arundo control and riparian restoration not only enhances habitat for several federally protected terrestrial species such as least Bell's vireo, yellow-billed cuckoo and southwestern willow flycatcher, but, as noted in the NMFS Recovery Plan for southern steelhead trout, benefits aquatic habitat by cooling waters with native canopy shade, removing stream blockage, improving channel morphology, and providing food resources through inputs of native leaf litter because our prior studies have shown

Removal of giant reed, which forms dense, highly flammable 6-meter high stands across the floodplain.. Photo: Adam Lambert

that Arundo litter is largely unusable for sustaining detritivorous aquatic insects (bugs that eat decaying things) that can form the food base for stream trout. We are privileged to have cooperation from CalTrout watershed specialist Candice Meneghin in coordinating resoration efforts, especially through a new grant made possible by California Department of Fish and Wildlife's Fisheries Restoration Grant Program, and NOAA Fisheries Pacific Coastal Salmon Recovery Funding.

(continued on page 63)

DONOR PROFILE

This summer I participated in CalTrout's Five Rivers Challenge, a fishing tournament on the Hat, Pit, McCloud, Upper Sac and Fall rivers. On each of the big rivers, there were moments of profound vulnerability. My footing, the pressure from the rush of water headed downstream, fraction-of-a-second moments of imbalance and swift reminders of my fragility – then a strong fish on the line would bring me into focus – the adrenaline, hands, line, net, a little bit of chaos. And sometimes a fish in the net.

And I would think, how fortunate am I to be here at this moment, on this river, standing in the lifeblood of these places and all the places downstream in California. Some molecules of this water destined for Southern California, for the ag lands in the Central Valley, for cities, towns, parks and some for the sea. I am grateful for the CalTrout efforts to assure these waters are protected for all of us, for the state, for the fish, and for future generations to enjoy.

Armando Quintero, of San Rafael, is the Executive Director of the University of California, Merced Sierra Nevada Research Institute. Mr. Quintero is a Board Member of the Marin Municipal Water District and serves on the California Water Commission.

Protect Strongholds • Restore Headwaters • Wild Fish, Working Landscapes

CALIFORNIA TROUT

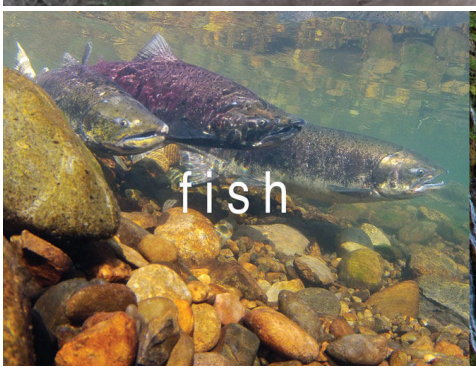
FISH · WATER · PEOPLE

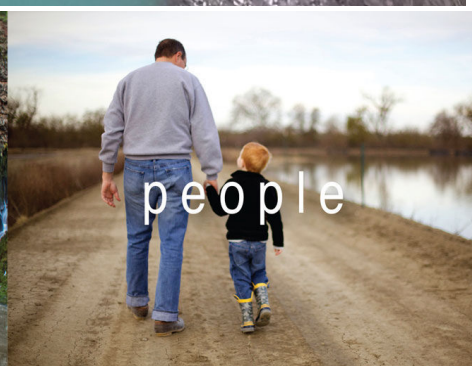
Ensuring resilient wild fish in healthy waters for a better California

Your Support

Being a CalTrout member brings you into a community of Californians who believe that clean, cold water and wild rivers benefit fish *and* people. Our work relies on the support of our members and donors. Please renew your membership or donate today.

Join CalTrout today!





PROJECT UPDATE

By Mike Weir
Outreach and Content Specialist

McCloud Redband Reintroduction

CA Department of Fish & Wildlife to the Rescue

McCloud River trout are arguably one of the most famous fish in the world. In the early 1870's rainbow trout from the lower McCloud were taken into a newly built hatchery and transplanted all around the world. Rainbow trout are now on every continent and in just about every mountain range and many have some lineage to original McCloud River rainbow.

Technically speaking, there are two different, genetically distinct types of McCloud River rainbow trout. Trout that lived below the Middle Falls of the McCloud River, an impassable fish barrier, are genetically classified as coastal rainbows. For thousands of years they have been subjected to genetic drift from other populations of rainbows in the form of steelhead. Before Shasta and McCloud dams were built in 1945 and 1965, respectively, steelhead from as far south as the Central Valley and as far north as the Columbia River migrated up the McCloud River. These rainbows share a genetic resemblance to all coastal rainbows and steelhead that have access to the ocean throughout California.

Photo by Mike Weir

The trout from above the impassable Middle Falls of the McCloud River have been genetically isolated for thousands of years and have evolved into their own distinct fish know as McCloud River redband trout. They are thought to be one of the oldest populations of rainbow trout, called the proto rainbow by some fish biologists. Historically, the range for these unique fish was the upper reaches of the McCloud River system and a few small creeks along the east flanks of Mount Shasta, where the fish have remained isolated for centuries.

Following the turn of the century, fish from the lower river and other strains of rainbow trout had been stocked into the upper McCloud for angling opportunities. Those fish spread throughout the upper basin and readily hyrbidized with McCloud River redband trout, diluting the gene pool. Only a few very small isolated populations of fish survived, unaltered by non-native genetics. After genetic testing by UC Davis and others, these small fragmented populations were identified and eventually became listed by the state as threatened due to the sensitivity of their habitat and the densities of these small populations. These small vestiges of native fish have been monitored and protected for a few decades.

Fish in Peril

The true, pure strain McCloud River redband trout were hit especially hard by the California drought. The creeks that hold pure strain McCloud redband are disconnected from the mainstem McCloud River. These small creeks well up from springs and only flow for a mile or two before going sub-surface again. Due to the nature of the habitats and how they swell with the spring runoff then dry up and become disconnected in the summer, there is always some level of mortality on a few of these creeks. However, in 2013, DFW biologists noticed conditions were reaching critical levels for fish in a large portion of the available habitat. In late summer, dissolved oxygen levels were getting low and temperatures were rising. In the winter, the small creeks are subject to freezing if the water levels and flow are too low. After careful consideration, the hard decision was made to bring some of these fish into captivity to reduce mortality and potentially lose important meta populations in the wild.

DFW to the Rescue

Fortunately, the DFW has a hatchery facility nearby in the town of Mount Shasta that is run off very cold spring source water, much like the McCloud River redband are used to in their natal streams. A portion of the facility was equipped with a state of the art self-contained Recirculating Aquaculture Systems (RAS). Fish captured from the wild were kept separate in their distinct family groups from each individual stream and treated different than typical hatchery raised fish that are to be released for sport. To keep the McCloud River redband as "wild" as possible, handling was kept at a minimum to avoid association with humans and food and they were fed natural insects to while in the hatchery facility.

Some fish populations were in captivity for over two years. These fish were bred twice, once each year, and produced two generations of offspring while at the hatchery. Genetic testing was done on each fish and they were then cross-bred according to a genetic matrix on a paper drafted by UC Davis to increase genetic diversity while maintaining the purest genetic makeup of the different family groups and meta populations.

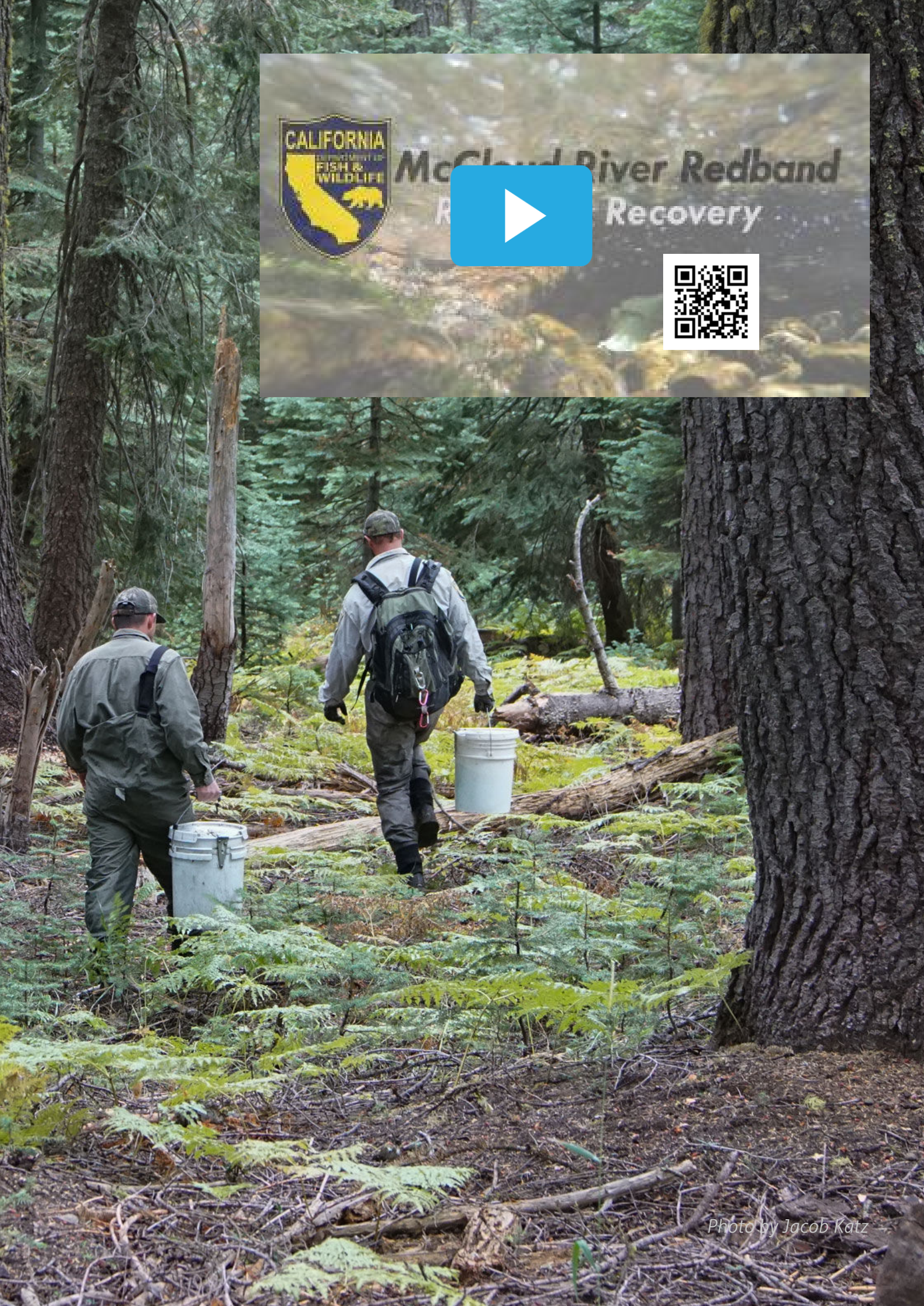


Photo by Jacob Katz

Returning Home

Luckily for the McCloud River redband, the winter of 2016 brought above average precipitation and conditions in the creeks improved greatly. Continued monitoring of the creeks have yielded favorable data. That along with projected weather forecasts led to the decision to begin releasing most of the fish back into the wild to their home waters.

Earlier this month, crews from the Department's Inland Fisheries Division, the Mount Shasta Hatchery, and the Wild Trout program came together to carry out the reintroduction process. This effort was led by Heritage and Wild Trout Program biologist Mike Dege. A week before being released each fish was equipped with a PIT tag, which will allow the DFW to track fish movements and survival rates.

Each day they picked a different creek and went about releasing the different populations of fish back into the habitats from which they were rescued two years earlier. It was a meticulous process with each fish scanned, catalogued and GPS coordinates marked where they were released. Close to a thousand fish were released back into the wild. Some of these fish were the original rescued fish and some of them were the juvenile fish that were bred in the hatchery. Care was taken to release the fish back into the same stretches of creek from which they were rescued. The same family groups were released back into their natal creeks and a 10% addition of fish from the neighboring creeks were added to each system to ensure genetic health for the long term viability of the species.

It is stories like this of the McCloud River redband trout that underscore the severity of drought in California and its lasting effects on our native fish populations and coldwater ecosystems. It also demonstrates the importance of our mission to ensuring California will always have resilient wild fish thriving in healthy waters.

Photo by Mike Weir

Over the past few days the reintroduction has gone well. Conditions in the creeks were about what we expected. We have experienced very low mortality rates and the fish seem to be taking well to the natural habitat. Over the course of the next few months, we will continue to monitor the fish to make sure they can transition safely into the winter months."

- DFW field biologist, Mike Dege

PROJECT UPDATE

NO GOING BACK

A SMALL FILM ABOUT A BIG IDEA

FISH AND FARMS

THE NIGIRI PROJECT

PUTTING NATURE BACK INTO THE MIX

Join us in revolutionizing the way California's rivers and floodplains are managed. Show your support and help us influence California water policy and leverage state and federal agencies as we chart a political path forward to a more prosperous future for California's fish, wildlife and people.

No Going Back is a short film about California's Central Valley, one of the most productive agricultural valleys in the world that once hosted one of the largest salmon runs on Earth.

The film highlights our Nigiri Project where, with four years of rigorous science, we've demonstrated that by putting nature back into the mix we can re-create fish abundance on this working agricultural landscape.

Our work has changed the conversation from fish OR farms to **fish AND farms**.

WATCH THE FILM NOW

Now it's time to put this science into action and update California's water management and policy. Together, we can create sustainable water solutions for both fish and people.

Click to Support the Water Revolution

Over 3,000 Inches of Wild Trout Caught

After a 15 year hiatus, the Five Rivers Challenge returned August 24-28, 2016 on the wild trout rivers between Mt. Lassen and Mt. Shasta in the Burney area of northeastern California. Six two-person teams caught and released an amazing 3,090 inches of wild fish over three days of fishing on five rivers.

The event was hosted by Clearwater Lodge and was held on five of the best blue ribbon trout waters in the country —the Upper Sac, McCloud, the Pit, Fall River and Hat Creek—iconic places sharing a common attribute: cold, clean spring water. The challenge was as much a friendly competition as it was a celebration of the health of these rivers and their wild trout populations.

"We were excited to bring this event back to the area to raise awareness of these iconic fisheries while supporting CalTrout's continued efforts to keep these rivers thriving," shared Curtis Knight, California Trout's Executive Director. "This area and these waters are an important part of CalTrout's history, starting

Photos by Mike Wier

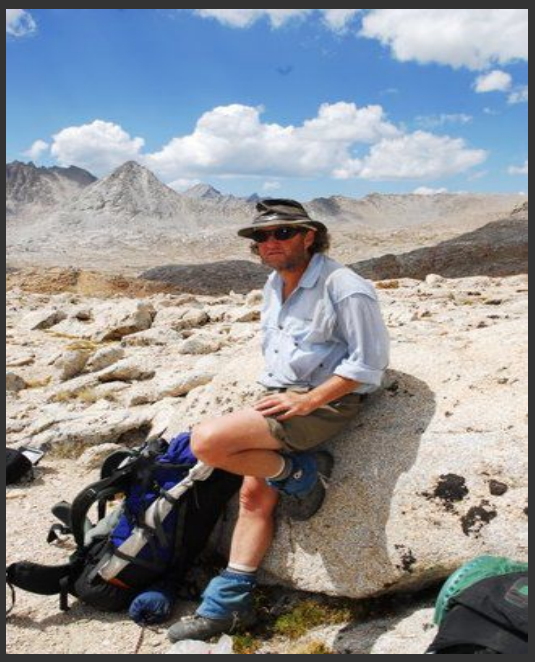
with Hat Creek in 1971 where we laid the ground work for wild trout management." Teams competed to see who could catch and release the most fish inches across all five waters over three days. First place went to Steve McCanne and Alec Gerbec guided by John Fochetti, coming in with 1,088 inches of wild trout. The team established a solid lead after Day 1 on the McCloud and Upper Sac and never looked back. McCanne and Gerbec will have their names engraved on the bronze Five Rivers Challenge perpetual trophy that will be housed at the Clearwater Lodge. They also received prizes from sponsors Sage and Rio.

Coming in second was Steve Johnson and Armando Quintero guided by Jason Cockrum with 547 inches. Johnson and Quintero received prizes from sponsor Redington and Rio. Rounding it out in third was Mike Moran and Ben Paul guided by Dave Neal with 414 inches. They each received a canvas print by Josh Udsen.

A total of 863 wild trout were caught and released across the five rivers with the largest being a 19 inch rainbow caught on the Fall River. The Pit River was the most prolific – 801 inches of wild trout – while the Fall was not, offering

only 273 inches. The Challenge was sponsored by Clearwater Lodge and Patagonia with prizes from Sage, Redington, and Rio.

The 2017 Five Rivers Challenge will be held June 20 - 24. Space is limited. Register early at caltrout.org/5-rivers-challenge.



Craig's Corner

By CRAIG BALLENGER
CalTrout Ambassador

High

Among the great high Sierra trout streams is the South Fork of the San Joaquin, above Florence Lake. This is an easy backpacking trip that can be followed to it's headwaters near Martha Lake at around 10,00 feet.

Designated a California Heritage Stream by California Department of Fish and Wildlife (CDFW). It covers, as they claim, 156 miles of perennial stream. This includes Paiute Creek, with it's headwaters in the Humphrey Basin.

For over 40 years CDFW has added unique California waters with designated protection for "aesthetically pleasing and environmentally productive" streams and lakes under the Heritage program.

Sierra Trout

This section of the stream passes through John Muir Wilderness, though the upper end travels under the name of Goddard Creek and lies within the boundaries of Kings Canyon National Park.

Don't look for big fish here, except in the lower reaches when brown trout of Florence Lake make their way upstream to spawn during the autumn.

The South Fork of the San Joaquin offers an easy introduction to the many streams found within the range, along with off the chart scenery.

Spot Check

By Guest Columnist
CalTrout Ambassador, Tyler Graff

Wandering Blue Lines

A few years ago while on my family's annual camping trip near Sonora Pass, my uncles had come back to the campfire with stories of Lohantan Cutthroat Trout in a small mountain stream. They went on to describe paired-off fish in tail outs and small pocket water holding eager trout. Although they didn't do any fishing with the creek closed for the season, they had sparked my imagination for one of California's Heritage Trout.

Since those first campfire stories of Lohantan Cutthroat trout I've explored Wolf Creek a few times. It's a small creek, one you can fish without getting wet. Jumping from bank to bank, balancing on mid-creek rocks as you cast to actively rising wild fish. Its diminutive size probably fools most hunters that frequent the area. Upon first glance, Wolf Creek looks too small to hold fish, let alone strong numbers of native Lohantan Cutthroat.

A few weeks ago, with a free weekend on hand, I decided to head to the Sierras and see how Wolf Creek was fairing this summer. After a long drive over Sonora Pass and down a rugged dirt road, we crossed the tiny creek, parked the car, and laced up the 3wt rods. Before we started fishing, I walked down to the creek to take a closer look at the water conditions. I didn't seen any of the spooky little LCT in the first hole but the water was cold and clear.

We walked the up the bank looking for one of my favorite spots. It's one of the deeper pools in the creek with water cascading over boulders and the head of the pool and a large rock creating a deep undercut for trout to hide under. After just two casts, I had my first LCT in hand. With countless dark spots and characteristic deep orange slash on their throats, these may be some of the most beautiful trout in California. We snapped a quick photo and gently slid the beauty back into the creek.

Photo: Tyler Graff

Over the next few hours we made our way up the creek, looking for likely holding spots. In nearly every deep pool there were a handful of LCT waiting patiently for food to float by in the current. With a short growing season and limited biomass in this high altitude creek the fish come easy to a well presented dry fly. We took our time fishing each pool and landed more than our fair share of LCT, taking in the high sierra peaks as we found our way from pool to pool The trickiest part about fishing a creek like this is stealth. Shadows, less than gentle casts, and any sign of people will send these fish running to the nearest rock for cover.

We left the creek and headed back to the car fully satisfied with how the LCT of Wolf Creek were fairing. It's clear that the fish and habitat they depend on were healthy but things weren't always like this on Wolf Creek. Non-native Brook Trout had taken root here and pushed the Lohantan's out. With support from the Department of Fish and Wildlife the cutties were reintroduced to

their native drainages. Both Wolf Creek and Silver Creek, tributaries to the Walker River, have gone through significant restoration work through California Trout's Sierra Headwaters Initiative.

In the face of non-native brook trout, habitat loss, and drought the LCT seem to have taken root on Wolf Creek but their existence here is delicate. The open fishing season is from August 1st through November 15th and is limited to catch-and-release fishing with artificial, barbless hooks. Although, my uncles have yet to cast a fly on Wolf Creek it has become one of my favorite high sierra creeks to fish in the fall. I just might drag them from the campsite one of these trips and show them what it has to offer.

For more stories of California's trout, follow the *Baetis and Stones* blog and Instagram feed.

REFLECTIONS

Announcing the Winners of the 2016 Photo Contest

GRAND PRIZE WINNER- JOEY GUZMAN "Liquid"

PEOPLE'S CHOICE AWARD - MICHAEL NILES, "Pyro Pes

scador"

BEST PHOTO WINNERS

REFLECTIONS

Announcing the Winners of the 2016 Photo Contest

BEST PHOTO WINNERS

CALTROUT VIDEO VAULT

NO GOING BACK

We've effectively concurred the California landscape. Wildlife abundance has been replaced by agricultural abundance. But what if it doesn't have to be that way? What if we can put nature back into the mix?

OSA MEADOW RESTORATION

Osa meadows is a long-term study site for the CalTrout-spearheaded assessment of greenhouse gas fluxes in Sierra Meadows, which aims to answer whether restored meadows are sequestering a significant amount of carbon compared to degraded meadows.

STEELHEAD COUNTRY

The Wild Steelhead Coalition, Patagonia, and award-winning filmmaker Shane Anderson have teamed up to produce a new film series called Steelhead Country. The six-episode series explores the rise and fall of angling for wild steelhead in Washington State.

NORTHERN INSPIRATIONS

By Morgan Dabbs - Steelhead season is here. Get inspired by this film!

Who We Are

IN THE SPOTLIGHT

Photos: Mike Wier

JULIE SEELEN *Advancement Director*

Julie is the Advancement Director in charge of fundraising. She has been in the fund development field for more than a decade and has experience in organizing large recreational events as well as small donor trips, grant writing, annual and capital campaigns. She has a Master's degree in Architecture and Building Construction from the University of Eindhoven in the Netherlands. Julie lives in the East Bay, loves to hike and can't wait to go fishing.

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Klamath Dams continued from page 15

The decision by PacifiCorp to consider dam removal opened the door for a Klamath Basin-wide negotiation among dozens of local, state (both California and Oregon) and federal stakeholders. By 2006, more than 40 parties agreed to a pair of agreements that would have met PacifiCorp's terms for dam removal and also provided a comprehensive water sharing plan and plan for environmental restoration throughout the watershed. PacifiCorp put its request for relicensing with FERC on hold and worked with stakeholders, including CalTrout, to pursue the required Congressional approval to put the agreements into action.

Unfortunately, Congress never adopted the Klamath Agreements, which expired at the end of 2015.

In the beginning of 2016
Oregon, California, severa
groups including CalTrou
solution that included dam
parties signed onto a nev
course for dam removal
other aspects of the deal
since Congress failed to act

PacifiCorp is in the proc
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Klamath River Renewal
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Matilija Dam continue

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eventually be the largest
restoration effort in the

In addition to opening up access to historic spawning grounds for steelhead, removing Matilija Dam will provide aquatic and riparian habitat restoration, which will help several other threatened and endangered species in the watershed, such as the California red-legged frog, tidewater goby, southwestern willow flycatcher, and California condor. Removal will also help to restore the beach and other nearshore and coastal habitats. And it will eliminate the current risk to downstream homes of a catastrophic flood. CalTrout is a long-standing member of the Matilija Coalition, and has recently taken a key role in developing comprehensive dam removal grant proposals and identifying needed funding to complete the project.

ed from page 17

New Era of Dam Removal cont'd from page 23

O'connor et al. (2015) point out that the vast majority of studies on dam removal are of short duration and rarely examine the interactions between physical change and biological response. Further, most dam removal projects have been conducted on small dams (<20 ft.) and the benefits and potential consequences of large dam removal efforts will be significantly amplified (from both an ecological and societal perspective). This suggests that scientifically documenting and understanding ecosystem function prior to dam removal is critical, that ecological context is important, and that interdisciplinary science linking physical system change to biological response is paramount. River ecosystems are incredibly dynamic and the science behind dam removal is developing, but still young. As such, it's imperative that the ecological response of rivers be treated experimentally and the results disseminated widely. As the science associated with dam removal improves, so, too, will our understanding of the processes associated with ecosystem recovery.

Dr. Lusardi is the California Trout-UC Davis Wild and Coldwater Fish Scientist
O'connor et al. (2015) first appeared in the May issue of Science Magazine.

O'connor, JE, Duda, JJ, and GE Grant. 2015. 1000 dams down and counting. Science 348 (6234): 496-497.

Partner Profile continued from page 27

The Santa Clara River Steelhead Coalition, led by Meneghin, also includes The Nature Conservancy, Friends of the Santa Clara River, Stillwater Sciences and other partners in applying a landscape-level approach to watershed restoration based on understanding the nature of geomorphic and ecological regulation of ecosystem processes critical to restoration success. Tributary streams, such as Sespe and Piru Creeks,
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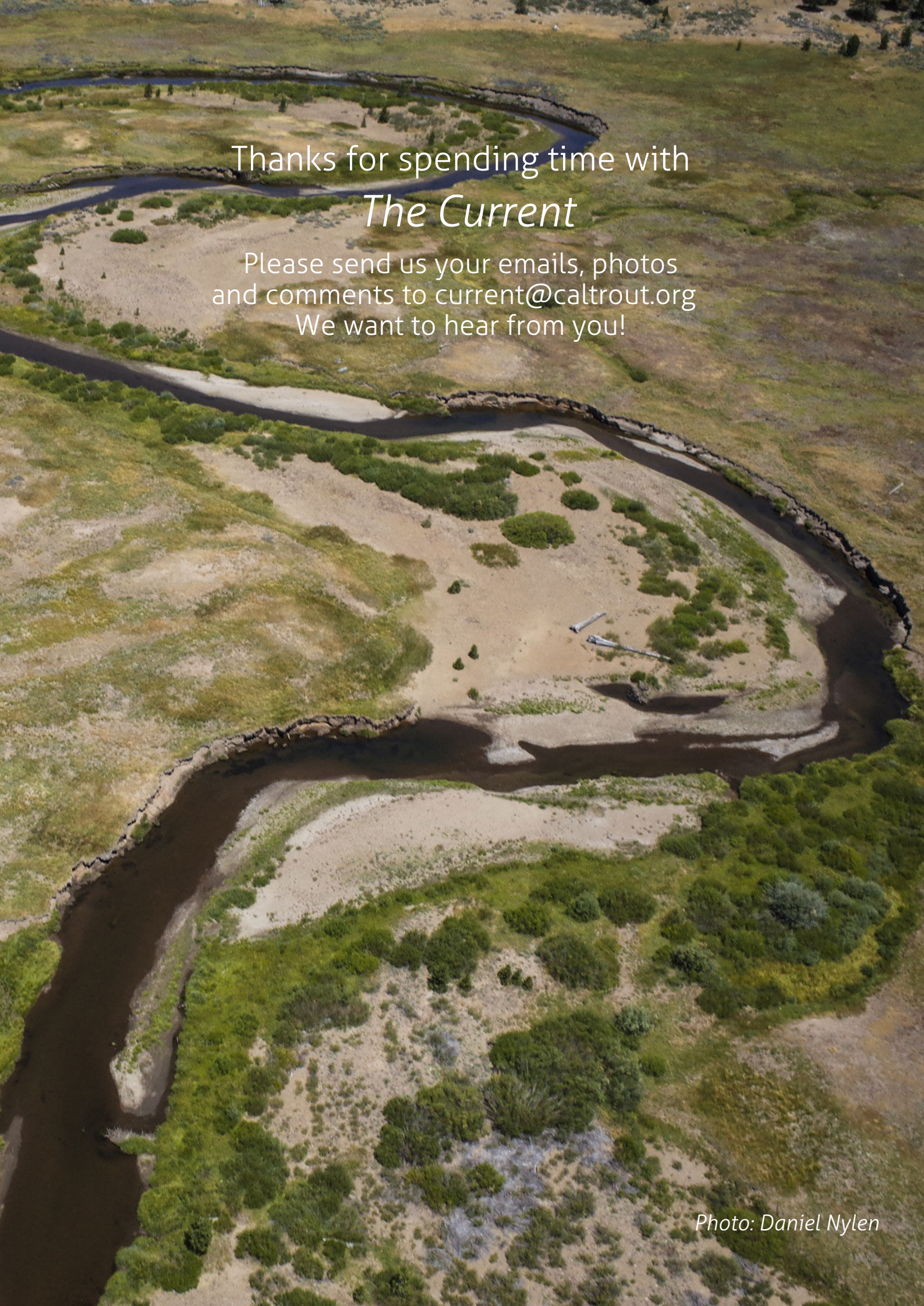

Thanks for spending time with

The Current

Please send us your emails, photos
and comments to current@caltrout.org
We want to hear from you!

Photo: Daniel Nylen