

Trinity County Resource Conservation District Summer 2022 Conservation Almanac

Trinity County Resource Conservation District Quarterly Newsletter

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Photo: Klamath mountain catchfly (*silene salmonacea*), a rare flower found in Trinity County. Credit: Nathan McCanne



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It's About Dam Time: Beaver Dam Analogs in Trinity County



A beaver dam analog constructed at the Bucktail Restoration Site in Lewiston

Often referred to as “nature’s engineers,” beavers and the dams they create provide numerous ecosystem benefits that increase the biodiversity and resiliency of our streams. Beaver dams create wetlands, providing increased fish and wildlife habitat, slowing down the water, and increasing groundwater recharge. Many of our impacted stream and meadow ecosystems could be improved with beaver dams, but we just don’t have the beaver population to do that restoration work for us. Thankfully, there is a way humans can emulate the work of beavers in the environment!

Beaver Dam Analogs (BDAs) are man-made structures mimicking natural beaver dams, which provide many of the same environmental benefits for a riverine ecosystem as natural beaver dams. Most BDAs are comprised of wooden posts driven into the stream with vegetation woven between the posts. The structure receives reinforcement from natural materials such as downed trees, large rocks, and fine sediment. Managers use the

structures to achieve the same list of benefits that natural beaver dams create. BDAs can be used to increase water storage, create channel complexity, reconnect streams with their abandoned floodplains, provide slow water rearing juvenile fish, collect fine sediments from erosion, and more. In recent years, BDAs have become a widely-used restoration strategy to improve stream, meadow, and wetland health.

Organizations including the Trinity County Resource Conservation District have plans to construct BDAs in tributaries to the Trinity River in the near future. One objective of the Upper Trinity River Assessment and Management Plan includes collaborating with landowners who are willing to support the installation of BDAs in streams near their property. The BDAs will support the goals of the Assessment and Management Plan by increasing water storage in the upper watershed.

Moving forward, Beaver Dam Analogs can provide a substantial contribution to stream, wet meadow, and wetland restoration. Due to the minimally invasive nature of the structures, and the limited need for expensive equipment, this affordable rehabilitation tool may be increasingly accessible and attractive to natural resource managers. As the effects of drought present greater concerns for the Trinity River, improving drought resilience through the use of BDAs can assist our communities in adapting.

In the interview below, Denise Wesley, TCRCD GIS Manager explores this topic with former TCRCD GrizzlyCorps fellow, Nicole Eastman, who used Geographic Information Systems (GIS) analysis to explore beaver dam analog feasibility while working at TCRCD.

Q. First, I think it would be helpful to provide some context. So, can you tell the reader what Beaver Dam Analogs are all about?

A. Beaver Dam analogs are man-made structures that are placed in streams and rivers. They mimic beaver dam structures and the processes that dams create in an ecosystem such as backwatering, pooling & recharge.

Q. How did you use spatial analysis to determine the best analog placement?

A. I used the Beaver Restoration & Assessment Tool (BRAT) to analyze criteria for beaver dam suitability, such as vegetation, stream flows, elevation, and historic & current land use to help determine where analogs might be successful.

Q. Did you find any suitable sites?

A. Yes, we found 8 potentially suitable analog sites according to the model. A few of them turned out to be pretty steep terrain though, which is especially relevant to conditions in Trinity County. If I were to redo this study, I would weigh elevation & slope data more heavily. This model didn’t consider the steep hydrologic gradients we encountered. Steep slopes make dams more susceptible to blow-out, and also, while the stream itself may not have had a steep gradient, steep terrain in

Beaver Dam Analogs in Trinity County, Cont.

accessing the actual site ruled out the potential for suitable placement in a few cases. I felt the model did a good job of assessing suitable vegetation and learned that ground-truthing a model is an important part of this process.

Q. What GIS layers were used in your analysis?

A. National Hydrography Dataset (NHD), LANDFIRE vegetation raster, National Elevation, streamflows, valley bottom, roads, railroads, canals & land-use data. Many of these layers are available on Joe Wheaton's website (Watershed Sciences Department, Utah State University).

Q. Why should we care about beaver dam analogs?

A. Our goal is stream restoration and increasing water storage. Backwatering allows water to cool, slow down and recharge to a more natural state, assists aquifers, and fish habitat slows groundwater evaporation, and helps with floodplain connectivity. Beaver dam analogs are also considered useful for fire prevention.

Q. What significant or interesting findings pertinent to Trinity County resulted from your analysis?

A. Part of this analysis, in addition to analog suitability, was to look at the actual habitat suitability for beavers. For our area of focus in northern Trinity County, we found that the vegetation species might not be ideal for actual beaver restoration because they prefer species like aspen, which we don't have. This was an eye-opening experience to learn that the habitat in some cases was not perfect for beavers. We found some species at the sites that they like such as alders and willows. The reintroduction of beavers wasn't the focus of this study but provides food for thought. We also found that some of the streams were more incised than the current hydrography data that we have. We have a lot of steep streams coming out of Trinity County, which is unique to our area. This was a concern of ours because the model didn't select sites entirely in the way we had anticipated with this dataset.

Q. From a geospatial perspective, what challenges do you see in getting beaver dam analogs implemented in Trinity County?

A. Terrain, snow, snow melt, and high flow events which can cause dam blowouts. Would the dams need to be reconstructed? How would this be monitored? Analog requires maintenance. We might want to think of these as temporary solutions, instead of being permanent. This is very much like nature.

Q. After doing this work, do you have any ideas for using GIS to monitor the effectiveness of implementing beaver dam analogs?

A. Maybe assessing the stream flows post-implementation and looking at stream connectivity to the flood plain, possibly stream depth. But this is a challenge because dams blow out so quickly.



A beaver building its dam. Credit: Cheryl Reynolds (Worth A Dam)

Rare Plant Surveys on the Shasta Trinity National Forest

This year, TCRCD's Revegetation Program participated in rare plant surveys with The Watershed Research and Training Center (WRTC). Surveys took place within the Shasta-Trinity National Forest in the North Lake area where forest health improvement projects such as thinning and fuels reduction are being planned. The surveys were conducted as part of a third party National Environmental Policy Act (NEPA) project. The NEPA process is completed prior to implementation of projects to ensure sensitive resources, including rare plants, will not be harmed during the project.

This third party NEPA project is being completed by the WRTC, with TCRCD staff assisting in the survey work, as opposed to the US Forest Service completing it themselves. Third party NEPA can increase the number of projects that are "shovel ready," or ready to implement by expanding the workforce with Forest Service partners and contractors.

The forest lands in and adjacent to the project are known for their biodiversity and have many documented rare plant communities, so it was no surprise that among hundreds of other beautiful native plants encountered during field surveys, our team found six special status plants, some of which are pictured within this article. Special status refers to species that are rare, threatened, or endangered, and require special considerations or protections. The specific locations and details about species found or sensitive communities will not be disclosed publicly as some rare plants are targets of illegal harvesting.

In this biodiversity hotspot of California, we have over 6,500 species of plants, many of which are adapted to unique habitats or harsh conditions. A plant is considered rare when it is found in such small numbers that it may be endangered if its environment changes. Changes occur when we as humans develop lands for various purposes, including building roads, harvesting timber, or installing power lines. Environmental changes may also occur when natural disasters strike, like flooding, drought and wildfire. The rarer a plant, the lower the number will be on the California Rare Plant Rank. In Trinity county, we have at least 174 special status plants. In California as a whole, there are about 2414 species ranking between rare, threatened or uncommon and /or needing study. Many characteristics are considered when the California Natural Diversity Database (CNDDDB) rates a plant species, including whether or not a species is lacking sufficient documentation.

Botanical survey work is an invaluable service to provide, as data collected on surveys like this will not only serve its purpose in protecting the intrinsic value of the plants within the project perimeters; it will also help paint the larger picture for each species' health and range for botanists and conservationists across the state. Location information and species population data will be shared through CNDDDB. If you would like your property surveyed for rare or endemic species, call our offices at 530-623-6004 to schedule a fee for service evaluation.

CA Rare Plant Rank	Description
1A	Plants presumed extinct in California and rare/extinct elsewhere
1B.1	Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California
1B.2	Plants rare, threatened, or endangered in California and elsewhere; fairly threatened in California
1B.3	Plants rare, threatened, or endangered in California and elsewhere; not very threatened in California
2A	Plants presumed extirpated in California, but more common elsewhere
2B.1	Plants rare, threatened, or endangered in California, but more common elsewhere; seriously threatened in California
2B.2	Plants rare, threatened, or endangered in California, but more common elsewhere; fairly threatened in California
2B.3	Plants rare, threatened, or endangered in California, but more common elsewhere; not very threatened in California
3.1	Plants about which we need more information; seriously threatened in California
3.2	Plants about which we need more information; fairly threatened in California
3.3	Plants about which we need more information; not very threatened in California
4.1	Plants of limited distribution; seriously threatened in California
4.2	Plants of limited distribution; fairly threatened in California
4.3	Plants of limited distribution; not very threatened in California



Silene salmonacea (Klamath mountain catchfly), CA Rare Plant Rank 1B.2



Lewisia kelloggii ssp. *hutchisonii* (Sierra valley lewisia), CA Rare Plant Rank 3.2

2022 Trinity River Summer Snorkel Dives

Each summer, divers suit up in wetsuits, armed with a mask and snorkel, and take to the streams to count fish. The summer snorkel surveys are an effort to count the adult summer steelhead (*Oncorhynchus mykiss*) and spring chinook (*Oncorhynchus tshawytscha*) populations on tributaries to the Trinity River. Divers from multiple agencies, organizations, and communities come together to survey each stream in a day or multiple days, providing a snapshot of fish in the river at that time. The numbers can be considered an index of population abundance, but are not an estimate of the total number of fish in the river. These surveys happen once per year, and monitoring these two species each summer is crucial to understanding and tracking their population changes. In recent years, returns of both spring chinook and summer steelhead have decreased notably. Klamath-Trinity River Spring Chinook are also a newly listed Threatened species on the California Endangered Species List as of June 2021.

In 2022, Hayfork Creek and South Fork Trinity River dives were coordinated by The Watershed Research and Training Center (WRTC) while Canyon Creek, North Fork Trinity River, and New River dives were coordinated by TCRCD. The results in select tributaries were higher than in recent years but ultimately, lower than hoped. Over 129 stream miles were surveyed, with a grand total of 171 chinook and 739 steelhead observed. See full results below.

2022 Summer Snorkel Dives			
Creek	Miles Surveyed	Chinook Salmon	Steelhead Trout
Canyon Creek	17.85	23	11
North Fork Trinity River	19.1	27	233
New River	29.7	87	312
Hayfork Creek	9.2	1	34
South Fork Trinity River	53.6	33	149
Totals	129.45	171	739

Salmon and steelhead are anadromous, meaning they are born in the rivers, travel to the ocean to mature, then return to the rivers as adult fish to spawn. Most chinook leave the ocean and return to the rivers at age 3 to spawn and die. Steelhead generally also head up the river to spawn at age 3, but unlike salmon, steelhead can spawn multiple times in their life and can travel back to the ocean after spawning. These numbers include chinook jacks and steelhead half-pounders. Jacks and half-pounders are fish that return to the rivers one year earlier than other adult spawning fish. Since they are younger, jacks and half-pounders are smaller than typical adult salmon and steelhead.

Thank you to the 41 agency representatives and community members that took part in the 2022 Snorkel Dives, including California Department of Fish & Wildlife, the Watershed Research & Training Center, US Forest Service, Yurok Tribe, Trinity River Restoration Program, Hoopa Valley Tribe, National Oceanic and Atmospheric Administration, US Fish & Wildlife Service, and members of the public.



A diver surveying a stretch of the New River on July 27th, 2022



A spring chinook observed in Canyon Creek on July 9th, 2022

2022 Weaverville Summer Day Camp

For three weeks in July, the Young Family Ranch came alive with children for Weaverville Summer Day Camp. Forty-eight kids ages six to twelve attended camp this year. Campers had the opportunity to visit a local llama and alpaca ranch; swim in local creeks; explore the Weaverville Community Forest; raft on the Trinity River with 6 Rivers Rafting; learn about wildfire preparedness, nutrition, salmon, the water cycle, and animals; play games; express their creativity through arts and crafts; and much more!

Presenters from Bureau of Land Management, One Thing Ranch, US Forest Service, Trinity River Restoration Program, CalFresh Healthy Living, Trinity County Fire Safe Council, Circus Nature, Whiskeytown National Recreation Area, and Trinity Together provided engaging educational programming to campers. Thank you to all who came to camp and shared their expertise with the campers!

Camp was generously supported by the USFS Shasta Trinity RAC, Humboldt Area Foundation, Trinity River Restoration Program, Trinity River Lumber, Holiday Market, Coast Central Credit Union, Friends of the TCRCD, the Young Family Ranch, and private community member donations. Thank you to all who contributed, big or small, to Weaverville Summer Day Camp!



Campers rafting on the Trinity River with 6 Rivers Rafting



Newly tie-dyed Weaverville Summer Day Camp shirts

Weaverville Summer Day Camp, cont.



A camper hand-feeding a llama at One Thing Ranch



A group of campers, ages 8 & 9, on a field trip at East Weaver Creek



Campers swim and explore on a field trip to Stuart Fork

Young Family Ranch

Events

The 13th annual Plant & Seed Exchange was held in April at the Young Family Ranch. Over 50 community members, young and old, came to share their plants, seeds, starts, and cuttings. The Nor Rel Muk Wintu Tribe held their annual Spring Acorn Dance in April. The event featured soap stone carving, pine needle basket-making, the Acorn Dance Ceremony, and a delicious potluck feast. Weaverville Summer Day Camp was held at the Young Family Ranch for three weeks in July (see page 6-7).

Capital Improvements

Concrete sidewalk steps were installed next to the basement door of the Young Family Ranch. The motivation behind this project was to reduce the safety risk of the area for summer campers and community members. The loose gravel that was in the sloped walkway was susceptible to slippage and made using the basement less desirable. The sidewalk now spans to the front stairs to the house. After this project is completed, the Ranch house access is improved with more usable spaces and a clean, tidy appearance out front. This project was made possible by an incredibly kind community member with experience pouring and finishing concrete. Thank you to Joaquin Hale. For more information, please see <https://youngfamilyranch.org>



Before sidewalk construction



During sidewalk construction



After sidewalk construction

Weaverville Community Forest

The Weaver Basin Trail System (WBTS) is the network of trails that spans the Weaverville Community Forest. As the Trinity Trail Alliance and the US Forest Service (USFS) work with many partners to build and improve trails in the Weaver Basin, TCRCD staff have been updating maps for the WBTS. TCRCD staff are collaborating with partners to name and map the newly built trails and the user created trails that are being improved to meet USFS standards. Recently, trailheads and parking areas on Mill Street and Oregon Street have also been improved by the Bureau of Land Management (BLM).

Meanwhile, TCRCD Forest Health Program staff are collaborating with BLM on the development of a Harvest Plan in the Oregon Mountain area. The Weaverville Community Forest Steering Committee completed a site visit in March to view the potential harvest area and review the prescription. Furthermore, Amelia, Watershed Program Manager, is coordinating with SHN Engineering and Mark Arnold for botanical and archaeological surveys within the Weaverville Community Forest to support the BLM's development for the Weaverville Community Protection Hazard Removal and Vegetation Management Project. For more information, please see: <https://weavervillecommunityforest.org>

WCF Steering Committee site visit in March to view the area proposed for harvest on Oregon Mountain



Trinity County Fire Safe Council

The Trinity County Fire Safe Council (TCFSC) hosted its first annual Wildfire Preparedness Day Fair on May 7th, 2022 which was attended by 59 individuals and supported by 45 partners. Amelia Fleitz, TCFSC Coordinator also participated in the Trinity Center Wildfire Preparedness Day event and held community meetings in Coffee Creek, Salyer, and Big Bar this spring. TCFSC has worked to get seven Local Area Advisors appointed by the Board of Supervisors to represent their communities and has accepted applications for eight Neighborhood Ambassadors. Three TCRCD staff attended the Wildland Fire Mitigation workshop in Dunsuir to become certified to train others in the National Volunteer Fire Council's Wildland Fire Assessment Program. Staff hope to host a training this fall and utilize the Wildland Fire Assessment Program to update and improve the existing Big Red Truck Program. TCFSC developed evacuation preparedness Go-Bags for humans and pets which were available at all recent events. TCFSC partnered with the Trinity County Food Bank to deliver the Go-Bags to residents throughout the County. Go-Bags are available at the TCRCD office if you would like to pick one up. Over 1,500 human bags and 1,000 pet bags have been provided to Trinity County residents from May to July.



Wildfire Awareness Day Fair at the Highland Arts Center Meadow in May



Amelia Fleitz, Trinity County FSC Coordinator, handing out evacuation Go Bags at a community event in Trinity Center



Trinity County Fire Safe Council table at a community event in Trinity Center

The Trinity County Fire Safe Council seeks to improve cooperation and coordination in all aspects of wildfire management in Trinity County. Meetings are held on the 4th Thursday of each month. See firesafetrinity.org or follow Trinity County Fire Safe Council on Facebook.

Cold Water Pools on the Trinity River

By Todd Buxton and Chad Abel, Trinity River Restoration Program



Program scientists taking pool measurements on the Trinity River

Adult salmon target deep pools on their upstream spawning migration from the ocean. One can imagine the sense of safety from predators that they feel when resting in deep pools, and these pools provide an additional requirement for healthy adult salmon - cold water. Large, deep pools on most rivers in Northern California thermally stratify, meaning cold water settles toward the bottom while warmer water remains near the surface. Anyone who has ever cannonballed into a deep, welcoming swim hole knows this to be true – the coldest water is typically at the bottom.

Temperature targets exist on the Trinity River to ensure the water is adequately cold when adult salmon and steelhead return to spawn. After July 1, the target is 60°F at Douglas City for returning spring chinook, and the temperature target is lowered to 56°F on September 15 for spawning chinook and coho. Warm water stresses adult salmon and can lead to disease and unnaturally early development of their eggs before spawning. To keep the river cool, the Trinity River baseflow from Lewiston Dam is kept at 450 cfs during the summer months, which is more than double the 190 cfs flow in summer before the dams were built.

Consistently low water temperatures were long assumed by fishery managers to be either positive or at least not harmful; however, there is strong evidence that uniformly cold water suppresses juvenile salmon growth and the prey base (aquatic insects) they depend on for food. Temperature diversity helps provide juvenile salmon abundant food in riffles and the channel's



margins where the water is naturally warm. The fish can feed to satiation in these areas and then travel to colder and slower water in pools to rest and digest as their metabolism slows, and they are able to assimilate more of the food into body growth and increases in size. In this manner, a juvenile salmon's migration downstream is naturally timed with decreases in flow so they can enter the ocean before water quality in the river may degrade to harmful levels. However, the unnaturally high and cold water in the Trinity River in summer can suppress fish growth by limiting food availability and slow water areas to rest. These impacts can delay a fish's migration to sea, often forcing them to encounter the poor water quality and presence of disease in mid to late summer in the lower Klamath River, where they are believed to suffer high rates of mortality.

The ideal is to provide the diversity of water temperatures in the river that supports different life stages of salmon and benefits other species. Diverse temperatures in the river allows salmon of all life stages to occupy a preferred temperature by inhabiting different parts of the river at a given time of day. For instance, adult chinook will typically rest in the bottom depths of stratified pools in daytime and then resume their upstream migration at night when the entire river has cooled. Juvenile salmon often feed in relatively warm water on the channel margins, in riffles, and on shallow floodplains and then rest in a pool with temperature diversity and slow water to digest, save calories, and maximize growth.

Program scientists saw evidence that high summer baseflows in the Trinity River made pools exhibit uniformly cold temperatures and high velocities compared to what would exist under natural baseflow conditions. High summer flows provide the cold temperatures adult salmon require, but do they also harm juvenile salmon and reduce future adult returns?

Program scientists began studying this question in 2020 to see if data supported this hypothesis. The study included measurements of water temperatures, flow velocities, and depths in two pools on the Trinity River. One pool is located upstream of the reservoir above Coffee Creek and the other pool is located near Pear Tree, which is near the confluence with the North Fork Trinity River, well below the dam.

Results indicate that summer flows below Lewiston Dam provide the water temperatures and depths in pools that adult salmon need, but temperatures are uniformly cold and flow velocities are too high for the salmon to passively rest. The lack of thermal diversity also prevents juvenile salmon from accessing the different temperatures they need to maximize growth. In contrast, the Trinity River pool above the dam exhibited a temperature difference of almost 15°F from the warm surface water to the cold water in the bottom depths of the pool. Such temperature differences occur naturally on undammed rivers in California and other locations where river flows are naturally low and air temperatures high in summer.

Another fascinating finding was the unregulated pool above the dam exhibited diurnal formation and destruction of thermal stratification that occurred throughout summer until late fall. Thermal stratification occurs when temperatures separate into layers based on their differences in water density. Warmer water is less dense and resides in the top of the pool while the colder, more dense water sinks and resides toward the bottom depths. This arrangement of temperatures formed daily when solar heated water entered the pool and moved downstream by flowing near the surface while the cold water supplied to the pool at night was preserved under the warm top flow throughout the day. Many swimmers have noted the cold, deep water after a refreshing plunge, but only a moonlight swimmer would have noticed the change that occurs every night!

Program scientists also discovered that when a pool stratifies in daytime, it releases water downstream that can be as much as 3°F colder than the water entering the pool. Then at night when the stratification is destroyed, the pool stores cold water from upstream and releases relatively warm water downstream. This indicates that pools that stratify help regulate water temperatures throughout the river.

Second only to river flows themselves, water temperatures are the most important driver of biological populations in the river. For this reason, as we consider how to provide conditions in the river that support multiple species and all life stages of salmon, we cannot overlook water temperature. TRRP continues to explore how summer flow management should change to provide a better range of temperature conditions in the Trinity River.

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Trinity County RCD Board Meetings

Third Wednesday
5:30 PM
Open to the Public

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Maryann Perdue
Arvel Reeves
Stuart Beylik

GrizzlyCorps Fellows

In spring and summer of 2022, two GrizzlyCorps Fellows worked with TCRCD; Nicole Eastman in the Watershed Program and Bethany Llewellyn in the Forest Health Program.
In mid-September 2022, two new GrizzlyCorps Fellows will join TCRCD; Miles Raymond and Charlie Curtain.



The Trinity County Resource Conservation District (TCRCD) is a special district set up under state law to carry out conservation work and education. It is a not-for-profit, self-governing district led by a volunteer board of directors.

The Trinity County RCD Vision

The Trinity County RCD envisions a balance between utilization and conservation of our natural resources. Through economic diversity and ecosystem management our communities will achieve and sustain a quality environment and healthy economy.

This institution is an equal opportunity provider in accordance with Federal Law and U.S. Department of Agriculture policy, this institution is prohibited from discriminating on the basis of race, color, national origin, gender, age, or disability.

