



San Luis Obispo Beaver Brigade
a 501(c)(3) non-profit organization

Rios Bebibles

Drinkable Rivers



2025 PROGRAM REPORT

**2024 CENTRAL COAST COMMUNITY-BASED
WATER QUALITY GRANT RECIPIENT**

Ríos Bebibles

Contents Page

1 Acknowledgments

2 Introduction

How *Ríos Bebibles* came to be

3 Background: Why Beavers?

- What do beavers eat?
- Why do beavers build dams?
- Wait... doesn't the Salinas River dry up in the summer? How do beavers survive in our dry climate?
- How do beavers improve the health of the river?

9 About the Program

- Who are the Participants?
- Community Science
- Culture and Ecology
- Stewardship and Restoration
- Art & Identity
- Connection

22 Water Quality Testing

- Methods
- What kinds of data did we collect?
- Wildlife
- Human Activity
- Overview
- Measurements with little to no change
- Measurements that may show changes from upstream to downstream
- Findings: How beaver dams affect water
- Reflections

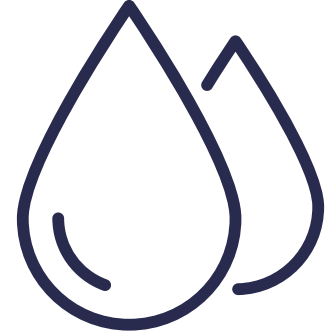
36 Recommendations

- Take Care of the Water, Take Care of the Beavers
- Practice Gratitude
- Raise Awareness

41 Conclusion: Looking Ahead

42 References

44 Appendix



Acknowledgments

This program was funded through a 2024 Central Coast Community-Based Water Quality grant from the Rose Foundation. Thank you to the Rose Foundation for your generous support, without which this program would not have been possible. Support from the Community Foundation San Luis Obispo County helped the SLO Beaver Brigade to strengthen our ties with community organizations, which led to some of the partnerships in Ríos Bebibles.

Donations of food and meeting space were made by Gather Natural Foods Market, Paso Robles Housing Authority, Atascadero Chamber of Commerce Bridgeworks, San Luis Obispo County Public Libraries, and City of Paso Robles Recreation Services. The grant funding support that we had allowed us to be in abundance with the meals provided by Paso Bakery and Deli, La Parrilla in Paso Robles, Suprema Market in Atascadero, and Azteca Market in Atascadero.

Thank you to the Promotores Collaborative of San Luis Obispo County (a program of the Center For Family Strengthening) and Mixteco/Indígena Community Organizing Project (MICOP) for both supporting the program through youth recruitment, interpretation services, and hosting a youth presentation.

Thank you to our guest presenters: Emily Rose Friedman; María Belén Luzuriaga Abad; Esmeralda Garcia and Helen Yanez, Corazón del Pueblo; Cooper Lienhart, Nature's Engineers; and Jessica Rodgers and Shaunie Briggs, Salinan Tribe of San Luis Obispo and Monterey Counties. Each of you brought a unique and valuable contribution that shaped this program.

Thank you to the Netherlands-based nonprofit organization, Drinkable Rivers, for providing the inspiration and water quality testing kits used for this program.

Thank you to the beavers and to the Salinas River for being an enduring source of life and beauty.

Finally, thank you to the youth who participated in this program. It has been a joy and an honor to get to know each of you over the course of this summer, and we are so grateful to you for getting out of your comfort zone and trying something new.

Introduction: How *Ríos Bebibles* Came To Be

The San Luis Obispo (SLO) Beaver Brigade, a nonprofit organization, was founded in February of 2020 after a conversation among friends about what we each could do to contribute to climate regeneration. Supporting the beavers in our county was our answer to that question.

Since then, we have dedicated ourselves to supporting the native beaver population by protecting beaver habitats, educating our residents and visitors of the benefits of beavers and coexistence tools, supporting research of beavers and wetlands, organizing cleanups, and more.

The publication of the 2024 San Luis Obispo Mexican Indigenous Community Study (SLOMICS), carried out by MICOP, Cuesta College, QueerProfs, CSU San Marcos and Diringer and Associates, and funded by The San Luis Obispo Public Health Department, members of the County Board of Supervisors, and First Five San Luis Obispo County, came to our attention as we began the planning for a grant application to the Rose Foundation. Through this study, which consisted of interviews of 325 Mexican indigenous immigrant households in San Luis Obispo County in 2023, we learned that Mixteco-speaking farmworker families in the northern region of our county face multiple challenges: very low household income (80%, earning below \$2500 a month), conditions of severe overcrowding (up to 14 persons in a household) and food insecurity. That study made it clear to us that our grant request should focus on developing opportunities with Mixteco and Spanish-speaking communities in northern San Luis Obispo County in order for those communities to engage in new ways in local environmental conversations. We then began to envision a multidisciplinary Spanish language summer program for Spanish- and Mixteco-speaking youth in Paso Robles which would engage program participants in learning about beavers, enjoyment of the Salinas River, training and experience in gathering water quality data, exploration of ecological and cultural topics,

and eventually to share their experiences in multiple languages directly with the community.

The purpose of this report is to provide our community with an overview of our inaugural *Ríos Bebibles* summer program, including the experiences of the youth participants and the results of our water quality testing.

Background: Why Beavers?



Heather Craig

A beaver on Pismo Creek chews on a willow branch.

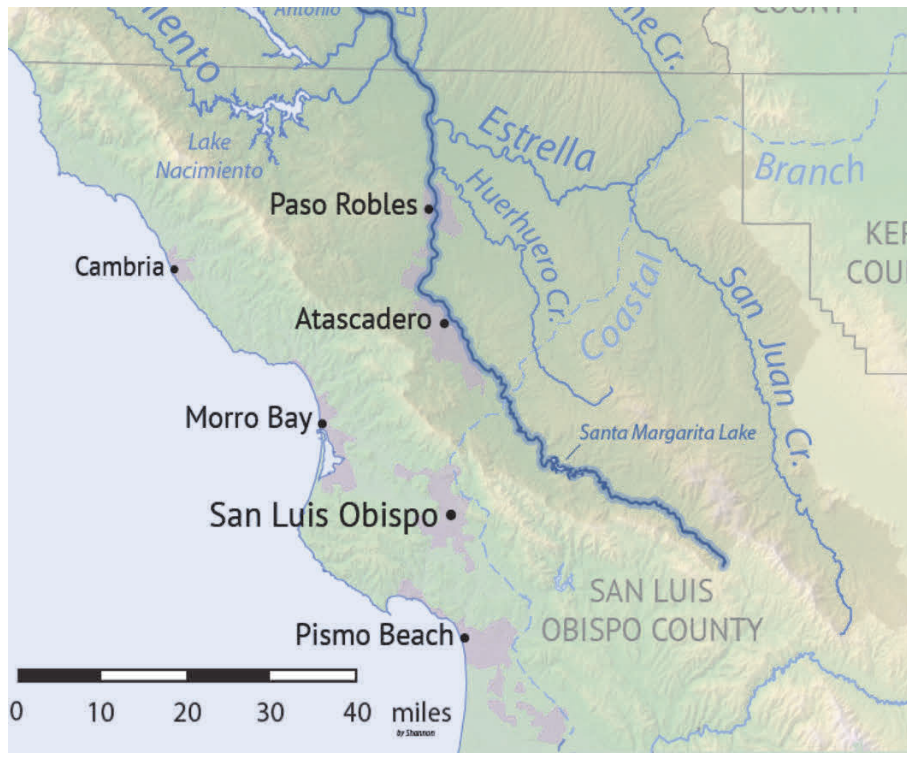


The North American beaver (*Castor canadensis*) is a large rodent native to North America. Beavers used to be plentiful on the rivers and streams of San Luis Obispo County, but they were hunted and trapped extensively during the 1500s to the 1800s.¹ Beavers were extirpated (removed) from many of their native territories, including the Central Coast, and they almost went extinct across North America. Starting in the 20th century as fur trapping decreased, beavers have returned to our region. Since at least the 1960s, local residents have reported seeing beavers living again in the Salinas River and its tributary creeks.² However, many lifelong residents of our community have no idea that beavers live here or why it is important to protect our local beaver populations!

Although there is no official beaver population data, community science efforts have found evidence of beaver populations on the Salinas River and its tributaries, as well as in Southern San Luis Obispo County on Pismo Creek, Arroyo Grande Creek, Nipomo Creek, and Oceano Lagoon.

¹ Goldfarb, B. (2019, February 21). *Eager: The Surprising, Secret Life of Beavers and Why They Matter* (p. 40). Chelsea Green Publishing.

² D. Highland, personal communication, April 15, 2025.



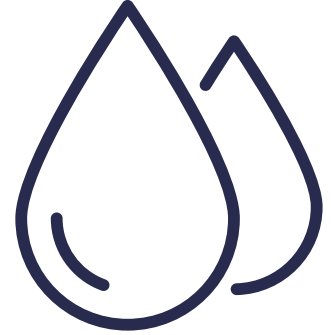
The Salinas River, which runs through Atascadero and Paso Robles, is marked on this map by a dark blue line. The Salinas River is one of several parts of San Luis Obispo County where beavers are found.

Where Do Beavers Live?

Beavers in our region live in dens on the bank of a river or creek. They dig out tunnels into the banks of the creeks and rivers, often under thick tree roots and willow thickets. Beaver dens usually have two rooms: one room for eating and one for sleeping.



Sometimes it can be difficult to spot a beaver family's bank den. One sign to look out for is a series of small tunnels that begin at the edge of the river. These tunnels lead from the water up to the beaver den. Illustration by Ríos Bebibles participant Victor



What Do Beavers Eat?

Beavers are herbivores, meaning that they only eat plants. Beavers on the Salinas River primarily eat the inner bark layer of willow and cottonwood, two kinds of native trees that grow near the water.



Branches that have been chewed off by a beaver are beginning to sprout again.



A willow branch in a beaver dam is beginning to grow in the water.

Why Do Beavers Build Dams?

Protecting themselves from predators is the main reason why beavers build dams. Beavers are a semiaquatic animal, which means that they spend a lot of time in the water. Beavers are fast swimmers, but they are slow on land, which puts them at greater risk of being eaten by predators. Therefore, beavers prefer to swim rather than walk to keep themselves safe. This means that they need water to swim in.

In order to keep water in the river, beavers build dams out of rocks, sticks, and mud. These beaver dams slow down the flow of water in the river, which gives the water more time to soak into the groundwater basin. The water continues to flow downstream, but at a much slower pace, which means that the river is able to keep flowing even in the summer and fall, when it has been months since the last time it rained.



Dr. Emily Fairfax

This aerial photo of the Salinas River in Atascadero shows the large pond formed by a beaver dam.

Wait...doesn't the Salinas River dry up in the summer? How Do Beavers Survive in Our Dry Climate?

When Jazmin, age 20, first heard that we would be visiting the Salinas River to do water quality testing, she wondered, "Where are we going to go where there will actually be water?" Like most of us, she is used to seeing the Salinas River dry up every year.

However, beaver dams create a wetland environment that holds water very well. Although many parts of the Salinas River do dry up in the summer, many of the beaver ponds in Atascadero maintain water year-round—even in drought years!

Reflecting on the first time we went to the river, Jackie, age 16, said, "I was surprised [because] when we're walking there it's really dry, the grass is all dead, and when we get to the river, it's all green, the water is all flowing. It's just beautiful."



An Atascadero beaver pond.



Brittany App

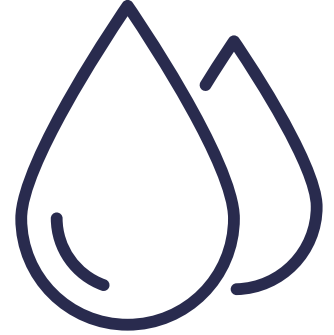
How Do Beavers Improve the Health of the River?

Beavers help keep our rivers and creeks healthy by improving groundwater recharge, water quality, wildfire and drought resilience, and much more.³

Groundwater Recharge

By increasing the amount of time that water spends in the river before flowing downstream to the ocean, more of that water is able to percolate down into our groundwater basin. Groundwater recharge is important because our human communities rely on wells and groundwater pumping for much of our drinking water.

³ Jordan, C. E., & Fairfax, E. (2022, April 28). Beaver: The North American freshwater climate action plan. WIREs Water, 9(3), e1592. <https://doi.org/10.1002/wat2.1592>



Water Quality

By slowing down the flow of water in the river, beaver dams allow pollutants to settle to the bottom of the riverbed rather than flowing downstream. Beaver dams also support wetland plants, including plant species that help to filter pollutants out of the water.

Wildfire and Drought

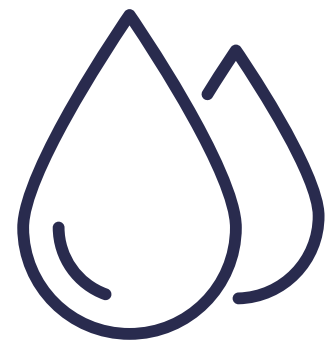
When beavers build a dam, a pond forms upstream of the dam. The river becomes wider and water continues to flow for more of the year. This makes the water more available to plants and animals. The beaver pond becomes a source of water for animals during droughts, and the plants near the beaver pond are well-hydrated and healthy, which reduces the risk that they will burn in the event of a wildfire.



Joseph Wheaton, Utah State University

This photo from the Sharps Fire, which burned 64,000 acres, shows a landscape that is entirely burnt except for where beavers are active.

Although these beaver benefits are well documented in other regions, to date there has not been a local study of how beavers affect water quality in our watershed. Through community science water quality testing, the *Ríos Bebibles* youth program seeks to start developing a local dataset which can help us better understand water quality at beaver dams on the Salinas River.



About the Program

The program took place over the summer of 2025 and consisted of seven weekly meetings during June and July, three youth presentations during August, and a final celebration with youth and their families at the end of August. Through this program, we explored interconnected topics such as Community Science, Ecology, Restoration, Culture, Art, Identity, and Connection.

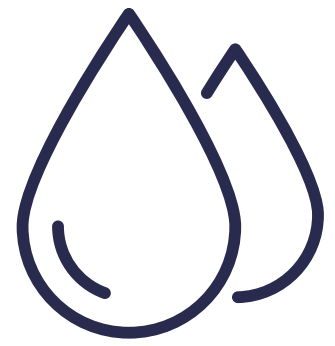
Who Are the Participants?

The program engaged eight young adults who live in Paso Robles: Angel, Arismenty, Eleticia, Everardo, Jackie, Jazmin, Jessica, and Victor. Their ages range from 16 to 20.

At the beginning of the program, this is what participants shared about their goals in participating:

- Help the environment
- Contribute to their community
- Learn something new
- Improve communication skills
- Pursue higher education in science

Community Science



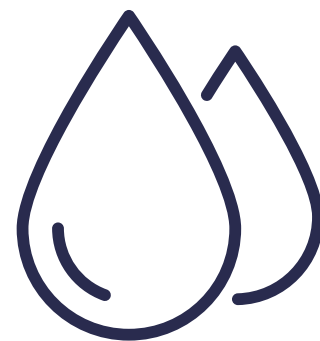
Water Quality Testing

With SLO Beaver Brigade guidance and supervision, youth participants learned to perform community science water quality testing on the Salinas River. Testing occurred for four consecutive weeks at an active beaver dam on the Salinas River in Atascadero. We tested upstream and downstream of the beaver dam. Youth recorded data on datasheets and, at the end of the testing, practiced interpreting the significance of the results.



A youth participant prepares to test a water sample.

Culture & Ecology



Salinan Foodways

We learned about native plants and animals and their roles in culture. Jessica Rodgers, a member of the Salinan Tribe of San Luis Obispo and Monterey Counties, taught us about native plants that are important in Salinan culture, such as elderberry, chia, and hummingbird sage. We got to taste chia elderberry pudding and try out a percussion instrument made out of elderberry wood!



Jessica Rodgers of the Salinan Tribe identifies native plants and their uses at Centennial Creek.

Jessica led us on a walk alongside Centennial Creek in Paso Robles, which is home to a variety of native plants. "When I look out here, I see food... medicine... weaving materials ... and more food and medicine," said Jessica, gesturing at various plants and describing their uses. We learned the names of native plants and animals in English, Spanish, and Salinan.

Connecting Cultures

Even in areas with very different climates and plants, there are similarities between cultures across the continent. Our friends from Corazón del Pueblo, a Santa Maria-based arts nonprofit, brought white sage, an important ceremonial plant for the Chumash and several other California Native tribes. Esmeralda García made connections between the Chumash use of white sage and Indigenous communities' use of copal in southern Mexico. She shared about the importance of sustainably and ethically sourcing white sage and other native medicinal herbs.⁴ Helen Yanez guided an art project where youth crafted medicine bags filled with white sage to give to a loved one.

⁴ To learn more about Indigenous-led efforts to protect white sage, watch *Saging the World*, a short documentary by Rose Ramirez, Deborah Small, and the California Native Plant Society. Watch for free at: <https://www.cnps.org/conservation/white-sage>



A participant's completed medicine bag.



Corazón del Pueblo

Esmeralda holds up an example medicine bag.

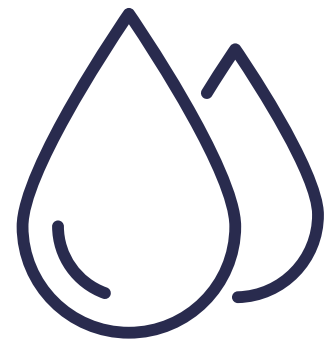
Stewardship & Restoration

We explored how we can engage in everyday stewardship and restoration, as well as potential careers in restoration. On a nature walk with youth, Emily Rose Friedman of Los Osos shared poetry and highlighted the importance of environmental stewardship and caring for native oak trees.

"Connecting with the land and learning how the First Peoples have stewarded this land is the first step in becoming effective stewards ourselves. The second step is implementing these practices into our daily lives, even if that act is simply acknowledging an oak tree as a living entity like you and me," shared Emily Rose.



Youth work on decorating their medicine bags.



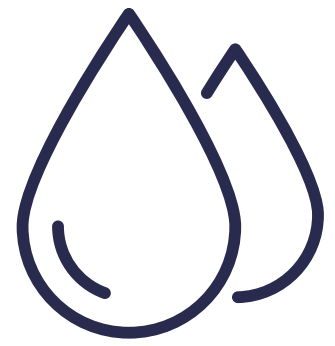
Cooper Lienhart

Cooper Lienhart and his colleagues at Nature's Engineers build beaver dam analogs (BDAs), which are human-made structures that help to restore rivers and creeks by mimicking the effects of beaver dams!

Restoration as a Career

Cooper Lienhart of Nature's Engineers shared his story of learning about climate change and being inspired by how beavers help build climate resiliency. After several years with the San Luis Obispo Beaver Brigade, Cooper decided to start his own business and pursue a career in river and creek restoration. He shared that by supporting beavers and mimicking their behaviors, we can help restore natural long-term health to rivers and streams.

Art & Identity



Art is a powerful way for us to express and explore our experiences, our cultures, and our relationship with the earth. We incorporated art into the program as much as possible. We often ended our sessions with reflection time, during which participants drew and wrote in their sketchbooks about what they had experienced that day. With Corazón del Pueblo we crafted medicinal bags to hold white sage, and with local artist María Belén Luzuriaga Abad we painted masks to express important aspects of ourselves and our relationships.

Helen Yanez, Art Program Manager for Corazón del Pueblo, shared with us what art means to her, "Our elders have always seen art as a communal and collective expression, rooted in ceremony, storytelling, and cultural memory. As an Indigenous artist, I reclaim my power by creating art that reflects my own identity, my own culture, and my own community without needing to over-explain or justify it to others. I create not to be consumed, but to empower to heal, to resist, and to decolonize.

Art, for me, is not just expression. It's a return. A tool for cultural survival. An act of self-definition."

"Art, for me, is not just expression. It's a return. A tool for cultural survival. An act of self-definition."

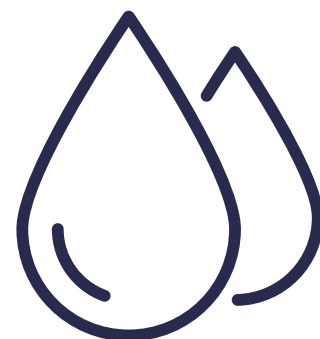
Helen Yanez

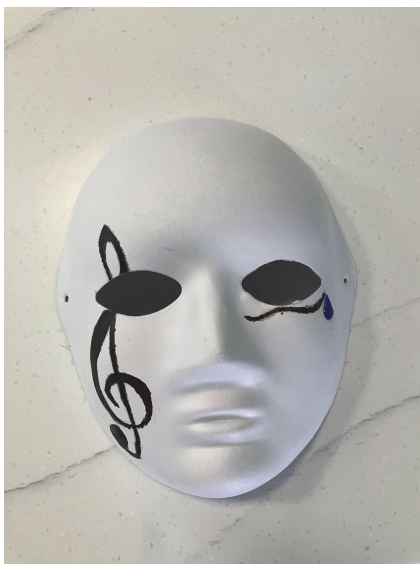


Mask Making and Identity workshop in progress

Mask Making

We explored how art helps us express and connect with our identity, including our connection to the land. Local artist María Belén Luzuriaga led a workshop on Mask Making and Identity and shared a wealth of information about the cultural and ecological significance of masks from around the world. In the words of María Belén: "Masks can serve as a mirror that intertwines us to our communities, traditions, and the natural world."





Masks created by participants and staff as part of the Mask Making and Identity workshop



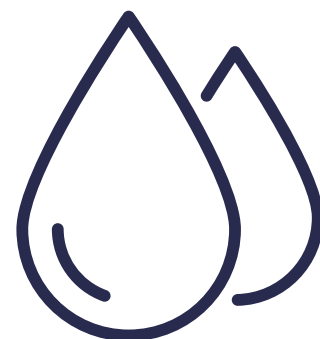
"My mask represents a black panther. I painted it with the color black first because the panther hides and is always quiet. The green is its surroundings, how it is always up high in the trees. The blue represents the rivers and the forests. The yellow is its eyes, how they are always looking at everything."

Everardo, 17

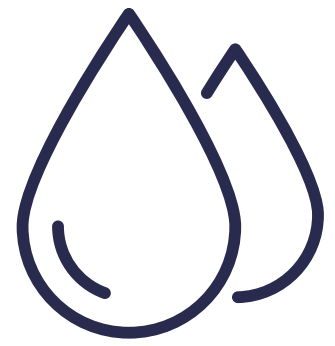


"The meaning behind my mask: The colors orange, yellow, and red, and the circles, represent the sun. The little black lines are supposed to represent trees, nature. Then the feathers are supposed to represent freedom, how a bird is free because they get to fly. It also has a little beak which is like a bird."

Jackie, 16



Connection



Another important aspect of this program was connection: with the river, with beavers, and with each other. Participants worked as a team to collect data, made new friends and strengthened existing friendships, and got to know the Salinas River. When asked about their favorite parts of the program, the most common things mentioned by participants were being in the river and spending time with friends.

Connecting with the River, Connecting with Each Other

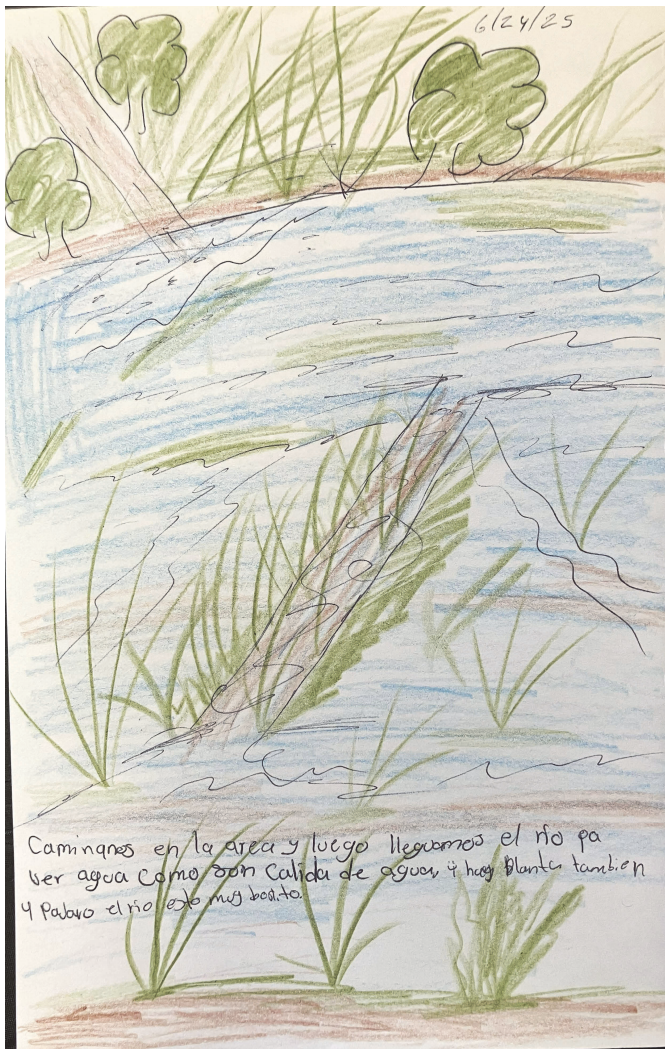
Some of the participants shared that they had never been to the Salinas River before, despite growing up right next to it. Others shared that they had been to the Salinas River, but not in Paso Robles or Atascadero.

Eleticia, 19, had never spent time at the Salinas River before. She was nervous at first, but by the end of the program, she said that the best part of the program was getting to be in the river with her friends. "I feel really peaceful at the river, listening to the sounds of nature," she said.

"For me the river is a very calm, relaxing place where it's impossible to feel stressed," said Everardo. "If someone has never felt peace before, they might find peace in nature."

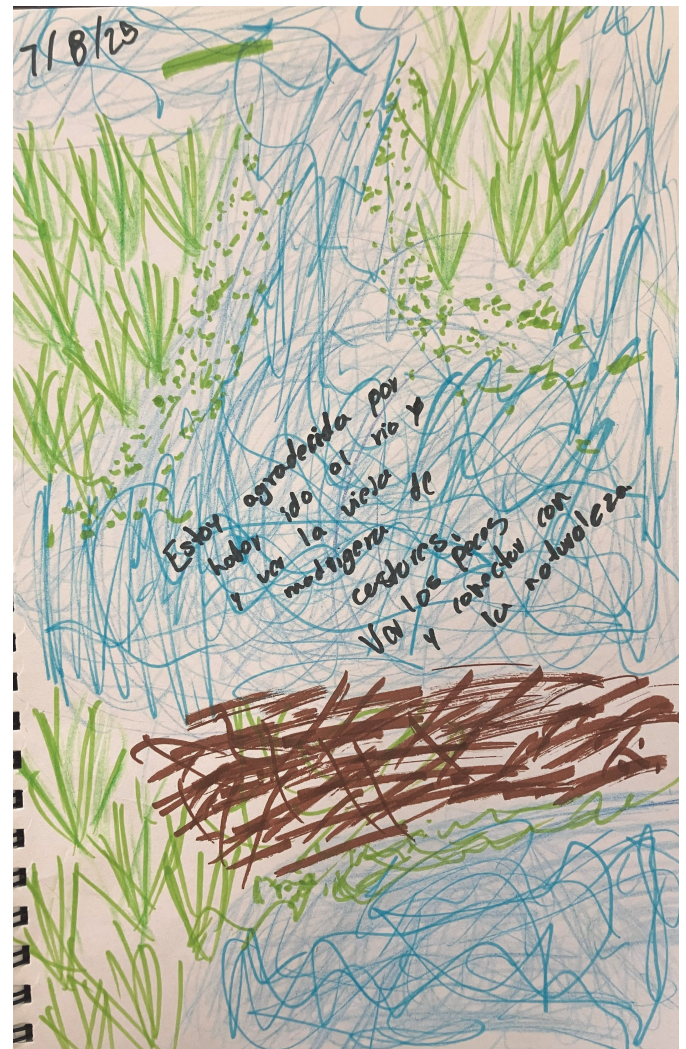
Angel echoed these sentiments, saying, "Going to the river in the mornings made me feel alive." This program gave him an opportunity to "wake up in the mornings, be active, forget [his] problems," and make memories with new friends.

Several other participants mentioned friendship as one of the most meaningful parts of the program. Some of the participants knew each other before the program, but many of them had never met or never spoken. Jackie said, "I didn't know [any of the participants] before, and then... I don't know, we all just hit it off and I got really comfortable. Now we're, like, hanging out and we're all friends."



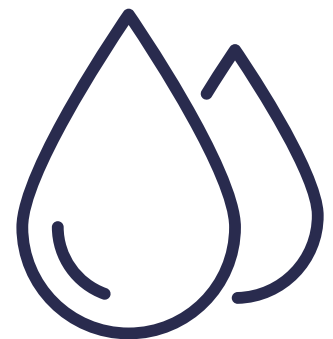
"I'm grateful for having come to the river to see the beavers' old den, see the fish, and connect with nature."

Jessica, 16



"We walked in the area and then arrived at the river to see how the water quality is. There were plants and birds too. The river is very pretty."

Eleticia, 19

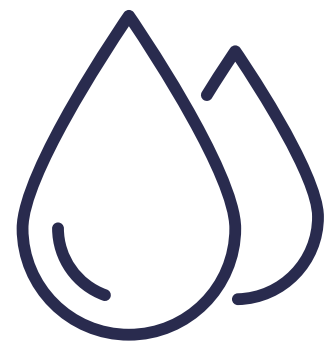




Participants worked as a team to collect data during the water quality testing.



Participants exploring the Salinas River downstream of the beaver pond.



Connecting with the Community

Our community includes people with many different backgrounds and experiences, but we all have something very important in common: we all depend on the rivers and creeks! We got to hear from a variety of guest speakers from around the community, each of whom shared their unique perspective.

"All the guests kind of opened our eyes that we have more possibilities [of what we can] do—because they come from different backgrounds, and they tell us their story. Each person that came to us gave us a piece of their heart to take home." *Angel, 18*

"All the guests kind of opened our eyes that we have more possibilities [of what we can] do—because they come from different backgrounds, and they tell us their story. Each person that came to us gave us a piece of their heart to take home."

Angel, 18

Water Quality Testing

Water Quality Testing

With SLO Beaver Brigade guidance and supervision, youth participants learned to perform community science water quality testing on the Salinas River. Testing occurred for four consecutive weeks at an active beaver dam on the Salinas River in Atascadero. We tested upstream and downstream of the beaver dam. Youth recorded data on datasheets and, at the end of the testing, practiced interpreting the significance of the results.



Angel

Participants did reflections in their sketchbooks throughout the program.

Methods

With SLO Beaver Brigade guidance and supervision, youth participants learned to perform community science water quality testing on the Salinas River. Testing occurred for four consecutive weeks at an active beaver dam on the Salinas River in Atascadero, from June 24 to July 15, 2025. We tested upstream and downstream of the beaver dam.

For our testing we used the water quality testing kits provided by Drinkable Rivers, a nonprofit organization from the Netherlands which helps communities across the world to establish their own community water quality testing program. We adapted the Drinkable Rivers testing protocol for our local conditions.

Participants performed water quality testing as members of two teams of four youth, and each team was supervised and guided by a SLO Beaver Brigade staff member. One team tested upstream of the beaver dam and the other team tested downstream of the beaver dam.

Which kinds of data did we collect? What were we looking for?

In addition to taking measurements and collecting water samples, we recorded our observations of the site and noted anything that had changed since the previous week.

When we look at the results of the test, we analyze the data for changes over time, and we compare the water upstream and downstream of the dam to see if there are any changes.

Wildlife

We observed many animals at the beaver pond. "I noticed a lot of life in the river," reflected Angel.

Birdsong from different bird species could be heard every time we visited the river.

Here are some animals we observed:

- Hummingbirds
- Bees
- Flies
- Dragonflies
- Damselflies
- Crawfish
- California toad
- Tadpoles
- Turkey vulture
- Fish



A drawing shows some of the wildlife in the river, such as fish, crawfish, and frogs.

4

The fact that wildlife is abundant near the beaver dam is a sign of health, although it is also important to take into account what kinds of species are present. For example, crawfish are an invasive species, and they can have a harmful effect on the native species. We would need to do further studies on wildlife to understand what the species composition can tell us about river health and water quality.

Human Activity

Trash – In the four weeks of testing, we only observed a single piece of trash at this site: a piece of toilet paper floating in the water. The fact that there is very little litter at this site has a positive effect on the water quality.

Vehicle Usage – The Salinas River in Atascadero and Paso Robles is a popular spot for off-highway vehicle (OHV) use. Although this is illegal in the city limits of both cities, enforcement of the OHV ban is limited. The beaver dam where we performed our water quality tests has caution tape around it to discourage people from driving over the beaver dam. While we did not observe vehicles driving in the river while we were performing our tests, we saw tire tracks in the river and vegetation on the riverbank that had been driven over. We also noticed a lack of vegetation in the areas where the vehicles drive frequently, creating very hot sections of sand. We did not see signs of any vehicles driving over the dam during the summer.

When people drive in the riverbed, it kills the vegetation and makes it so plants cannot grow and beavers cannot build their dams. This is important because the areas where there is no vegetation get much hotter and can't hold as much water. Driving in the riverbed can also injure or kill aquatic animals, such as fish.

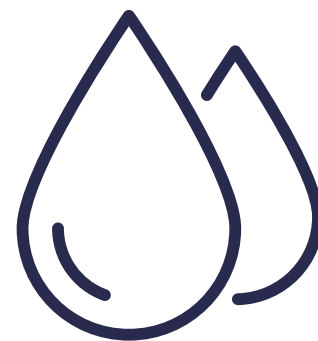
If people stop driving in the riverbed, beavers will have a greater opportunity to build and maintain their dams—and the beaver dams will lead to the growth of wetland plant communities. Additionally,

the more mature dams create more complex and healthier waterways: with more branching of the river, more mature plants, and a more diverse pond depth allowing for deeper pockets and cooler waters that are supportive of fish populations. Youth participants Jazmin and Jackie both shared that they were struck by how much more vegetation was growing at the beaver dam compared to the parts of the river that did not contain beaver dams.



Tire marks in the Salinas River.

Overview



For many of our water quality tests the results were within range, meaning that the values we measured were in the range of acceptable water quality.

Measurements with little to no change

The following elements showed little to no change from week to week, and did not show a significant difference between upstream and downstream.

Water Odor and Color

Why it matters: If water has an odor or a color, this can indicate that there may be some form of contamination or a high amount of fine sediments (dirt) in the water.

Results: There was no color detected in the water. On two occasions there was a light odor detected by at least one participant, but not by all participants.

Our Analysis: The presence of the beaver dam did not have a noticeable effect on the odor or color of the water.

Rating: Good

Electrical Conductivity

Why it matters: Electrical conductivity refers to the ability of water to conduct an electrical current. Conductivity is related to the amount of salts or acids dissolved in the water. Pure water has low conductivity. High conductivity could mean that there are contaminants in the water.

Results: The electrical conductivity was an average of 833 $\mu\text{S}/\text{cm}$ upstream of the beaver dam and 830.5 $\mu\text{S}/\text{cm}$ downstream of the beaver dam.

Our Analysis: There was no significant difference in electrical conductivity upstream and downstream of the beaver dam, and the electrical conductivity did not show a pattern of change over time.

Rating: Good – Drinkable water in the U.S. typically has an electrical conductivity in the range of 30 - 1500 $\mu\text{S}/\text{cm}$. All of our measurements fell within this range.⁵

Total Hardness

Why it matters: Water hardness refers to the levels of minerals, such as calcium and manganese, in the water. These minerals can leave white deposits on sinks and dishes, and they can affect the taste of water.

Results: Every time we tested for total hardness, the result was 425 parts per million (ppm). This measurement was the same each week and was the same both upstream and downstream of the dam.

Our Analysis: Our region is known for having "hard" water, meaning that there are high levels of naturally occurring minerals. Our data for water hardness is similar to the data from water quality tests completed by Atascadero Mutual Water Company.⁶

Rating: N/A – While many people do not like hard water, water hardness does not affect the safety of water.

Alkalinity

Why it matters: Alkalinity is a measure of water's ability to neutralize acids. Water with low alkalinity cannot maintain a stable pH level (see the section on pH below to learn more).⁷ Maintaining a stable pH is important for the safety of aquatic life. If the pH of the water changes suddenly, this can be harmful for aquatic species.

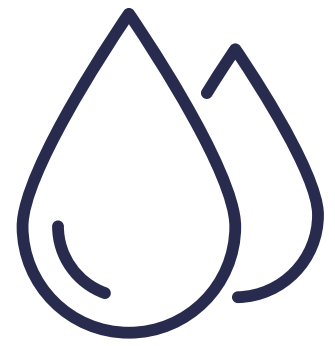
Results: Every time we tested for alkalinity, the result was 240 ppm. This measurement was the same each week and was the same both upstream and downstream of the dam,

Our Analysis: The beaver dam did not have an observable effect on the alkalinity of the water.

⁵ California State Water Resources Control Board (2004, April 27). Electrical Conductivity/Salinity Fact Sheet. The Clean Water Team Guidance Compendium for Watershed Monitoring and Assessment, FS-3.1.3.0(EC)V2e. https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/cwt/guidance/3130en.pdf

⁶ Atascadero Mutual Water Company (2025). Water Quality. <https://www.amwc.us/ccr>

⁷ Water Science School (2018, August 7). Alkalinity and Water. United States Geological Survey. <https://www.usgs.gov/water-science-school/science/alkalinity-and-water>



Rating: N/A – There is no established water quality standard in the United States for alkalinity levels. However, alkalinity affects pH, which does have water quality standards.

Chloride

Why it matters: When chloride combines with sodium, they make salt. High levels of chloride can be found in water in urban areas, especially in areas that use road salt to melt snow during the winter. When water flows from the roads into rivers and streams, the water carries these chlorides with it. High levels of chloride can harm aquatic life.⁸

Results: Every time we tested for chloride, the result was 0 ppm. This measurement was the same each week and was the same both upstream and downstream of the dam.

Our Analysis: It does not snow in our area, so road salt is not used. Based on the data we collected, chloride is not a concern in the area we tested. The beaver dam did not have an observable effect on the chloride levels in the water.

Rating: Good – Our results fall in an acceptable range for chloride.

Nitrates and Nitrites

Why it matters: Nitrate is an important nutrient that plants get from the soil or from the water. Nitrates are found in fertilizers used by farmers, and they can flow into the river when it rains. Although nitrates themselves are relatively harmless, they can be broken down into nitrites, which can be harmful to animals and humans in large quantities.⁹

Results: Every time we tested for nitrates and nitrites, the result was 0 ppm for each of them. This measurement was the same each week and was the same both upstream and downstream of the dam.

⁸ Water Resources Mission Area (2019, March 1). Chloride, Salinity, and Dissolved Solids. United States Geological Survey. <https://www.usgs.gov/mission-areas/water-resources/science/chloride-salinity-and-dissolved-solids>

⁹ Poulson, B. (2025, January 2). Nitrites vs. Nitrates: Sources, Benefits and Risks. Verywell Health. <https://www.verywellhealth.com/nitrites-vs-nitrates-5324098>

Our Analysis: Based on our data, nitrates and nitrites are not found in high amounts in the water at our testing location. Because we did not have any positive results for nitrates or nitrites, we cannot determine whether the beaver dam had any effect on the nitrate or nitrite levels.

Rating: Good – Our results fall in an acceptable range for nitrates and nitrites.

Measurements that may show changes from upstream to downstream

The following elements showed a potential pattern of change from upstream to downstream, meaning that the beaver dam may have an effect on these indicators.

Water Temperature

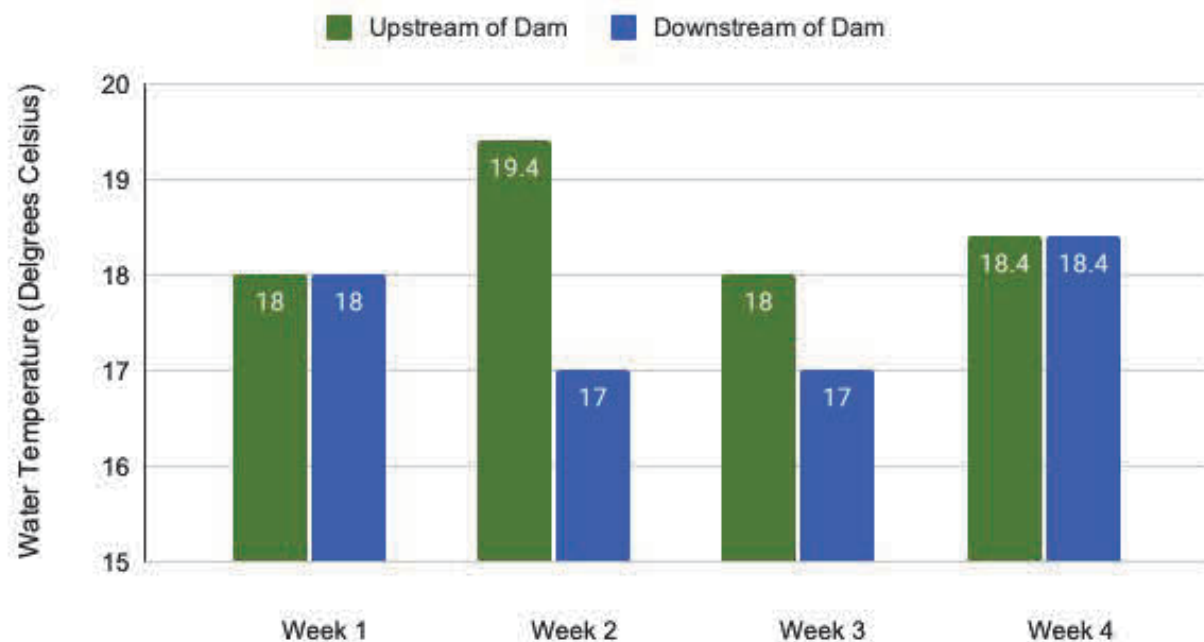
Why it matters: The temperature determines which species can live in the water. Water temperatures have been rising as a result of climate change, including extreme heat and drought. Water temperatures are also higher in areas that do not have many trees providing shade to the water. Water temperatures that are too warm can harm or kill native aquatic species. There have been questions about whether or not the beaver dam causes the water upstream (in the beaver pond) to become warmer than it would be if it were flowing continuously.

Results: On two of our testing dates, the water temperature was the same upstream and downstream of the beaver dam. On the other two testing dates, the water temperature was higher upstream than downstream. Water temperature upstream of the beaver dam was, on average, 18.5° C. Downstream of the dam, the average water temperature was 17.6° C

Our Analysis: Beaver dams might have an effect on water temperature, given that we observed higher upstream temperatures during two of our four testing dates. However, we would need further testing to understand if this is a pattern, and we can't draw any conclusions based on our limited data.

Rating: Needs Further Investigation – Understanding if beaver dams cause warmer water temperatures upstream, and whether these temperatures pose a threat to aquatic life in the beaver ponds, would require further testing.

Water Temperature



Based on our data, the water temperature in the beaver pond (upstream of the dam) was the same or higher than the temperature downstream of the pond. Water temperature was tested in the middle of the channel, which receives full sunlight. The potential for beaver dams to cause warmer upstream water temperatures is a concern that needs further study.

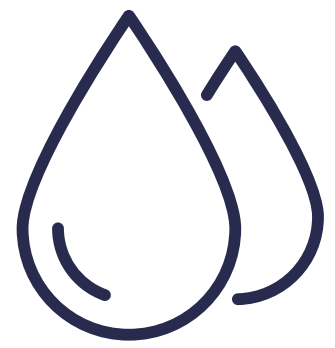
pH

Why it matters: pH is a measure of how acidic or basic water is. pH is measured on a scale from 0 to 14. A low pH (0-7) is more acidic, and a high pH (7-14) is more basic (alkaline). Pure water is right in the middle, with a pH of 7. Lemon juice is an example of a very acidic substance with a pH of 2.0. Limewater, which is used to treat corn and turn it into hominy, is very basic and has a pH of 12.4.¹⁰ pH affects the taste of water, and an extremely low or extremely high pH could make it hard for aquatic species to survive in the water.

Results: The pH was generally somewhat higher (more basic) upstream than downstream. We did not observe any pattern of change in pH levels over time. Upstream of the beaver dam, the pH was an average of 7.8, while the average downstream pH was 7.5.

Our Analysis: pH could be affected by the presence of the beaver dam, although we would need more testing to establish whether there is a consistent pattern.

¹⁰ Helmenstine, A. (2020, September 30). The pH Scale of Common Chemicals. Science Notes and Projects. <https://sciencenotes.org/the-ph-scale-of-common-chemicals/>



Rating: Good – Drinking water in the United States should have a pH between 6.5 and 8.5, and all of our pH measurements fell within this range.¹¹

E. coli

Why it matters: Escherichia coli (E. coli for short) is a bacteria found in the feces (poop) of many animals, including humans and beavers. The presence of E. coli in the water can mean that the water is contaminated with feces. Drinking water contaminated with certain strains of E. coli can make us sick. A person swimming in water with high levels of E. coli may accidentally ingest water and get sick.

Results: The average E. coli measurement upstream of the beaver dam was 16.7 colony-forming units per milliliter of water (CFU/mL). Downstream the average was 14.5 CFU/mL. We did not observe any consistent difference between upstream and downstream E. coli levels, and E. coli levels didn't show a pattern of changing over time.

Our Analysis: The beaver dam did not have a clear effect on E. coli levels in the water.

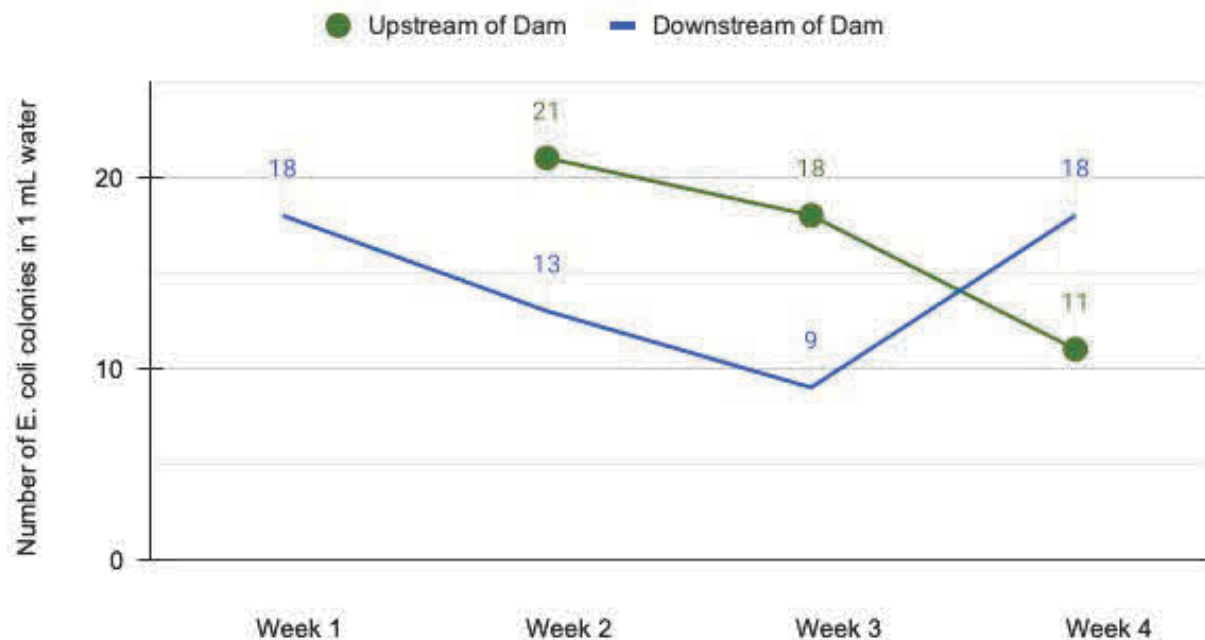
Rating: Low – In the United States, water is not considered safe for drinking if any E. coli is detected in the water.¹² Water is considered safe for swimming if it has E. coli levels of 4.1 CFU/mL or less.¹³ All of the E. coli levels we measured were higher than the safe swimming guideline. This means that people could get sick if they swim (i.e. fully submerge themselves) in the water at this location. People should not wade in the water if they have any open cuts or wounds on their body, and anyone who wades in this water should wash their hands and take a shower afterwards to reduce the risk of infection or illness.

¹¹ Environmental Protection Agency. (n.d.). Secondary Drinking Water Standards: Guidance for Nuisance Chemicals. Safe Water Drinking Act. <https://www.epa.gov/sdwa/secondary-drinking-water-standards-guidance-nuisance-chemicals>

¹² Environmental Protection Agency. (n.d.). National Primary Drinking Water Regulations. Ground Water and Drinking Water. <https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations>
13 Office of Water (2012, December). 2012 Recreational Water Quality Criteria. (EPA - 820-F-12-061).

¹³ Office of Water (2012, December). 2012 Recreational Water Quality Criteria. (EPA - 820-F-12-061). Environmental Protection Agency. <https://www.epa.gov/sites/default/files/2015-10/documents/rec-factsheet-2012.pdf>

E. coli bacteria



Graph showing the E. coli levels detected during each week of testing. Note: We did not have time to collect an E. coli sample upstream of the dam during the first week.

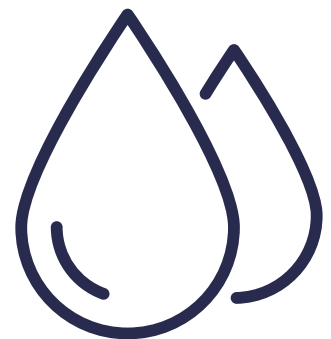
Findings: How beaver dams affect water

The most obvious effects that the beaver dam had on water in the river had to do with stream flow, velocity, wetted width, and water depth.

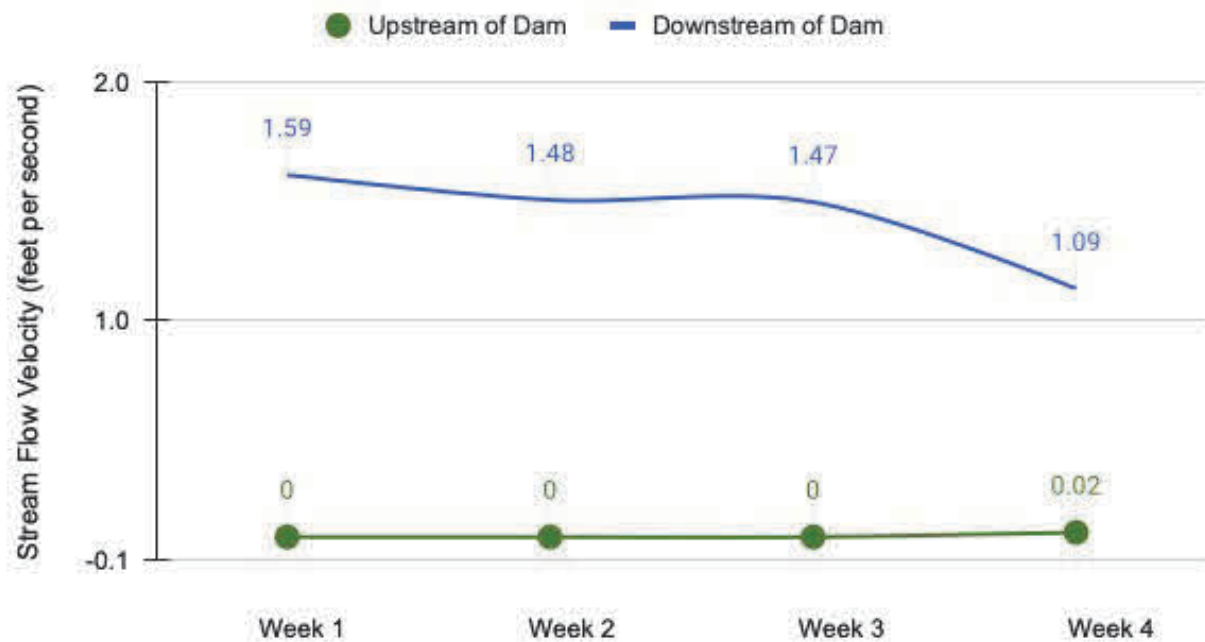
Overall, the beaver dam:

1. Slowed down the flow of the water (Stream Flow Velocity),
2. Spread out the water in a larger area of the riverbed (Wetted Width), and
3. Stored more water upstream of the dam (Water Depth).

We also noticed changes over time. As the summer went on, the water flowed more slowly. The river may also have become more shallow, meaning that there was less water in the river.

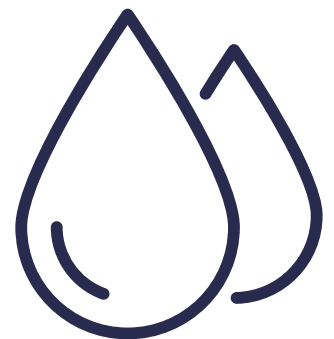


Stream Flow Velocity

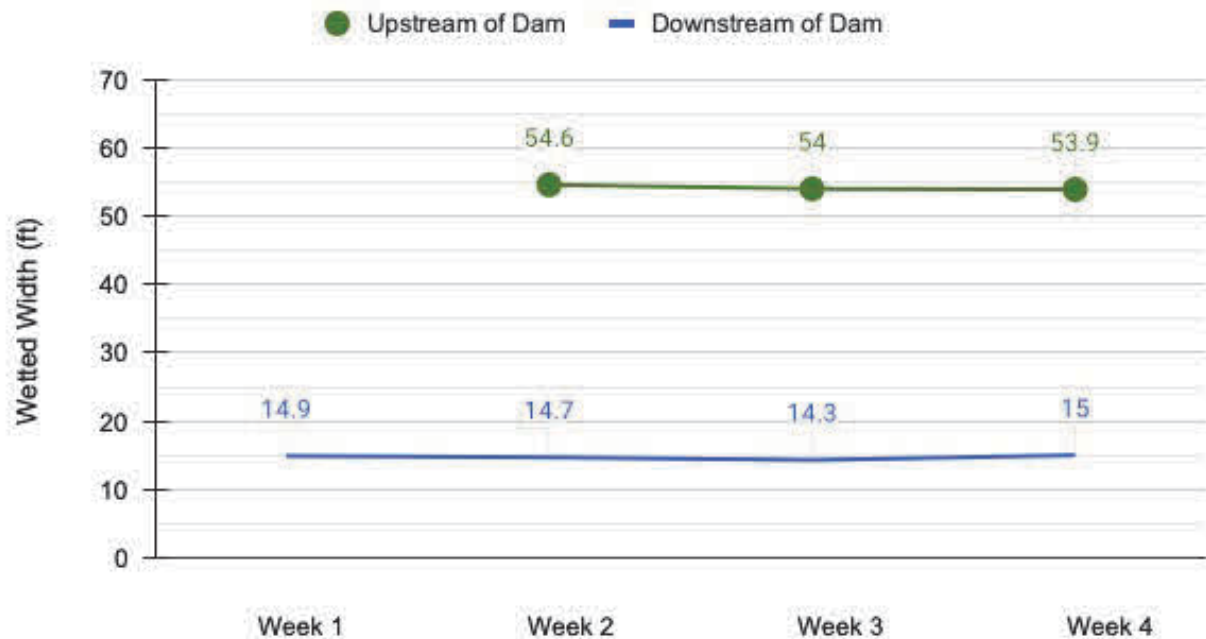


Stream Flow Velocity

How quickly is water flowing in the river? We measured how far a tennis ball floated down the river in 30 seconds to determine the stream flow velocity. Our measurements show that the water upstream of the dam did not have any velocity—the water was still. Downstream of the dam, the velocity of the water went down each time we tested in. This means that as the summer progressed, the water continued to flow more and more slowly.



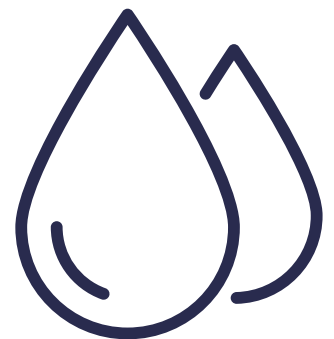
Wetted Width



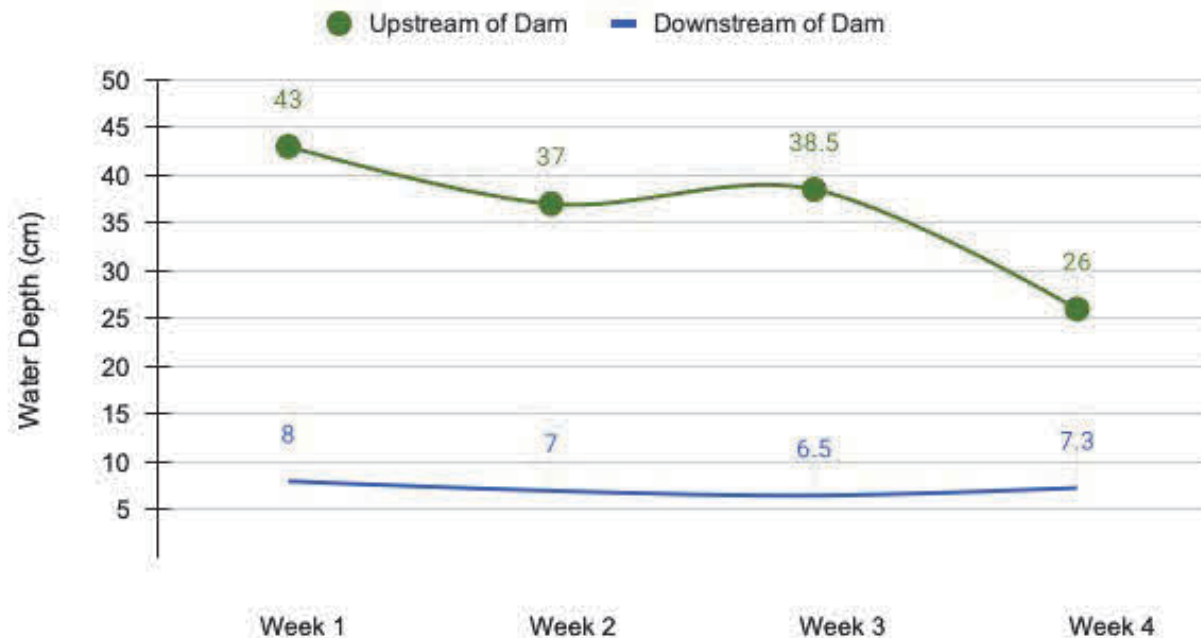
Wetted Width

Wetted width is a measure of how wide the river is, only including the part of the river that contains surface water. Our measurements indicated that the river was approximately 3.7 times wider upstream of the dam than it was downstream, representing an average difference of 39 feet and 6 inches. This means that the beaver dam caused the water to spread out across the riverbed.

We did not measure the wetted width upstream of the dam during week 1 because we ran out of time. However, we can confidently say that the presence of a beaver dam results in a significant increase in the wetted width of the river.



Water Depth



Water Depth

How deep is the water in the river? Based on these data, the river was approximately 5 times deeper upstream of the dam than it was downstream. The beaver dam increased the depth of the water upstream, which means that the beaver dam increased water storage in the river.

Note: The lower water depth during week 4 may be due to the measurement being taken in a different location. This is something we can improve next year by marking a consistent location at which to take measurements.

Reflections

It is important to mention that there are many limitations to the data we collected. The water quality tests were performed using community science equipment. Community science monitoring is effective at detecting changes over time and from one location to another. However, it is less accurate and precise than monitoring with lab-grade equipment.¹⁴

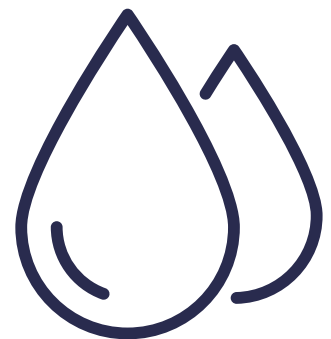
Additionally, these tests were a learning experience for both our staff and the youth participants, which increases the likelihood of errors in comparison to professional water quality monitoring.

¹⁴ Vadez, C., & Riley-Shepard, A. (2024, August 11). DO WE MEASURE UP? Testing the Validity of our Drinkable Rivers Measurement Kit Data Against Other Citizen Science and Lab-Grade Materials. Drinkable Rivers. <https://drinkablerivers.org/2024/11/08/do-we-measure-up-testing-the-validity-of-our-drinkable-rivers-measurement-kit-data-against-other-citizen-science-and-lab-grade-materials/>

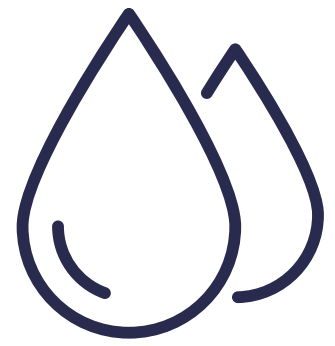
In order to improve the quality of data, in the future we would like to:

- 1. Test over a longer period of time** – For this project we only conducted weekly tests for four weeks, which is not enough time to establish a pattern for most of the indicators we tested.
- 2. Test at more sites** – In order to understand how beaver dams affect water quality, we would like to collect data at multiple beaver dams. We would also like to perform water quality tests at a control site (i.e., a site where there is no beaver dam) to see how the data compares.
- 3. Improve quality control** – We would like to incorporate quality control practices such as running field blanks and duplicate tests. Running these kinds of tests will help us to detect errors in our data collection process.

While we cannot make any definitive claims based on the data from this first summer of water quality testing, it does give us an important first look at the health of the Salinas River at a beaver dam in Atascadero. We hope that this program will be the inspiration that leads to more awareness, community conversations, and further studies of how beavers affect water quality on the Salinas River.



Recommendations



Based on what they have learned and experienced, both in this program and beyond, the youth had many insights and recommendations to share with the community. Here is what they have to say.

1. Take Care of the Water, Take Care of the Beavers

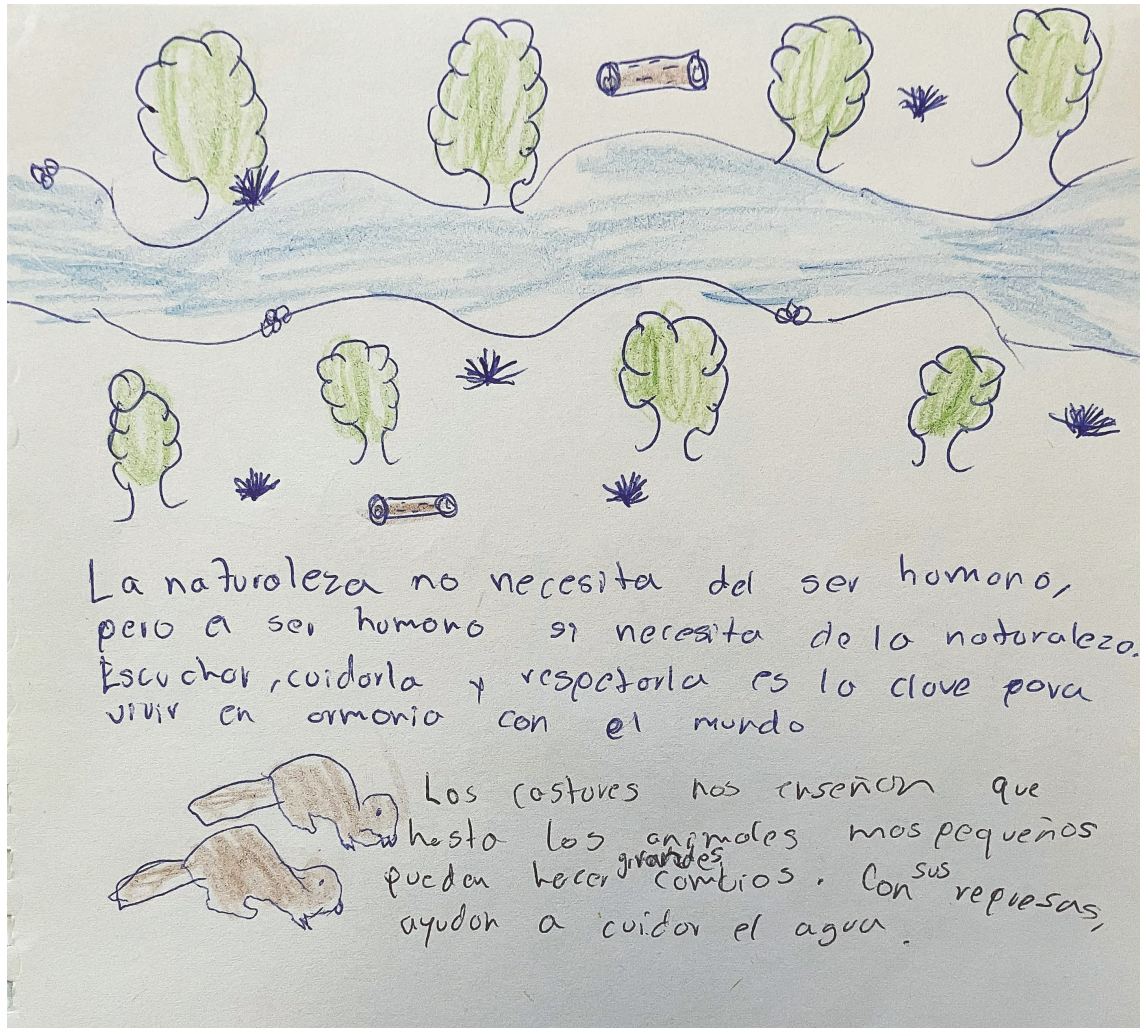
Arismenty, 18, says, "Take care of [the water] like you want it to take care of you, because if you don't take care of it, you're not going to be able to use it. So take care of it like it was yourself."



Participants answer the question, "What should we do as a community to take care of the river?"

As Jessica reflected in her sketchbook, "Nature doesn't need humans, but humans do need nature. Listening, caring for it, and respecting it is the key to living in harmony with the world.

Beavers teach us that even the smallest animals can make big changes. With their dams, they help to take care of the water."



Jessica

2. Practice Gratitude

"One thing that I would like to change in this world is for all of us to appreciate things and be grateful," said Angel.

When we truly appreciate what we have, we don't waste it. For example, Jazmin's family puts a bucket in the shower to catch some of the water, which they then use to water the plants outside. Arismenty shares that using all the parts of an animal is another important way to reduce waste and show respect for other living creatures. If we all do these everyday actions, it will add up.

3. Raise Awareness

Youth prepared group presentations to deliver in August 2025 at three community meetings: two in Paso Robles and one in Atascadero. Like many members of our community, the youth participants had no idea that there were beavers in the Salinas River until joining this program!

"I believe that [the community should] be more informed about what it is that beavers can do. I believe that the presentation we'll give will be a good way of [informing the community]," said Jazmin as she prepared for the presentation.

Through their presentations, youth shared their experiences in the program and raised community awareness about the importance of beavers and how we can support water quality. These presentations have made information about beavers and water quality available to the community in English, Spanish, and Mixteco.

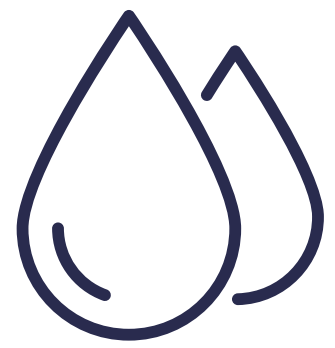
"I want my community to know that beavers keep the water clean," said Victor, 16. "I recommend that the community keep the river clean so the beavers can be healthy."

Jackie, who is going into her senior year of high school and is interested in studying science in college, said, "Something I hope to do is become a positive change for this world. I hope to have/create a world where the next generation can live without the worries of climate change and the nearing end for all ecosystems. I hope that children get to learn young about [environmental] struggles and also want a change for the planet."



Jackie

Presentations

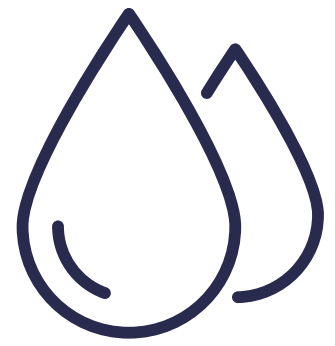


The participants developed presentations to deliver at community meetings in Paso Robles and Atascadero, sharing with the public what they had learned regarding local water quality and utilizing public speaking skills to raise awareness about the importance of beavers to watershed health. Through these presentations, which were held in English, Spanish, and Mixteco, participants shared information with approximately 75 community members about beavers and the Salinas River.



Youth participants deliver presentations at community meetings.

Final Celebration

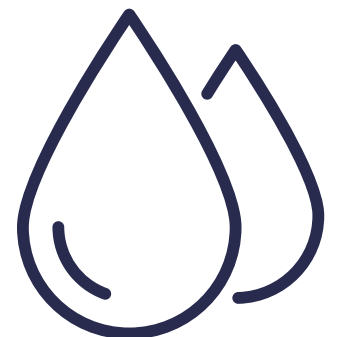


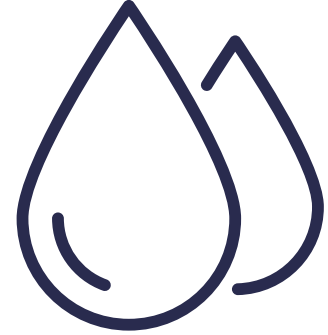
After a summer full of learning, exploring, collecting data, and making connections, the program culminated with a celebration of the achievements of the youth participants. We gathered to celebrate with the youth participants, their families, our community partners, and our guest presenters. Our partner organizations and guest presenters expressed their gratitude to the participants, and the youth had the opportunity to be recognized by their families and the organizations. With all these people gathered together, many of whom didn't know one another before this summer, we truly felt the impact of this program on the community.



Conclusion: Looking Ahead

We at the SLO Beaver Brigade are thrilled with this program: the baseline data gathered, the connections with the local organizations supporting our Spanish- and Mixteco-speaking communities, the participants themselves and their willingness to participate and share their precious summer days with us, the local restaurants and grocery stores that supported our participants, and the local venues that hosted us. We were able to successfully share beaver education with a community of people we have never before been able to reach. Now the participants have a living connection with the river, with us, and with each other, and we have a living connection with all of the people who participated in this program and a deeper connection to our shared river. What better outcome could we have asked for?



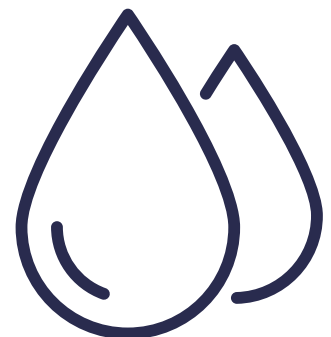


References

- Goldfarb, B. (2019, February 21). Eager: The Surprising, Secret Life of Beavers and Why They Matter (p. 40). Chelsea Green Publishing.
- Jordan, C. E., & Fairfax, E. (2022, April 28). Beaver: The North American freshwater climate action plan. WIREs Water, 9(3), e1592. <https://doi.org/10.1002/wat2.1592>
- California State Water Resources Control Board (2004, April 27). Electrical Conductivity/Salinity Fact Sheet. The Clean Water Team Guidance Compendium for Watershed Monitoring and Assessment, F S - 3 . 1 . 3 . 0 (E C) V 2 e . https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/cwt/guidance/3130en.pdf
- Atascadero Mutual Water Company (2025). Water Quality. <https://www.amwc.us/ccr>
- Water Science School (2018, August 7). Alkalinity and Water. United States Geological Survey. <https://www.usgs.gov/water-science-school/science/alkalinity-and-water>
- Water Resources Mission Area (2019, March 1). Chloride, Salinity, and Dissolved Solids. United States Geological Survey. <https://www.usgs.gov/mission-areas/water-resources/science/chloride-salinity-and-dissolved-solids>
- Poulson, B. (2025, January 2). Nitrites vs. Nitrates: Sources, Benefits and Risks. Verywell Health. <https://www.verywellhealth.com/nitrites-vs-nitrates-5324098>
- Helmenstine, A. (2020, September 30). The pH Scale of Common Chemicals. Science Notes and Projects. <https://sciencenotes.org/the-ph-scale-of-common-chemicals/>

References

- Environmental Protection Agency. (n.d.). Secondary Drinking Water Standards: Guidance for Nuisance Chemicals. Safe Water Drinking Act. <https://www.epa.gov/sdwa/secondary-drinking-water-standards-guidance-nuisance-chemicals>
- Environmental Protection Agency. (n.d.). National Primary Drinking Water Regulations. Ground Water and Drinking Water. <https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations>
- Office of Water (2012, December). 2012 Recreational Water Quality Criteria. (EPA - 820-F-12-061). Environmental Protection Agency. <https://www.epa.gov/sites/default/files/2015-10/documents/rec-factsheet-2012.pdf>
- Vadez, C., & Riley-Shepard, A. (2024, August 11). DO WE MEASURE UP? Testing the Validity of our Drinkable Rivers Measurement Kit Data Against Other Citizen Science and Lab-Grade Materials. Drinkable Rivers. <https://drinkablerivers.org/2024/11/08/do-we-measure-up-testing-the-validity-of-our-drinkable-rivers-measurement-kit-data-against-other-citizen-science-and-lab-grade-materials/>



Appendix

Water Quality Test Results Organized by Date (Upstream/Downstream side-by-side comparison for each date)								
Upstream (US) or Downstream (DS)	June 24		July 1		July 8		July 15	
	US	DS	US	DS	US	DS	US	DS
Riverbank plants	---	26-50%	5-25%	5-25%	<5%	26-50%	<5%	26-50%
Emerging plants	---	51-75%	26-50%	76-100%	51-75%	76-100%	26-50%	51-75%
Filamentous algae	---	0%	<5%	0%	<5%	0%	0%	0%
Free floating plants	---	<5%	5-25%	<5%	5-25%	5-25%	5-25%	<5%
Submerged plants	---	0%	25-50%	0%	<5%	0%	<5%	0%
Water Depth (cm)	43	8	37	7	38.5	6.5	26	7.3
Visibility (% of total depth)	100%	100%	100%	100%	100%	100%	100%	100%
Velocity (feet / second)	0	1.59	0	1.48	0	1.47	0.02	1.09
Wetted Width (feet and inches)	---	14' 11"	54' 7"	14' 8"	54' 0"	14' 4"	53' 11"	15' 0"
Water Odor	Light odor (earth, oil, or sulfur)	No	No	No	No	Light odor (earth)	No	No
Color	No	No	No	No	No	No	No	No
pH Sensor	7.80	7.70	7.79	7.55	7.84	7.69	8.06	7.57
pH Test Strip	7.8	7.2	8.4	8.1	7	7.2	7.8	7.2
Electrical Conductivity (µS/cm)	820	772	---	790	780	840	900	920
Temperature (C)	18	18	19.4	17	18	17	18.4	18.4
Total Hardness (ppm)	425	---	425	425	425	425	425	425
Alkalinity (ppm)	240	240	240	240	240	240	240	240
Free chloride (ppm)	0	0	0	0	0	0	0	0
Total chloride (ppm)	0	0	0	0	0	0	0	0
Nitrate (ppm)	0	0	0	0	0	0	0	0
Nitrite (ppm)	0	0	0	0	0	0	0	0
E. coli (CFU/mL)	---	18	21	13	18	9	11	18

Appendix

Water Quality Test Results Organized by Upstream/Downstream (week-to-week comparison for each site)								
	Upstream				Downstream			
	June 24	July 1	July 8	July 15	June 24	July 1	July 8	July 15
Riverbank plants	---	5-25%	<5%	<5%	26-50%	5-25%	26-50%	26-50%
Emerging plants	---	26-50%	51-75%	26-50%	51-75%	76-100%	76-100%	51-75%
Filamentous algae	---	<5%	<5%	0%	0%	0%	0%	0%
Free floating plants	---	5-25%	5-25%	5-25%	<5%	<5%	5-25%	<5%
Submerged plants	---	25-50%	<5%	<5%	0%	0%	0%	0%
Water Depth (cm)	43	37	38.5	26	8	7	6.5	7.3
Visibility (% of total depth)	100%	100%	100%	100%	100%	100%	100%	100%
Velocity (feet / second)	0	0	0	0.02	1.59	1.48	1.47	1.09
Wetted Width (feet and inches)	---	54' 7"	54' 0"	53' 11"	14' 11"	14' 8"	14' 4"	15' 0"
Water Odor	Light odor (earth, oil, or sulfur)	No	No	No	No	No	Light odor (earth)	No
Color	No	No	No	No	No	No	No	No
pH Sensor	7.80	7.79	7.84	8.06	7.70	7.55	7.69	7.57
pH Test Strip	7.8	8.4	7	7.8	7.2	8.1	7.2	7.2
Electrical Conductivity (µS/cm)	820	---	780	900	772	790	840	920
Temperature (C)	18	19.4	18	18.4	18	17	17	18.4
Total Hardness (ppm)	425	425	425	425	---	425	425	425
Alkalinity (ppm)	240	240	240	240	240	240	240	240
Free chloride (ppm)	0	0	0	0	0	0	0	0
Total chloride (ppm)	0	0	0	0	0	0	0	0
Nitrate (ppm)	0	0	0	0	0	0	0	0
Nitrite (ppm)	0	0	0	0	0	0	0	0
E. coli (CFU/mL)	---	21	18	11	18	13	9	18

