

Beavers and Why They Matter

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SLO Beaver Brigade
March 2, 2022



Presentation Overview

- Beaver history and facts
- Benefits of beavers
 - Fire
 - Drought
 - Climate Change
- Obstacles for Beavers
- SLO Beaver Brigade
 - Education
 - Support Research
 - Beaver Restoration
 - Beaver/Human Management
 - River Stewards



Beginning Reflection

- Have you ever spent time at a river or stream in our county?
- What are your thoughts of the rivers? What reactions do you have, if any?

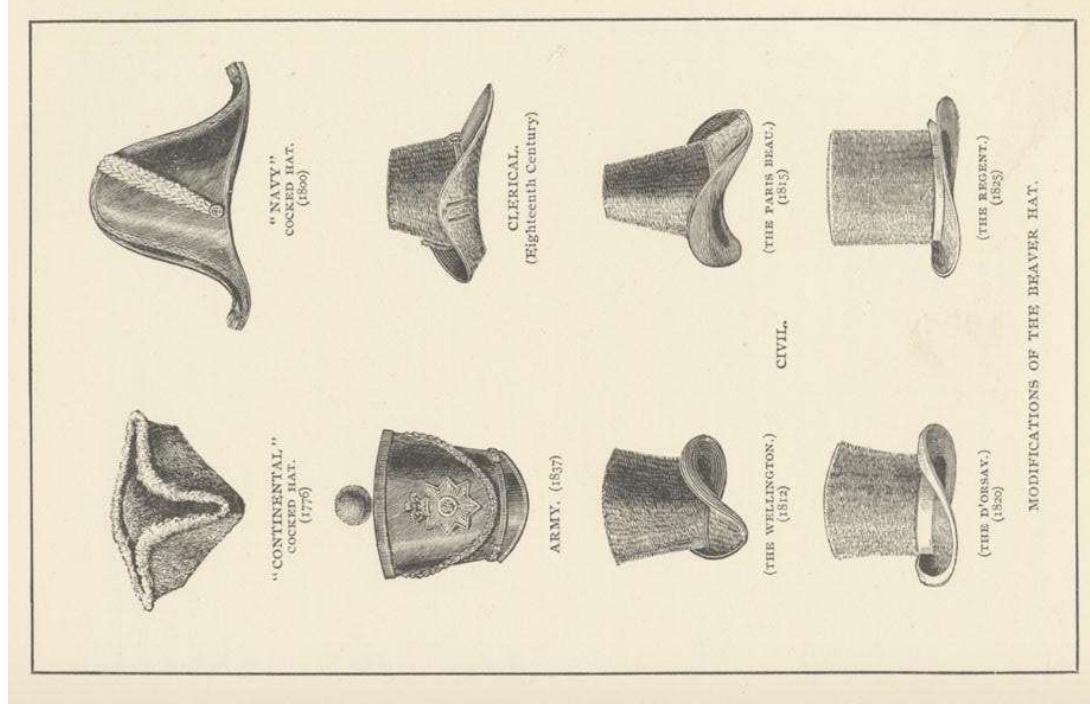
Beavers were almost wiped out of North America

- Estimated 60-400 million beavers in North America **prior to European contact** (1) 1/10th of the land were wetlands.
- Reduced to 100,000 beavers in North America by early 1900 - "Fur Desert"
- California Fur Rush 1820 to 1845
- By **1911 there were 11 known colonies** of beaver in the entire state of California (2)
- **1942 Status of Beaver report prompted reintroduction efforts, 1923-1950.**

Result: False belief that beavers are a non-native pest, and subject to **state-permitted removal from backyard streams, or anywhere else people find their presence to be inconvenient.**

Sources:

- (1) Ernest Thompson Seton, *Lives of Game Animals*, 1929
- (2) FUR BEARING ANIMALS OF CALIFORNIA Their Natural History, Systematic Status, and Relations to Man BY JOSEPH GRINNELL JOSEPH S. DIXON, AND JEAN M. LINSDALE, 1937
- (3) Fur.Fortune.and.Empire by Eric Jay Dolin, 2010



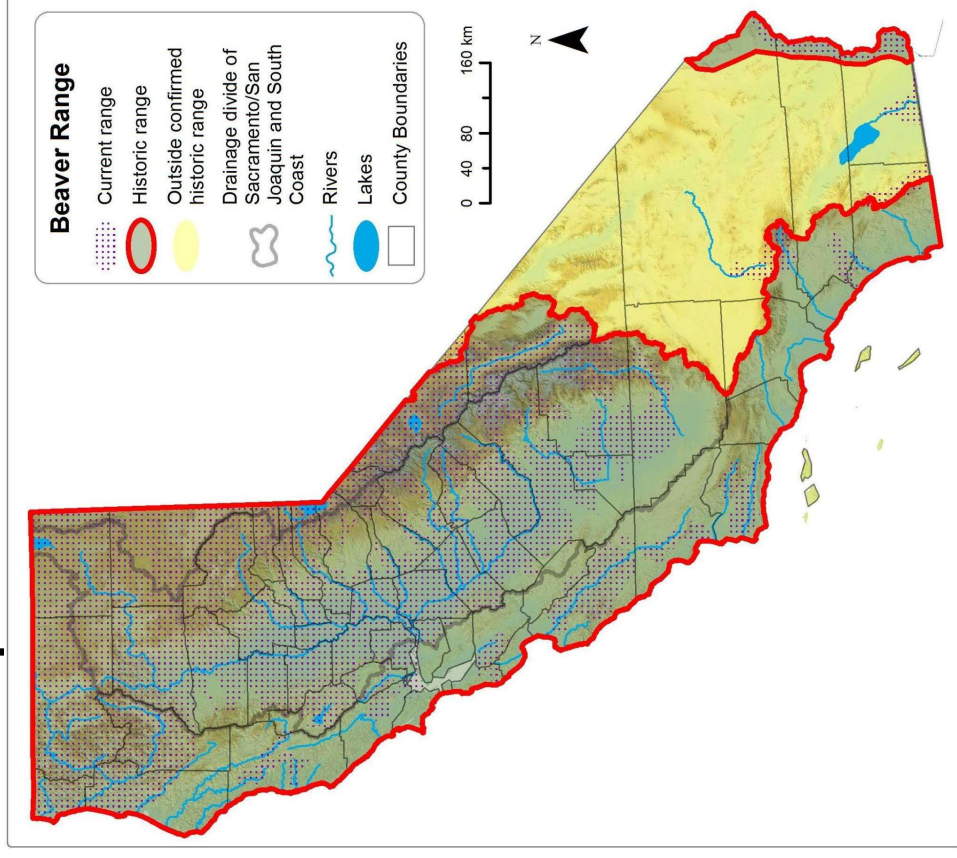
Historic Range of Beaver in California

2013 California Fish and Game 99(4):193-224;

The historical range of beaver (*Castor canadensis*) in California: an updated review of the evidence

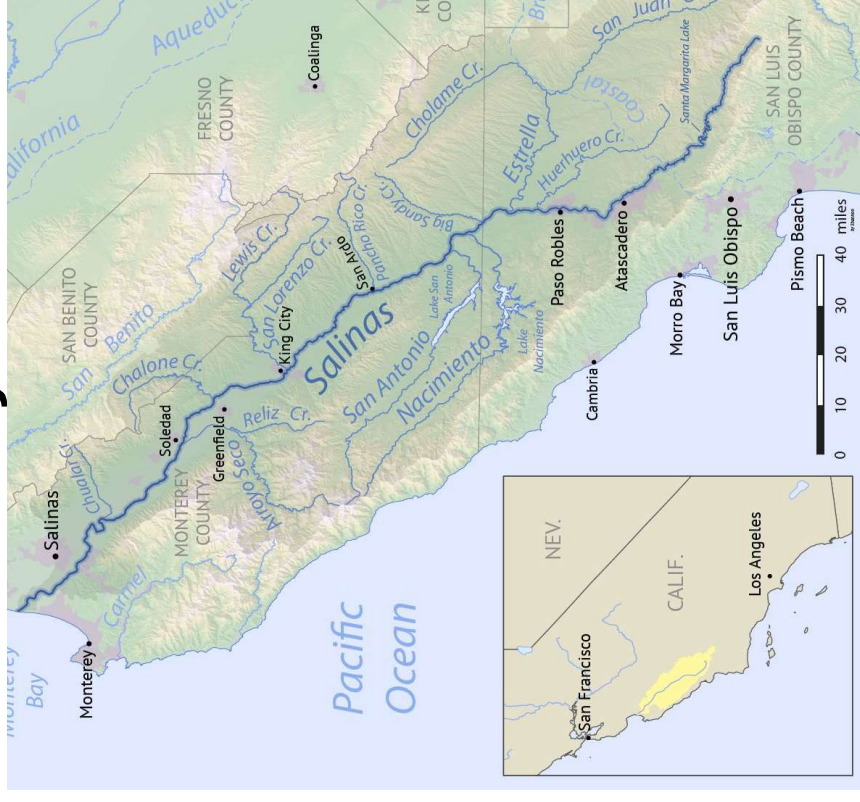
Christopher W. lanman, Kate lundquist, heidi perryman, J. eli asarian, Brock dolman, richard B. lanman*, michael m. pollo

Graphic Courtesy of Eli Asarian, Riverbend Sciences



Current Beaver locations SLO County

- Salinas River
 - Atascadero,
 - Templeton,
 - Paso Robles
- Arroyo Grande Creek
- Oceano Lagoon
- No official population data



Beaver Facts

- Beavers live in family groups, and they mate for life!
- 2-8 beavers typically per family/colony
- Typically 2-4 young per year
- Adults 50-80lbs
- Can hold breath for 15 min underwater. Very awkward on land and graceful in water
- Build dams and lodges to stay safe

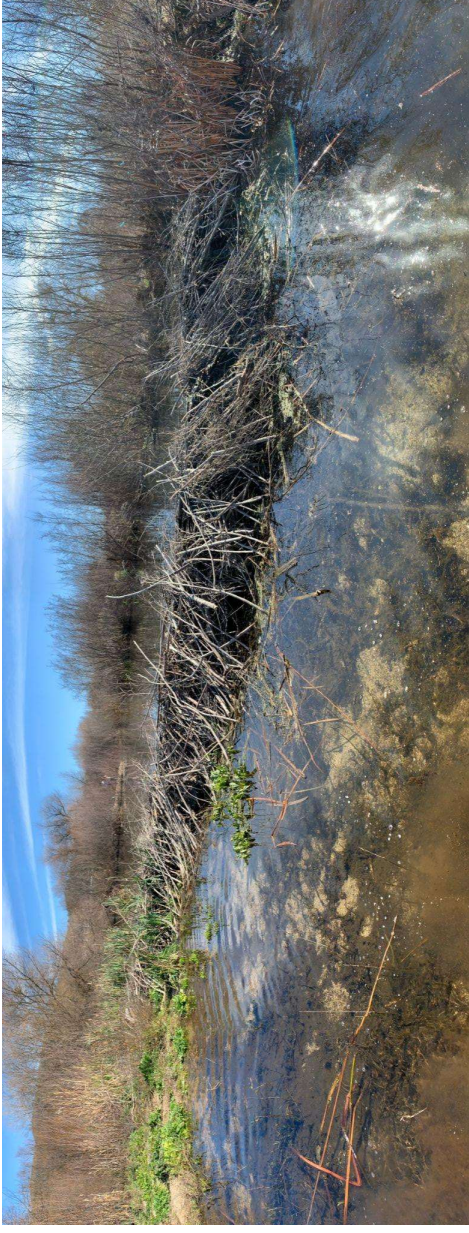


More fun facts about beavers

- Vegetarian diet. In our area, willow, cottonwoods, cattails, herbaceous plants
- Webbed feet
- Second set of eyelids to see underwater
- Second set of lips to allow them to swim with tree limbs in their mouth
- Social animals - groom their fur often to spread oils and keep it waterproofed
- Iron makes the teeth strong & colors them orange - they are also self-sharpening



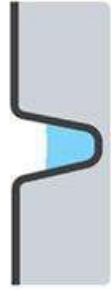
What Beavers Do



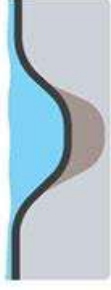
- **Beavers build dams**
- Dams **slow** the water down, **spread** it out onto the landscape, allowing it to **sink** in (Slow IT, Spread IT, Sink IT)
- **Beavers dig channels** and further spread out the ponds. These channels create shallow, slow waters for fish & amphibians
- **Vegetation thrives** around beaver ponds, erosion is reduced.
- **Keystone Species** - create habitat characterized by **abundant wildlife**
- Purify water: slows the water down filtering **silt, nutrients and other pollutants**

A stream comes back to life

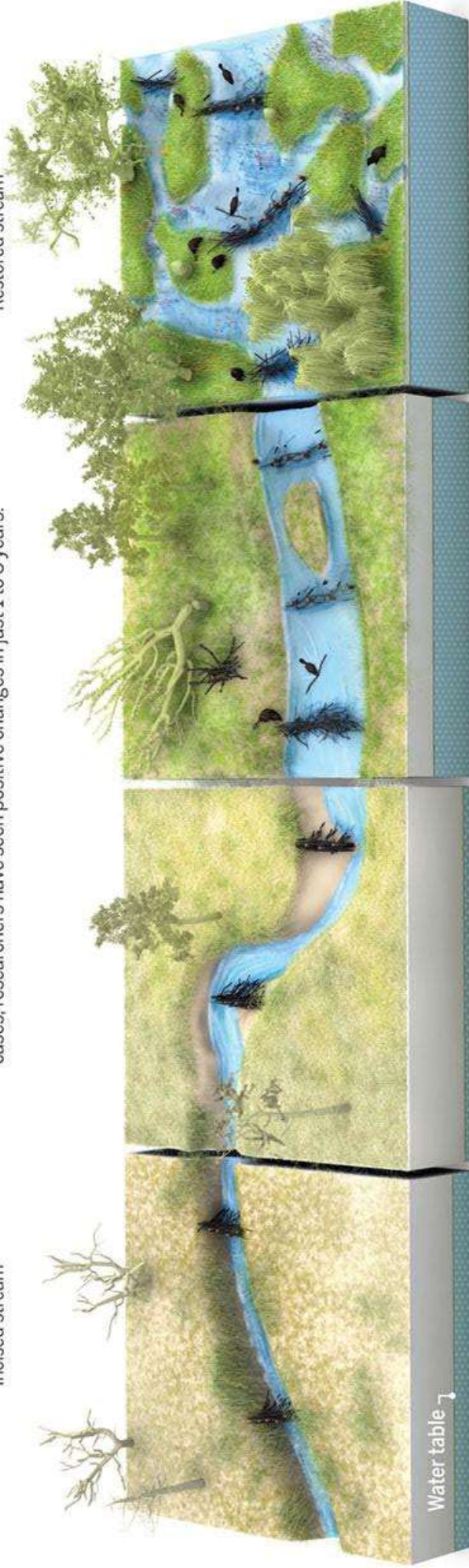
Across the U.S. West, scientists and land managers are using beaver dam analogs (BDAs) to heal damaged streams, re-establish beaver populations, and aid wildlife. In some cases, researchers have seen positive changes in just 1 to 3 years.



Incised stream



Restored stream



Adding dams

Beaver trapping and overgrazing have caused countless creeks to cut deep trenches and water tables to drop, drying floodplains. Installing BDAs can help.

Widening the trench

BDAs divert flows, causing streams to cut into banks, widening the incised channel, and creating a supply of sediment that helps raise the stream bed.

Beavers return

As BDAs trap sediment, the stream bed rebuilds and forces water onto the floodplain, recharging groundwater. Slower flows allow beavers to recolonize.

A complex haven

Re-established beavers raise water tables, irrigate new stands of willow and alder, and create a maze of pools and side channels for fish and wildlife.

GRAPHIC: V. ALTOUNIAN/SCIENCE

Beavers and Fire: Refugia

- Sharps Fire, 2018, Idaho, 65,000 acres
- Beaver complex provides important refugia for wildlife during wildfire.

Photo Courtesy of Joseph Wheaton (Utah State University) Creative Commons Attribution 4.0 International License.



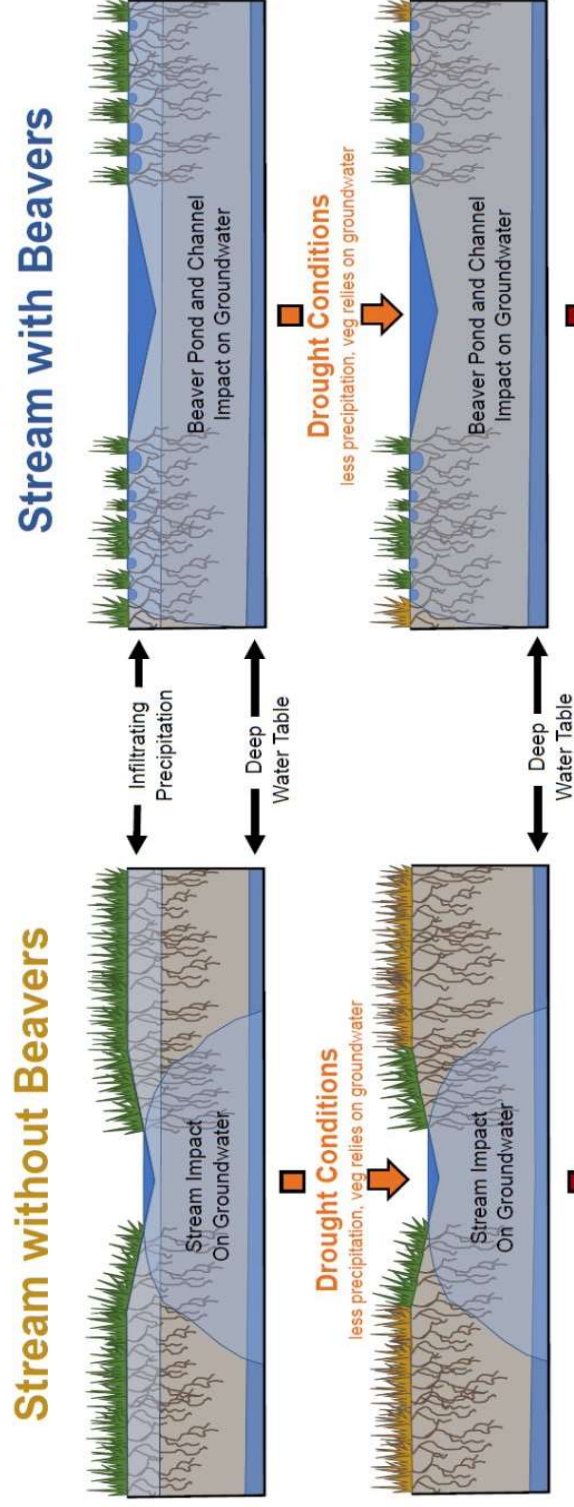
Beavers and Fire: Firebreak

- Wetlands won't burn
- High water table and wet vegetation
- Ideal for fighting wildfires



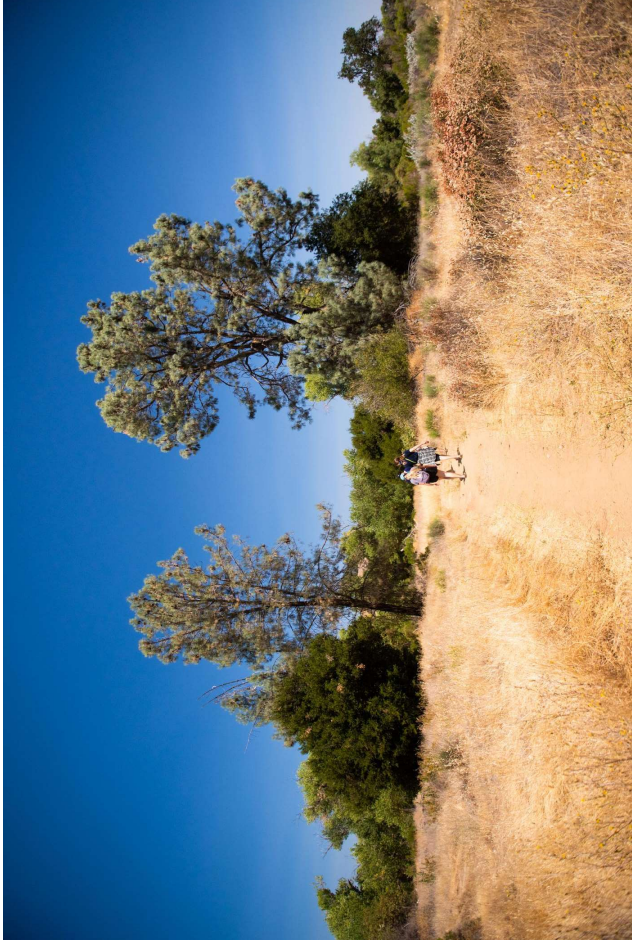
Photo Courtesy of Joseph Wheaton (Utah State University)
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Beavers and Drought



Publication: Fairfax, E, Small, E. Using remote sensing to assess the impact of beaver damming on riparian evapotranspiration in an arid landscape. *Ecology*. 2018; 99(11):e1993. <https://doi.org/10.1002/eco.1993>

Beaver dams keep water on the landscape longer



Photos taken August 2020, Atascadero, CA, 6 months after the last rainfall.

Beaver dam and walk to the beaver dam

Photo by Brittany App

Beavers and Climate Change

- Wetlands are most efficient land ecosystem at absorbing and storing CO₂
- Wet soil holds at least 10-12x more carbon than dry soil
- Anaerobic decomposition means carbon gets locked underwater, and buried underground- turning to peat and eventually coal.



Photo Courtesy of Joseph Wheaton (Utah State University) Creative Commons Attribution 4.0 International License.

Wenjuan Huang, Steven J. Hall. **Elevated moisture stimulates carbon loss from mineral soils by releasing protected organic matter.** *Nature Communications*, 2017; 8 (1) DOI: [10.1038/s41467-017-01998-z](https://doi.org/10.1038/s41467-017-01998-z)

Climate Change continued

- Beaver's chewing habits help lower CO2 levels
- A growing tree absorbs more CO2 than a fully grown tree
- The tree stores carbon in its wood
- Beavers use that wood to build more dams = more wetlands!



Beaver Benefits Summarized

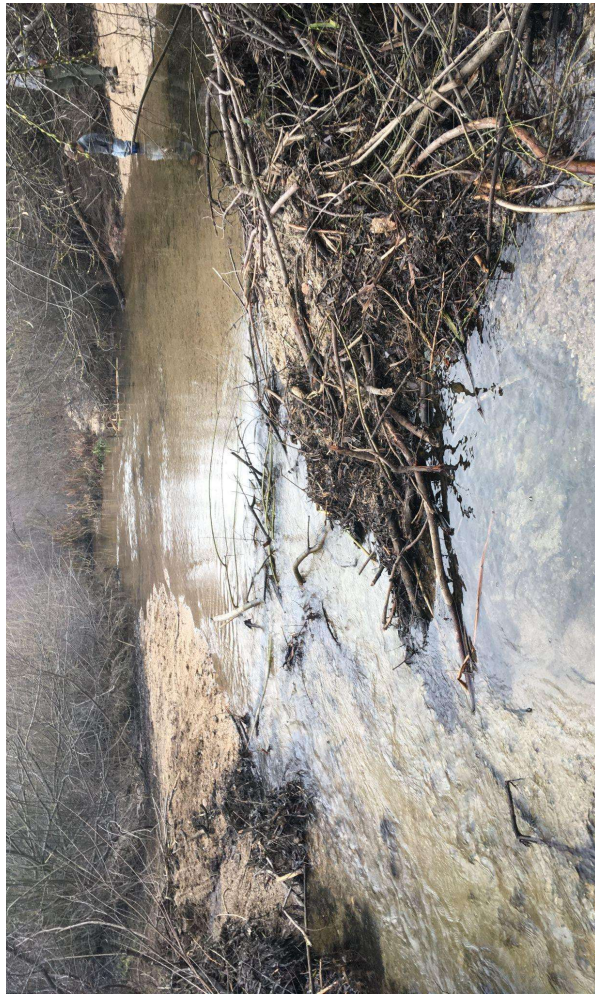
- Keystone Species
- **Wildfire** Refugia/Break
- Store water on the land to help during **Drought**
- Slows water down which reduces intensity of **Floods**
- **Recharge groundwater**
- Improve **Water Quality: filter ash after wildfires essential for fish populations.**
- Provide important **fish and amphibian habitat**
- Combat **Climate Change**



Photo of beaver dam on the Salinas River in Atascadero, June 2021

Obstacles for local Beavers

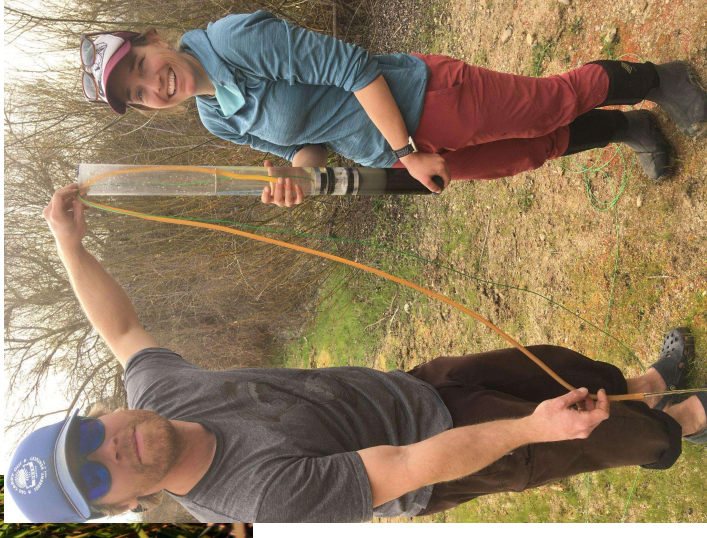
- Beavers are rodents.
- Beavers are considered a nuisance. CDFW issues permits to kill beavers that affect landowners. There is no requirement on reporting the number of beavers 'taken' per permit.
- Lack of education about beavers, ex: "beaver fever", "dams block flow of water", "non-native".
- It's illegal to relocate beavers in CA
- ATVs in the River
- Invasive Species (Phragmites, Arundo, Tamarisk)



SLO Beaver Brigade

Creating the conditions for beavers to thrive in SLO County

- Educate our County on the benefits of beavers
- Restoration projects using human-built beaver dams (BDA)
- Beaver Management Tools
- Support scientists' efforts collecting data on beavers in CA
- River Stewards: Restoration/Cleanups/Out reach



One Year of Beaver Modifications to a Large Sandy River: a case study in Central California

Keltrice Kirksey and Emily Fairfax
 California State University Channel Islands: Environmental Science and Resource Management
 Contact: emily.fairfax@csuci.edu



Motivation and Background

Can small paws make big changes on big rivers?

Beavers are well known ecosystem engineers that help sustain many wildlife, create and widen riparian wetlands, attenuate floods, buffer droughts, and provide a habitat that supports and protects many species. These things are all possible due to how beaver dams and canals slow, spread, and store water in both surface water and groundwater. Beavers typically are most active on small streams where their engineering is obvious, but they are also present on large rivers. The scale of their impacts in these larger hydrologic systems is less understood. Beavers recolonized a site on the Salinas River, a big and sandy river in Central California, and we saw an opportunity to monitor changes - do their dams and canals still provide the same benefits that are often observed on smaller streams?



Figure 1: The main beaver dam within our study area.

Methods

Game Camera Monitoring

- Two camera traps set up near beaver dam, videos retrieved ~2x/month
- Reviewed footage and created dataset of animal occurrences over time

Field Visits and Photospheres

- Ten visits to field site during study - photosphere (360 photo) taken at each
- Note locations of dams and dam condition during visits

Remote Sensing

- Landsat 8 and Sentinel 2 NDVI (Normalized Difference Vegetation Index) to monitor plant productivity over time
- SPEI (Standardized Precipitation Evapotranspiration Index) for drought monitoring over time

Study Location

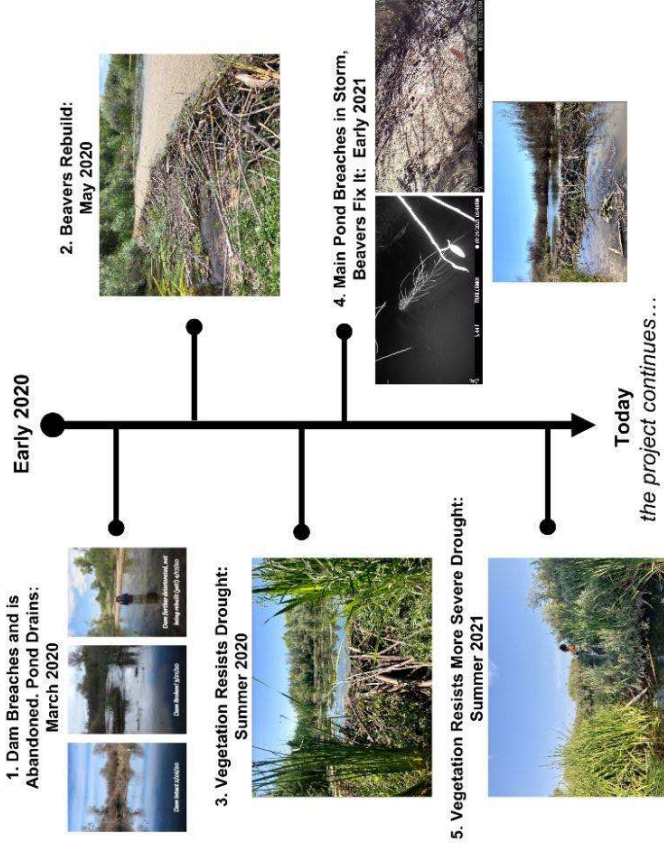


Salinas River,
 Atascadero, California,
 USA

The study took place on a 2.44 km stretch of the Salinas River in Atascadero, CA. The site is adjacent to open space ranches, and a water treatment plant.

Figure 2: Study location on the Salinas River in Atascadero, California (Central California).

Timeline of Key Changes at the Complex



The Big Picture Story

We used publicly available satellite and aerial imagery between 2004 and present to count the number of satellite-visible beaver dams in our study area. We also calculated the SPEI as a measure of drought conditions during that time.

We found that the SPEI did not have a significant relationship with the number of beaver dams or the change in the number of beaver dams ($p > 0.05$). A lethal trapping permit was issued and executed in the study area around 2017 which could explain the dramatic population crash during that time. Generally, the beavers in this area have created and maintained disturbance resistant wetland habitat for the majority of the last 17 years. The other portions of the Salinas do not have the same observed drought resistance or biodiversity.

Historic Counts of Satellite Visible Beaver Dams

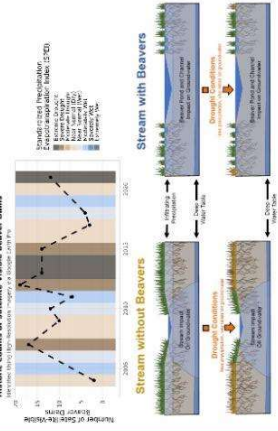


Figure 5: Top history of satellite-visible beaver dams in study area. Background shaded according to drought conditions for each year. Bottom: conceptual model for how beaver damming increases drought resistance of riparian vegetation by storing water in saturating soils and in ponds during low periods.

See the Changes Yourself!

3D models are great for seeing the study area changes in what you are looking for. You can see some of our game cam highlights for yourself at: bit.ly/SalinasBeavers or by scanning the QR code below.



Acknowledgements

This project was supported by a research grant from Biodiversity First and the National Science Foundation HSI-SMART grant. The material is based upon work supported by the National Science Foundation under Grant No. 1528593. Special thanks to our furbers: SLO Beaver Brigade, Joe, Colvin, and Brandon!

Beavers Increased Riparian Productivity Despite Intensifying Drought

- Over the last five years, beavers have consistently increased the productivity of nearby riparian vegetation (Fig 3)
- This happened despite 2020 and 2021 being drought years
- We determined correlations between the number of beaver dams, the drought index, the winter (off-season) NDVI, the summer (growing season) NDVI, and the Year.
- Growing season NDVI had a negative correlation with SPEI - the riparian zone got greener and denser while the drought got worse!

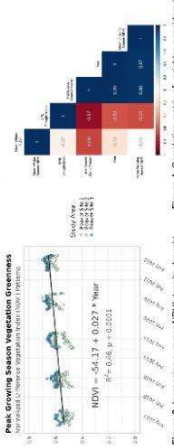
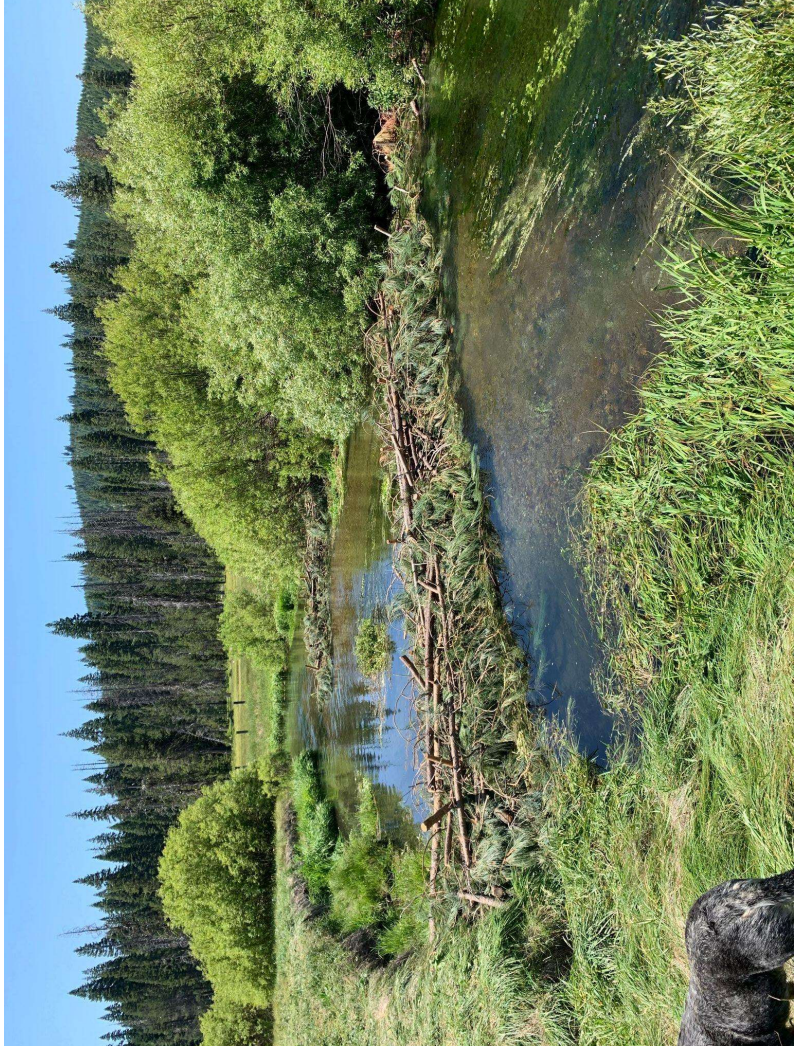


Figure 3: Increasing summer NDVI despite drought. Figure 4: Correlation matrix of variables considered

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Beaver Dam Analog (BDA) Installations



These training trips were made possible by a grant from a local organization, Biodiversity First!

Beaver Relocation



Thank you to the Tulalip Tribes for your wisdom and generosity!

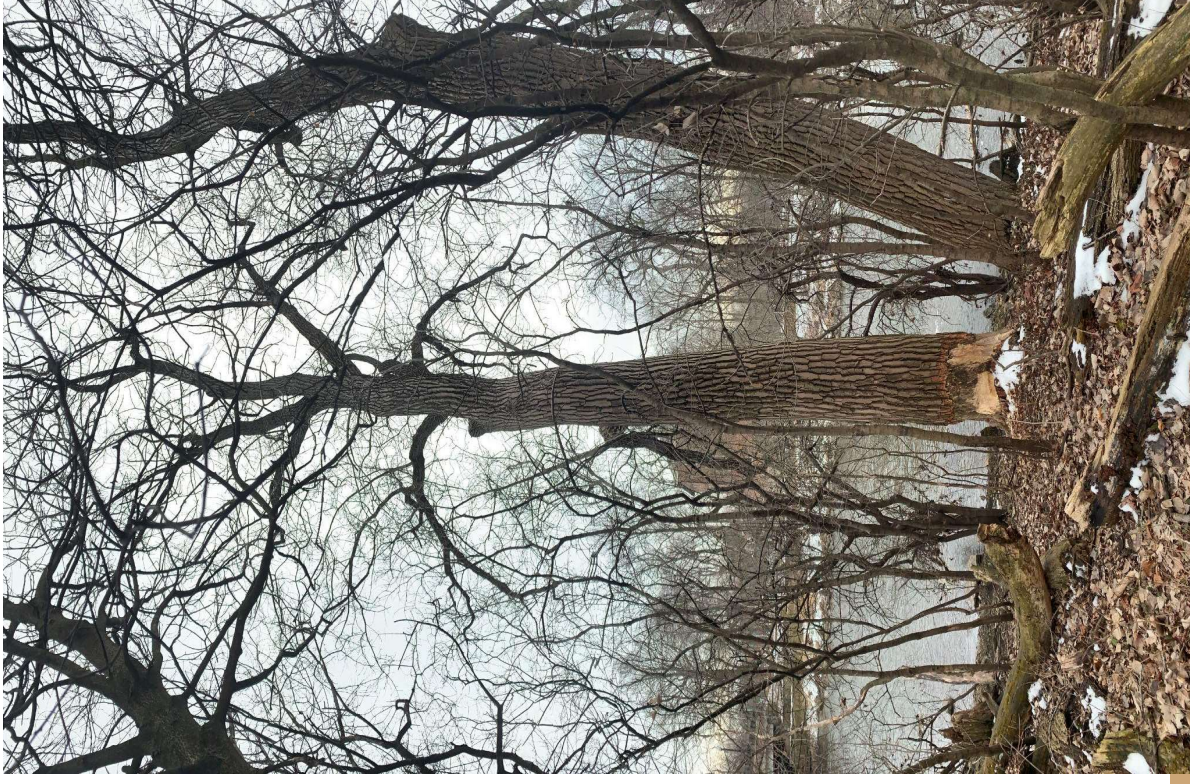
Beaver-Human Conflicts

A growing population of beavers means more interaction with humans.

Unwanted problems can occur:

- Chew down trees
- Cause flooding from dam building - flooded trails and yards
- Block road culverts

All can be prevented!



Beaver Management Tools



Flow devices allow humans to set the height of beaver ponds. Wrapping trees protects them from beavers.

Photos © Mike Callahan, Beaver Institute



SLO Beaver Brigade River Stewards in Action



Mural by Brandy Lee Phippen @Bru Coffeehouse, Atascadero for the Equality Mural Project



Successful Salinas River cleanup! Photo by Brittany App

SLO Beaver Brigade: River Stewards (Continued)

- Identified *Phragmites australis* species as an invasive (see report).
- Support OAEC in their efforts to propose change in CDFW code to require landowners to **exhaust all non-lethal** methods PRIOR to issuing a permit.
- Support pilot program to allow for **relocation of beavers in California.**
- Continue to support research of beavers at site on the Salinas River.

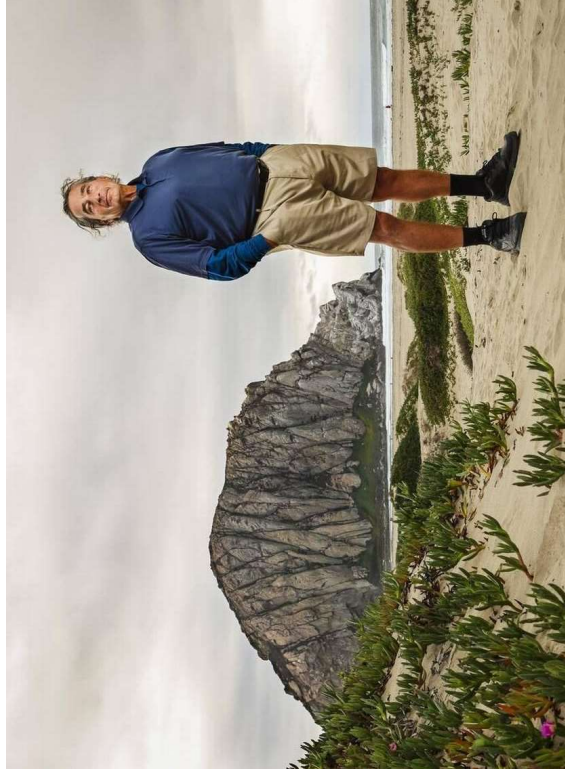


Northern Chumash View of Beavers

“Beaver are one of the wonders of our environment, we love the Beaver, they are an integral part of all things that have to do with water, creating so many great benefits for our environment. Please keep me in the loop, I am extremely interested in your project, and have much to say concerning our Sacred Beavers.

I will be traveling and not able to make your walk, but let everyone know we are great supporters of the Sacred Beavers, the work they do to bring life to our streams and rivers. They play a hidden connection to the great Spirit and the bringing of rains, recharging our aquifers, and the regeneration of life to our streams and rivers. Our Sacred Beavers can play a great part in climate change.”

-Fred Collins, former Chief of the Northern Chumash Tribal Council, warrior for the environment



Beavers are a Keystone Species



“The politics and ethical practices of wisdom”

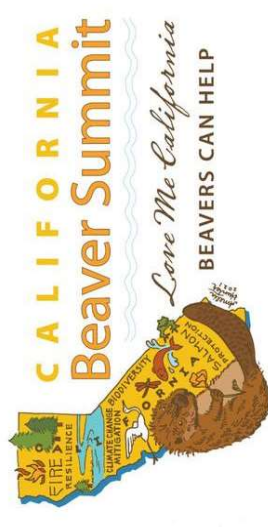
For more beavers in CA information



Climate change is making California hotter, drier, and harder for people and wildlife. Beaver can help.

CA Beaver Summit April 2021: <https://cabeaversummit.org/day-one-video/>

- [Kevin Swift: Swift Water Design](#) – Local Examples of Beaver Management
- [Michael Callahan: Beaver Institute](#) – Common Conflicts and How to Manage
- [Emily Fairfax, Cal State Channel Islands](#) – Beavers & Fire Refugia
- [Nina Hemphill: BLM](#) – Using BDAs to restore small meadows
- [Bob Pagliuco: NOAA Fisheries](#) – Beavers, BDAs & Coho Salmon Recovery
- [Betsy Stapleton: SWWA](#) – Barriers to Beaver Restoration



What can you do?

- Participate in our [Beaver Data Gathering Event](#) this spring. (Citizen Science in action!)
- Get on our newsletter and sign up for a Watery Walk out to a beaver complex.
- Join in on a River Cleanup
- Support legislation to legalize pilot beaver relocation projects.
- Contact your CDFW and let them know you want them to exhaust all possible non-lethal management tools PRIOR to issuing depredation permits for beavers to landowners.
- **<http://slobeaverbrigade.com>**

Closing Reflection

- Recall your beginning reflection today of the waterways around us.
- Have your thoughts of the rivers and streams changed?
- What now do you see as the **potential** of our rivers?



