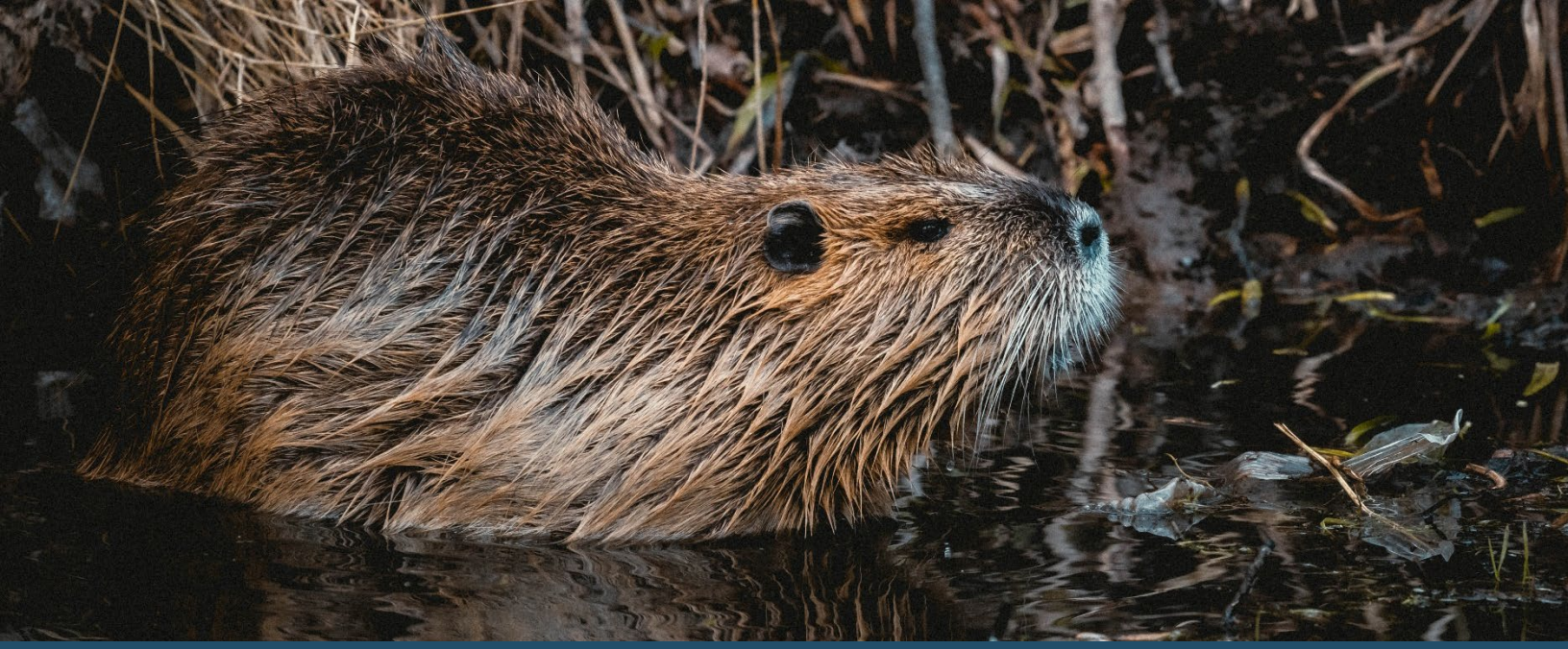
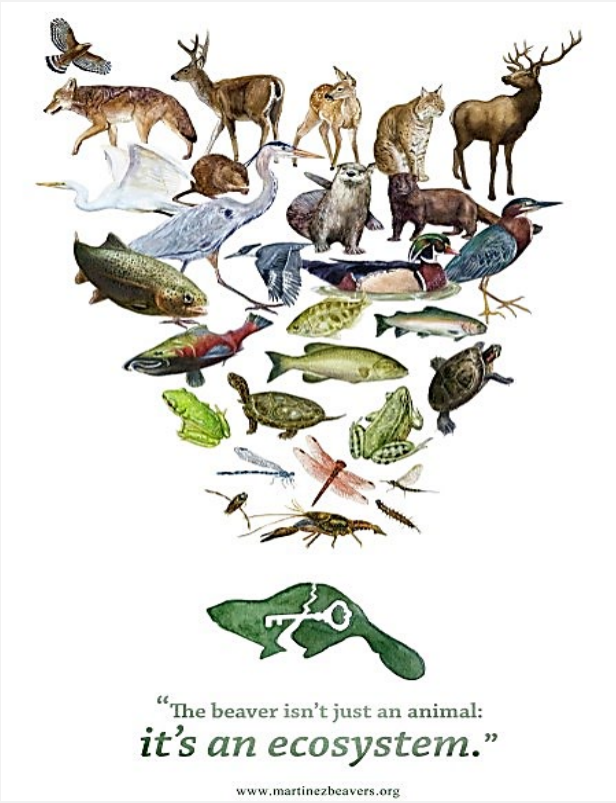


LANDOWNER GUIDE TO BEAVERS

Beavers are considered a “keystone species”, that is they are a species that modifies the environment in such a way that benefits the ecosystem as a whole and encourages the presence of other species. By slowing and spreading water, changing vegetation, and creating or expanding ponds and wetlands, beavers dramatically alter the landscape. Insects, fish, reptiles, birds, amphibians, terrestrial ungulates, and carnivores all depend on the regeneration and ecological integrity of the wetlands and riparian areas that are enhanced by beaver activity. Without beavers, the integrity of these ecosystems decline substantially.

In addition to ecological benefits, numerous scientific studies and anecdotal evidence are proving that beaver are a super effective partner for building greater resilience to drought, fires, and floods. They also help improve water quality by slowing and spreading water and rehydrating the landscape. In the absence of beaver dam complexes, snow and stormwater runs off the landscape at a faster rate, causing stream channels to deepen and narrow, eventually disconnecting them from their natural floodplain and compromising the riparian vegetation. Disconnected channels result in ecological degradation and makes the landscape and ecosystem more vulnerable to disturbances from fire, erosion, and floods.



The beaver was hunted to near extinction in Northern America in the early 1800s. Before this time, beaver colonies would have been present in most Colorado mountain streams. Beavers influence physical stream processes and what we see in most streams today is a degraded condition relative to when beaver were present through the west prior to the 1800s. Check out this video to see how beavers influence stream complexity and resilience to disturbance.

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Beaver Benefits

Wildfire resilience - Protected and restored beaver ponds, meadows, and wetlands can provide important natural fire breaks. Additionally, these areas have been found to rebound more quickly post-wildfire. A 2020 study of large western US wildfires found that riparian vegetation around beaver complexes had a three times greater rate of survival during a wildfire than vegetation around stream segments without beavers. In addition, beaver ponds and wetlands provide ecosystem service benefits such as debris ash flow filtration and the complexes also serve as critical refugia to wildlife during and following wildfires. Photos like the one below taken the spring following the 2020 Cameron Peak Fire in Colorado are becoming important visual tools to show the dramatic forest and upland habitats losses from mega wildfires, except in locations where there are sizeable beaver complexes.

Beaver complex that survived the 2020 Colorado Cameron Peak fire. Photo by Evan Barrientos/Audubon Rockies

Drought and flood resilience - Studies indicate that healthy natural stream systems and restored headwater floodplains and wetlands recharge local aquifers. Enhanced water storage capacity in floodplains/beaver complexes allows for slow infiltration of runoff into adjacent alluvial aquifers and wetlands, providing natural storage during spring runoff that can be slowly released to streams during the summer months. This is especially beneficial to maintain baseflows during the late summer and during drought. Similarly, during floods beaver ponds and meadows may help to attenuate flood flows and reduce peak runoff volumes.

Increased water quality – reducing sedimentation and other pollutants – Studies have documented that beaver complexes retain sediment and nutrients—as well as heavy metals—leading to a reduction to downstream pollution levels. A study in England monitored 13 beaver ponds built by beavers that were re-introduced to a controlled 4.5-acre site. They determined that the beaver ponds trapped on average 7.8 tons of sediment over three years, totaling 101.5 tons. The water clarity improved substantially downstream from the ponds due to the ponds filtering out sediment coming from the intensively managed farmlands upstream of the ponds.

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What do beaver need to survive?

Riparian Vegetation

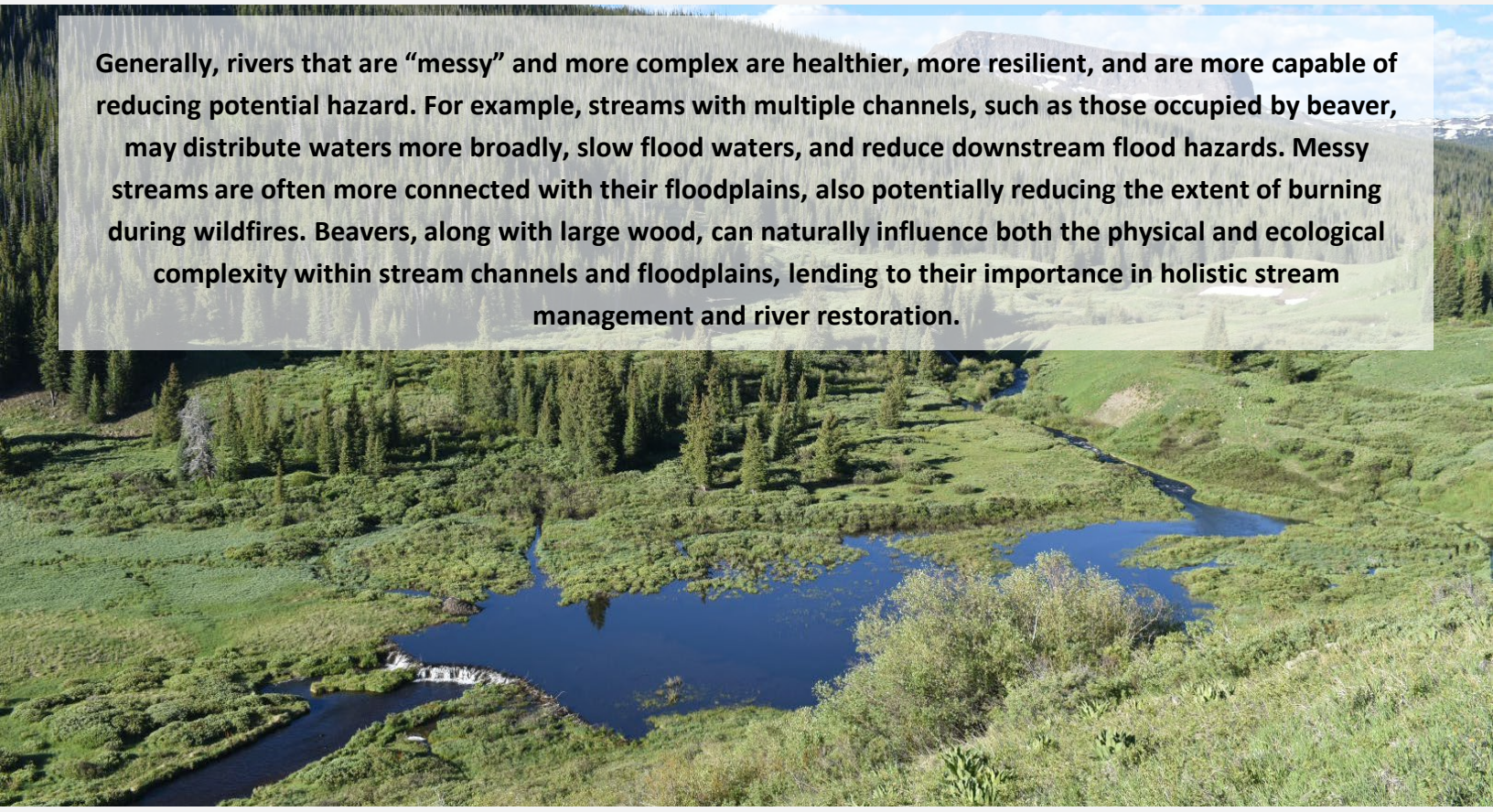
Beaver eat both woody and non-woody herbaceous plants. They prefer herbaceous vegetation, but also consume aspen, cottonwood, and willow species and store large quantities of aspen and willow for winter consumption. Beaver use a wide variety of trees, shrubs, cobble, mud, and herbaceous vegetation for use as construction material for their dams and lodges. This material must be available near the stream to reduce the beaver's exposure to predators. When there are not enough building material and food sources, beaver will move up or down stream in search of another suitable location.

Flowing Water

Beaver are found across a wide range of aquatic landscape types in all 50 states from deserts to forests, but they prefer to build dams on small- to medium-sized streams with slopes of less than 6%. Steeper grades, channelized rivers, or larger streams usually have too much water and power for beavers to maintain dams over the long term. Perennial streams are favored, but beavers can also inhabit intermittent streams under the right circumstances.

Pools and Ponds

Despite their large teeth and tails, beavers are defenseless on land against predators. However, in the water, they can hold their breath for long periods of time and are excellent swimmers. By building dams, beavers create the depth of water needed for cover to shield them from predators (typically three feet or more). Additionally, the lodge entrances are built below the water surface. Lodges are where winter food is cached. In order to maintain access to this food through the winter, adequate pool depth is also critical such that access is maintained under any surface ice.



Generally, rivers that are “messy” and more complex are healthier, more resilient, and are more capable of reducing potential hazard. For example, streams with multiple channels, such as those occupied by beaver, may distribute waters more broadly, slow flood waters, and reduce downstream flood hazards. Messy streams are often more connected with their floodplains, also potentially reducing the extent of burning during wildfires. Beavers, along with large wood, can naturally influence both the physical and ecological complexity within stream channels and floodplains, lending to their importance in holistic stream management and river restoration.

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Beaver Recolonization or Relocation

The ideal situation is when beaver can naturally return to and thrive in a degraded stream system on their own. However, if the local populations are too far away or depleted, project managers may need to relocate beaver from other locations to the project area. Relocation of beaver requires a permit from **Colorado Parks and Wildlife** and usually requires taking the time to live-trap the entire beaver family over the course of a week in order for the relocation to be successful (usually 2 adults and 2 kits, but often there can also be 2 subadults as well). Moving just one adult beaver often results in that beaver not staying where it was released and/or not surviving or reproducing. Even moving the whole family is no guarantee they will stay if there are issues with predation, human encounters, loud roadways, or insufficient food and/or building supplies.

Human-made beaver dam structures in Gunnison County

When a stream is significantly incised and disconnected from its floodplain and riparian vegetation is not robust, sometimes beaver need our help to restore the stream and vegetation before they can return and inhabit an area. In these instances, case studies across the Western States have shown using low-tech process-based restoration (LTPBR) methods of installing temporary hand-built structures that mimic beaver dams can help jumpstart the habitat healing process. Once the riparian vegetation has recovered, beaver located upstream or downstream may be able take over for the long-term maintenance of the riparian corridor by moving back into their ancestral land and waters.

Beaver Challenges: What to Consider

Over the past ten years, valuable resources have been developed to inform landowners and land managers about the many benefits of allowing beaver to remain in place and how to manage issues that might be problematic, such as flooding roads or pastures, and tree removal. One of the best comprehensive resources, ***The Beaver Restoration Guidebook***, was developed in partnership with USFWS and USFS staff. Another great resource is ***Working with Beaver For Better Habitat Naturally***, written by Sherri Tippie, a local Coloradan with decades of experience in successful beaver coexistence measures.

Common human-beaver conflicts often stem from the following issues:

Plugging Road Culverts

Beaver often build dams right in front of a culvert that can end up causing flooding of the road during high water months. This is such a common issue that land managers and road agencies have developed many different "beaver deceiver" designs over the past few decades. These devices allow beavers to build dams, while still allowing water to flow through culverts.

Flooding Fields

As beaver continue to build their complexes over the years, the ponds become larger and occupy more area, sometimes spilling into areas the landowner does not want flooded. A solution to this is called a "pond leveler" which keeps the pond at the desired size by allowing excess water to flow downstream.

Tree Loss

Landowners and managers may have trees that they rather not have beaver cut down, and this can be prevented by caging the trees in sturdy wire or painting the trunks with a paint mixture that contains sand to make the tree bark gritty.

With these cost-effective measures available to resolve conflict, many public and private landowners are finding that the benefits of beaver far outweigh any management challenges.

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WANT TO LEARN MORE?

Here are a few additional resources you may find helpful:

Books

- Eager, the Surprising, Secret Life of Beavers and Why They Matter, by Ben Goldfarb
- Saving the Dammed: Why We Need Beaver-Modified Ecosystems, by Ellen Wohl

Articles

1. LA Times, July 25, 2022 Want to fight climate change and drought at the same time? Bring back beavers, Great article by Dr. Emily Fairfax & Dr. Chris Jordan about why we need to partner with beaver to build resilience to climate change impacts.
2. Scientific American, Feb 7, 2022- Beaver Dams Help Wildfire-Ravaged Ecosystems Recover Long after Flames Subside - great article about beaver complexes filtering post-fire ash debris across western states - of great interest to water users/providers and fish and wildlife agencies and organizations.
3. Water Education Colorado, May 12, 2021- Scientists: Beavers latest tool to emerge in rebuilding drought-stricken streams - Water Education Colorado - interviews with both farmers and wetland scientists and informs readers about the Oct. 2021 Colorado Beaver Summit.

Videos

- Want to Solve Wildfires and Drought? Leave it to BEAVERS! PBS Terra. A quick review of the history of beaver in North America (nearly trapped to extinction), basic explanations on beaver benefits to the ecosystem, and interviews with top researchers.
- Partnering with Beaver: Restore a Wetland. Mark Beardsley, EcoMetrics. A great primer on beaver basics and why they are so important to healthy river ecosystems.
- Partnering with Beaver: A Landscape View. Jessica Doran, Ecometrics. This presentation follows up on Mark Beardsley's above by providing the next level of information about how to consider restoring beaver to Colorado's watersheds.
- Restoring streams post-fire with low-tech structures in Idaho, Idaho Conservation Commission