

FACT SHEET

NO LONGER WORKING AGAINST THE STREAM

THE BENEFITS OF HEALTHY RIVERSCAPES FOR CLIMATE RESILIENCE AND ECOSYSTEMS IN THE WEST

Healthy riverscapes are critical natural infrastructure; they filter pollution from our water, support fish and other wildlife, form natural firebreaks, and buffer communities from the impacts of flooding and drought. Unfortunately, most riverscapes in the West are a tiny remnant of their former footprints and no longer provide meaningful habitat or regulate the filtering and flow of water as we need them to do. But with strategic investments and restoration efforts, we can improve the health of our riverscapes and regain these benefits.

This fact sheet summarizes the ecological, community, and economic benefits of healthy riverscapes, with an emphasis on arid and semiarid regions of the West where communities and wildlife are already confronting water insecurity, wildfires, and persistent drought.

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Riverscapes can be reconnected with their floodplains through restoration efforts, so natural processes such as beaver dam building and wetland creation can be re-established. Trail Creek (left) was treated with beaver dam analogues and artificial logjams in September 2021 and in a year's time beavers were able to take over the dam building, slow the flow of water, and create wetlands (right).

DEFINITIONS

Riverscapes are streams, rivers, or wet meadows and their associated floodplains, wetlands, and riparian vegetation.

A **healthy riverscape** is defined by three principles. A healthy riverscape needs space; is physically complex and often cluttered with vegetation and wood; and slows the flow of water, allowing it to sink and spread.

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BENEFITS OF HEALTHY RIVERSCAPES

Because most of our streambeds and riverscapes are currently constrained and degraded, it's easy to underestimate the role that a healthy waterway can play in increasing climate resilience, wildlife habitat, biodiversity, access to freshwater, and other community benefits. Many of these benefits could return through restoration efforts, which can include beaver-based restoration among other solutions.

Drought and Flood Resilience

Healthy riverscapes are naturally resilient systems that can help western communities cope with drought cycles and rain events that are made worse by climate change.¹ Healthy riverscapes can be recognized by their multiple flowing channels, adjacent wetlands, abundant streamside vegetation, and beaver dams that allow them to naturally store and slowly release water.² When freshwater systems can naturally retain water on the surface and in shallow aquifers, they have an enhanced ability to slow flows during spring runoff or heavy rain events and release stored water during dry periods—mitigating both floods and drought.³

Through riverscape restoration, some streams can flow for a longer time or transition from being seasonal to flowing year-round, resulting in greater resilience against the impacts of climate change.⁴ In many cases, increasing drought and flood resilience can be as simple as encouraging and facilitating robust beaver colonies. When beavers are active in riverscapes, their dams and associated ponds and canals increase base flows and elevate the water table, resulting in increased groundwater storage and aquifer recharge.⁵

Wildfire Risk Reduction and Post-wildfire Recovery

Large wildfires exacerbated by climate change are damaging lives and landscapes in the West and having far-reaching impacts on air and water quality. Healthy riverscapes can help reduce these impacts, both before and after fires. The saturated soils, braided stream channels, and vegetation associated with healthy riverscapes and beaver dam complexes do not readily burn. Thus they can slow fire movement and provide refuge for wildlife.⁶ Long stretches of restored and connected beaver dam habitat can serve as natural firebreaks, giving firefighting teams time to evacuate people and contain a wildfire.⁷

After a fire, wetlands and beaver ponds continue to help by filtering out the sediment, ash, and other pollutants that are left in a fire's wake.⁸ This filtering can provide cleaner water for downstream fish and other aquatic organisms and decrease the amount of sediment that ends up in reservoirs and water treatment facilities.⁹

Water Quality

Both people and nature need clean water to thrive. Healthy riverscapes—and their associated vegetation, beaver dams, and logjams—help filter out pollutants and capture and retain sediment.¹⁰ When water flow is slowed for days or weeks, nutrients and toxics can be removed from the water column by plant uptake or microbial decomposition, or through a process of settling out or sticking to solid surfaces.¹¹ This helps maintain water quality needed to support fish and other aquatic wildlife and protects downstream drinking water.¹² Public water utilities and state conservation commissions have proactively deployed structures that mimic beaver dams to reduce sediment transport and capture ash resulting from fires.¹³



© Emily Fairfax

This beaver-created wetland area was able to resist burning and provide safe harbor for wildlife during the 2021 Beckwourth fires in California.



Great blue herons and many other birds make their homes in the varied habitats found in healthy riverscapes.

Increased Fish and Wildlife Habitat

Healthy riverscapes help support fish and other wildlife species—many of which are struggling or declining due to loss of habitat, water scarcity, and other threats.¹⁴ Even though freshwater ecosystems occupy only a small proportion of the landscape, they are regional hot spots of biodiversity and exhibit high rates of biological productivity.¹⁵ Healthy riverscapes not only provide essential habitat for fish and other aquatic species but also support 70–80 percent of terrestrial wildlife during some part of their life cycle by providing microclimates and shade, clean and abundant water, wood accumulation, nutrient retention and cycling, and habitat and food.¹⁶ For example, greater sage grouse, a regionally important and declining upland species, rely on the wet meadows and vegetation of healthy riverscapes when they raise their chicks.¹⁷ And moose and other large mammals rely on healthy riverscapes for safe cover and movement corridors.

Wildlife and Livestock Forage

As riverscape health declines, floodplain vegetation decreases, leaving less food for wildlife and livestock. One way to improve riverscape health where livestock graze is by employing rotational grazing or wildlife-friendly fencing to reduce or minimize grazing impacts near streams. This allows native vegetation to grow back, encouraging beavers to return and build dams that will reconnect rivers with their floodplains, recharge groundwater, and maintain wetlands.¹⁸ These healthy riverscapes can then maintain stream flows for longer into the summer, which can increase both vegetation productivity and the length of time that plants are available for wildlife and livestock.¹⁹ If grazing management programs are maintained, there can be a sustained increase in available livestock forage. In a survey of ranchers participating in beaver-based restoration, most felt the water and forage availability benefits outweighed any costs of taking steps to accommodate beavers.²⁰

Carbon Storage

Healthy riverscapes store carbon in riparian vegetation, sediments, and woody materials that accumulate in their wetlands.²¹ Research estimates from Colorado indicate that active beaver meadows have significantly higher carbon storage than the dry grasslands that tend to move in after streams and wetlands have been simplified.²² When beaver dams become inactive (e.g., when beavers abandon a site or are removed through trapping), the carbon benefits of their meadows diminish over time but can persist for nearly three decades.²³ The net carbon balance of a beaver-modified floodplain is complex, and more study is required, but the science to date strongly suggests that riverscape restoration, particularly restoration with beavers, can support a significant increase in carbon storage.²⁴

CULTURAL AND SPIRITUAL BENEFITS

The cultural and spiritual significance of healthy riverscapes, their waters, and their wildlife is impossible to enumerate and quantify but should not be overlooked. These natural systems are important to tribes whose ancestors were connected to them for millennia and valued for the fish and wildlife, including salmon and beavers, that are culturally and spiritually significant to many tribes.



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Tribes, public land managers, and others are turning to beaver mimicry and other approaches to restore riverscapes. Here, the Tulalip Tribes' Natural Resources Department installs a beaver dam analog.

Economic Impacts

Riverscape restoration delivers socioeconomic benefits and creates high-quality jobs for restoration practitioners, project managers, construction workers, engineers, hydrologists, and fish biologists. Aquatic restoration programs support on average 15 jobs per million dollars spent.²⁵

In addition to job creation, the ecosystem services provided specifically by beavers lead to clear economic benefits. These include restored salmon runs; increased recreational spending; decreased flooding severity; savings from restoration projects that would no longer be required; aquatic habitat; longer water residency times that support

fish, agriculture, and recreation; and incalculable tribal subsistence value. Scientists have estimated beavers' economic impact in North America to be \$690 per hectare per year (\$179,000 per square mile per year).²⁶ In Utah, allowing beavers to return to the Escalante River Basin would provide millions of dollars in estimated benefits to residents and visitors annually.²⁷ For another example, if beavers and their habitat were maintained on federally managed lands in Oregon, Oregonians would reap hundreds of millions of dollars per year in future benefits across diverse segments of the economy.²⁸

Healthy riverscapes can also provide significant savings in flood damage costs. Streams connected to their floodplains can store floodwater and slow peak flow events, protecting property and infrastructure downstream. For example, the value of flood risk mitigation benefits from a network of riverine wetlands in Vermont was estimated at \$126,000–\$450,000 per year in avoided property damage alone, sufficient to cover more than a quarter of the estimated cost of wetland conservation in the watershed.²⁹

Healthy riverscapes decrease the cost of providing clean drinking water. Utilities, such as Denver Water, are restoring riverscapes to prevent sediment from traveling

downstream to reservoirs and water treatment facilities.³⁰ Such investments can decrease future reservoir dredging costs and reduce the likelihood that sediment will clog hydropower and filtration systems.

Finally, healthy riverscapes provide economic benefits by supporting biodiversity with recreational and commercial value. For instance, in British Columbia, researchers estimated that floodplain restoration sites have directly contributed to the production of 27–34 percent of the out-migrating wild coho smolts, supporting both recreational and commercial fisheries.³¹

CONCLUSION

It is time to reimagine the role our riverscapes can play in increasing our resilience to climate change, providing economic benefits, and supporting nature. Healthy riverscapes will reduce water scarcity, improve water quality, and provide habitat for fish and wildlife while simultaneously increasing resilience to the increasing frequency and severity of droughts, floods, and fires. We must start implementing this long-term strategy now, so we can reap the benefits in the future.



© Anne Lowe

Beavers are ecological engineers that create and maintain wetlands in riverine systems.

INTERESTED IN LEARNING MORE ABOUT RIVERSCAPE RESTORATION?

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[An Overview of Riverscape Restoration—How We Got Here and Where We Need to Go](#)

[Five Policy Pathways to Restoring Healthy Riverscapes in the West](#)

[How the Bureau of Land Management Can Restore Healthy Riverscapes in the West](#)

ENDNOTES

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