



FACT SHEET

NO LONGER WORKING AGAINST THE STREAM

AN OVERVIEW OF RIVERSCAPE RESTORATION— HOW WE GOT HERE AND WHERE WE NEED TO GO

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. These benefits are especially beneficial in the semiarid and arid West where communities and wildlife are already confronting water insecurity, wildfires, and persistent 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.

This fact sheet outlines how we constrained our riverscapes over time and lost many of the benefits they provide, and how riverscape restoration in the West can aid efforts to build resilience and adapt to climate change.

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A healthy riverscape on Sheep Creek in Pike National Forest in Colorado.

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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.

HOW DID WE GET HERE, AND WHAT DID WE LOSE ALONG THE WAY?

Today we regularly see creeks squeezed into narrow channels or streams hemmed in and transformed by the built environment, often with only a few trees and plants alongside them.

They are ghosts of their former more braided and complex riverscapes, constrained in their movement and severed from essential wetlands and floodplains, which have likely been drained or developed.¹ Because healthy riverscapes are so scarce, it is easy to underestimate the role they can play as a buffer against intense droughts, large wildfires, and frequent flooding.

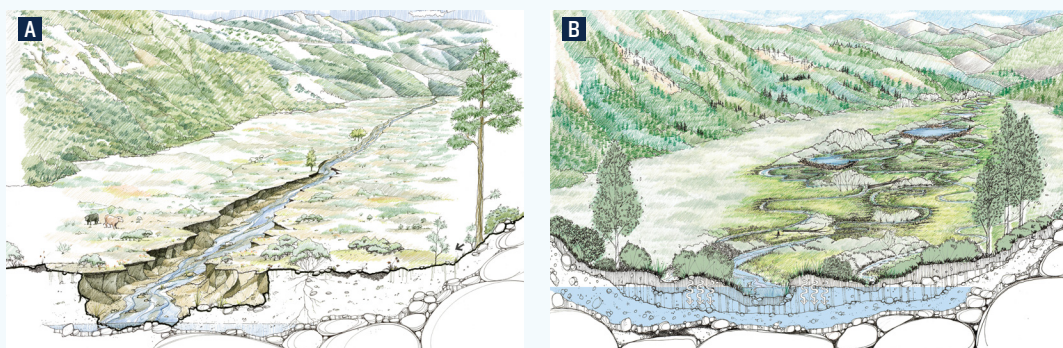
Healthy riverscapes, which in many cases means streams and rivers thick with vegetation such as downed trees and beaver dam complexes, function by temporarily retaining water, then slowly releasing it over time (see Figure 1B). This natural storage capacity reduces flooding and prolongs water availability during periods of heat and drought.² Further, the wet, saturated soils and vegetation of floodplains, wetlands, and braided stream channel systems created by beavers don't readily burn and therefore serve as natural firebreaks, slowing the spread of wildfires and providing a refuge for wildlife.³ After fires, physically complex waterways help reduce the amount of sediment that would otherwise move downstream into reservoirs or water treatment facilities, improving water quality and reducing costs.⁴ Healthy riverscapes also provide productive, diverse habitat and help a wide array of plants, fish, birds, invertebrates, amphibians, and mammals endure harsh and unpredictable conditions in the arid and semiarid regions of the West.⁵

Before Europeans arrived in North America, healthy riverscapes were abundant, constituting roughly 20 percent of the land surface of the continental United States.⁶ Starting in the late 1600s and continuing through the early 1800s, however, beaver trapping led to the systematic removal of nature's most industrious wetland engineers from riverscapes across the country. Over time, agriculture, logging, and mining further altered our waterways.⁷ As rivers were separated from their floodplains, then diverted, diked, dammed, and otherwise industrialized for navigation, irrigation, and energy production, their natural flows and processes were further disrupted.⁸ As a result, the footprints of healthy riverscapes have been reduced and most of this country's dynamic, multi-threaded rivers have been erased.⁹ Across the West, most streams and rivers are now hydrologically disconnected from some portion of their historic floodplains (see Figure 1A).

Without the ability to meander across floodplains and form wetlands, these waterways are less able to retain spring snowmelt, slow stormwater, naturally refill aquifers, or prevent sediments and soils from being flushed downstream into our drinking water infrastructure. These riverscapes, once full of clean water and life, have become less capable of serving their valuable role as nature's carbon and water sponges, reducing their ability to store carbon and leaving our communities more vulnerable to persistent drought, wildfires, pollution, and flooding.¹⁰

FIGURE 1

When riverscapes are unhealthy (A), channels are cut deep into the land, streams and rivers are disconnected from their floodplains, receding groundwater dries out streamside vegetation, and wetlands nearby are lost. Healthy riverscapes (B) provide a suite of ecological and societal services. In addition, the high water table helps sustain streamflow during low-flow conditions or drought.



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A restoration crew builds artificial logjams to slow the flow of water, capture sediment and other materials, and improve habitat.

THE PROMISE OF RIVERSCAPE RESTORATION

Through strategic restoration efforts, many riverscapes can be revitalized and reconnected with their floodplains, allowing them to form and maintain wetlands and again sustain natural processes like beaver dam building.¹¹ Riverscape restoration is a powerful nature-based solution to mitigate some impacts of climate change, improve habitat, and strengthen resilience to natural hazards such as wildfires and drought. For riverscapes, this means encouraging natural beaver activity or using wood and other natural inputs to divert flows, connect water to all parts of the floodplain, and trap stream sediment to begin the process of moving water back onto the floodplain and recharging groundwater.¹²

Restoration techniques that include mimicking beaver dam building and allowing wood to accumulate are successfully being used across the West to help reestablish healthy riverscapes and strengthen communities' defenses against drought, flooding, pollution, and wildfire.¹³ Process-based restoration, which has strong and immediate ecological benefits, includes a variety of simple and effective techniques for restoring priority watersheds. For example, one method known as low-tech, process-based restoration (see "Kickstarting Natural Processes," below) does not require the use of heavy machinery and so has a relatively low entry cost. It is also an efficient way to restore wet meadows in headwater systems, as well as streams and creeks located a distance from roads. When established in the right location, low-tech, process-based restoration can encourage beavers to return to their historic habitat, where they can maintain, modify, and expand riverscape restoration in a sustainable way.¹⁴

While it may be simpler to restore riverscapes in environments where there is less infrastructure and development, with intentional planning and community support there are opportunities to increase riverscape health in not only rural but also urban environments.¹⁵ For example, the City of Portland, Oregon worked with residents

along Johnson Creek to restore part of the floodplain and create a natural area to reduce the risk of flooding, enhance habitat for salmon and steelhead, and provide walking trails and wildlife viewing areas for Portland residents to enjoy.¹⁶ In Colorado, the Big Thompson Watershed Coalition restored sections of the Big Thompson River after it experienced major flooding in 2013. The restoration, which occurred in the city of Loveland as well as in nearby rural areas, succeeded in increasing aquatic habitat and river processes such as floodplain connectivity.¹⁷

Riverscape restoration can also lead to the creation of high-quality jobs and new partnerships that help advance information exchange and a broader stewardship culture. Many tribal nations have cultural, spiritual, and ecological connections with beavers and have extensive Indigenous Knowledge about the many ecological and community benefits that come from their presence. The restoration community can learn from this Indigenous Knowledge and the beaver management practices used by tribes to bring beavers back to their ancestral lands.¹⁸ In addition, multiple training programs exist to build and support a river restoration workforce, which can enable more communities to benefit from restoring degraded waterways.¹⁹

IT'S TIME TO REVITALIZE OUR RIVERSCAPES

Climate change and the loss of healthy riverscapes already harm western communities. To meet the urgency of this moment, we need to deploy proven restoration techniques to return ecological health to our riverscapes. Such investments will help turn degraded stream channels into healthy, functioning riverscapes that will yield greater and more consistent benefits in water quantity, water quality, habitat quality, and carbon sequestration—while simultaneously increasing resilience to drought, flooding, and wildfire.

KICK-STARTING NATURAL PROCESSES

The following low-tech, process-based restoration techniques are meant to initially mimic, quickly promote, and eventually sustain natural riverscape processes.

- **Grazing management** includes rotational grazing, timing and duration of grazing, and wildlife-friendly fencing to reduce or minimize grazing impacts near streams. It is used alone or with other restoration techniques to ensure that sufficient vegetation reoccupies the historic riverscape so it can eventually sustain natural processes without further structural additions.
- **Wood additions** get woody structure back into the riverscape. Approaches include adding whole trees inclusive of their roots and building logjams. This wood forms debris jams, which in turn filter sediment, slow water flows, and improve habitat.²⁰
- **Beaver dam analogs** (see Figure 2) are hand-built structures of natural materials that span a water channel to mimic and promote the processes of beaver dam activity.²¹
- **Erosion control structures**, typically made from rock, brush, and/or turf mats, are designed to slow and disperse water, dissipate energy, capture sediment, and increase soil moisture, thereby promoting plant production in moist soils and wetlands and the recovery and expansion of wet meadows.²²
- **Beaver management** includes a variety of individual and population-management activities including strategically limiting beaver trapping, providing tools to help people successfully live alongside beavers, and actively translocating beavers to areas where they historically lived and can be encouraged to recolonize.

FIGURE 2



Illustration of the process of encouraging beaver dam activity with beaver mimicry devices (i.e., man-made structures designed to imitate the form and function of natural beaver dams) and how this can lead to self-sustaining conditions. *Source:* Goldfarb, 2018.²³

INTERESTED IN LEARNING MORE ABOUT RIVERSCAPE RESTORATION?

TAKE A LOOK AT OUR FULL SUITE OF **NO LONGER WORKING AGAINST THE STREAM** FACT SHEETS:

[The Benefits of Healthy Riverscapes for Climate Resilience and Ecosystems in the West](#)

[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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