



Healthy stream with a beaver complex on the Uncompahgre National Forest.

# Restoring Headwaters for Water Supply Resilience

## MULTIPLE BENEFITS FOR THE ENVIRONMENT AND WATER USERS

Colorado and the West face unprecedented drought conditions, wildfire impacts, and water stress driven by climate change. These changes threaten our local and regional water supplies, food supply, bird and wildlife habitat, economies, and quality of life. This fact sheet will define the scale of the problem and describe a low-cost scalable innovative solution that's catching on across the drought-stricken Western states.





Yellow Warbler: one of many species whose habitats are threatened by reduced stream flows and wildfires.

## WORKING WITH RIVERS FOR MULTIPLE BENEFITS

Colorado has over 105,000 river miles. Approximately 61% of smaller streams and about 97% of major rivers have experienced floodplain alteration, rendering them partially or wholly nonfunctional. When rivers are incised and disconnected from their floodplains, there is substantial loss of ecological functions and ecosystem services. Impacts include lowered groundwater tables, loss of wetlands, lower summer base flows, increased sedimentation, warmer water temperatures, and the loss of habitat diversity for birds and other wildlife.

As the impacts of climate change persist on our water resources, the need to invest in long-term, sustainable solutions becomes more critical. That is, solutions that restore and protect natural water infrastructure (stream floodplains and wetlands), and enhance our resilience to drought, floods, and ever-increasing megafires. One such affordable method for restoring our headwater streams is low-tech process-based restoration (LTPBR), an approach designed to repair headwater river floodplains, wet meadows, and riverine wetlands, which are collectively referred to as river-wetland corridors or the “riverscape”.

The approach includes identifying and addressing root causes of the degradation and then utilizing methods to return the riverscape back to natural and healthy processes to sustain surrounding ecosystems. LTPBR is a strategy to scale up low-cost effective restoration work in order to match the extent of degraded and incised streams in the West.

### WHAT IS A RIVERSCAPE?

Streams and riverine landscapes, or “riverscapes,” are composed of connected floodplain and channel habitats that together make up the valley bottom.

This graphic illustrates the restoration goals – going from incised degraded stream that benefits no one, to a healthy connected stream that benefits people and wildlife.



UNHEALTHY DEGRADED RIVER CORRIDOR



HEALTHY RIVER CORRIDOR

## GOALS AND METHODS

The goals of LTPBR projects can vary, but usually include improving a stream’s health for people and wildlife by restoring the riverscape functions of capturing sediment, filtering pollutants, providing diverse aquatic and terrestrial habitat, attenuating flood waters, and improving resilience to drought and wildfires. Many projects use a combination of different types of hand-built structures utilizing natural materials (branches, cobble, native sod) designed to mimic beaver activity. Structures are designed to be temporary, deformable, and porous in order to pass baseflows and allow fish passage.

The idea is to use the energy of spring runoff or storm flows that bring sediment and wood downstream that can accumulate on these “speed bumps” to reconnect the floodplain. This allows riparian vegetation to recover and be naturally hydrated by the rise in groundwater that occurs once floodplains are reconnected. Projects are typically installed in historic beaver habitat, and the hope is that beaver will continue to build on these structures, advancing the restoration process, and ultimately providing free and consistent labor.

LTPBR approaches are most suitable on first to fourth order streams high in the watershed above reservoirs and diversions where streams have space for natural stream processes to occur and conflicts from beaver are minimized.

## ADVANTAGES

LTPBR costs substantially less to install, ranging from ~\$50,000 to \$100,000/mile, as compared to restoration using engineered approaches that require heavy equipment (e.g., rock weirs, rip rap, deflectors) that typically costs between \$600,000 to \$1 million/mile. Additionally, because LTPBR uses native and

### COST COMPARISONS

Restoration Method	Average Cost Per Mile
LTPBR	\$50,000 to \$100,000
Heavy Equipment Restoration	\$600,000 to \$1 million

locally sourced materials with minimal equipment, it has reduced environmental impacts on the land, streams, and lower greenhouse gas emissions.

There is a growing focus on the science and benefits of connected floodplains and beaver complexes. A recent review of the published research and unpublished LTPBR case studies was completed for American Rivers and can be found on their [webpage](#). The studies cited document that restoration of riparian-wetland corridors delivers numerous ecological and ecosystem services benefits.

These include:



#### Hydrologic effects

- » restored floodplains attenuate snow and storm run-off, resulting in recharging the groundwater, which can result in improved later season flows.
- » higher water table that naturally hydrates riparian and wetland plants



#### Reduced impacts of natural disasters

- » improved resilience to flooding and drought from snowpack/storm flow attenuation in functioning floodplains
- » beaver complexes serve as wildfire breaks and wildlife and livestock refugia during fires
- » healthy floodplains and wet meadows store more carbon than when degraded



#### Ecological benefits

- » greater biodiversity from the improved habitat



#### Agriculture benefits

- » increased water and forage availability



#### Improved water quality by filtering out pollutants and sediment

This restoration work provides countless mutually beneficial outcomes for all. The resilience of Colorado's water resources and the health of surrounding ecosystems depend on these long-term solutions. Audubon Rockies is currently working to improve Colorado's streams through our habitat restoration projects.

Before | April 20, 2020



After | June 11, 2020



LTPBR project designed to slow and spread the flow of water, reconnecting the narrow incised channel to the broader riverscape by using small sod structures built with on-site materials that act as flow speed bumps. Made up of sedges with deep root systems, these small structures interrupt the downstream flow of water and spread it back out onto the landscape, reconnecting the stream to its floodplain.