

NATURE-INSPIRED ENGINEERING FOR THE COLORADO RIVER BASIN

A CASE STUDY OF BEAVER DAM ANALOGS

SUMMARY

Restoring ecosystems also restores the services they provide us: water supply, flood protection, recreation space, and many more. We feel these benefits when our local streams are restored and looking healthier– but do our wallets feel it, too?

The University of Georgia Institute for Resilient Infrastructure Systems (UGA IRIS) partnered with the Walton Family Foundation to conduct a complete valuation of the benefits and costs behind stream restoration in the Colorado River Basin.

We compiled data on existing **beaver dam analogs** (BDAs), a nature-based method for stream restoration, in the region and estimated the net present value of the benefits and costs of various implementation scenarios in order to determine the optimal number of BDAs to provide the most benefit to the river basin.

According to our estimates, the average implementation case, involving ~15 BDAs per kilometer or one every ~200 feet, provided a net benefit of approximately \$400,000, a value that more than covered the estimated construction and maintenance cost (~\$49,000).

WHAT IS A BEAVER DAM ANALOG?

Beavers are critical ecosystem engineers across North America. Natural beaver dams have a big impact on streams, slowing water flow and raising the stream level. This change provides storage for floodwaters, maintains flow during droughts, enhances fish and wildlife habitat, improves water quality, reduces wildfire risks, and reduces the need for stream repair after storms.

Beaver dam analogs are human-made, low-tech structures inspired by nature. They are built in streams using natural materials like wood, mud, and vegetation to mimic the functions of a natural beaver dam. This nature-based solution can improve both flood protection and environmental health by restoring natural stream function. BDAs also encourage beavers to return to a stream, helping populations recover.



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OUR ASSESSMENT

Stream Restoration Conditions

There is a lot of variability in these projects, so our estimate of the benefits of BDA restoration actions were calculated based on an “average” case, using data from other BDA projects in the region as well as data from natural beaver dams.

The average case assumes that a 0.6 km of river reach is rehabilitated with 10 BDAs, then maintained and monitored for 30 years.

Benefits & Costs

Our analysis evaluated the changes in 7 specific ecosystem services given the average BDA scenario and calculated their economic costs and benefits:

Water supply	\$32,990
Water quality	\$18,173
Carbon storage	\$21,418
Flood and drought protection	\$440,689
Habitat and Biodiversity	\$21,951
Recreation	\$118,515
Wildfire risk reduction	\$146,214
Total 30-year benefit value	= \$399,868
Benefit-cost ratio (benefit value divided by cost)	8.2

This benefit-to-cost ratio varied with the number of BDAs implemented. We determined that an optimal goal, with the highest return on investment of 8.2, was approximately 15 BDAs per kilometer of river (one every ~200 feet).



Natural beaver dam, Cottonwood Heights, UT



Beaver dam analog

Every \$1 spent on stream restoration through beaver dam analogs results in a return of \$8 in benefits.

Learn more about our work at www.iris.uga.edu.



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