

Fire resiliency -

Beaver and BDA restored rivers and streams are proven to show enhanced fire resiliency, often creating large wetted areas that will not burn, thus creating fire refuge for wildlife. A restored river or stream network can also act as a fire break. Furthermore, restored streams aid in post-fire recovery - settling out harmful ash.

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Groundwater recharge -

Beaver and BDA restored rivers and streams support increased surface water storage, groundwater connectivity and recharge, and duration of surface water flow.

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- A. Pollock, M. M., Castro, J., Jordan, C. E., Lewallen, G., & Woodruff, K. (2015). The beaver restoration guidebook: Working with beaver to restore streams, wetlands, and floodplains (Version 1.02) (p. 189). United States Fish and Wildlife Service.

- A. Thompson, S., Vehkaoja, M., Pellikka, J., & Nummi, P. (2021). Ecosystem services provided by beavers *Castor* spp. *Mammal Review*, **51**(1), 25–39.
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Increased biodiversity -

Beaver and BDA restored rivers and streams support increased biodiversity and richness of plant and animal species.

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- A. Silverman, N. L., Allred, B. W., Donnelly, J. P., Chapman, T. B., Maestas, J. D., Wheaton, J. M., & White, J. (2019). Low-tech riparian and wet meadow restoration increases vegetation productivity and resilience across semiarid rangelands. *Restoration Ecology*, **27**(2), 269–278.
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- A. Bellmore, J. R., & Baxter, C. V. (2014). Effects of geomorphic process domains on river ecosystems: A comparison of floodplain and confined valley segments. *River Research and Applications*, **30**(5), 617–630.

Carbon sequestration -

Beaver and BDA restored rivers and streams connected to the floodplain hold significantly more carbon than degraded rivers and streams, as well as grasslands. Active beaver complexes hold on average 10-30 times more carbon than grasslands.

- A. Yarnell, S.M., K. Pope, E.C. Wolf, R. Burnett, and K. Wilson. 2020. A Demonstration of the carbon sequestration and biodiversity benefits of beaver

and beaver dam analogue restoration techniques in Childs Meadow, Tehama County, California. Center for Watershed Sciences Technical Report (CWS-2020-01), University of California, Davis. Prepared for CA Department of Fish and Wildlife. pp. 29.

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- A. Laurel, D., & Wohl, E. (2019). The persistence of beaver-induced geomorphic heterogeneity and organic carbon stock in river corridors. *Earth Surface Processes and Landforms*, **44**(1), 342–353.
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- A. Baldwin, J. (2015). Potential mitigation of and adaptation to climate-driven changes in California's highlands through increased beaver populations. *California Fish and Game*, **101**(4), 218–240.

Reverse erosion/Catch sediment -

The introduction of beaver dams and BDAs into rivers and streams is shown to reverse the effects of erosion. The added in-channel structure dampens the erosive force of the water flow by slowing and spreading the water, while the structures catch sediment to help build the river or stream back up to the floodplain. Meanwhile increased riparian vegetation help stabilize the banks.

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- A. Cluer, B., & Thorne, C. (2014). A stream evolution model integrating habitat and ecosystem benefits. *River Research and Applications*, **30**(2), 135–154.
- A. Sands, A., & Howe, G. (1977). Riparian forests in California, their ecology and conservation. Paper presented at the Importance, Preservation and Management of Riparian Habitat: A Symposium, Tuscon, AZ.
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Improve Water Quality -

Beaver restored areas improve the water quality of the river or stream as well as lessen the pollutants that make it to the ocean. Beaver ponds create slow water to settle out pollutants such as heavy metals and excess nutrients. Then the beaver dams force water underground, binding pollutants to the soil where natural decomposition processes can convert excess nutrients.

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- A. Puttock, A., Graham, H. A., Cunliffe, A. M., Elliott, M., & Brazier, R. E. (2017). Eurasian beaver activity increases water storage, attenuates flow and mitigates diffuse pollution from intensively-managed grasslands. *Science of the Total Environment*, **576**, 430–443
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Lessen flood intensity -

Beaver dams and BDAs act as speed bumps that slow and spread the water flow, which disperses the energy of the system, thus lessening the intensity of high flow events that cause flooding.

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