



Beavers: Nature's Wetland Engineers

The return of a once-vanished keystone species and what it means for Maryland's wetlands

For thousands of years, one animal shaped the American landscape more than any other: the North American Beaver (*Castor canadensis*). Beavers engineered wetlands across the entire continent, then all but disappeared from many states, including Maryland. Today, the beaver is quietly returning and is being recognized as one of the most effective and affordable allies we have for restoring the wetlands of the Chesapeake Bay. Understanding this history and how to live alongside beavers again is central to this story.

A Rodent That Once Ruled the Continent

Before European colonization, beavers were found across nearly all of North America, from the Arctic tundra to the deserts of northern Mexico. Historical reconstructions suggest that the continent supported tens to hundreds of millions of beavers, possibly as many as 400 million, before the fur trade decimated their populations (Seton 1929). Dam building by beavers shaped the region's

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rivers and floodplains for thousands of years. Paleoecological research, including work by Johns Hopkins paleoecologist Dr. Grace Brush (Brush 2009), provides strong evidence that the pre-colonial Mid-Atlantic was far wetter than what exists today, largely because beavers were everywhere along the nontidal waterways.

Historical Range of the North American Beaver

The beaver's dominance changed quickly once European colonists arrived. Beaver pelts, prized for making water-resistant felt hats and trimming coats, became one of the most valuable commodities in colonial North America and a major driver of the continent's exploration. Traders such as Henry Fleet and William Claiborne moved thousands of pounds of beaver pelts through Maryland and Virginia in just a few years in the 1630s along the Potomac River. A single pelt could be worth a dozen axe heads. The fur trade built fortunes. John

Jacob Astor, America's first multi-millionaire, made much of his money in furs, but it was ultimately unsustainable. By the mid-1800s, unregulated trapping resulted in local extinction of beavers in Maryland and most of the eastern United States.

The consequences went far beyond the loss of a single species. Without beavers maintaining their dams, the braided, marshy stream corridors that once spread water slowly across valley bottoms gradually gave way to the narrow, incised, single-thread channels common today (see top left image on Page 6). These channels move water and sediment quickly downstream with negative cascading effects on habitats, water quality, and wildlife.

Nature's Wetland Engineers

The beaver is one of the only animals besides humans that reshapes its own habitat on a landscape and hydrological scale. By felling trees and building dams, beavers slow down moving water and spread it laterally across the floodplain, allowing the soil to become saturated and

raising the local water table. This creates fluctuating water levels and complex habitat structure that defines a healthy wetland. Beaver ponds and associated canals also boost groundwater exchange, allowing water to flow back and forth between groundwater and surface water, creating a cooling effect. This buffers stream temperatures during low summer flows, which is increasingly critical for cold-water species like native brook trout.

These changes ripple outward. When water spreads out over the landscape, suspended sediment settles to the wetland floor before it reaches downstream waterways, improving water quality and reducing the sediment load reaching the Bay. The deep pools that beavers create rarely freeze solid in winter, offering refuge for fish, turtles, and amphibians. Meanwhile, the mosaic of open water, saturated soil, and shrubby edge habitat that beavers maintain supports far more plant and animal diversity than a single straight channel ever could, including herons, wood ducks, dragonflies, salamanders, and freshwater mussels. Beaver wetlands also store water, thereby mitigating flood peaks after storms and sustaining stream baseflow during drought, making watersheds measurably more resilient to both extremes.

Maryland's Wetlands, and a Widening Gap

Maryland has lost an extraordinary share of its original wetlands. Roughly 73 percent of the state's wetlands disappeared between the 1780s and 1980s, according to U.S. Fish and Wildlife Service records, and progress on reversing that decline has been slow. Under the 2014 Chesapeake Bay Watershed Agreement, the Bay states committed to restoring or creating 85,000 acres of tidal and nontidal wetlands and enhancing another 150,000 acres by 2025. By most measures, progress has fallen short of that goal. Only a small fraction of the new-acreage target had been met by the early 2020s.

In recognition of that shortfall, the revised Chesapeake Bay Watershed Agreement, approved by the region's governors and the Environmental Protection Agency (EPA) in December 2025, scaled the wetlands commitment back dramatically to restoring or creating at least 3,000 acres and enhancing 15,000 acres of wetlands across the watershed by 2040. Even that more modest target will be difficult to reach through engineered restoration projects alone, which are often expensive and slow to permit and build.

This is exactly the gap beavers can fill. No engineered project can match

a beaver colony's ability to create and maintain complex wetland habitat across a landscape at essentially no cost to taxpayers. Every beaver pond, canal, and abandoned wet meadow that forms Maryland's landscape moves the state closer to its wetland goals without a single excavator. And beavers aren't required to get permits!

Living With Beavers: Coexistence Over Conflict

Welcoming beavers back to Maryland's landscape raises two legitimate concerns for landowners: tree loss and flooding. Historically, the default response to both was to trap and remove the beavers or tear out their dams. But those approaches are usually only a short-term fix, as new beavers often recolonize good habitats within a year or two. Research comparing management strategies has found that removal strategies are far more expensive over time than leaving the beavers in place and addressing tree loss and flooding.

Trapezoidal-shaped culvert fences (e.g., Beaver Deceiver™) or pond levelers (large pipes inserted high in the beaver dam to allow for regulated release of water) can be used to successfully control water height. One widely cited analysis (Boyles and Savitzky 2008) found that flow devices reduce flooding and return roughly \$8 in costs for every \$1 spent installing them. Whereas repeated lethal trapping actually lost money over the long run. Other non-lethal strategies, such as strategic fencing that prevents beavers from damming culverts and wrapping or fencing valuable trees, have also proved very ecologically and financially effective. Organizations working across our region are already helping landowners put them to use.

Organizations finding solutions

The Human-Beaver Coexistence Fund, a non-profit organization that focuses on Maryland, Virginia, West Virginia, and Washington, D.C., works to educate the public about the benefits



A beaver dam impounding a Piedmont floodplain. Dams range from a meter across narrow channels to hundreds of meters across broad alluvial floodplains. Photo by S. McGill.

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Jabez Tributary 3 in Anne Arundel County showing channel before (left) and after (right) restoration. The first season after the project was implemented, beavers arrived! Left photo by C. Donegan; right photo by unknown.

of living alongside beavers and provides funding for non-lethal management when conflicts arise. Nationally, the Beaver Institute's Beaver Corps program trains and certifies practitioners in the

installation of low-flow devices and other coexistence techniques, building the workforce needed to make non-lethal management the default rather than the exception. The Maryland Beaver Working

Group is a coalition of environmental professionals promoting the North American Beaver as a keystone species—a species whose activities are essential for the health of an ecosystem. Together, the efforts of these groups are helping shift the conversation from “how do we get rid of beavers” to “how do we support the work beavers do while also saving money and managing our land.”

Beavers built much of the wetland landscape essential to the Chesapeake Bay ecosystem long before wetlands were measured in acres or written into an agreement. Bringing back beavers and learning to coexist with the mess as well as the magic they create is the simplest, cheapest, and most effective step Maryland can take toward a healthier, more resilient watershed.

REFERENCES

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A classic beaver lodge constructed from interlocking woody stems and mud along a trout stream in Baltimore County, MD. The dense woody dome insulates the interior chamber and prevents terrestrial predators from digging in from above, while the secure access for the beaver remains entirely submerged beneath the water's surface. Photo by S. McGill.