



## BI Beaver Primer

The North American beaver, *Castor canadensis*. This animal means different things to different people, including: a nuisance rodent, cute animal, water rat, destructive tree killer, Canada's national animal, road flooder, dam builder, ugly swamp creator, or environmental savior. Whereas, Native Americans thought of beavers as "Little People" in part because they are second only to man in their ability to change their environment to serve their own needs<sup>i</sup>. They revered the beaver as a totem animal and lived in harmony with them.

Today however, most people have limited exposure to the natural world, and beavers typically only make the news when problems occur. So our talk about this furry, aquatic mammal can be quite polarizing. Fortunately, as you'll soon learn, this polarization is unnecessary.

### Historical Perspective

Beavers have lived in North America for millennia. An estimated 60 - 400 million beavers lived in North America when Europeans first arrived here.<sup>ii iii</sup> Over many millennia countless species evolved on this continent to take advantage of the ecological niches beavers created. Due to the myriad of species that began to rely on beaver created habitats, beavers became a Keystone species, -responsible for supporting biodiversity in North America. Biologists call them a Keystone species because like a keystone in a stone arch, the ecosystem collapses if you remove the beaver.

Native Americans had sustainably trapped and hunted beaver for thousands of years. In stark contrast, Europeans had eliminated nearly all the beavers in Europe to make fashionable top hats made of felt. They highly coveted beaver fur because it made the best felt. So upon discovering more beaver in the New World this new fur supply was greedily exploited.

Beaver trappers were usually the first white people to explore this continent, leading the white man's westward settlement. Trading with natives for furs was common. Beaver pelts were so valuable that they were used as currency by early pioneers, and frontier wars were even fought over furs. By the time most settlers arrived all the beavers were gone.

Since beavers were eliminated in advance of most white settlers, towns, roads, farms, etc. were all established in the absence of beavers. As we'll soon see, this historical fact creates serious problems for us today.

## **Beavers Return**

Top hats and furs eventually went out of fashion, but by then the only surviving beavers were in remote areas. No longer hunted and often protected by wildlife managers who recognized the eco-system values that beavers offered, throughout the 20<sup>th</sup> century these resilient animals slowly rebounded<sup>iv</sup>.

Probably the most dramatic and innovative reintroduction program occurred Idaho. In 1948 to establish beaver colonies in remote areas without roads, Idaho Fish and Game biologists dropped a total of 76 beavers from planes inside parachuted wooden crates! The first parachuted beaver was named Geronimo. Amazingly, all but one of the beavers survived their landings and successfully established colonies in the remote wilderness.<sup>v</sup>

Beaver recolonization in most of North America was less dramatic but also successful, both because many farms had reverted to forest, and beaver pelts were no longer valuable so interest in trapping beavers was limited.

## **The Beaver Cycle**

As beavers returned, so did an important natural cycle that had been missing from our landscape.

When beavers open the forest canopy by damming streams and cutting down trees they create new ecological niches and transition zone habitats where various species thrive. Many of our threatened and endangered species require these vanishing habitats at some stages of their lives.<sup>vi</sup> Beaver activity creates “Mosaic Habitats” (a mix of habitats), even as they continue to disappear elsewhere from development, negatively impacting species that are declining in numbers, such as turtles, bats, and grouse.<sup>vii</sup>

So while killing trees in and around a beaver pond appears destructive, these dead trees actually create critical habitats for honeybees, wood ducks, swallows, herons, and others, and also allow grasses, sedges, bushes and saplings to grow on the perimeter of the pond. These plants provide habitat variety, food and cover for foraging animals.

Since beavers prefer not to travel far from the water, eventually they exhaust their woody food supply. When this happens the beavers will move to a new location. Then their dams develop leaks and the ponds drain out. The rich pond sediment gives rise to a lush, grassy meadow. Eventually shrubs and trees become established, and after 10 -15 years there is enough woody vegetation to attract new beavers and the process starts over. This natural beaver cycle creates a repeating series of successional habitats that support biodiversity.

Opening the tree canopy creates valuable land-based habitats, and it also allows sunlight reach the water where it triggers an explosion of aquatic biological activity. Algae and aquatic plants grow in the sun-drenched, nutrient rich water. This organic material supports microscopic organisms, which are eaten by a variety of invertebrates. These become food for fish, birds and mammals. An entire food chain is created which is why beaver ponds become magnets for wildlife. The biodiversity that exists due to beaver activity makes beavers our prototypical Keystone species and nature’s ecosystem engineers.<sup>viii</sup>

Each Keystone species is critically important for biodiversity, yet there is another Keystone species that relies on beavers, salmon! More beavers mean more salmon, and more salmon mean even more biodiversity!

Scientific research by Pollock, Wheaton, Kemp, and many others shows that streams with beaver dams actually produce larger and more numerous native trout and salmon.<sup>ix</sup> It turns out that beaver dams create ponds that serve as ideal nurseries for juvenile fish by creating complex edge habitat, increasing the invertebrate and insect food supply, putting beneficial woody debris in the water, reducing fish energy needs by providing slow water refuge, and increasing winter survival of salmonids. It is believed that having more beaver ponds could help some salmon be taken off the threatened species list!

### **Why Give a DAMn?**

As if biodiversity and salmon recovery weren't enough, there are many other benefits to having beavers on our landscape.

Beaver dams actually *improve* stream flow and water quality<sup>x</sup>. Dangerously high stream flows are moderated by dams that function as natural sponges to reduce damaging peak flows and erosion during high runoff events, and increase low stream flows during droughts by slowly releasing stored water.

Water quality is also improved by the algae, plants and sediment in the ponds. How? They remove suspended particles, process organic wastes, and capture toxic heavy metals, pesticides and fertilizers from runoff in streams. These wetlands serve as the "Earth's Kidneys".<sup>xi</sup>

Want more benefits? Beaver ponds also recharge our drinking water aquifers, stabilize the water table, and help repair incised streams. Therefore, beavers are currently being relocated in western states such as WA, OR, ID, CO and UT for their stream restoration, water storage, and salmon and trout restoration services. Plus beavers provide all these valuable services for free, saving taxpayers millions of dollars!

Where erosion has cut a very deep stream channel the water table will drop, killing the surrounding vegetation, and making the area inhospitable to beavers. When this occurs Beaver Dam Analogs<sup>xii</sup> made from wooden posts and woven branches, are being successfully installed across streams to promote sediment deposition to raise the stream bed and water table. Beaver Dam Analogs reverse severe channel incision damage and ultimately make the area hospitable to beavers who will move in and complete the restoration work.

### **Beaver Problems**

Remember all our infrastructure that was built in the absence of beavers? That is a big reason why beaver problems arise today.

As beavers returned, they entered a highly altered landscape due to human development. So when they began to dam their ancestral streams, conflicts with humans sometimes occurred and our two species would butt heads.

Initially problematic beavers could be relocated to uninhabited areas, and this continues in many western states with low beaver populations and large rural areas. However, in the late 20<sup>th</sup> century as the number of these isolated sites diminished in some states, lethal control became the primary management tool. In many states lethal beaver management remained the only viable beaver control method for decades. However, over the past 20 years great strides have been made to resolve beaver - human conflicts nonlethally in order to maximize the benefits of beavers.

That being said, nonlethal management is not feasible everywhere. In the Beaver Institute's experience beaver trapping remains the most viable option in up to 25% of beaver-human conflicts. However, new beavers will be always be attracted and relocate to good habitat, so if trapping is chosen it will need to be done indefinitely. This is one of several reasons we recommend that beaver removal only be used as a last resort.

There are many advantages of using non-lethal beaver management tools. First and foremost, properly designed and installed flow devices are extremely effective at limiting the size of beaver ponds and protecting human infrastructure. Second, they allow us to safely maximize valuable wetland and mosaic habitat acreage. Third, nonlethal beaver management is usually the most cost-effective method to manage beavers since the solutions are long-term, versus the typical short-term success of trapping.<sup>xiii xiv</sup> Fourth, in many states it is illegal to relocate wildlife, so all trapped beavers must be killed making nonlethal management more humane. And finally, where feasible, coexistence with beavers promotes a culture of respect, balance and proper stewardship for our environment.

### **Effective Nonlethal Methods**

Understanding how and why beavers do what they do is necessary to properly manage them.

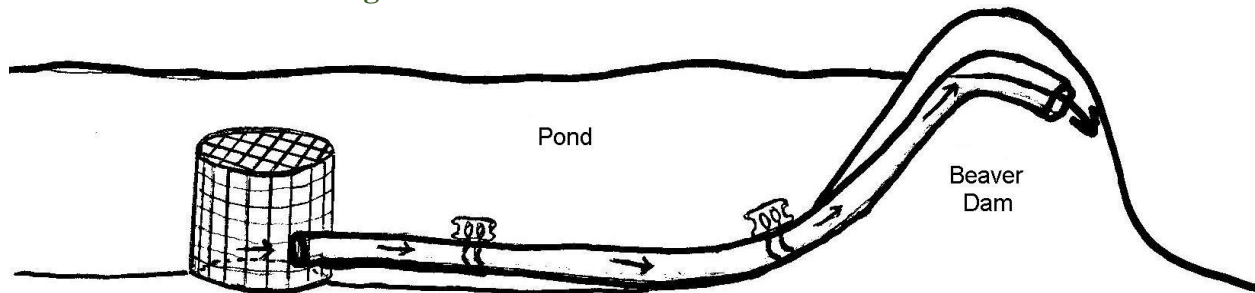
There are currently a wide variety of devices that can effectively prevent infrastructure damage from beavers at road culverts and manmade dam spillways, and there are effective pipe systems that can be installed through freestanding beaver dams to control ponds at safe levels. Thousands of successful water control devices have been installed across North America. These successful water control devices are commonly known as flow devices, Beaver Bafflers, or Beaver Deceivers.<sup>xv</sup>

Blocked road culverts are a very common beaver problem. To a beaver, a culvert pipe through a roadbed looks like a hole in a dam. With a little work they can "repair" the hole and turn the roadbed into a large dam. Good for the beaver, but bad for us because a blocked road culvert can quickly cause serious health and safety issues, damage to infrastructure and create major expenses and headaches for highway departments.

Fortunately, it is rare that a road culvert cannot be protected from beavers. Depending upon the site characteristics, different culvert protective devices can be used, such as Diversion Dams, Large Culvert Fences, or Fence and Pipe flow devices. When designed and installed professionally, all these devices exceed a 95% success rate and can be guaranteed effective. These flow devices can also be successfully used on other manmade structures such as manmade dam spillways and retention ponds. Many examples and testimonials can be found on our website at: [www.beaverinstitute.org](http://www.beaverinstitute.org).

Flooding problems from freestanding beaver dams are managed differently. Often a device called a Flexible Pond Leveler pipe system can lower and maintain a beaver pond at a level that will not threaten human interests. See diagram.

### Flexible Pond Leveler Diagram



Created by Michel LeClair in Canada, the Flexible Pond Leveler pipe system works because the fencing on the pipe intake keeps the beavers far enough from the inlet so they do not feel or hear water flowing into the pipe. If the beavers cannot detect the flow of water into the pipe, they do not try to block it. The pipe is placed through a trench dug in the dam. The height of the pipe in the dam controls the pond level.

Another common beaver complaint is tree chewing. Fortunately, valuable specimen trees or other mature trees that people value can be readily protected from beaver chewing with simple and inexpensive methods such as tree trunk fencing or a paint-sand mixture applied to the base of the tree. Again, successful techniques with instructions and pictures can be found on our website at: <https://www.beaverinstitute.org/management/tree-protection/>.

### Beaver Institute, Inc.

The Beaver Institute, Inc. is a charitable 501(c)3 nonprofit whose Mission is to be a catalyst for advancing beaver management and watershed restoration by providing technical and financial assistance to public and private landowners experiencing beaver conflicts, supporting scientific research, training mitigation professionals, and increasing public appreciation of the beaver's critical role in creating wetland ecosystems. Our Vision is to resolve all beaver-human conflicts in a science-based manner in order to maximize the many benefits that beavers contribute to the environment. Please consider joining our Beaver Believer Volunteer Krew<sup>xvi</sup>, or support us with a tax deductible donation.

There is a wealth of useful information and many other resources on our website that can successfully guide you how to resolve beaver conflicts with proven techniques, or you can find a professional Beaver Management expert in your area at: <https://www.beaverinstitute.org/management/installer-locator/>.

## Conclusion

Although these four-legged “Little People” can present serious challenges, they are a critical Keystone species and cost-effective, long-term, environmentally-friendly and humane management options exist to resolve conflicts.

We all have an important role to play by educating others about the many benefits of beavers, and advocating for coexistence with beavers wherever feasible. This enlightened approach can protect human property and interests, save taxpayer money, and preserve and improve the natural environment that we and all living things rely upon.

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<sup>i</sup> [www.animalfactsencyclopedia.com/Beaver-facts.html](http://www.animalfactsencyclopedia.com/Beaver-facts.html)

<sup>ii</sup> <https://en.wikipedia.org/wiki/Beaver>

<sup>iii</sup> [http://www.ohiohistorycentral.org/w/American\\_Beaver](http://www.ohiohistorycentral.org/w/American_Beaver)

<sup>iv</sup> B. Baker and E. Hill, (2003) *Wild Mammals of North America: Biology, Management, and Conservation*. 2<sup>nd</sup> ed., Johns Hopkins University Press, Baltimore, MD, pp. 288-310.

<sup>v</sup> <http://boisestatepublicradio.org/post/parachuting-beavers-idahos-wilderness-yes-it-really-happened#stream/0>.

<sup>vi</sup> <https://www.epa.gov/wetlands/why-are-wetlands-important>

<sup>vii</sup> K. Wagener, *The Habitat*, CACIWC Newsletter, (2017) Vol. 29, No. 4, p.6.

<sup>viii</sup> [https://en.wikipedia.org/wiki/Ecosystem\\_engineer](https://en.wikipedia.org/wiki/Ecosystem_engineer)

<sup>ix</sup> <https://www.beaverinstitute.org/research/library/>

<sup>x</sup> Terry, N & Bañuelos, G. (2000) *Phytoremediation of contaminated soil and water*. CRC Press LLC

<sup>xi</sup> <https://blog.epa.gov/blog/2014/06/wetlands-earths-kidneys/>

<sup>xii</sup> <https://www.beaverinstitute.org/management/stream-restoration/>

<sup>xiii</sup> [Mitigating infrastructure loss from beaver flooding: A cost-benefit analysis](#), Hood, G. et. al. (Dec. 2017) *Human Dimensions of Wildlife*, pp. 1-14.

<sup>xiv</sup> *An Analysis of the Efficacy and Cost of Flow Devices along Roadways in Virginia*, (2008) Boyles, S and Savitzky, B, Univ. of Calif. Davis, pp.47 – 52.

<sup>xv</sup> The “Beaver Deceiver”, a trapezoidal fence designed to protect road culverts was invented and trademarked by Skip Lisle at Beaver Deceivers International.

<sup>xvi</sup> <https://www.beaverinstitute.org/about/support/>