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## **Billerica Municipal Beaver Management Program** **2000 - 2019 Analysis**

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### **Abstract:**

*The North American beaver, *Castor Canadensis*, is a Keystone species due to its dam building behavior. While critically important for biodiversity and a multitude of other ecological benefits, beaver dams can cause significant flooding problems for humans. Beaver conflicts with humans are typically managed with either lethal beaver removal or nonlethal methods. This study compares traditional lethal control versus nonlethal management methods in the town of Billerica, MA. A total of 55 beaver conflict sites were studied from 2000 through 2019. This first of its kind study revealed that the sites managed with nonlethal control methods cost significantly less than sites that were managed with beaver removal. In addition, nonlethal control methods provided millions of dollars of ecological services to the town annually that would have been lost with beaver removal.*

### **Background:**

Until colonial times beavers inhabited every waterway in Massachusetts. However, unregulated fur trapping extirpated beavers from MA by the 18th century. Farms, roads, homes, etc. were often built in drained beaver wetlands.

Beavers returned to western Massachusetts in the 1930's. As their population increased, they slowly spread east. Beavers found good habitat in Billerica's multitude of wetlands, streams, and the Concord and Shawsheen Rivers. When they built dams on the same streams as their ancestors, they sometimes flooded human properties. As conflicts arose the beavers were trapped, and the dams removed.

In 1963 Massachusetts passed the first wetland protection regulations in the nation. However, some of Billerica's wetland and floodplain areas had already been developed. This increased human-beaver conflict potential. Today Billerica's population exceeds 40,000, with over 1,500 residents per sq. mile, and the town continues to grow.

In 1996 voters overwhelmingly passed a statewide referendum that significantly curtailed trapping. By 1999 reports of serious beaver problems were common in Billerica and restricted beaver trapping made it worse. Local residents, businesses and town departments needed help.

The year 2000 was significant for beaver control in Billerica for three reasons. First, the state legislature passed regulations authorizing local Boards of Health to issue emergency beaver permits whenever human health, safety or property were threatened. This greatly improved a slow wetland permitting process. Second, a heavily attended public meeting was held in Billerica Town Hall where an expert panel addressed residents' concerns. And third, the town hired Beaver Solutions LLC to develop and implement an innovative town-wide Municipal Beaver Management Program.

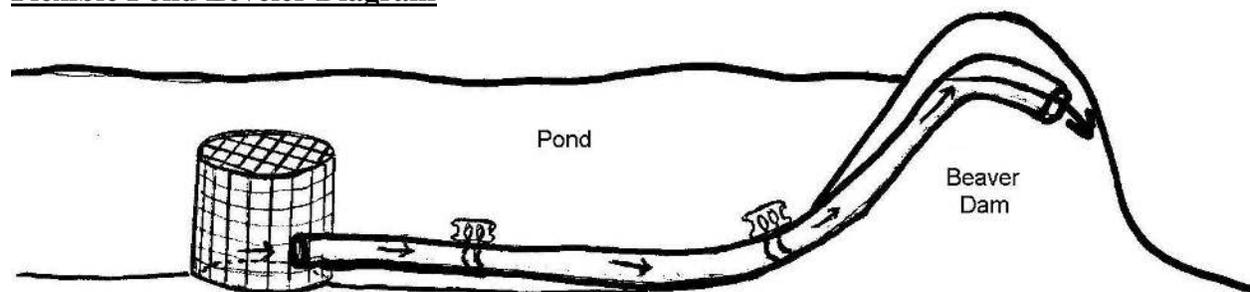
### **Billerica Municipal Beaver Management Program**

Since water is a public resource, and because a beaver dam can adversely affect town property such as a road, or multiple property owners, it was decided that it was appropriate for town government to take an active role in managing beavers in town. So beaver conflict sites on town property or affecting multiple taxpayers were added to the Billerica Municipal Beaver Management Program (BMBMP).

A list of beaver problem sites was collected by town officials. These sites were assessed, prioritized, and the most cost-effective plan was developed for each site. Following conflict resolution, each site was placed on an inspection schedule. This enabled new problems to be quickly identified and resolved before significant damage is done. Beaver Solutions began submitting status reports to the town every 6 months.

In 2000, the first year of the BMBMP a total of 7 beaver conflicts were resolved with innovative water control devices. Water control devices can be Flexible Pond Leveler pipes that are installed through beaver dams and are designed to prevent detection from beavers, or Culvert Protective Devices that are designed to keep road culverts undammed and flowing normally. The flow devices can be constructed to allow wildlife passage.

### **Flexible Pond Leveler Diagram**





*Pond Leveler Being Installed, Rangeway Rd.*



*Pond Leveler in Beaver Dam, Rangeway Rd.*

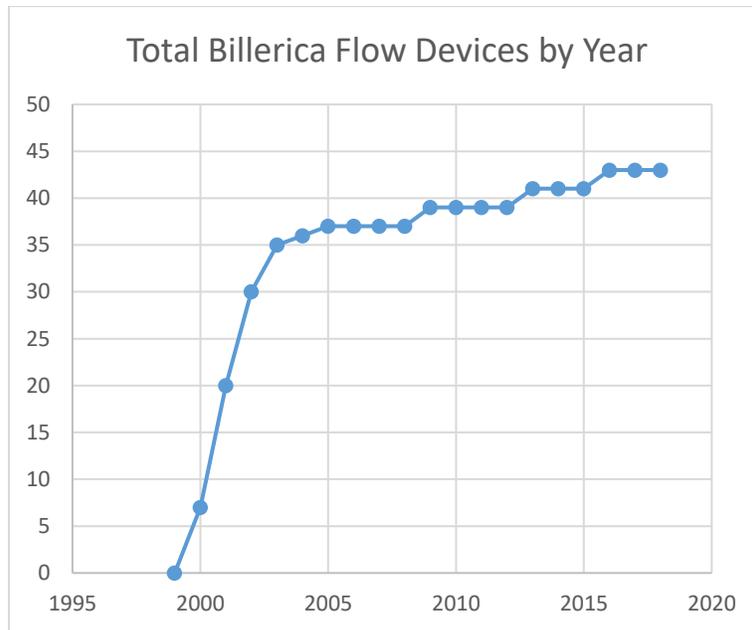


*Billerica Culvert Fence w/ Wildlife Passage*

Within 3 years the BMBMP was successfully managing 35 conflict sites with flow devices, and 7 sites with trapping. The trapping sites were classified as "No Tolerance Zones" for beaver damming because flow devices had either failed or were not feasible at these locations.

Initially there were concerns that using non-lethal management to coexist with beavers would result in a proliferation of conflict sites throughout the town. Fortunately though, experience has proven otherwise. In the subsequent 16 years, the total number of beaver conflict sites in Billerica has only risen from 42 to a total of 55. This is less than one new beaver problem per year.

Currently there are a total of 55 BMBMP sites. 43 sites are successfully managed with non-lethal water control devices, and the other 12 are "No Tolerance Zones" for beaver damming that are managed with trapping.



## **Non-Lethal Beaver Control in Billerica**

The 43 beaver conflict sites in Billerica that are successfully managed with non-lethal water control devices are all sites that would have traditionally been managed with trapping. Based upon the rate of trapping at "No Tolerance Zones", the use of non-lethal controls over 19 years has reduced the number of beavers trapped in town from 1,250 to 222.

Since 2000 a total of \$83,731 has been spent by the town on flow device installations and maintenance for 43 no-trap sites. The average flow device costs \$1,500 and lasts an average of 10 years before needing replacing, for an annualized cost \$150. The monitoring and maintenance of a flow device site averages \$79 per site per year. Therefore, each beaver conflict that is managed with flow devices costs an average of \$229 per site per year.

## **Beaver Trapping in Billerica**

Billerica's twelve "No Tolerance Zones" are monitored regularly for evidence of new beavers and beaver damming. Beavers relocate quicker and more frequently to some of these areas than others. Since the inception of the program a total of 222 beavers have been trapped from these "No Tolerance Zones". This corresponds to an average of 18.5 beavers trapped in town per year, or an average of 1.5 beavers per site per year. By law, all trapped beavers must be killed.

Since 2000, the cost of beaver trapping and beaver dam breaching at the 12 "No Tolerance Zones" has totaled \$51,350, or \$225 per site per year. The monitoring costs for these 12 sites averages an additional \$184 per site per year. Therefore the annualized cost for each site managed with trapping is \$409 per year.

## **Cost Analysis of Trapping v. Flow Devices**

The cost to Billerica taxpayers to trap beavers is \$409 per site per year. The flow device cost to taxpayers averages \$229 per site per year. So, non-lethal beaver control saves an average of \$180 per site per year. Altogether, the 43 nonlethal beaver management sites currently save Billerica taxpayers \$7,740 annually versus trapping.

Note, this does not mean that all sites should be managed non-lethally because flow devices are not feasible for every situation. Approximately 25% of the time beaver removal by trapping is the only viable option.

## **More Beaver Benefits**

In addition to the greater financial burden of trapping, there are also significant hidden costs to beaver trapping. These costs are directly related to the valuable ecological services that vanish when beavers and their dams are removed.

Biologists classify the North American beaver (*Castor Canadensis*) as a Keystone species because their dams and tree cutting create habitats that greatly support biodiversity. Beaver-created wetlands also offer many other important ecological benefits including downstream drought and flood protection, water table and aquifer recharge, and improved water quality, acting as the “Earth’s kidneys”.<sup>1,2</sup>

The ecological service values of beaver dams are real and important, but can be difficult to quantify, and vary in different regions of the country. In arid regions where water is in short supply, or salmon are endangered, or streams are badly incised and in need of restoration, the ecological benefits of beavers are nearly invaluable. Many western states have recently adopted beaver repopulation programs as a cost-effective way to manage these issues.

While Billerica does not have those issues, it does derive value from beaver dams in a multitude of other ways<sup>3</sup>. Beaver ponds slow stream flow, reduce erosion, reduce turbidity, and remove harmful runoff pollutants from the water. Beaver impoundments also moderate stream flows, reducing downstream flooding during peak flows and maintaining higher stream flows during droughts. Beaver ponds create vibrant ecosystems that support biodiversity, including habitats for many threatened and endangered species. They also offer open space and areas for human recreation.

### **Ecological Accounting**

The use of flow devices at 43 sites in town has prevented the trapping of 38 beaver colonies. In Billerica these 38 beaver colonies create an average of 10 wetland acres with their dams, or 380 total wetland acres that would not exist if the beavers were trapped. Estimates vary but ecological value of freshwater wetlands can conservatively be valued at over \$5,000 per acre per year.<sup>4</sup> Therefore the untrapped beavers are providing the town with approximately \$2,000,000 of free ecological services every year, and over 35 million dollars in ecological services since the inception of the program.



*Billerica Beaver Created Heron Rookery*

## **Summary**

In 2000 the Town of Billerica and Beaver Solutions LLC partnered on a unique Municipal Beaver Management Program. Currently, a total of 55 beaver conflict sites are successfully managed by the program. 43 of these conflict sites have been successfully managed nonlethally. The remaining 12 “No Tolerance Zones” are managed with beaver trapping and dam breaching.

The Billerica Beaver Management Program has shown that nonlethal beaver management at 43 sites saves Billerica taxpayers \$180 per site per year (\$7,740 per year total) versus beaver trapping.

Factoring in the difficult to quantify, but very real economic value of beaver created wetlands, you can make the case that where beaver coexistence is feasible, millions of dollars in free ecological services are provided to the town annually.

Since 2000, nonlethal beaver management tools have proven of great benefit to Billerica taxpayers, homeowners, businesses, and roads, as well as to nature and animal lovers. The Billerica Beaver Program is a proven model with nearly two decades of success that other communities can and should adopt for economic and ecological reasons.

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## **Citations:**

<sup>1</sup> EPA – *The Functions and Values of Wetlands*; <https://www.epa.gov/sites/production/files/2016-02/documents/functionsvaluesofwetlands.pdf>

<sup>2</sup> Beaver Institute website library, <https://www.beaverinstitute.org/research/library/>

<sup>3</sup> EPA – *The Economic Benefits of Wetlands*  
<https://www.epa.gov/sites/production/files/2016-02/documents/economicbenefits.pdf>

<sup>4</sup> Wetlands Management website,  
[http://forestandrange.org/new\\_wetlands/economics\\_and\\_recreation.htm](http://forestandrange.org/new_wetlands/economics_and_recreation.htm)