



*Castor canadensis*

# Beaver:

## Ecosystems Engineers

Beaver are second only to humans in how much they change their environment. It has been said that no animal has had a greater impact on the land surrounding Bangor, and that the Penjajawoc Marsh owes its existence to the beaver.

We can see signs that we are entering an area that has been inhabited by beaver, usually long before we spot a beaver.

Some signs of beaver are: pointed chewed stumps, lodges, chewed bark on trees, beaver canals, dams, and scent mounds.



*Beaver sign*

These signs tell us a lot about the beaver.

For instance: if the beaver are actively living in the area, how long the beaver has been there, and how long they may stay.



For example:

- Recently downed stumps have blonde wood, and indicate that beaver have been active that year/season.
- Gray stumps, seen along with blonde stumps, let us know beaver were also here more than one year ago. Conversely, if only gray stumps are present (with no blonde stumps), then beaver left the area more than one year ago.
- Gray stumps with turkey tail fungus growing on them are at least three years old. They tell us how long beaver have been present (if blonde stumps are also found) or how long they have been gone.
- Beaver have favorite trees. If we see pointed stumps of their least favorite trees, which are pine & hemlock, the beaver are probably running out of food. You can predict that they will leave the area within a year.

So, we know when we are in an area that beaver are living in. Why don't we see them more often? The major reason is that beaver work the night shift; they are nocturnal! So they are awake and moving at night, while we are usually asleep. The best time to see beaver is



*Gray stump with fungus*

at dusk, or just before dawn. Occasionally, we will be lucky and see a beaver during the day.

Beaver live an average of five to ten years in the wild, but can live up to 24 years. Beaver that die before old age are usually lost to trapping by humans; predation by coyote, bobcat, fisher, weasel or black bear; car accidents; or starvation during very harsh winters.

Beaver mate for life and have one to nine babies or kits in the spring. The size of the litter is dependent on the abundance of food supply, and the health of the mother. The average litter is three to four kits. Beaver are mammals, so the kits are live-born, and drink their mother's milk. The kits can open their eyes soon after birth and can swim within two weeks.

Beaver are good swimmers. They have special adaptations for swimming underwater. Beaver have special see-through eyelids that protect their eyes when swimming, like goggles. They have valves in their noses and ears that shut out the water when they go under. Besides that, they have thick, oily, and waterproof fur. They have webbed feet, like flippers, that give them strong propulsion. They can swim as fast as 5 miles per hour. They steer with their big, flat tail. Beaver can slow their heartbeat underwater, and stay under as long as 15 minutes. If a beaver feels threatened, it will give a warning slap with its tail and retreat underwater.





*Beaver dam*

Beaver have big front teeth, called incisors. They are in the rodent family and all rodents have incisors. These incisors grow continuously. Chewing, especially bark and felling trees, keeps the teeth from growing too long.

Some of the beaver's favorite foods are aquatic plants, such as water lilies and cattails. Favorite trees are in the willow family. These are trees that prefer moist soils, and include Aspen & Balsam Poplar. After the favorite trees are Ashes and Oaks and Sugar Maples; then Birches. Less favored trees are Speckled Alder and Red Maples and Hop Hornbeam. Least favorite are Pines & Hemlocks, although sometimes the beaver will partially eat, or "girdle," these (eating bark off around the tree). Girdling will kill these least favorite trees and promote areas for the more favored trees to grow. It makes sense that beavers' favorite trees are closer to the water, and like to grow in moist soil; and that their least favorite trees like to grow in drier soil, often further from the beaver pond.

In areas of shallow water, or streams, beaver build dams to create beaver ponds. The sound of rushing water will trigger a beaver to make a dam, and create a pond. The beaver has such a strong instinct to stop the sound of flowing water that it will even build a dam

over a tape recorder, playing the sound of flowing water, on dry land! Bangor Land Trust has protected the culvert under the Blue Trail in the Walden-Parke Preserve with a beaver deciver.

Dams are made of trees, and branches, mud and stones. Beaver will eat the bark off the trees and branches first, and then “recycle” them into the dams and lodges. Beaver carry sticks and mud and stones in their mouths and front paws to build the dams. Dams must raise the water level in the pond high enough to keep the lodge entrance under water and help protect the beaver from predators. An “average” dam is three feet wide and five feet high. Length grows over time, but is usually at least 15 feet long. The biggest known beaver dam in the United States (2014) is in Three Forks, Montana. It is 713 yards long, five yards (15 feet) high, and eight yards (24 feet) thick. The biggest dam in the world (2014) can be seen from outer space. It is in Northwest Canada in Canada’s Wood Buffalo National Park. It was all built since 1975, and is over ½ mile long (929 yards)!

Lodges are made from a large pile of sticks. They can be at the pond’s edge, or surrounded by water. The beaver will eat through the sticks to create underwater entrances and rooms inside the lodge. The outside of the lodge is fortified with mud to help keep predators (like bear and coyote) out.



Lodge

The beaver spend the entire winter under the ice, and in the lodge. They must store enough food (branches) under the pond ice to sustain the family through the whole winter. The beaver push branch ends into the mud to help hold them, just outside a lodge opening.

The family consists of the original pair of beaver and their offspring of two years. The lodge can be quite full. The lodge has several entrances, and usually two rooms. The lower room is used for eating, with living and sleeping occurring in the upper room. After a long winter under the ice, the beaver emerge again.

In the spring, the two year olds are turned out on their own to make room for this year's coming kits. The young beaver need to search for their own potential ponds. The beaver search first up and down the watershed. On their travels, scent mounds in ponds tell the searching beaver whether the pond is inhabited and they should keep going, or if a male or female beaver is living alone on the pond and needs a mate. If there are no spaces in the watershed, a beaver must find another watershed to live on. Traveling across land, in search of a new home is very dangerous for beaver. They are slow on land, and easier prey than when in water. For those that survive, new homes are found; new dams and lodges are built. At three years old, beaver mate, having kits of their own.

So the beaver transform the shallow stream into a shallow pond. It becomes home to the beaver. Additionally, the beaver make canals

from the pond to access other ponds and other areas of trees.

And then the magic that is an ecosystem begins. The beaver pond that has been created becomes home to many others as well.



Insects lay their eggs in the wetland pond environment. Dragonflies,

aquatic beetles, worms, leeches and mosquitos live in the calm water, while stoneflies and mayflies and caddisflies are preserved near the running water at and just below the dams. Frogs including green frogs, pickerel frogs, and bullfrogs come to feed on the insects and larvae. Snakes and some salamanders also come for the feast. Fish and ducks in turn are, attracted to the pond with its food supply of insects and larva and tadpoles.

The recovery of the wood duck population in the U.S. has been credited to the recovery of the beaver population and increase in

beaver ponds. In addition to the food source, the wood duck find dead trees to nest in. Turtle also find good habitat in the beaver pond. Weasel, mink, and raccoons hunt for frogs and snakes along the edge of the beaver pond, as does the great blue heron, green heron and bittern. Osprey hunt the fish and occasionally small mammals. Hawk are attracted by the abundance of small birds and mammals and frogs. Migrating ducks settle and feast before traveling on. Song birds also increase in areas of beaver ponds. Flycatchers, common yellow throat, the ruby crowned kinglet, and many warblers find a home near the beaver pond wetland too.



Muskrat, voles, and otters make their homes along the shore. Rabbit, deer, and moose come to browse on young shoots that sprout from the beaver stumps.

Red fox come to feed on the rabbits. Even the standing dead trees in the pond attract beetles, who in turn feed the woodpecker.

In the end, all the living and non-living parts of the beaver pond interact together in a balanced system: an ecosystem. The beaver has been the ecosystem engineer.

The biodiversity of a beaver wetland rivals that of a rain forest. Half of the endangered species in America rely on these wetlands. The beaver, in making its home, also makes a rich environment for many, many others. Because of the critical role the beaver plays in creating wetlands, and because of the importance of wetlands, the beaver is known as a “keystone species”. Without the beaver, there is much less wetland and much less biodiversity.

Beaver created ponds and wetlands also benefit humans. The beaver pond and wetland decreases the chances of flood (as the wetland can hold excess water). The wetland reduces the severity of droughts by recharging drinking water aquifers (acting as wells of water, percolating down to raise the water table when needed). Wetlands also prevent soils from washing downstream, and reduce

erosion. Perhaps most importantly, the ponds reduce pollutants and create clean water. Bacteria in the pond consume water's organic contaminants. Phytoplankton use the inorganics to make food. The water is cleaned by sedimentation as well. Beaver wetlands are responsible for the purity of water in our water table.

For our spirit of discovery and enjoyment, beaver ponds provide us areas for wildlife observation, fishing, nature photography, bird watching, kayaking and canoeing.

Eventually, the beaver run low on food supply. They abandon their pond and search for a new place to make their home. Without the beaver there to repair the dam, the water level in the pond begins to drop. The pond becomes only a wetland, and through years of succession, a fertile meadow. Shrubs begin to grow. Eventually trees that prefer moist soil return. Perhaps one day, the beaver will return.

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