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Beaver Ecology

Core Curriculum Content Standards: 3.3.A, 3.4.A, 5.1.A, 5.5.A&B, 5.10.A&B, 6.6.E

DESCRIPTION:

This field investigation of the beaver (*Castor canadensis*) concentrates on adaptations, ecological relationships, and the general life history traits of this species. Participants will have the opportunity to get a close-up look at a preserved beaver specimen, to discuss a brief historical overview of beavers in New Jersey, and to hike to an active beaver community. In the field, dams, lodges, and other evidence of the beavers' influence on the natural landscape will be observed. In conclusion, participants will determine the implications of their discoveries to human environments.

OBJECTIVES:

- To give students the opportunity to get a comprehensive overview of a unique wildlife species and its influence on the environment.
- To demonstrate how the natural history of the beaver governs not only its own survival, but also the survival of other species of wildlife.
- To compare the ecological influence that the beaver has on its environment with that of human populations, and suggest ways that humans might alter their living habits to enhance the existence biodiversity.

BACKGROUND INFORMATION:

See the Beaver Fact Sheet and the Beaver Natural History handout.

TEACHER PREPARATION:

The teacher should review the Beaver Fact Sheet and the Beaver Natural History handout.

STUDENT ORIENTATION:

If possible, help students understand meanings of the following key vocabulary words before they participate in the session:

Adaptation, biodiversity, carrying capacity, conservation, density, ecosystem, edge effect, environmental impact, habitat, herbivore, home range, niche, renewable resource, succession.

MATERIALS NEEDED:

- Preserved beaver specimen and skull.
- Map of beaver pond area.
- SOC literature: "Beavers Facts" and "The Beaver"

PROCEDURES:

1. Look at the preserved beaver specimen and quiz the students about their knowledge of beaver and its life history traits. Fill in what's presented using the information you have gleaned from the *Beaver Facts* and *The Beaver* handouts.
2. Take the group to the shore of Lake Wapalanne to view the beaver lodge and examples of beaver cuttings and felled trees.
3. Begin hike to one of the local beaver pond communities (the SOC instructor will show you where these communities exist).
4. On the way to the beaver pond, point out as many features of natural landscape as possible. Potential examples will include twigs browsed by deer, nuts carried and chewed by squirrels and chipmunks, burrows dug by voles, holes bored into trees by woodpeckers, etc. The SOC instructor will help to familiarize you with these sightings.
5. Once at the pond, have students locate the features typical to a beaver pond (fresh cuttings, dam, lodge, stored food cache, etc.). Then have students try to comprehend the magnitude of the changes the beaver has created in the area. Finally, begin to point out some features that show how the beavers' activities have enhanced the environment for a variety of other species. The pond environment established by the beaver is home for a much greater and diverse population of wildlife than existed before the pond was created. In addition, the sequence of ponds that beavers create along a stream watershed help to moderate the flow of water during periods of heavy precipitation to prevent flooding and soil erosion.
6. Review and summarize before returning to campus. On the way back, look for examples of human changes and discuss the impact that these types of changes might have on the environment (i.e., paved roads, woods trails, tree-cleared areas, etc.).

WRAP-UP INTERPRETATION:

- The instincts that govern the survival of the beaver are generally those that *sustain* the ecological integrity and harmony of the natural community in which it survives. That is, it *perpetuates*, and does not destroy, the environment in which it lives.
- Conclude with a discussion of how humans alter their environment just like the beavers do, however, the impact of our alterations to the environment usually have a negative effect on other species. Discuss the importance of creating ecologically responsible human communities and setting aside natural areas, such as Stokes State Forest, for other species.

TEACHER ROLE:

Help to keep group together during the session, maintain discipline, and assist SOC instructor with various aspects of activity, as requested. Be prepared to teach future sessions with other groups of students.

VARIATIONS:

If time permits, while at the pond site, have small sub-groups try to construct miniature *models* of beaver dams or lodges using small dead twigs and mud gathered from the immediate locale. This activity can impress upon the students the adaptive skills needed by the beaver to build its various structures as well as the recyclable nature of all of the materials that it uses.

FOLLOW-UP:

Have students look for evidence of beavers in their own home communities or areas and determine: 1) The *impact* they are having on the surrounding environment and 2) Public *perception* of that impact (i.e., is it perceived as positive or negative impact?)

GLOBAL EXTENSIONS:

Have students research the kinds of human activities on the planet that have adversely affected native species.

Beaver Facts

1. Beavers are **mammals** and give birth to live young, have hair or fur, and nurse their young.
2. Beavers are members of the order of mammals known as **rodents**.
3. Beavers, like all rodents, have **incisor teeth that grow for their entire lives**.
4. Beavers can **hold their breath for 8-10 minutes and up to 15** when pressed.
5. Beavers live to **15 years of age**.
6. Beavers are **crepuscular**, active at dawn and dusk, and may be active at night also.
7. **Otters are the principal predator** but lynx, fishers, wolves, and coyotes can also kill beavers.
8. Beavers **store fat in their tail** to help survive winter.
9. Beavers can **use their tail to stand upright**.
10. Beavers are **herbivores** and eat the inner bark of trees called **cambium**.
11. Beavers alter their habitat substantially and **build structures including dams and lodges**.
12. Beavers can **live in dens made out of sticks and mud** or simply dig a chamber into a stream bank. Both bank and stick/mud dens will have under water entrances.
13. Beaver dams are not waterproof and the **beavers will constantly monitor the water level**, even dropping the water level under the ice to create breathing pockets.
14. Beavers will **store many tree branches at the bottom of a pond or stream** (make a cache) and they will live off of the cache during the winter.
15. **Many animals benefit from the habitat that beavers create including, amphibians (frogs and salamanders), wading birds, ducks and geese, and fish.**
16. Beaver **ponds eventually fill in** and become rich stream meadows.
17. Beavers will **dig channels that they use to float trees to the main pond**.
18. Beavers were the **main reason that much of North America was explored** and later settled.
19. Beavers were **trapped for their fur**, which was shipped to Europe, felted, and turned into expensive hats.
20. Beavers were **nearly hunted and trapped to extinction** and had to be reintroduced to much of its former range including NJ.
21. Beavers **numbered 60-100 million in NA** when Europeans arrived on the scene.
22. Beavers **live in family units with a mother and father, new-born infants or kits, and 1-2 year olds**. At the end of two years young beavers move on to their own territory.
23. The beavers **three main senses sight, sound, and smell** are all located on the upper third of their head, which is the only part of the beavers body not submerged when they swim.
24. Beaver's **hind feet are webbed**, and are much larger than its front feet.
25. **Adult beavers can weigh 40-75 lbs**. One beaver was trapped in Canada weighing over 100 pounds!
26. Beaver fur is composed of both **under fur that traps air next to the skin, and outer guard hairs that help to keep the fur dry**. Beavers **rub their fur with oil to help protect it and keep it dry**.
27. Beavers **mate in February and have a 128-day gestation period (pregnancy)**.
28. Beavers have **valves in their ears and nose that close automatically when they submerge** and a membrane that shields their eyes.
29. Beavers have **self-sharpening teeth that with a harder outer enamel and a softer inner dentine**

BEAVER NATURAL HISTORY

(*Castor canadensis*)



The beaver is a furry animal with a wide, flat tail that looks like a paddle. Beavers are known for their skill at cutting down trees with their strong front teeth. They eat the bark and use the branches to build dams and lodges (homes) in the water. Beavers almost always seem to be busy working. For this reason, we often call a hard-working person an "eager beaver" or say that the person is "busy as a beaver."

Beavers live in rivers, streams, and freshwater lakes near woodlands. They are excellent swimmers and divers. A beaver can swim underwater for 1/2 mile (0.8 kilometer), and can hold its breath for 15 minutes.

There are more beavers in the United States and Canada than anywhere else in the world. Beavers are also found in Asia and Europe. In the 1980's, trappers in the United States and Canada captured about a million beavers a year. Beaver fur is soft and shiny, and it wears well. Clothing manufacturers use it to make fur coats and to trim the collars and cuffs of cloth coats. Beaver fur is also squeezed together with other kinds of fur to make a cloth called felt.

Beavers were probably the most hunted animals in North America from the late 1500's through the 1800's. The pioneers and Indians ate beaver meat, and traded the furs for things they needed. In the late 1600's, a person could trade 12 beaver skins for a rifle. One beaver skin would buy four pounds of shot, or a kettle, or a pound of tobacco. Trading companies shipped beaver fur throughout the world to be made into coats or hats. Hunters killed so many beaver that hardly any were left in North America by the late 1800's. The U.S. and Canadian governments passed laws to protect the animals. Today, beavers, like many other wild animals, can be trapped only at certain times of the year.

The body of a beaver

North American beavers are 3 to 4 feet (91 to 120 centimeters) long, including the tail, and weigh from 40 to 95 pounds (18 to 43 kilograms). They are the largest rodents (gnawing animals) in the world except for the capybara of South America. Unlike most other kinds of mammals, beavers keep growing throughout their lives. Most beavers look larger than they really are because of their

humped backs and thick fur. Thousands of years ago, some beavers of North America were about 7 1/2 feet (2.3 meters) long, including the tail--almost as long as the grizzly bears. No one knows why these huge beavers disappeared.

Head

The beaver has a broad head, with large and powerful jaws. Its rounded ears and small nostrils can close tightly to keep water out. A beaver has three eyelids on each eye. Two outer eyelids, one upper and one lower, fit around the eye. A transparent inner eyelid slides down over the eye and lets the animal see under water. On land, it protects the eye from sharp twigs when the animal cuts trees. The beaver cannot see well, and depends on its keen hearing and smell to warn it of danger.

Teeth

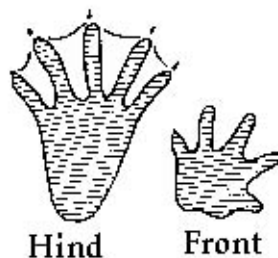
A beaver has 20 teeth--4 strong, curved front teeth for gnawing, and 16 back teeth for chewing. The front teeth, called incisors, have a bright orange outer covering that is very hard. The back part of the incisors is made of a much softer substance. When a beaver gnaws, the back part of its incisors wears down much faster than the front part. As a result, these teeth have a sharp, chisel-like edge. The incisors never wear out because they keep growing throughout the animal's life. The back teeth have flat, rough edges and stop growing when the beaver is about 2 years old.

There are large gaps between the beaver's incisors and its back teeth. Flaps of skin, one on each side of the mouth, fold inward and meet behind the incisors. These skin flaps seal off the back of the mouth. They let the animal gnaw wood on land or in the water without getting splinters or water in its mouth. The flaps open when the beaver wants to eat or drink.

Feet

The beaver's legs are short, and its feet are black. Tough skin, with little hair, covers the feet. Each front paw ends in five toes that have long, thick claws. A beaver uses its claws to dig up the roots of bushes and trees for food. When swimming, the animal usually makes tight fists of its front paws and holds them against its chest. Sometimes, when a beaver swims through underwater brush or grass, it uses its front paws to push the plants aside.

The back feet are larger than the front ones, and may be 6 to 7 inches (15 to 18 centimeters) long. The toes are webbed and end in strong claws. Two claws on each foot are split. The beaver uses these split claws to comb its fur. The webbed feet serve as flippers, and help make the animal a powerful swimmer and diver.



Tail

The tail of a beaver is one of the animal's most interesting features. The stiff, flat tail looks like a paddle. It is about 12 inches (30 centimeters) long, 6 to 7 inches (15 to 18 centimeters) wide, and 3/4 inch (19 millimeters) thick. A small part of the tail nearest the beaver's body has the same kind of fur as the body. The rest is covered with black, scaly skin and has only a few stiff hairs. The beaver uses its tail to steer when it swims. The tail is used as a prop when the animal stands on its hind legs to eat or to cut down trees. A beaver slaps its tail on the water to make a loud noise to warn other beavers of danger.

Fur

Beaver fur varies from shiny dark brown to yellowish brown. It looks black when wet. A beaver's coat consists of two kinds of fur: (1) short, soft underfur; and (2) long, heavy guard hairs. The guard hairs lie over the underfur and protect it. The underfur helps keep a beaver comfortable in the water. This fur traps air and holds it close to the animal's skin. The trapped air acts as a protective blanket that keeps the beaver warm, even in icy water.

The life of a beaver

Beavers usually live in family groups. As many as 12 beavers may make up a family, but generally there are 6 or fewer. The group includes the adult male and female, the young born the year before, and the newborn.

Beavers live as long as 12 years. Their enemies include bears, lynxes, otters, wolverines, wolves, and people. A beaver avoids these enemies by living in the water and by coming out mostly at night to eat or work. Unfortunately, they cannot defend themselves against water pollution.

The Young

A female beaver carries her young inside her body for about three months before they are born. She has two to four babies at a time. Most young beavers, called kits or pups, are born in April or May. A newborn kit is about 15 inches (38 centimeters) long, including its tail, and weighs 1/2 to 11/2 pounds (0.2 to 0.68 kilogram). The tail is about 3 1/2 inches (8.9 centimeters) long. A kit has soft, fluffy fur at birth, and its eyes are open.

The young live with their parents for about two years, and then are driven from the family group. These young adults are forced out to make room for the newborn. Beavers rarely fight with each other except in spring, when the 2-year-olds are driven away.

Food

Beavers eat the inner bark, twigs, leaves, and roots of trees and shrubs. Poplar trees, especially aspens and cottonwoods, and willow trees are among their favorites. One acre (0.4 hectare) of poplars can support a family of six beavers for one to two years. Beavers also eat water plants, and especially like the roots and tender sprouts of water lilies.

Beavers store food for winter use. They anchor branches and logs in a cache under the water near their lodges. In winter, they swim under the ice and eat the bark.

Cutting down Trees

A beaver uses its strong front teeth to cut down trees and to peel off the bark and the branches. To cut a tree, the beaver stands on its hind legs and uses its tail as a prop. It places its front paws on the tree trunk, and turns its head sideways. Then the beaver bites the trunk to make a cut in it. The animal makes another cut farther down on the trunk. The distance between the two cuts depends upon the size of the tree. The cuts are farther apart on large trees than on small ones. The beaver takes several bites at the cuts to make them deeper. Then the animal pulls off the piece of wood between the cuts with its teeth. It keeps cutting and tearing out pieces of wood until the tree falls. Beavers usually cut the wood away around a tree trunk, but they may cut through the trunk from only one side.

A beaver cannot control the direction in which the tree falls. It cuts until the trunk starts to break, and then runs to safety. The animal usually dives into the water nearby. It waits there until it is sure that no enemies have been attracted by the noise of the falling tree. Then the beaver goes back to work on the tree.

First the animal gnaws the branches off the tree. Then it carries, drags, pulls, pushes, or rolls the log into the water. The beaver stores some branches deep in the water for use as food during the winter. The other branches may be used to enlarge or repair the dam and the lodge. Beavers often work alone, but sometimes several work together.

Building Dams and Canals

The beaver's habits of building and of storing food seem to be instinctive (unlearned). A beaver cuts down trees even if it has no place to build a dam or a lodge, and even if it has more than enough food.

A whole beaver family, and sometimes beavers from other families, may join in building a dam. Beaver dams are made of logs, branches, and rocks plastered together with mud. Beavers use mud and stones for the base of a dam. Then they add brush and log poles. They strengthen the dam by placing the poles so that the tips lean in the same direction as the water flows. The beavers plaster the tops and sides of the poles with more mud, stones, and wet plants. They do most of this work with their front teeth and front paws. They bring mud from the river bottom by holding it against their chests with their front paws.

The beavers build their dam so that the top is above the water. Some dams are more than 1,000 feet (300 meters) long. Beavers may keep their dams in good condition for many years. Most beavers that live in lakes do not build dams, but some build dams across the outlets of small lakes.

A beaver marks its territory with castors, small piles of mud mixed with the beaver's scent. The castor glands of beavers are used in making perfume.

Sometimes beavers dig canals so they can move logs to their dams or lodges easily and quickly. The canals are 12 to 18 inches (30 to 46 centimeters) deep, 18 to 24 inches (46 to 61 centimeters) wide, and

may be more than 700 feet (210 meters) long. A beaver canal may extend from a wooded area to a lake or riverbank. Or it may cut across a piece of land that sticks out into the water.

Building Lodges

A beaver lodge looks somewhat like a teepee. A family of beavers builds its lodge with the same materials and in much the same way as it builds a dam. The lodge may stand on the riverbank or in the water like an island. The tops of most lodges are 3 to 6 feet (91 to 180 centimeters) above the water. Each lodge has several underwater entrances and tunnels, all of which lead to an inside chamber. The floor of the chamber is 4 to 6 inches (10 to 15 centimeters) above the water. Here, young beavers can stay warm and dry in winter, and the adults can dry off after bringing in food. Holes between the branches in the ceiling let in fresh air.

The size of the lodge depends on the size of the family and the length of time the beavers have lived there. The animals enlarge and repair the lodge as long as they live in it. Most beavers abandon their lodge only if they have eaten all the food in the area, or if too many enemies move nearby.

Beavers that live in large lakes or in swift rivers may dig dens in the banks. These beaver dens, like the lodges, have underwater entrances and tunnels.