

Beaver Ecology

Program Purpose

The purpose of this program is to introduce students to beaver adaptations, the beaver life cycle, and to explore the effects of beaver behavior on ecosystems.

Length of Program

1½ hours

Age

Grades 2nd – 8th

Maximum Number of Participants

20

Objectives

After completion of all activities, students will be able to:

- Identify the physical and behavioral adaptations that help beavers survive in their environment.
- Recognize beaver signs in the natural world.
- Compare and contrast how beavers influence the ecology of both forest and aquatic ecosystems.

Preparation

Before the class arrives:

- Obtain the “Beaver Ecology” kit from the storage room.

Basic Outline

- I. Introduction (5 minutes)
- II. Beaver Dress-up (30 minutes)
- III. Beaver Signs (10 minutes)
- IV. Beaver Life Cycle (15 minutes)
- V. “Beaver Jive” song (5 minutes)
- VI. Beaver Ecology (20 minutes)
- VII. Conclusion (5 minutes)

Materials

Beaver parts (front and hind feet, skull, pelt)
Beaver signs (chewed sticks and stumps, wood chips)

Beaver Dress up (goggles, clothespin, ear muffs, webbed hind feet, fur coat, foam pad, tail, teeth, rubber gloves with fake nails, plastic comb, deodorant, WD40 can)
Beaver Ecology cards

Introduction

Introduce yourself and the class. Explain that this class will be focused on beavers. We will learn about their physical and behavioral adaptations, the life cycle of beavers, signs they leave behind, and the ways in which beaver behavior affects the ecology of different habitats.

Introduce beavers as the largest North American rodent, scientific name *Castor canadensis*. Explain that we will first be learning about beaver adaptations. Ask the students to define the term “adaptation.”

- *An **adaptation** is a characteristic that helps a plant or animal survive in its environment.*

There are two types of adaptations: physical and behavioral.

- *A **physical adaptation** is a characteristic that a plant or animal HAS (is born with) that helps it survive in its environment.*
- *A **behavioral adaptation** is something that an animal DOES (a behavior) that helps it survive in its environment.*

Beaver Dress-up

- The beaver has many physical adaptations that help it thrive in its

aquatic environment. In this activity, a volunteer from the class will be dressed up as a beaver. Ask the class for some physical adaptations of beavers. If available, pass out the real beaver parts representing each adaptation, and dress up the volunteer using representative props (beaver feet, teeth, tail, etc.). Talk about the functions of each physical adaptation as you add it to the volunteer beaver. Incorporate questions about the beaver's behavioral adaptations and use beaver sign props when possible (chips, chewed sticks and logs, etc.)

- **TEETH (cardboard cutout):** teeth have two layers: a hard orange enamel on the front side and soft white dentine in the back. Beaver teeth grow constantly (like all rodents), so they must constantly chew to keep their teeth the proper length. Beaver teeth are self sharpening; the dentine wears away faster than the enamel as the lower jaw works against the upper jaw.

Behavioral adaptation: Beavers use their sharp teeth to cut down trees and saw off small branches. They gnaw vertically on trees, parallel to the trunk, leaving large chips around a fresh cutting. A beaver can cut down a four inch tree in less than 10 minutes. A large tree may take several days to cut. Beavers eat pond plants, ferns, buds, and leaves in summer, and the bark of aspen, willow, birch and alder trees and shrubs in winter.

- **TAIL (cardboard cutout):** tail has two physical functions: to store fat in the winter (enlarges up the three times its normal thickness!) and act as a kickstand to balance the beaver as it chews trees upright.

Behavioral adaptation: The tail is used as a rudder for steering in the water, and as a paddle to slap against the water as a warning signal. It is NOT used to pack mud as seen in cartoons.

- **WEBBED HIND FEET (cardboard cutouts with Velcro comb):** Webbing between the toes helps to push water as the beaver swims. The fourth toenail on each hind foot is split and has a special purpose.

Behavioral adaptation: The fourth toenail is used as a comb to spread waterproofing oils through the fur.

- **FRONT FEET (gloves with fake fingernails):** front feet have long nails which give the beaver traction in mud. Front feet are similar to human hands, except the thumb is weakest and the pinkie is strongest.

Behavioral adaptation: Nails are used to grasp wood and as a comb for grooming. They will also use their front feet to dig canals between streams, through which they can float branches to add to dams or lodges.

- **FUR (coat):** has two layers: long outer layers called guard hairs and soft inner layer of fur called felt. Felt is made up of tiny, interlocking hairs that stick together and hold their shape.
- **FAT LAYER (foam pad):** Insulates the beaver in 32 ° F water in the winter, and streamlines the body for faster travel in water.
- **OIL GLAND (WD40 can):** Located near the base of the tail is a waterproofing oil gland.

Behavioral adaptation: Beavers spread the waterproofing oil through their fur, similar to the preening of ducks.

- **CASTOR GLAND (deodorant):** Located near the tail on the abdomen, this gland contains

castoreum. Castoreum was and is still used as a fixative in expensive perfumes. It is NOT related to castor oil, which comes from the castor bean.

Behavioral adaptation: From spring-time to mid-June, beavers build mounds of mud with their hands and squirt castoreum on top of them to mark territory and attract mates.

- **NICTITATING MEMBRANE (GOGGLES):** Clear third eyelid that beavers can close, but still see through, while swimming in the water. Protects the beavers eyes and helps them see.
- **SPECIAL INTERNAL FLAPS (NOSE, EARS, MOUTH) (clothespin attached to the goggles, earmuffs):** Keeps water out of the beaver's nose and ears while diving. The mouth flap is a special inner mouth membrane BEHIND the teeth. Beavers can carry a stick in their teeth and close this membrane so they don't swallow the whole pond while swimming.
- **GOOD LUNGS:** Ask the volunteer beaver to hold his or her breath for 15 minutes! Beavers' lungs can remove 75% of the oxygen in air, compared to humans' measly 15%. They can also tolerate a high build-up of carbon dioxide in the blood, which we cannot.

Other behavioral adaptations: Damns and lodge building, and food caches.

- Beavers are stimulated to build **damns** by the sound of rushing water. Damns provide a protective pond and a constant water depth. Water 5-6 feet deep is important to avoid exposing an underwater lodge entrance, and to keep the pond from freezing solid in winter.

- Beavers only build **lodges** IF there is no suitable river bank to burrow into. The lodge protects a beaver family from predators and the winter's cold. Snow cover on a lodge is very important for insulation; interior temperatures must remain about 40° F. Abandoned beaver lodges are often occupied by river otters.
- **Food caches** made up of cut branches are stored underwater in huge piles near the lodge for use in winter. A beaver will chew off about a foot-long branch, swim back to the lodge and eat it like corn on the cob. When finished, allow time for taking photographs. Let the volunteer beaver strip off the physical adaptations one by one and quiz the class about the function of each physical adaptation.

Beaver Signs

Ask the students to review what type of signs might indicate that a beaver is present. We have touched upon many already, and this should serve as a good review.

- 1) Damns
- 2) Chew marks on branches and logs
- 3) Pencil-shaped stumps of cut tree trunks
- 4) Wood chips
- 5) Canals
- 6) Lodges
- 7) Food caches (in winter these can be seen underneath the ice)
- 7) Scent mounds
- 8) Drag marks (a trail leading to the water where branches have been dragged several times)

Beaver Life Cycle

Have the students all stand in a circle. Inform them that they have magically transformed into the outside of a beaver lodge. Ask for a volunteer to step into the center of the circle and be the beaver. Tell

the students that in the beaver family, MAMA beaver is the boss. Females spend more time building dams and lodges, marking territory, and have a more effective tail warning slap. When mama beaver slaps her tail, everyone dives. When papa beaver slaps, everyone looks around. However, mama beaver needs a mate. Ask for a volunteer to step into the circle to be papa beaver. Beavers mate for life, searching for another only after their partner is killed. They usually mate in February, and give birth to 3-9 kits (baby beavers) in May. Ask for 3 volunteers to join mama and papa beaver in the lodge as kits. Kits are born fully furred with their eyes open. They can swim within 24 hours of birth. The kits live in the lodge with their parents the whole year. The following spring, mama and papa have another litter. Ask 3 more volunteers to enter the lodge as new kits. Ask the kits how they like sharing the lodge. In real life, there may be up to a dozen beavers at any one time in the lodge. However, many times kits will be eaten by predators, including large fish, snapping turtles, mink, fox, coyotes and wolves. If you feel the group is mature enough, ask for a volunteer to be a wolf and pretend to eat a couple of the baby beavers. Then send the wolf and the eaten kits out of the lodge to join the circle. After the end of the second winter, mama and papa have a third litter, and the first set of kits are kicked out of the lodge (kick out the first litter). These two-year-olds must disperse to find their own territories and mates. (On Isle Royale, dispersing young beavers make up 25% of wolves' diets during the summer. In Canada one radio-tracked beaver traveled 148 stream miles before finding a suitable territory.) Each year after the second, a new litter of kits are born and the oldest young are kicked out of the lodge. Beaver families will stay in the area until most of their food source is wiped out.

When they move on, new young trees (usually aspen or birch) will grow and forest succession will create future habitat for other beavers.

“Beaver Jive” song

While still in a circle, teach the “Beaver Jive” song. Each verse has movements to go with it. The chorus is a smacking sound made by sticking out your top front teeth and sucking them against the bottom.

“Beaver one, beaver all
Let’s all do the beaver call.”

(Chorus)

“Beaver two, beaver three
Let’s all climb the beaver tree.”

(Chorus)

“Beaver four, beaver five
Let’s all do the beaver jive.”

(Chorus)

“Beaver six, beaver seven
Let’s all go to beaver heaven.”

(Chorus)

“Beaver eight, beaver nine
STOP! It’s beaver time!”

(Chorus)

Beaver Ecology

Ask the students if they know what ecology means.

Ecology is the study of how living and non-living things interact in the natural environment.

Ask the students what it means to study beaver ecology. We will be learning about how beavers affect the living and non-living components of their environment.

Besides humans, beavers are the animal that most greatly impacts their environment. Beavers can turn a forest habitat with a fast flowing stream into a floodplain filled with dead trees and cattails (Appendix 1). Ask the students how this might affect other plants and animals that live in the same habitat. Explain to the students that during

the next activity, they will be role playing different plants and animals. Pass out the Beaver Ecology cards and give the students a few moments to read their cards silently. Each student will have to decide if the presence of beavers are beneficial or detrimental to them. Ask the students to form debate groups, and an adult to come forward as the “beaver on trial.” Members from each debate group must come forward to either denounce or applaud the beaver for its damn-building actions.

Who benefits

Ducks	Hérons	Cattails
Wolves	People	Otters
Frogs	Minnows	Muskrat
Water lilies	Mink	Woodpeckers
Dragonflies	Water bugs	

Who suffers

Aspen	Birch	Alder
Trout	People	Voies
Shrews	Mice	Deer
Hawks	Owls	

(These answers are flexible. What is important is to allow the students to come up with arguments for or against the beaver.)

Conclusion

If time still remains, read the Ojibwe legend, “When Beaver Was Very Great,” from Appendix 2.

Review questions can be used as the end to once again reemphasize the knowledge covered in this lesson.

REFERENCES

The Fur Trade: Badger History, The State Historical Society of Wisconsin, Vol. 28, No. 2, 1974.
When Beaver Was Very Great, Ann M. Dunn, 1995, ISBN 1-883953-07-3.
Wolf Ridge “Beavers” lesson plan.