

Becoming a Beaver – Adaptations Exploration Costume Demonstration



Grade Level: preK-adult (adaptable vocabulary for any audience)

Subject Areas: Biology (adaptations), Expressive Arts

Duration: 30-60 minutes

Group Size: up to 20 students

Setting: any

Key Terms: physical and behavioral adaptations, ecosystem, habitat

Objectives:

Students will (1) identify physical adaptations that allow beavers to survive in their environment, (2) deduce what type of environment and food the beaver needs based on its adaptations, and (3) compare and contrast the beaver's physical adaptations with those of another rodent native to Colorado.

Overview:

Students will develop their inquiry skills by observing various models and materials related to beavers and their habitat. Students will help one of their peers dress as a beaver and identify the significance of each article of clothing and accessory. For an extended lesson, students will compare and contrast the pelts and skulls of a beaver and a muskrat and record their observations in a Venn diagram.

Beaver Background

Castor canadensis



Description: Beavers, the largest rodents, measure more than three feet in length, and weigh up to 55 pounds, with a broad, nearly naked, flat tail and webbed feet. Their sign is familiar: dams, lodges, bank dens, canals, slides and of course gnawed stumps of aspen, alder, willow or cottonwood. It takes a beaver approximately 30 minutes to fell a 5-inch diameter tree. Beavers feed on the upper, tender branches, leaves and bark of trees. Many mountain ponds, willow thickets and meadows also are the works of beavers over time. Beavers

are active year-round – their food is present year-round, and their ponds provide navigable water beneath the ice. No mammal other than humans has a great an influence on its surroundings. This is a "keystone species" in riparian communities; without them the ecosystem would change dramatically.

As abundant as beavers are today, it is difficult to believe that once they were on the verge of extinction, trapped for their under fur, which was used to make felt for beaver hats. In the mid-19th century, silk hats replaced beaver felt as a fashion, and that probably saved the beaver from extinction. But, before it ended, the beaver trade opened the mountains of Colorado to European exploration.

Beavers are fairly well protected from predators by their large size and aquatic habits. Mink eat some kits, and coyotes can capture a beaver waddling on dry land. Aside from that, floods may be the largest cause of death. Beaver in Colorado are managed as furbearers.

Range: The beaver lives throughout Colorado in suitable habitat, although it is most abundant in the sub-alpine zone.

Habitat: Beavers live around ponds and streams that are surrounded by trees.

Diet: Beavers feed on grasses and forbs in the summer, and bark in the winter.

Beavers eat the upper, tender branches, leaves and bark of trees. They do not eat the inner wood.

Reproduction: The den houses a nuclear family: parents, yearlings, and four or five kits. There is a single litter of young born each year, born in the spring after about a four month gestation period.

Beavers were on the verge of extinction in the early 19th century because felt hats made from their underfur were extremely fashionable. It was only when hat designers turned to silk in the mid-19th century that beaver populations were able to recover from the trade. Today, they enjoy very stable populations across Colorado. They are especially abundant in subalpine zones.

Our largest rodents, beavers can grow to be more than 3 feet long and weigh up to 55 pounds. Beavers are some of nature's most skilled engineers. They modify their environment more than any other animal on earth, second only to humans. Beavers build dams in order to regulate the water levels at the entrance of their lodges and to act as a storage reservoir for food. An entire colony of up to eight individuals will share a lodge made of sticks, mud and rocks. They will store caches of food below ice level for the cold winter months since they do not hibernate. Beavers don't need to hibernate because their food does not become scarce

In Colorado, beavers use birch, alder, willow, aspen and cottonwood for food as well as building material. These herbivorous rodents eat the leaves, buds, and **cambium** (a thin layer of living, dividing cells just under the bark of trees), and save the inner wood for construction. A grown beaver can fell a 5-inch diameter tree in half an hour! The average beaver colony needs about eight to ten acres of suitable trees to survive. Once their supply is depleted, beavers will abandon the area, allowing it to return to its pre-dam conditions.

Muskrat Background (for optional comparison)

Ondatra zibethicus



Description: The muskrat is an overgrown, semi-aquatic vole. Muskrats have dense underfur and a nearly waterproof "overcoat." Their feet are webbed and fringed with stiff hairs. The ankles are rotated out so the hind feet work as paddles (but rather inefficient walking feet). The tail is flattened side-to-side and serves as a rudder. The animals are dark brown in color, about 26 inches in length (of which the tail comprises nine inches) and weigh about two pounds.

Range: Muskrats live statewide in marshes, ponds and slow streams, often in areas dammed by beavers.

Habitat: Their lodges, made mostly of cattails and other aquatic plants, may be three feet high and six feet across. Feeding stations are similar but smaller. Inside the lodge is a nest chamber accessible only from below the water. Once inside the lodge, muskrats are safe from predators other than mink and occasionally snapping turtles. Moving awkwardly on land, however, they are killed by coyotes, foxes and large owls. Floods also kill muskrats, and fluctuating water levels increase the risk of death. Muskrats are managed as furbearers in Colorado.

Diet: Like other voles, these are runway builders and herbivores, eating mostly grasses, cattails, bulrushes and other marsh plants. They occasionally damage cornfields on flood plains, and their burrowing sometimes weakens ditch banks and levees.

Reproduction: Females breed in spring and summer and produce two or three litters of one to ten(average about six) young after a gestation period of about 30 days. The newborn young are blind, naked and vole-like, with round tails. Soon they acquire the muskrat's proper flattened tail, and at two weeks can swim and dive.

Materials:

Beaver Props

1. A beaver pelt
2. A beaver skull model
3. Images of beavers in their habitat
4. Wood or an image of wood that was gnawed or otherwise manipulated by beavers: bare twigs, chips from tree chewing, small stumps from felled trees.

Costume Props

1. Teeth - orange/yellow paper cut outs
2. Tail –fabric attached with a belt
3. Webbed hind feet – foam feet/flippers, comb
4. Fur – brown felt piece with a hole for the head
5. Fat layer – foam pad, life jacket, or white felt piece with head hole
6. Nictitating membrane – goggles
7. Good lungs!
8. Front fingers curled into nimble “claws”

Optional:

1. Oil gland – “WD-40” can
2. Front feet – gloves with fingernails
3. Castor gland – perfume
4. Special internal flaps – earmuffs and nose clip

Compare and Contrast Aquatic Rodents (For an extended lesson)

1. A muskrat pelt
2. A muskrat skull model
3. Journal

Beaver Adaptations Overview

1. Teeth

- a. Hard enamel outer layer and soft dentine inner layer wear at different rates so the teeth are self-sharpening.
- b. Their teeth never stop growing and beavers sharpen them constantly by gnawing on vegetation.

2. Tail

- a. Serves as a rudder to help beavers swim
- b. Fat storage in the winter
- c. Kickstand support while cutting trees
- d. Warning signal when used to slap the water
- e. * Note that beaver do NOT use their tail to pack mud onto their dam as is often depicted in cartoons. Beavers carry and pack mud with their nimble front paws.

3. Webbed Hind Feet

- a. Propulsion while swimming
- b. Fourth toenail is split and acts as a comb for grooming

4. Front Feet

- a. Can be used to grasp building materials and food. Beavers carry and pack mud with their nimble front feet.
- b. Grooming

5. Fur

- a. Long outer guard hairs shed water.
- b. Soft inner fur traps air and body heat, previously used for making top hats

6. Fat Layer

- a. Insulation from cold waters in the winter
- b. Streamlines the beavers figure for swimming

7. Oil Gland

- a. Groomed into the fur for waterproofing

8. Castor Gland

- a. Females build mounds and squirt them with their castoreum to mark territory and attract males.

9. Nictitating Membrane

- a. Clear extra eyelid that allows beavers to see underwater

10. Special Internal Ear, Nose, and Mouth Flaps

- a. Designed to keep water out of the beaver's ears and nose
- b. Second pair of lips behind their teeth so they can chew underwater – helpful as they chew ice-locked twigs out of their underwater caches.

11. Good Lungs

- a. Beavers can hold their breath for 15 minutes, which is helpful as they swim under the ice to gather cached twigs, and as they dive to escape predation.

Procedure:

1. If it is a smaller group, begin by having the students sit in a circle. Divide larger groups into three or four smaller groups and have inquiry props set in separate stations. Introduce the students to the materials and ask them pay close attention to as many details as they can by using their senses of sight and touch. Ask that they try to remain silent and save their questions and observations until everyone has been able to handle each prop.
2. While in a circle, open the discussion to their observations. Guide the discussion by introducing the term 'physical adaptation' and ask students to frame their observations in relation to this term.
3. Ask them guiding questions about what beavers eat and where they live and have them point to a specific adaptation to back up their response. Be sure to touch upon the majority of the adaptations that will appear in the dress-up activity.
4. Choose one student to dress as a beaver. Ask the students what adaptations their fellow classmate needs to become a beaver. Have all of the props laid out and invite the students one at a time to suggest an adaptation, retrieve the corresponding prop, and dress their classmate.
5. To reinforce the lesson, as the student removes each prop have them hold it up and ask the other students why the beaver needed that adaptation and how it was used.
6. Circle up again and introduce the muskrat pelt and skull. Ask them what they know about muskrats and have them discuss the similarities and differences between the rodent pelts and skulls.
7. Have students draw a Venn diagram and either draw or write about the physical adaptations of the beaver and muskrat. Size, shape, color, fur, feet, claws, tails, and teeth are some categories they may choose to include. Provide time for additional journaling.

This lesson adapted from materials from Wolf Ridge Environmental Learning Center, Finland, MN. Beaver and Muskrat background information taken from the Colorado Parks and Wildlife online species profiles: <http://cpw.state.co.us/learn/Pages/SpeciesProfiles.aspx>

Beaver



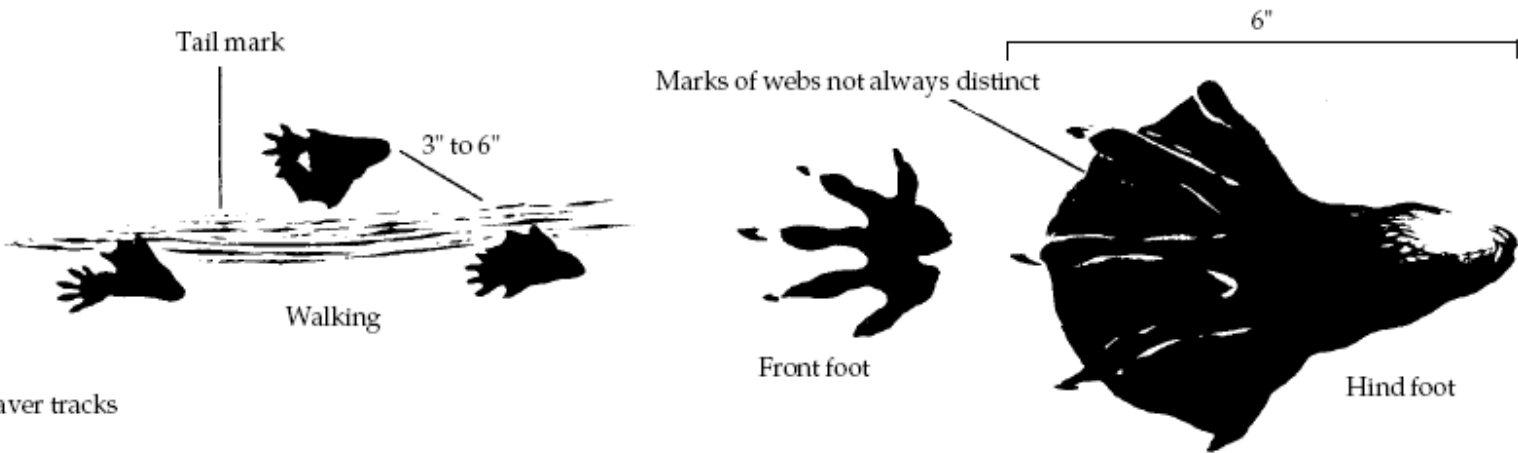


Fig. 2. Beaver tracks



Muskrat

© John White



Muskrat tracks

Tail mark
sometimes
shows

6 inches (152 mm)

3 inches (76 mm)



Walking



Front foot



Hind foot