



**Science Essential Standards:**

- 4.L.1.1, 4.L.1.2 (animal adaptations)
- 5.L.2.1, 5.L.2.2, 5.L.2.3 (ecosystems)

**Time:**

30 minutes

**Audience:**

4<sup>th</sup> or 5<sup>th</sup> grade

**Learning Objective:**

Describe how beavers are adapted to their environment and how they change their ecosystem.

**Materials:**

- Earmuffs or headphones
- clothespin
- goggles
- popsicle sticks
- balloon
- foam or life jacket
- rain jacket or coat
- gloves
- swimming flippers
- paddle

**Optional Materials:**

beaver mount, pelt, skull, teeth, chew

**Vocabulary:**

behavioral adaptation, dam, herbivore, lodge, mammal, physical adaptation

**Preparation:**

- ✓ Familiarize yourself with the area where you will be teaching. Check for poison ivy or other safety concerns.
- ✓ Gather the materials needed for the lesson.
- ✓ Know how many students are in your group.

**Background:**

Beavers are mammals that live up to 60 years on average. **Mammals** have hair or fur, give live birth, and produce milk to feed their young. As **herbivores**, beavers eat mostly bark, leaves, roots, and aquatic plants. Beavers have a series of unique adaptations that allow them to survive in an aquatic and terrestrial environment.

They have **behavioral adaptations** such as slapping their tail to warn off predators. They construct **lodges** using branches and mud to create their home. An underwater entrance provides access to the lodge, and protection from potential predators. Beavers are best known for the **dams** they build to create an ecosystem that meets their needs for survival. Dams block running water to create or enlarge ponds and lakes. They are one of the few animals that can drastically change their habitat to meet their needs. Humans do not always appreciate the engineering abilities of beavers, as beaver dams can have negative impacts for humans such as flooded fields and homes.

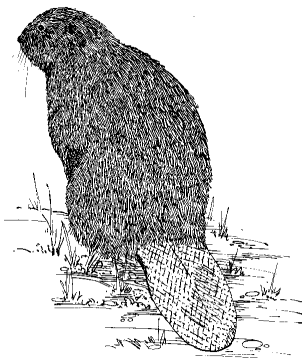
Beavers also have **physical adaptations** such a flat tail for steering while swimming underwater. Their webbed hind feet also help propel them through the water. Beavers have a clear eyelid, called a nictitating membrane, so they can still see underwater while keeping water out. They can similarly close their ears underwater. Beavers have large lungs which allow them to hold their breath for up to 15 minutes underwater. Two layers of fur, including a thick, soft undercoat and water repellent guard hair, allow beavers to keep warm and dry. This double layer keeps their body insulated, along with the help of a thick layer of fat. Their teeth never stop growing which allows them to gnaw on wood for food and building materials. This gnawing action helps file their teeth to create a sharp edge.

**Instructions:**

1. Greet the students and explain the learning objective of this activity. **Ask students what they know about beavers.** Share a personal experience with a beaver. **Ask them to share a personal experience they may have had with a beaver.** Use the students' answers to begin discussing beavers and their adaptations.

2. Ask them to give you a thumbs up if they have ever seen a **beaver dam or lodge**. Explain to students that beavers construct a dam to create a pond in which to build a lodge. The dam slows the flow of water around the lodge and maintains the water level. The lodge serves as a safe and warm place for beavers to live with its only entrance underwater. Baby beavers are also born in the lodge. Essentially, beavers are able to create the ecosystem in which they live.
3. Tell students that today they will be learning how beavers are adapted to their environment. Ask for a **student volunteer to demonstrate these adaptations by being dressed up as a beaver**. Explain that your volunteer will be transformed into a beaver. Once chosen, quietly confirm with your volunteer that they are okay with being dressed up in a silly way to represent the beaver's adaptations. You can also recruit the teacher as your volunteer.
4. Choose **at least 4** of the adaptations below to use and **discuss** with students. As you discuss each adaptation, have the student put on the items to dress up as a beaver.

- a. **Earmuffs or headphones (ears):** Beavers have a valve in their ear they can close when swimming to keep water out. They have an excellent sense of hearing.
- b. **Clothespin (nose):** Beavers have a flap in their nose they can close to keep water out.
- c. **Goggles (eyes):** Beavers have a clear eyelid that allows them to see underwater.
- d. **Popsicle sticks (teeth):** Beavers have very sharp teeth that are constantly growing. The teeth are very strong to allow them to cut down trees. Iron strengthens the teeth and causes them to turn orange.
- e. **Balloon (lungs):** Beavers have a large lung capacity that allows them to hold their breath for up to 15 minutes underwater. This is especially helpful when beavers are working underwater. Most of the time beavers will hold their breath for only a few minutes.
- f. **Foam pad or life jacket (fat):** Beavers have a thick layer of fat which helps keep them warm in the water. It also streamlines them when swimming.
- g. **Rain jacket or poncho (coat):** Beavers have a thick, two-layered coat to keep them warm and dry. The undercoat is soft and warm, while the guard hair on the outside repels water.



- h. **Comb (grooming claw):** Beavers use their grooming claw, which has a split toenail, to brush oil through their coat. The oil is produced by their oil gland. When the oil covers the guard hairs, it helps beavers be water repellent and move through the water.
- i. **Gloves (front feet):** Beavers use their front feet to construct dams, dig in the mud, hold food, move logs, and groom themselves. Their front feet also have claws.
- j. **Swimming flippers (hind feet):** Beavers have webbed hindfeet to help them swim in the water. Beavers can swim up to 6 miles per hour.
- k. **Paddle (tail):** Beavers use their tail to steer themselves while swimming. The tail is very wide and flat. They can also slap their tail on the surface of the water to scare off predators.

5. Ask students which adaptation they think is most useful for a beaver's survival. Have students give a thumbs up or a thumbs down if they agree with a student's response.
6. Ask which adaptation they would want to have and why.
7. Ask students if they have ever seen evidence of a beaver. Explain that chewed trees and sticks as well as beaver tracks can be evidence of beavers. Show students examples and how to look for evidence.

8. Take the students for a **brief hike** near a body of water, preferably where they can see **evidence of beavers**.
9. While standing in view of the water, **discuss** with students where they think beavers might build a dam and lodge. If there are or were beavers in the area, demonstrate how to find chew marks on trees and tree stumps.
10. **Ask students how a beaver dam does affect, or could affect, the ecosystem around it.**
11. Tell students that humans and beavers have not always had a good relationship. **Ask if they have any ideas why.** Prompt students with questions about how they think a beaver dam here would affect the surrounding area.
12. Explain that beavers used to be widely hunted for their pelts to make hats and coats. Beavers sometimes disrupt water flow causing it to flow where humans don't want it. Many species depend on the dams that beavers build, but humans do not always like them.
13. **Ask students if they can think of ways humans can have a better relationship with beavers.** Tell students that the beaver is MIT's mascot due to its impressive engineering abilities.

### *Opportunities for Extended Learning*

- Have students answer either or both **nature journal prompts**:
  - Which beaver adaptation would you want? How would you use it?
  - Beavers change their ecosystem by creating a pond. How might this affect the organisms already living there?

### *Behavior & Materials Management Tips:*

- ◆ Either have one student dress up as the beaver or let multiple students try on different parts of the costume.
- ◆ Interject brief movements and participation for the students during the explanation and demo to help keep them focused. For example, have students take a deep breath and hold it for 15 seconds when talking about how beavers can hold their breath for 15 minutes. Students could clap once to represent scaring off a predator with a tail slap.

### *References & More Information:*

Buffalo Bill Center of the West. (2014, February). Amazing Animal Adaptations Dress-A-Beaver Activity. Retrieved from [https://centerofthewest.org/wp-content/uploads/2014/02/Animal-Adaptations\\_Dress-A-Beaver-Activity.pdf](https://centerofthewest.org/wp-content/uploads/2014/02/Animal-Adaptations_Dress-A-Beaver-Activity.pdf)

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### *Credits:*

*Illustrations by Cindie Brunner.*

*Header photo of a beaver by Lauren Greene at Museum of Life and Science on February 17, 2014.*

Adapted from *Busy Beavers – Nature's Engineers* by Sean Higgins, Kerr Lake State Recreation Area, North Carolina State Parks.

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