



Build Like Beavers

A hands-on activity for students, families, and adults
Duration: About 45 minutes plus 4+ hours drying time

In this nature-inspired engineering challenge, you'll learn how beavers build their homes and build your own model of a sturdy, cozy beaver lodge.

Background:

Beavers are environmental engineers! A beaver family works together to build a dam that floods a patch of woodland. Swimming in the resulting pond, the beavers can collect food and building materials while avoiding land-based predators. The beavers push logs into the riverbed and use rocks to anchor the dam. For the upper structure, they stack crisscrossing branches and fill the spaces with bark, leaves, grass, moss, rocks, and plenty of mud.

When the pond is deep enough, the beavers start building a lodge atop the dam. They construct a solid mound and then dig into it from the underside to create hollowed-out chambers and tunnels. The entrances to the lodge are hidden underwater. Instead of hibernating, beavers can stay active all winter because their body heat warms the airspace within their lodge's thick, mud-sealed walls.

You will build, test, and improve a model lodge using some of the same methods that beavers use!

MIT Connection:

Beavers are common throughout Massachusetts waterways, including the Charles River. Tim the Beaver is the MIT mascot!



Juvenile and adult beavers. Image credit: Kent Miller, U.S. National Park Service



Tim the Beaver, the official mascot of MIT.

Goals:

- Build a dam that blocks the flow of water.
- Build a lodge with walls sturdy enough to protect an open space inside.
- Optional: Give the lodge one or more underwater entrances.
- Extra challenge: Give the lodge multiple levels or chambers.



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Materials:

- Large sheet of newspaper, wax paper, aluminum foil, or plastic wrap
- Bucket, mixing bowl, or other large waterproof container
- Water (enough to fill the container about 3 inches)
- Rocks (about 10 small rocks)
- Mud, clay, or Play-Doh (2–4 cups)
- If using natural outdoor materials: Many small sticks, several handfuls of leaves and/or grass
- If natural outdoor materials aren't available, try recycling materials from your home such as straws, toothpicks, twist ties, plastic utensils, cut-up plastic containers, aluminum foil, etc.
- Scissors (if you need to cut up plastic, foil, or other recycled materials)
- Simple tools if desired such as spoons or trowels—or just build with your hands



A beaver lodge in Acadia National Park.

Image credit: U.S. National Park Service

Directions:

It's easiest to build and test the dam and lodge separately, then attach the lodge to the dam.

Beaver Dam:

1. **Build** a dam across the bottom of the bucket, shaping it like a broad wall about 3 inches tall. Arrange the materials however you like, using rocks to help anchor it to the bottom. Leave space in the container on both sides of the dam.
2. **Test** the dam by tilting the bucket slightly and pouring water on the uphill side of the dam. Observing whether any water flows to the downhill side.
3. **Improve** the dam if it's too leaky. Don't worry if it doesn't seal perfectly; in a natural river, a beaver dam keeps the water level higher on one side than on the other, but the dam doesn't completely stop the river from flowing.

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Example: A dam made of rocks, sticks, cut-up plastic containers, leaves, and mud built across the bottom of a plastic dishpan.

Beaver Lodge:

4. **Build** your lodge on the large sheet of paper, plastic, or foil.
 - a. Beavers build a solid mound to start and then carve out hollow chambers from underneath. But for this activity, it's easier if you build the walls of your lodge around an object such as a rock or upside-down cup. You'll remove that object later, leaving a hollow space inside the lodge.
 - b. Beavers start their lodge by arranging logs in a rough cone shape. You can build a similar starting structure with sticks and bark.



Example: The first layer of the lodge is a cone of sticks and bark propped on a rock in the center.



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- c. Layer other materials onto the lodge in any arrangement you like. Use plenty of mud, clay, or Play-Doh to hold the structure together.
- d. *Important:* Let the mud or clay dry before picking up the lodge, or it will collapse! Drying time will be about 4 hours in the sun—longer in the shade.

Example: Outer layers of the lodge combine all the materials with mud sealing them together.



- a. *Important:* Let the mud or clay dry before picking up the lodge, or it will collapse! Drying time will be about 4 hours in the sun—longer in the shade.
5. **Test** your lodge by picking it up carefully, leaving behind the rock or cup that was propping it up in the center. Does the lodge hold together around the space in the middle?
 6. **Improve** your lodge if it doesn't hold together well. Think about what aspects need improvement. Do you need to interlock the sticks more? Do you need to use more mud?

Combine the Dam and Lodge:

7. Add water to the bucket until the water level is almost at the top of the dam. Place your lodge on the dam, letting the walls extend slightly below the water surface.

8. Beaver lodges usually have at least two underwater entrances that allow beavers to come and go while staying safe from predators. The entrances also give access the lodge even when the lake is covered in ice.

On the upstream side of the dam (where the water level is higher), tuck a finger or a twig under the wall of the lodge just beneath the water's surface, and press upward to dig a small tunnel leading into the space inside your lodge. Add more entrances if you like.





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Extra Challenge:

9. Beaver lodges can have multiple chambers, sometimes one above the other. Can you design a lodge that has two chambers separated by an internal wall or upper floor?

Explore More:

Some resources about beavers and their engineering skills:

- Beaver Lodge Construction Squad (video, BBC Earth) <https://youtu.be/iyNA62FrKCE>
- Leave it to Beavers (video, PBS NATURE) <https://youtu.be/yJjaQExOPPY>
- Beaver Natural History Narrative (article, Glacier National Park) <https://www.nps.gov/glac/learn/education/beaver-natural-history-narrative.htm>