

Lesson 6: The Mighty Beaver

Objectives:

- Students understand how beavers shaped the habitats of Mannahatta
- Students understand the importance of wetlands
- Students understand that environments change over time

Vocabulary: wetland, dam, lodge

Materials:

- Modern Manhattan orthophotos*
- 1609 Mannahatta images*
- species cards for wetlands and streams



Beaver dam built across a stream, creating a wetland

New York State Elementary Learning Standards *Key Ideas* and *Performance Indicators*:¹

- Science *Key Idea* MST4.LE6: Plants and animals depend on each other and their physical environment.
- Science *Performance Indicator* MST4.E.LE6A: Students describe how plants and animals, including humans, depend upon each other and the nonliving environment.
- MST *Key Idea* MST1.ED1: Engineering Design: Engineering design is an iterative process involving modeling and optimization (finding the best solution within given constraints); this process is used to develop technological solutions to problems within given constraints.
- Interconnectedness: Common Themes *Key Idea* MST6.ST1: Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.

Introduction: Mannahatta map/beaver review

(10 minutes)

Pass out orthophotos of modern Manhattan and images of Mannahatta 1609. Review the differences students discovered between the images in the introductory lesson. Ask them to pay attention to how much of the area is taken up by wetlands. Review the concept of wetlands with students. Ask students if they know how wetlands are created. Tell students that today they are going to learn about an animal that helps build wetlands: the beaver! Ask students what they already know about the beaver (e.g. its role in the colonial economy of North America and Europe), and what they already know about the ecology of Mannahatta.

Activity: Beavers building a wetlands habitat

(25 minutes)

Ask students if they know what a wetlands habitat is (review the term “habitat” if necessary). (If students did *Lesson 2: Weaving a Mannahatta Muir Web*, ask if they remember any of the species that live in wetlands, or what some of the major features of wetlands are.) Explain to students that today they are going to go back in time and create their own wetlands habitat on Mannahatta, and that each of them will play a role in it.

¹ From www.nylearns.org/standards. NY State learning standards encompass standards, key ideas, performance indicators and major understandings.

* These images are the same as the ones used in the introductory lesson.

** All images/materials are available on our website, at www.wcs.org/mannahatta. Images can be printed out in color or black and white.

Move to a large, open space in the classroom (or outdoors if possible). Have the students stand in a circle. Ask if students know where the water comes from that forms wetlands (if they did *Lesson 3, The Changing Life of a Water Droplet*, ask if they remember what some of the sources of wetlands water were – prompt them to remember that streams are one of the major water sources for wetlands).

- Begin by asking for 3-4 volunteers to be a stream. These students should lie down on the floor in the middle of the circle, stretched out, head to toe. Explain that the water starts in a little spring at the top of the stream (the first student's head), and at its beginning the stream is small, rocky and fast-moving. (If students did *Lesson 5: Island of Many Hills*, ask if they think the top of the stream would be in a high or low part of Mannahatta.) By the time the water has flowed down to the next part of the stream (the second student), it is still a little rocky but moving slower. By the time it has flowed down to the next part of the stream (the third and fourth students), it is moving much slower and more lazily, more relaxed. Ask the students to imagine that the water keeps moving in a stream out towards a river (like the Hudson River).
- Now pass out the species cards to all the other students in the circle, explaining that these are some species that lived on Mannahatta 400 years ago (if students did *Lesson 2: Weaving a Mannahatta Muir Web*, these species will be familiar). (Make sure you pass out the aspen and beaver cards, in addition to the other cards). Ask the stream to keep flowing while the other students read the back of their cards to learn about their species. Ask the species that live along streams to step up to the stream. Species that do not live along streams should stay in the circle. Have students count how many species live along the stream.
- Now ask for the beaver(s) to raise their hands, and explain that the beavers are the stars of this wetlands creation story – they are a very special species. Ask the beavers what they need for their habitat. Explain that beavers build their own houses to raise their children in, called lodges. What are other examples of houses animals build for themselves (nests, apartment buildings, etc.)? Beavers like to build their lodges in shallow ponds or wetlands. So in order to have a nice place to build their lodge, they have to first create a wetlands! And they do this by building dams across streams. Ask if students know what a dam is. A dam is a something you (or a beaver!) build to hold back a flow of water. Humans build dams to create energy for electricity, and to provide irrigation for farmland. Beavers build dams to create habitats for themselves.
- Ask the beavers what kind of trees they especially like to eat: the answer is aspen, which is growing by the stream. Tell the beavers that they are now going to chop down the aspen (with their big teeth!), eat some of it, and use the rest of it to build their dam across the stream. (Make sure they build it near the downstream, slower moving part of the stream.) The aspen lay down across the stream, and the stream parts behind the dam now widen out to become the wetlands.
- Now you have a new wetlands habitat! The beaver has created a new habitat not just for itself, but for lots of other species too. Now ask all the species that are still waiting in the circle if they now have a place to live, and ask them to move into the wetlands habitat. Ask if the species that lived along streams can also live in wetlands. Ask students to look around and see how many more species can live in wetlands than in just streams. Explain that a wetlands habitat is a very rich place – there are lots of different species living there. Have students count how many species live in the wetlands. See if the students in the wetlands can figure out how they are connected to each other.

Wrap-up Discussion:

(10 minutes)

Now have student return to the circle, and sit down. Ask students if they remember how much of the land on Mannahatta was covered by wetlands (a lot!). Are there still any wetlands on Mannahatta? No. Are there still

any beavers on Mannahatta? No. Do they know why there are no more beavers? (Hunted into extinction, habitat destroyed.) Do they have a guess as to why there are no more wetlands? (Filled in by humans for building, also there are no more beavers to build dams to create them!) Ask if they know what some of the good things are about wetlands (absorb water during storms to prevent excess flooding, help clean water, habitat for rich biodiversity). Explain that while the physical environment of Manhattan today has been created by humans, the physical environment of Mannahatta 400 years ago was created in large part by beavers! And make sure they know that a beaver was spotted swimming in the Bronx River last year, so maybe the beaver is coming back to New York City.

Extension activities:

- Using the tracing they made of the streams and wetlands of Mannahatta (in Lesson 1: *Tracing Mannahatta*), students identify possible locations of beaver dams. How many dams might there have been on Mannahatta? Knowing what they know about the habitat needs of beavers, can the students determine how many beavers may have lived on Mannahatta, based on their estimate of how many dams there were?
- Students become beaver architects, and design their own dams and dens on paper.
- Have students consider what happens when the beavers have brought down all the food trees (aspens, etc.) near the dam and lodge? (Beavers abandon the dam and find a site to build a new dam). What happens to wetland created by the beaver? (Eventually silts in). What happens to the silted in pond? (Makes a meadow and eventually a forest.) Have the students research how long each of these steps take and draw the process as a circular diagram, indicating the time for each part of the process.
- Use the interactive map at www.wcs.org/mannahatta to locate beaver ponds.