Inquiry-based Lesson Plan

Griffin Bray

Who lives by the Beaver pond?

Teacher: Griffin Bray Age: Middle School

Concept being addressed: Organism interactions in an ecosystem; keystone species

Standards addressed: MS-LS2-1, LS2-2, and LS2-4

Materials Needed:

- Organism cards (beaver, aspen, frog, trout, heron, otter, ash, painted turtle, box turtle, salamander, Brown Creeper, swallow, hawk, rabbit)
- Landscape "map" (large poster board/paper)
- Beaver pond cutout

Safety Concerns: None.

Background information for teacher:

A keystone species is one that has such an impact on the ecosystem that the composition of the ecosystem would be drastically different without it (National Geographic Society, 2019). Throughout the natural world there are many different keystone species. Many, such as sea otters and wolves, maintain the ecosystem through predation (e.g. sea otters eat sea urchins that would otherwise completely consume the kelp forests of the west coast) (National Geographic Society, 2019). Some other keystone species may provide an important service without which other organisms can't survive, such as the pollination that bees do for many plants (National Geographic Society, 2019). Then there are also a few that actually engineer the habitat to be suitable for the community. This lesson looks at one of those engineers, the beaver, and teaches how their dams and ponds shape the landscape *and* the biological community.

Beavers modify the landscape by damming streams, which creates beaver ponds. These raise the water level in an area, slow down water, decrease erosion, and modify the landscape dynamics (Miranda, 2017). This also affects the organisms living there. Beavers eat trees and fell them to make their dams. The dams provide water for fish, water-loving reptiles and amphibians, birds, and other animals (Haemig, 2012). Without these beaver ponds, the landscape would be very different and few of the animals that live by them would still be in that area. The following lesson is designed to help students realize the importance of keystone species like the beaver in maintaining healthy, natural ecosystems.

Sources:

Haemig, P. D. (2012). Ecology of the Beaver. Ecology of the Beaver: How its Dam-Building and Tree Felling Impact Other Wildlife. Ecology Online Sweden.

Miranda, D. (2017, March 12). The Community Builder: Beaver's Role in the Ecological Community. Retrieved November 11, 2019, from wetlandsconservancy.org/wp-content/uploads/2017/03/Donette-Miranda-Beavers_Role_in_the_Ecological_Community-Final.pdf

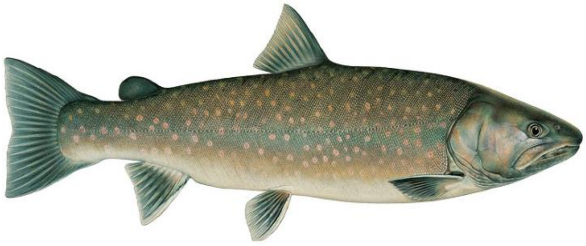
National Geographic Society. (2019, August 29). Keystone Species. National Geographic Society. National Geographic Society. Retrieved November 12, 2019, from https://www.nationalgeographic.org/encyclopedia/keystone-species/

Lesson length: 2 days

Day 1:

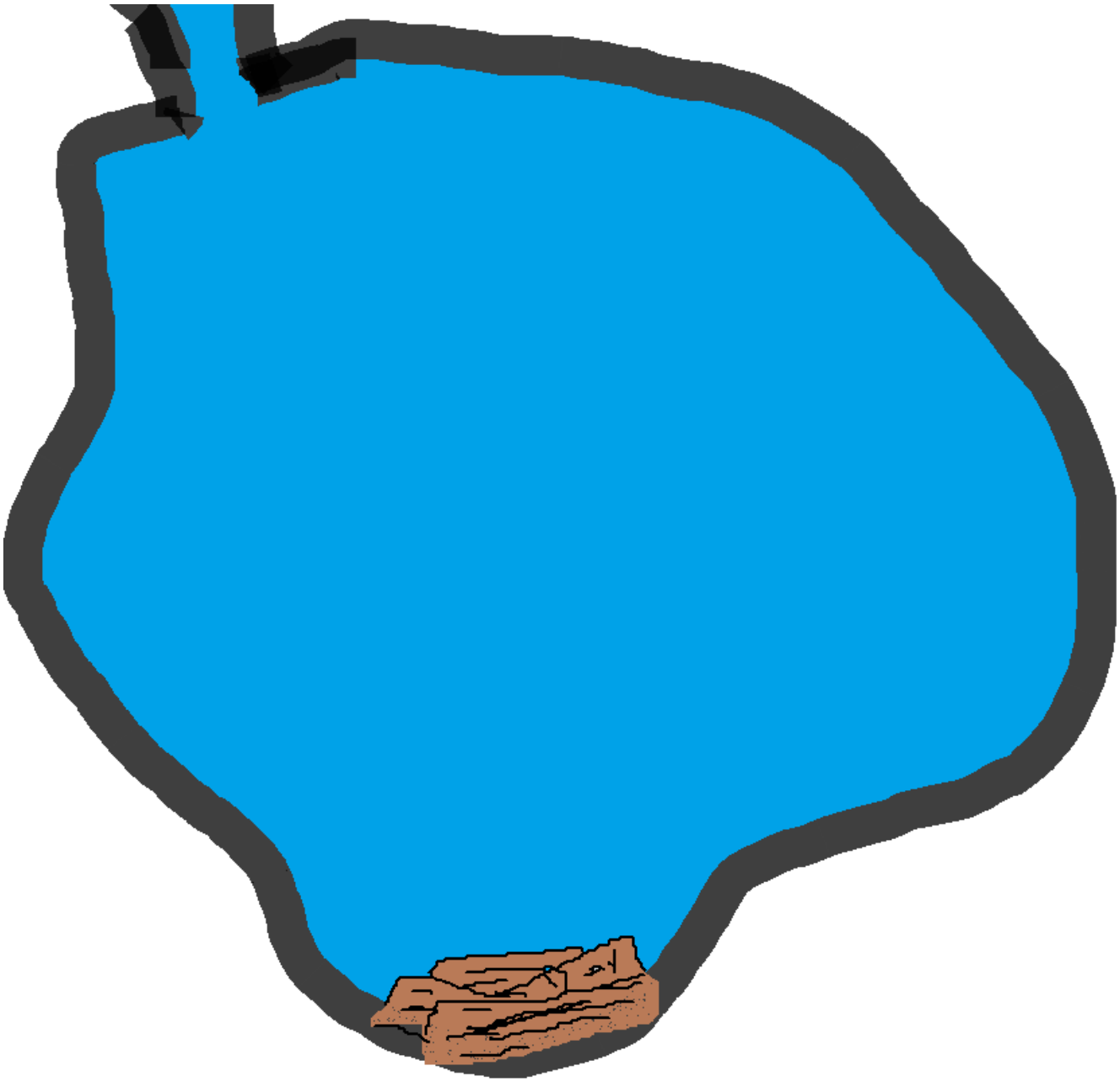
- Introduction: Assess student's understanding of community interactions
    - Ask why animals and plants live in one place instead of another
        - What factors affect an animal's choice of habitat?
            - E.g. food, water, shelter, space, predators, etc.
    - Ask students to share examples of important interactions between different plants and animals

        - E.g. predation, mutualisms, etc.
    - Is one species more important than another?
- Exploration: “Who lives in the Beaver Pond?” Activity
    - Separate the class into groups. Give each group a large sheet of poster board (the “map”), a beaver pond cutout, a set of the organism cards, and a notepad.
    - Ask them to put the beaver pond on the map. Have them read the information on the back of each card.
    - Have the students place the organisms that live in and around the beaver pond on the map. Ask them to write or draw a picture showing how each organism interacts (e.g. a food web). Note: the students can also draw directly on the poster board if desired. Leave them alone during this part to experiment and discuss amongst themselves.
    - Now, tell the groups that their beavers have been hunted and killed. Have them remove the beaver ponds and place the organisms that now live in the habitat on the map. Ask them to write or draw the changes on the notepad.
- Explanation:
    - Ask groups to share their results.
        - What lived in the habitat when the ponds were there?
        - How did things change when the beavers died?
        - Which habitat had more organisms?
        - Why do YOU think that is?
    - Introduce and explain the term “Keystone Species”
        - E.g. “A keystone species is a species that has a huge impact on the way an ecosystem works.”
        - Describe the different types of keystone species
        - Ask students to contribute examples of keystone species.
    - Give students a short handout to read about keystone species (such as the National Geographic site listed above).
- Extension and assessment:
    - Ask students to choose one keystone species that was not discussed in class and research it.
    - Ask students to write one page about the species, why it is a keystone species, and what they think would happen if it disappeared.
    - Have students present their findings in front of the class (Day 2).

Aspens are among a beaver's favorite tree to eat. They grow in a variety of areas across the United States.	Beavers create the beaver ponds in an area. They like places with flowing water and lots of trees, especially aspens, to eat.
Trout breed in cold water streams. They eat a lot of small insects that like to live in the dirt on the bottom of ponds and rivers.	Frogs need to live by water in order to raise their young. Most species prefer slow-moving water.
Otters live in water and love to live by beaver ponds where there is plenty of water and plenty of fish.	Herons are large wading birds that eat fish. They wade into shallow water and grab fish with their sharp beaks.
Painted Turtles spend most of their time in slow-moving or still water.	Ash trees are large, hardy trees. They have strong wood that is useful for making houses for all types of animals.

Salamanders need water to lay their eggs in, but like drier places than frogs.	Box Turtles are land-living turtles that only occasionally go into the water.
Hawks eat the small songbirds like swallows. They like somewhat open areas to soar above and find food.	Brown Creepers spend most of their time in trees, climbing up the bark to look for bugs.
Rabbits are at home in almost any area. They like to feed on small plants in meadows and live in burrows underground.	Swallows like to nest near water. They will skim the surface of still water to catch insects as they hatch.



Beaver Pond cutout for activity