

Create a Winter Pond

Adapted from: “Create a Pond” in All the Rivers Run. Cuyahoga Valley Association and National Park Service, 1996.

Grade Level: basic, intermediate

Duration: 45 to 90 minutes

Setting: classroom

Summary: Students draw a picture of a waterway and its inhabitants in winter based on information they learn.

Objectives: Students will understand how an aquatic community changes with the seasons and infer that organisms must change their behaviors based on their physical surroundings.

Related Module Resources:

- Various Fact Sheets
- Reference Books

Vocabulary: hibernate, dormant

Materials (Included in Module):

- Article “Aquatic Habitats in Winter”

Additional Materials (NOT Included in Module):

- Paper
- Additional art supplies

ACADEMIC STANDARDS: ENVIRONMENT AND ECOLOGY

7th Grade

4.1C Explain the effects of water on the life of organisms in a watershed.

- Explain how the physical components of aquatic systems influence the organisms that live there in terms of size, shape and physical adaptations

4.6.7.A Explain the flows of energy and matter from organism to organism within an ecosystem.

- Demonstrate the dependency of living components in the ecosystem on the nonliving components
- Identify the relationship of abiotic and biotic components and explain their interaction in an ecosystem

4.7.7.B Explain how species of living organisms adapt to their environment.

- Explain how living things respond to changes in their environment

10th Grade

4.1.10.C Describe the physical characteristics of a stream and determine the types of organisms found in aquatic environments.

- Describe and explain the physical factors that affect a stream and the organisms living there

4.6.10.A Explain the biotic and abiotic components of an ecosystem and their interaction.

12th Grade

4.6.12.A Analyze the interdependence of an ecosystem.

- Analyze the relationships among components of an ecosystem

BACKGROUND:

See “Aquatic Habitats in Winter” handout (at end of this activity).

OVERVIEW: Using information about aquatic habitats in winter, students create a drawing of a stream or pond in winter.

PROCEDURE:

1. Have the students picture a stream or pond in their mind. Ask the students what time of the year they are describing. Chances are, the organisms they have pictured are in their summer homes. But what happens to these organisms when the water gets colder? Discuss with the students what the habitat might look like in winter.
2. Have students read the “Aquatic Habitats in Winter” article enclosed

3. Have students draw a large, mural-sized cross-section of a stream or pond in winter. Be sure to include the top of the water, the water itself, the bottom, the substrate below and around the pond or stream, and the bank – they will add living organisms next.

OR

Have the students use copies of the enclosed cross-section illustration of a winter stream.

4. Students should now start drawing in aquatic organisms (perhaps the ones from the article) creating a winter pond or stream scene with any art supplies that are available. Encourage them to be creative in their art, but realistic in their placement of organisms and portrayal of what those organisms are doing. They should relate the information provided in the article with where they place the creatures in their drawing.

OR

There are illustrations of aquatic organisms enclosed the students could cut out and paste to their winter stream scene.

5. In any remaining time, have the students use references to find out more about what specific organisms do in the winter. They can then add these to the drawings. (This step can also precede Step 1, if desired.)

DISCUSSION:

Discuss with students about the advantages to the different strategies organisms have for surviving the winter in a pond. What organisms have special needs that might be difficult to meet in winter? How do they meet these needs?

EVALUATION:

- Explain how and why a pond community changes during the winter.
- Identify different strategies organisms use for surviving the winter.

EXTENSIONS AND MODIFICATIONS:

- Instead of giving the students a list of things organisms do in winter, have them come up with their own list, which can be compiled on the chalkboard.

NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):

Aquatic Habitats in Winter

During the winter, aquatic organisms face the challenge of adjusting to temperatures low enough to freeze their homes. To deal with this, organisms have come up with a number of different strategies to survive. These range from remaining active to slowing down their activity to sleeping through the winter.

As temperatures fall outside, life present in and around streams and ponds takes a dramatic turn. Water in the pond freezes over, enclosing and protecting animals that sleep through the winter nestled in mud and those that remain active. In the slower moving pools of streams, ice forms over the top of the water. However, ice may never form over the more rapid riffles. When this happens, the life within the creek must prepare for a long winter spent at a body temperature of only 4 degrees Celsius. Although many organisms die, they leave behind eggs and seeds as their method of survival. Duckweed, for example, deposits tiny green scales during the winter months. As springs rolls around, the scales surface and grow.

Fish and other cold-blooded animals adjust their body temperature to the environment they live in. They are fast and nimble in the summer because the water temperature is about room temperature, but in the winter they slow down as their body temperature drop. Some fish - such as the trout, salmon, pike and yellow perch - are specially designed to deal with this. Even at low temperatures, their bodies allow them to swim easily. They often take refuge in the deepest part of the stream were the water is warmest. Other fish, such as bass, sunfish, and catfish must **hibernate** (pass the winter in a resting state) due to their inability to cope with the cold water. They move to the edges of the stream or pond and bury themselves in mud or leaves. There they wait until they can successfully swim again. Bullhead catfish can often become completely frozen during the winter, thaw in spring, and live without harm. This is an amazing adaptation to the winter season!

Fish are not the only creatures living in the streams during the winter. Insects also have adaptations to survive the winter. Many invertebrates burrow in the mud or leaves for the winter. Spending their time as eggs, larvae, pupae, or adults, insects often secrete a fluid that is similar to antifreeze in order to withstand the cold. Huddled masses of water boatmen and backswimmers can sometimes be seen in small air pockets under the ice. When the occasional early spring thaw melts the surface ice, water striders and diving beetles swim in the near freezing water. Dragonflies and damselflies perform a similar task, but in the larval stage. Aquatic sowbugs are also active. Many waterfleas display rounded heads in winter, when the water is cold, and pointed heads in summer, during periods of warmth. (The pointed head is thought to be an adaptation to increased predation in the summer.) Horsehair worms have a unique solution to the problem of winter temperatures. They choose to either hibernate among shore plants or to remain in the host body and parasitize.

Snails become very inactive in winter. Those present in water that freezes solid burrow into mud and plant debris to hibernate. Some water mites may temporarily do this as well. Mussels become **dormant** (inactive), too. This is evident from the darker rest rings on their shells, sometimes called "growth rings." Mussels do not grow during

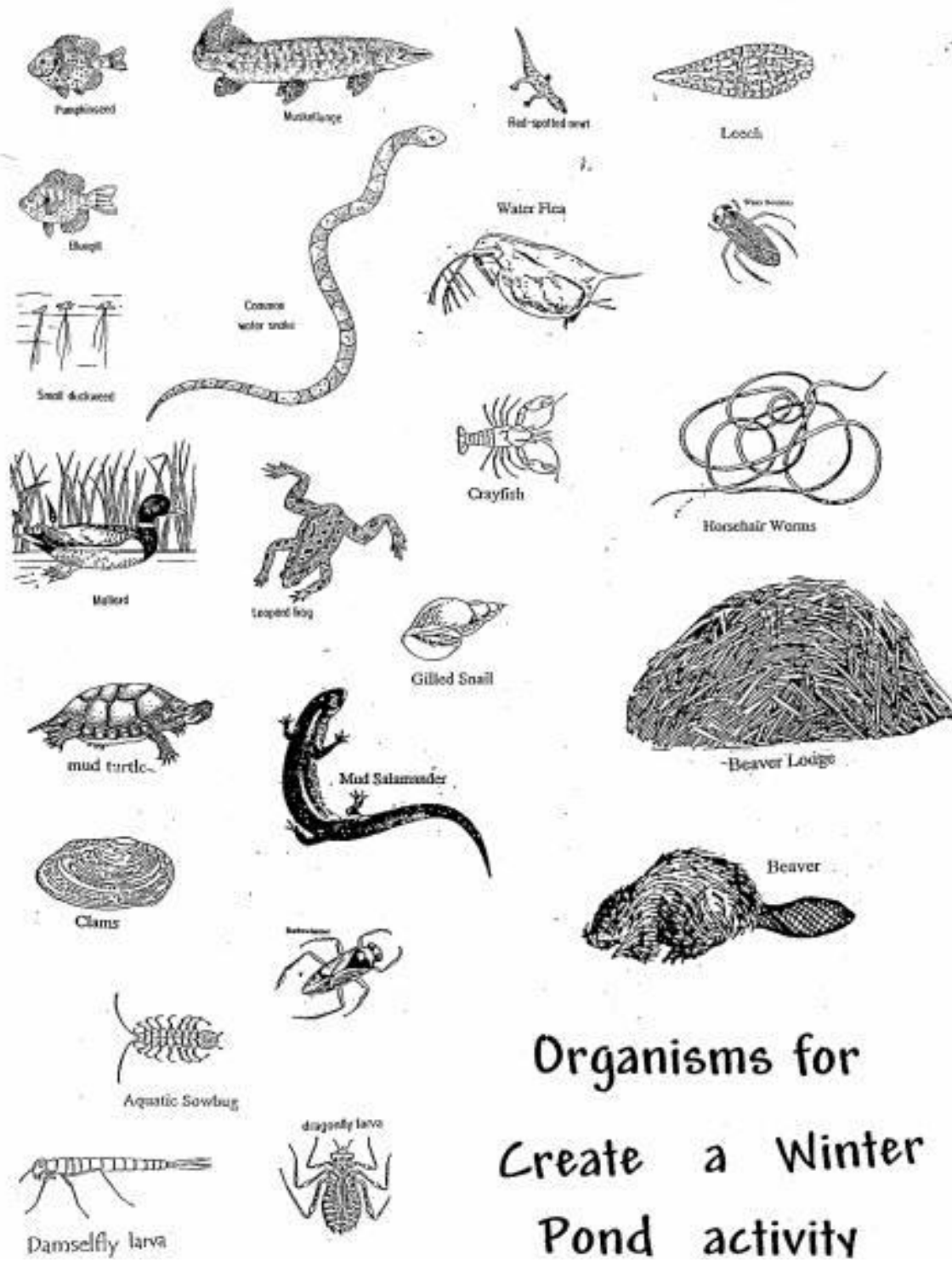
the winter, yet they are sometimes seen active through clear ice. Crayfish remain active, but not as active as they are in the summer. They tend to burrow into wet meadows and banks. Leeches become dormant and bury themselves in mud or plant debris. Adult newts and mudpuppies remain active, while salamanders hibernate under logs and stones. Most frogs hibernate in the mud below the ice, though some survive the winter in their tadpole stage. Many turtles also burrow into the mud and become inactive during the colder months. Snapping turtles, on the other hand, settle beneath plant debris and logs or even stay in muskrat or beaver burrows. Both snapping and painted turtles become active sometimes, and can be seen crawling around under the ice.

Mammals also live through winter in the frozen streams. Beavers make large mud and wood lodges that they stay in when the pond behind the dam freezes. Beavers keep their food underwater for the winter and have thick layers of fat and a dense coat of fur to protect them from the cold water. The actual living area inside the lodge is above the water line so that they stay warm and dry when not swimming. In fact, steam can sometimes be seen rising from beaver lodges on cold days. Otters and muskrats also stay for the cold weather. Though muskrats would rather stay under the ice like the beaver, otters love the snow. They have been observed making paths on the snow banks and sliding on their bellies into the water.

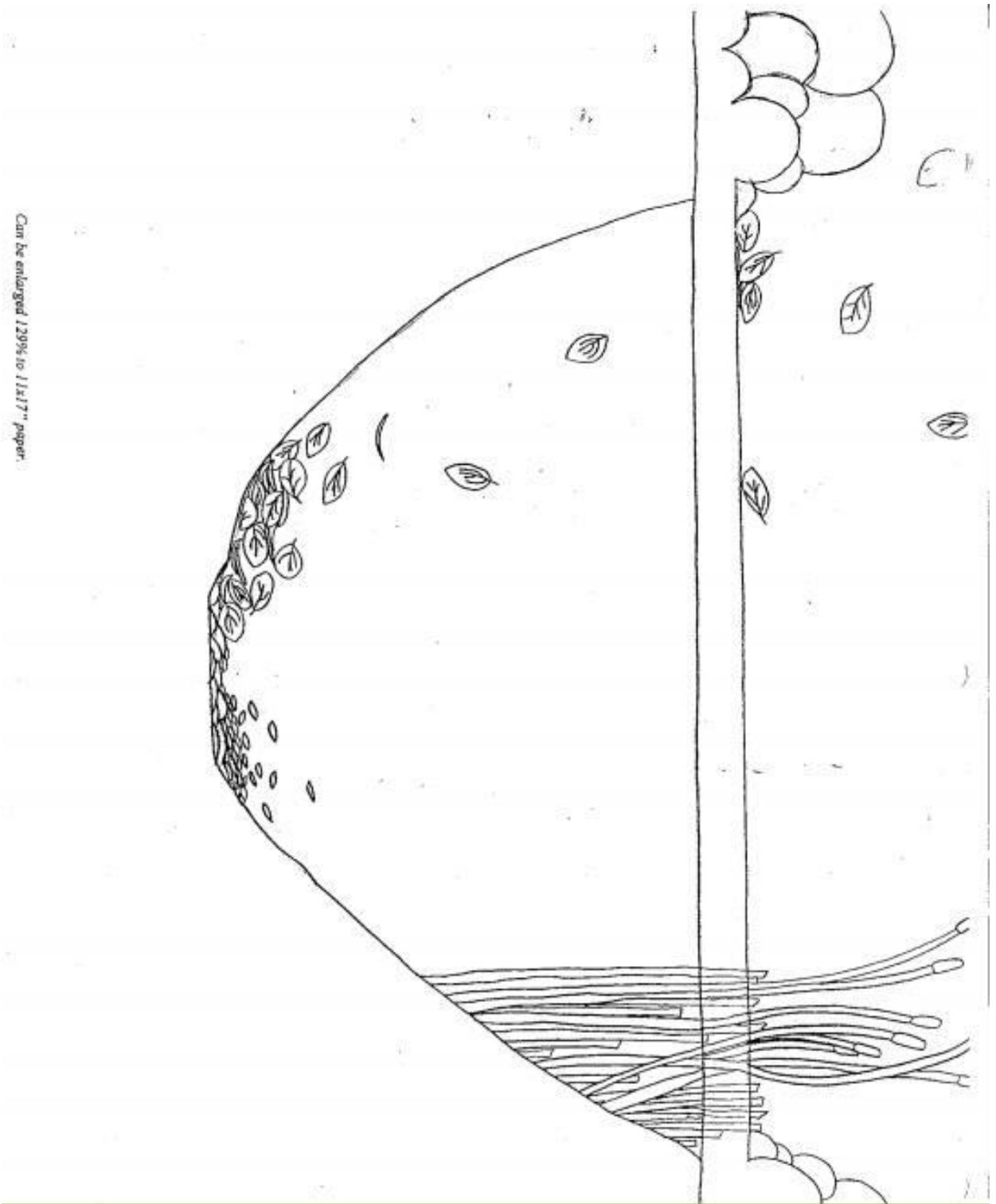
Most aquatic plants die in autumn to prepare for winter. However, they only die back to their roots, which means that they can grow back when the weather gets warmer. Plants that are partially submerged either wholly or partly disintegrate during the winter. Algae on the other hand, remain photosynthetic all winter long, or survive as spores in a dormant state.

Along the water's edge, chlorophyll is being broken down from the leaves of deciduous trees and shrubs during the winter months. This is why the leaves change colors in the fall- they are dying. Before these leaves drop from the limbs, though, they sprout winter buds that carry embryonic leaves and flowers through the period of winter dormancy. Although deciduous trees don't grow during the winter, conifers do perform photosynthesis when the temperature rises above freezing.

Mallard ducks stay near ponds as long as there is some open water. They can swim in cold water and stand on ice because they have thick feather insulation and their feet are adapted to keep out the cold. In contrast, many other species of birds migrate when the weather begins to chill. A few kinds of butterflies do as well. Cold-blooded toads, water snakes, and garter snakes head under decaying logs, in stone piles, burrows, or other holes, and hibernate. Raccoons only become active on mild days, on cold ones they hibernate in their dens. A raccoon's hibernation sleep accompanies near normal body temperature with only slightly slowed circulation and respiration rates. Deer change their diet for the winter. They eat tree buds, twigs, bark, and conifer foliage. Moose do the same, with the addition of aquatic plants as well.



Organisms for Create a Winter Pond activity



Can be enlarged 129% to 11x17" paper.