

NYSDEC Environmental Education

TITLE: WORLD OF THE POND

GRADE LEVEL: Grades 5-8

DURATION: 60-90 minutes

LOCATION: Outdoors - freshwater pond with access to edge and enough space for the class of students

OVERVIEW: This lesson will provide students an opportunity to examine a variety of fresh water organisms and discover the adaptations that enable them to survive in an aquatic environment

GOAL: To make students aware of the importance of aquatic habitats to wildlife and humans

CONCEPTS:

- The pond is a rich habitat that is important for wildlife
- Pond plants and animals are interdependent with each other and with the pond environment
- Wetlands are fragile ecosystems that can be damaged by humans

SUBJECT

AREAS: Science, Mathematics, English Language Arts

STANDARDS: Math, Science and Technology Standards 1 and 4
English Language Arts Standard 1

VOCABULARY: See Glossary for key words and definitions

MATERIALS:

- aquarium nets—one per student
- white plastic containers (whipped topping containers work well)—one per student
- white plastic dishpans—one for every 4 students
- white plastic spoons
- large net with long handle (if available)
- magnifying glasses or plastic bug boxes
- thermometer (to measure air and water temperature)
- data sheet
- *A Golden Guide—Pond Life* books or other aquatic macroinvertebrate ID resources

BACKGROUND:

A pond is more than just a body of water—it is a community of plants and animals which interact with and depend upon each other to survive. This lesson will enable students an opportunity to study the pond community by observing plant and animal species around the pond and sampling the aquatic macroinvertebrates in the pond.

Ponds undergo an aging process. A young pond is often deep and clear. As animals and plants in the pond grow, die, and decay, they sink to the pond bottom and start to fill it up. Gravel and silt are washed into the pond. At this mature stage, a pond provides food and shelter for more animals than young ponds. Over time, the pond becomes shallower and the shores contract in towards the center. Eventually, the pond will fill in almost completely, first becoming a marsh and then a meadow. This natural process is called succession.

ACTIVITY:

Prior to heading outdoors -

Discuss with the students the proper attire for the World of the Pond Lesson. Use these tips:

- Bring an extra sweater or jacket in cool weather
- Wear a bandanna or a hat for protection from sun and insects
- Wear long pants and socks to avoid contact with poison ivy and brambles
- If the possibility of rain is predicted, be prepared by bringing some kind of raincoat or poncho
- Wear old sneakers or boots or bring a pair of dry shoes, since it is often muddy near the pond

Introduction -

Ask the students to define a pond. Where does the water come from, and where might it go? If you were to write a recipe for a pond, it would need many more ingredients than just water. During this lesson, we'll find out what other ingredients are needed to make a pond.

Approaching the Pond -

Typically, as you walk to a pond site, encourage students to look for wildlife signs. You may see holes, footprints, gnawings, or other signs of animals. Ask students to deduce what kind of animal made each sign, and how the animal could use the pond for food, water or shelter. Note the animal signs or any animals observed on the data sheet.

Ponds are magnets for many kinds of animals. As you walk closer to the pond, you may be fortunate enough to glimpse some wildlife: perhaps a goose, muskrat or turtle. Encourage the students to observe the animal quietly. Ask them questions to help them observe the creature's color, camouflage, movement, etc. Does this animal depend on the pond for food, water or shelter?

How does a pond change over time? Just as you can sometimes guess a person's age, you can also guess whether a pond is "young" or "old," if you know what to look for. If possible, visit several different ponds to guess their ages. What age pond provides the most food and shelter for wildlife?

At the Pond Site -

Collecting

When the class arrives at the pond study site, have the students place all the equipment in a central location. Introduce the activity by discussing the pond as a home, or habitat, that a wide variety of animals live in. Explain that the students will capture and observe some of the smaller animals to learn more about them.

Describe and demonstrate the method for collecting pond creatures. Stress safe use of equipment, particularly nets. Emphasize that all animals should be put into the collecting pans quickly and gently. Finally hand out equipment and set boundaries to the area.

Collecting pans should be filled with a few inches of water and set on a level place that is easily accessible. The students can use their nets to collect vegetation and small organisms to be placed in the pan of water. The instructor should circulate among the students and encourage each child to participate in collecting.

Measure the air temperature and record the value. Then measure the water temperature and record it as well. Ask the students which they think is warmer—the air or the water? After they give their guesses, reveal the values for them to record on their datasheets.

Collecting Tips

- Avoid dumping large amounts of silt into the pan. If the water in the pan becomes muddied, let it settle for a few minutes.
- Encourage sharp observation to detect small organisms in nets and pans. Watch for movements which reveal the location of camouflaged creatures.
- Emphasize careful handling of the living creatures. Use plastic spoons to move small animals. Use a plastic bag or pail to hold large captures (such as a frog) temporarily.
- While students are collecting, isolate a few interesting specimens in jars for later discussion.

After what seems like a sufficient number of aquatic animals have been collected, ask the students to stack their nets and sit down. Pass out hand lenses and bug boxes. Have four students group around each pan, and observe the organisms. Encourage them to use hand lenses and plastic spoons and jars to examine the creature closely. Allow the students to move from pan to pan if they wish.

Challenge the students to identify as many organisms as possible. Have each group fill out the datasheet, or as much of it as time permits.

Pollution Index

Discuss what kinds of pollution might be found in this pond. Mention the fact that some organisms are more susceptible than others to pollution, and are therefore considered “indicator species” since their decline often indicates the presence of pollution. Examine the pollution index chart (on the datasheet). Have each group decide how many species (not individuals) they have in their pans. Complete the calculations on the datasheet. The resulting number is an indication of the general health of the pond. Discuss your results. Calculate the total pollution index for all of the dish pans combined. Did the pollution index change from the individual group results?

Return the aquatic creatures to the pond. Stress gentleness and care in floating them back into the water; not just dumping them in.

ASSESSMENT:

After the pond sampling, give each student a post-lesson sheet (located at the end of this lesson) to fill out. After everyone has completed the sheet, discuss their answers as a group.

EXTENSIONS:

Give each student a “map” – a piece of paper with a wavy blue line drawn from top to bottom. This line represents an acre of land with a stream running through the middle. Ask them to show on the paper how they would develop their acre so that they and their family can live on it. (Money is no object!) They should indicate locations of the house, garden, pool, or whatever they wish to have on their acre.

Now join all the maps in random order. Place them so that the stream lines flow into each other. Tape the pieces together to form one long thin map. Imagine that the stream is flowing from left to right. Tape a final piece on the end with the pond indicated on it.

Use the map for a discussion of how each students' development has impacted each other, and the pond itself. How will people and wildlife living downstream be affected by what goes on upstream? What impact would building a house have? Where would water from bathtubs and dishwashers go? Would manure from barns or pesticides from gardens be washed into the stream?

How can we plan our land use to minimize environmental damage? The pond and its creatures are affected by a wide variety of human actions.

RESOURCES

Books

Aquatic Habitats—Exploring Desktop Ponds by Katharine Barrett and Carolyn Willard
Discover Nature in Water & Wetlands by Elizabeth P. Lawlor
A Golden Guide—Pond Life by George K. Reid
A Guide to Common Freshwater Invertebrates of North America by J. Reese Voshell Jr.
One Small Square—Pond by Donald M. Silver
Pocket Naturalist—Pond Life by James Kavanagh
Pond and Brook—A Guide to Nature Study in Freshwater Environments by Michael J. Caduto
Pond Life: Educational Games and Activities for Kids of All Ages by James Kavanagh
Pond & River by Steve Parker
Pond and Stream Safari—A Guide to the Ecology of Aquatic Invertebrates by Cornell Cooperative Extension
Pondwatchers Guide to Ponds and Vernal Pools of Eastern North America by Massachusetts Audubon Society
Salamander Rain—A Lake & Pond Journal by Kristin Joy Pratt-Serafini

Websites

<http://www.dec.ny.gov/animals/7105.html>

Information and color pictures of aquatic macro invertebrates

<http://enature.com>

Online field guide to wild animals and plants of the United States

<http://www.acornnaturalists.com>

Source for books and pond nets

GLOSSARY

Adaptation: An adjustment to the environment; a change in an organism's characteristics that improves its chances for survival in a particular habitat. Example: a duck's webbed feet helps it to swim

Aquatic: Living in or on fresh water, as opposed to marine (salt water).

Decomposers: Organisms, usually bacteria and fungi, which break down dead plants and animals and their waste products into simpler forms. In the process, they release chemical substances stored in the dead bodies and make them available to be used again.

Ecosystem: An interacting system of plants, animals, soil and climactic conditions in a self-contained environment (e.g. pond, marsh, wetland, lake or stream).

Food chain: A transfer of energy through an ecosystem by the producers (food makers), consumers (plant or animal eater) and decomposers. For example, algae are fed upon by a fish, which in turn is eaten by a heron, which eventually dies and is decomposed by bacteria.

Habitat: The place where a plant or animal lives, finds food and shelter and raises its young.

Larva (plural, larvae): An immature stage in an animal's life history, during which its form differs from that of the adult, such as the "wiggler" stage in the development of a mosquito or the caterpillar stage in the development of a moth.

Macroinvertebrate: Animals that do not have backbones, but are visible to the naked eye.

Metamorphosis: A change in the form of a living thing as it matures, especially the transformation from a larva to an adult. Complete metamorphosis involves four stages – egg, larva, pupa, adult. Incomplete metamorphosis involves three stages – egg, nymph, adult.

Nymph: The immature form of certain insects which undergo incomplete metamorphosis. This stage resembles the adult. Examples: dragonfly, mayfly

Plankton: Small plant and animal organisms that float in aquatic environments.

Predator: An animal that lives by capturing other animals for food. Examples: dragonfly nymph, frog

Prey: Animals that are hunted by other animals for food. Examples: mice, rabbits, insects

Pupa (plural, pupae): The relatively inactive stage in certain insects during which a larva changes into an adult. Examples: mosquitoes, midges

Submergent: Plants, such as water milfoil, which grow wholly underwater.

Succession: The gradual replacement of one community of plants and animals by another, over a period of time.

Vernal pool: A shallow depression in the landscape that contains water for a short period of time, usually during the spring, and eventually dries out, typically in the summer.

Water table: The upper level of the underground reservoir of water.

Wetland: Area that is covered all or part of the time by fresh water or salt water, excluding streams, lakes and oceans.

WORLD OF THE POND POST-LESSON SHEET

Did you find any organisms that undergo metamorphosis? Give an example of any you found in the following stages:

<u>Stage</u>	<u>Name or Picture</u>
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nymph

larva

pupa

adult

What kind of adaptations did the organisms have to live? Give an example of how an organism might adapt for:

breathing _____

eating _____

protection _____

movement _____

Name one animal you found that feeds on other animals: _____

Name one animal you found that feeds on plants: _____

Draw a food chain of three organisms in the pond:

_____ → _____ → _____

What value might this pond have for people?

How would the change of a physical characteristic, such as lowering the level of oxygen, affect the animals in the pond?