



Science Unit: *Water*

Lesson 4: *Pond Ecosystem Field Trip*

School year: 2004/2005

Developed for: Queen Alexandra Elementary School, Vancouver School District

Developed by: Paige Axelrod (scientist), Trevor Wright and Jenny Lau (teachers)

Grade level: Presented to grades 4 - 5; appropriate for grades 2 – 6 with age appropriate modifications.

Duration of lesson: 5 hours

Notes: Field trip to Jericho Pond and Jericho Beach. Remind students that they should not wade into the pond water barefoot as there are small leeches in Jericho Pond. A 5:1 ratio for students to adult is recommended.

Objectives

1. Students will learn about a pond ecosystem, and collect and examine pond organisms.
2. Students will learn to identify pond organisms and be introduced to aquatic food chains.

Lesson extension will include beach and intertidal zone exploration to discover living and non-living components of Jericho Beach.

Background Information

Natural surface water on Earth includes lakes, ponds, streams, rivers, estuaries, seas, and oceans. A pond is a body of fresh water that is smaller than a lake. A pond is shallow enough for sunlight to reach the bottom and provides an environment for plants and microscopic and macroscopic organisms. A pond ecosystem is comprised of living organisms interacting with each other and non-living components such as water, oxygen, carbon dioxide, sediment, minerals, and nutrients. Sunlight, temperature, and pollution influence pond life. Pond organisms include bacteria, phytoplankton (microscopic free-floating plants such as algae), zooplankton (microscopic free-floating animals), plants, insects, crustaceans, worms, leeches, frogs, fish, and birds. Pond organisms form food chains characterized by the transfer of energy and food among different organisms (the chain of organisms that eat each other). These organisms include herbivores (animals that eat plants), carnivores (animals that eat other animals), omnivores (animals that eat plants and other animals), and detritivores (organisms that eat dead plants and animals). The primary producers (plants) make their own food (energy) via photosynthesis and represent the first trophic level. The primary consumers are animals that eat plants (second trophic level) and secondary consumers are animals that are predators and eat other animals (third trophic level). The decomposers (detritivores) help break down and cycle organic matter.

Vocabulary

Pond: A small body of fresh water (smaller than a lake) shallow enough for sunlight to reach the bottom and for rooted plants to grow.

Invertebrate: Animal without a backbone.

Aquatic invertebrate: Animals such as insects, crustaceans, and worms that spend part or all of their life cycles in water.

Incomplete metamorphosis: For aquatic insects: a type of insect development with distinct egg, naiad, and adult stages; the naiad and adult share some similar characteristics and there is no inactive



SCIENTIST IN RESIDENCE PROGRAM

pupa stage; naiad is an aquatic nymph.

<u>Complete metamorphosis:</u>	A type of insect development characterized by changes in the body form of insects that include egg, larva, pupa (resting and reorganizing stage) and adult stages; the larval stages look different from the adult stage.
<u>Food web:</u>	Complex network of many interconnected food chains and feeding interactions of organisms living in an ecosystem.
<u>Ecosystem:</u>	A community of living organisms that are linked by energy and nutrient flows and that interact with each other and with the physical environment.

Materials

- fish nets with handles (8 inch and 10 inch nets)
- a ziplock bag necklace for each student containing a pencil, a magnifying glass, a scavenger hunt list, and a note pad
- bug collection jars with 2x and 4x magnification (available at Vancouver KidsBooks)
- macro aquatic invertebrate identification key
- white shallow tubs
- camera
- white ice cream bucket with a handle
- weather appropriate clothing and supplies such as rain ponchos, rain boots, hats, and sunscreen

Field Trip Preparation

Introduce students to pond ecosystem concepts and read the book Strange Beginnings by Karen Needham and Launi Lucas (reference 3) prior to the field trip. Karen Needham is a Lecturer and the Curator of Scudder Entomology Museum, Department of Zoology, University of British Columbia.

On the Field Trip

Introductory Discussion

The meeting place is near the bridge in Jericho Park. Discuss the characteristics of Jericho Pond and the pond ecosystem.

What is a pond?

How is a pond formed?

What organisms live in a pond?

What does metamorphosis mean?

One class walks to the north end of Jericho Pond and the other class walks to the beach and intertidal zone for exploration. The intertidal zone is the area along the ocean shore that is covered by water at high tide and exposed to the air at low tide. After approximately one hour, the students switch exploration locations. Everyone enjoys lunch at the beach prior to returning to school.

Science Activity: Pond Dip

1. Students are reminded to use their observation and listening skills and to be gentle when handling pond organisms.
2. Students are divided into 4-6 groups with one adult per group. Each group is given a white tub, a net for each student, a bug collection jar, and a key to common macro invertebrates. The tub is filled with pond water. Students are shown how to use nets to collect aquatic organisms. This is best done by



SCIENTIST IN RESIDENCE PROGRAM

gently dipping the net near the base of aquatic plants growing near the edge of the pond. It helps to wear boots and wade into the pond for sampling aquatic organisms.

3. After a sample is collected, a hand can support the net, and the contents of the net can be examined for movement. Pond organisms are then gently transferred to a tub containing pond water and the process is repeated. Aquatic organisms can be gently transferred to bug jars containing pond water for closer examination.
4. People with knowledge of aquatic organisms can help identify the organisms and the invertebrate key as well as drawings and photos of invertebrates can also be used. Students collect and observe organisms for approximately 30 - 45 minutes.

Closure Discussion

Representative aquatic organisms are transferred to the bug jars and the students and adults then form a circle. The name of each aquatic organism, what they eat, and their defining characteristics are discussed, and the bug jars are passed around the circle so that students can further examine the organisms. Representative organisms can be transferred to a bucket containing pond water for the next class in case they are needed. The aquatic organisms are gently placed back into the pond after the lesson for both classes is completed. Tubs, nets, and bug jars are rinsed with pond water.

Acknowledgements

Special thanks to Karen Needham and Rex Kenner (Department of Zoology, University of British Columbia) for leading the Jericho Pond dip and sharing their knowledge about aquatic invertebrates and pond ecosystems.

References

1. Acorn, John and Ian Sheldon. 2001. Bugs of British Columbia. Lone Pine Publishing, Edmonton, AB, [Field Guide, includes aquatic invertebrates].
2. Fleischman, Paul. 1988. Joyful Noise, Poems for Two Voices. HarperCollins Publishers Inc., New York, New York, [Beautiful poems about insects, including aquatic insects; poems are written to be read aloud by two people].
3. Needham, Karen and Launi Lucas. 2001. Strange Beginnings. Tradewind Books Ltd., Vancouver, BC, Canada [A book about aquatic insects].
4. <http://www.bugsurvey.nsw.gov.au/html/buglopedia.html> Buglopedia web site, NSW Department of Land and Water Conservation, 2000, [Information about aquatic organisms including what they look like, where they live, what they eat, their pollution tolerance, and interesting facts].
5. <http://www.bugsurvey.nsw.gov.au/html/believornot.html#links> Bugasaurus Believe it or Not, NSW Department of Land and Water Conservation, 2000, [Riddles about pond organisms].
6. <http://www.yale.edu/ynhti/curriculum/units/1992/5/92.05.07.x.html> Pond Ecology by Joe Lewis, Yale - New Haven Teachers Institute, 2005.
7. <http://www.teachers.ash.org.au/jmresources/pond/life.html> Web links compiled by Jackie Miers, 2003, [Links to many web sites containing information about ponds and aquatic organisms].
8. <http://www.nab.waterwatch.org.au/pdfs/key.pdf> [Key to common aquatic macro invertebrates].



Extension of Lesson Plan

1. The following pond organisms were discovered at Jericho Pond: diving beetle larva and adult, midge larva, mosquito larva, caddisfly larva, dragonfly naiad, damselfly naiad, back swimmer, water boatman, side swimmer, fish, tadpole, leech, and snail. Students can work in groups to research a few organisms that they discovered on the field trip using web sites listed under references 4 and 5. Students can record the name of the organism, what they look like, what they eat, their pollution tolerance, and an interesting fact or riddle about the organism. Students can then present their research findings to the class.
2. Students can use scavenger hunt lists to help them explore and learn about living and non-living components of the beach and intertidal zone at Jericho Beach.
3. The lesson can be linked to the following topics:
 - Pollution issues: The influence of pollution on aquatic life.
 - Food chains: Students can play food chain, food web, and predator/prey games.
 - Literacy: Read poems about insects out loud from the book 'Joyful Noise, Poems for Two Voices' by Paul Fleischman (see reference 2).