2. WATER WAYS
(2) There's A Fly in My Water!

Aquatic invertebrates serve as water quality ***indicators.*** *(Field Trip / 45-60 min)*

Connecting with Science Standards			
Category/Strand	***Grade***	***Standard(s)***	***Benchmark(s)***
Life Science	4	Form, structures, habitats	Structure, body, senses, behavior, food webs
	4	Similarities/differences thru time	Survival of organisms in environment
	5	Structure & function	Habitat, ecosystems, food webs, environ changes, human impacts
		Genetic traits	Life cycles
Scientific Thinking/Practice	4	Scientific Method	Observation, interpretation, predictions, conclusions
	5		Investigation & interpretation

Goal: Students will identify, aquatic insects, learn about their **metamorphosis** and understand how they and other aquatic invertebrates indicate water quality.

Objectives:

- Identify various aquatic insects and invertebrates at Bottomless Lakes and/or Bitter Lake Wildlife Refuge
- Perform **quantitative** insect **surveys** to determine water quality
- Discuss causes of water pollution and possible solutions

Materials:

- Small insect dip nets
- Ice cube trays or small cups
- Aquatic invertebrate identification keys
- Hand lenses
- Data observation forms
- Pens/pencils

Background

Water quality is essential for healthy **ecosystems. Pesticides, chemicals, sediment** and **salinity** can all affect our water quality by raising water **temperatur***e* and **turbidity** and lowering the amount of **dissolved oxygen.**

Many aquatic insects and other invertebrates spend most of their lives underwater. Some invertebrates are very sensitive to water quality. Others have adapted to conditions where water quality may be affected by pollution, high levels of salt, or other environmental factors, allowing them to live in water that other insects and invertebrates cannot.

Who lives in the water, or not, tells us a lot about our water.

PROCEDURE:

1. Have students work in pairs.

2. Distribute all materials.

3. Have students spread out along the shoreline so they're not too close together. Remind students they will stay on the bank – no swimming or wading!

4. Have students fill cups or trays with water and place them close by.

5. Students will "stir up" the mud and water with their dip nets, scooping up mud, pebbles and organic material.

6. Students will look for anything moving in their nets and gently transfer insects to cups or trays already filled with water. ***It is important that invertebrates be kept in water at all times or they may die!***

7. Using the identification ***keys***, students will work together to identify insects, recording their findings on the data observation forms. Students will add up how many insects they find in each category.

8. Based on their findings, students will be able to determine what quality of water is at Bottomless Lakes.

9. Have teams share their results. Discuss possible environmental factors or pollution sources.

10. Encourage class to brainstorm ways to reduce water pollution.

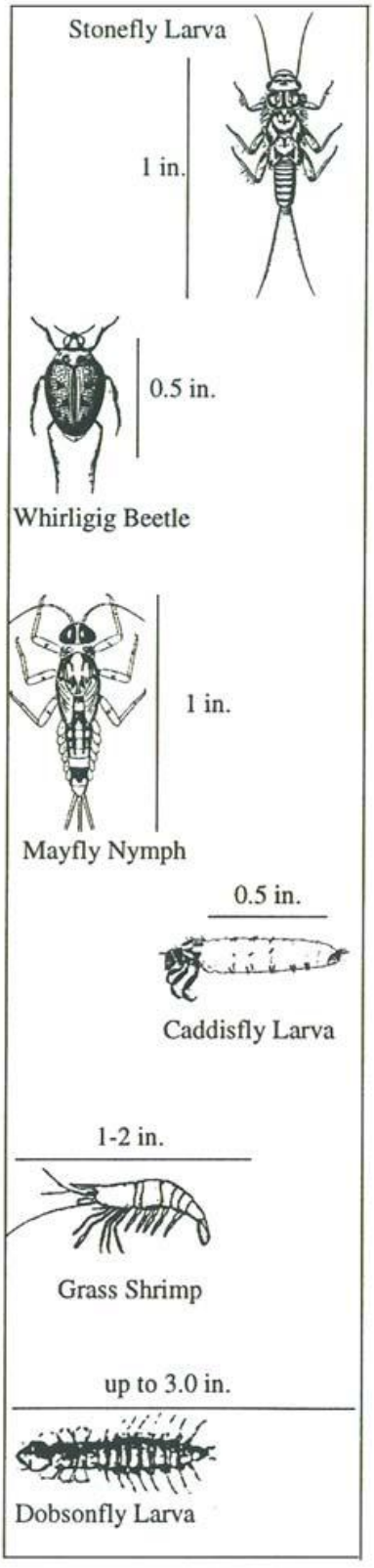
11. After activity is completed, have each group gently return their insects back into water and rinse out cups and nets.

EXTENSION:

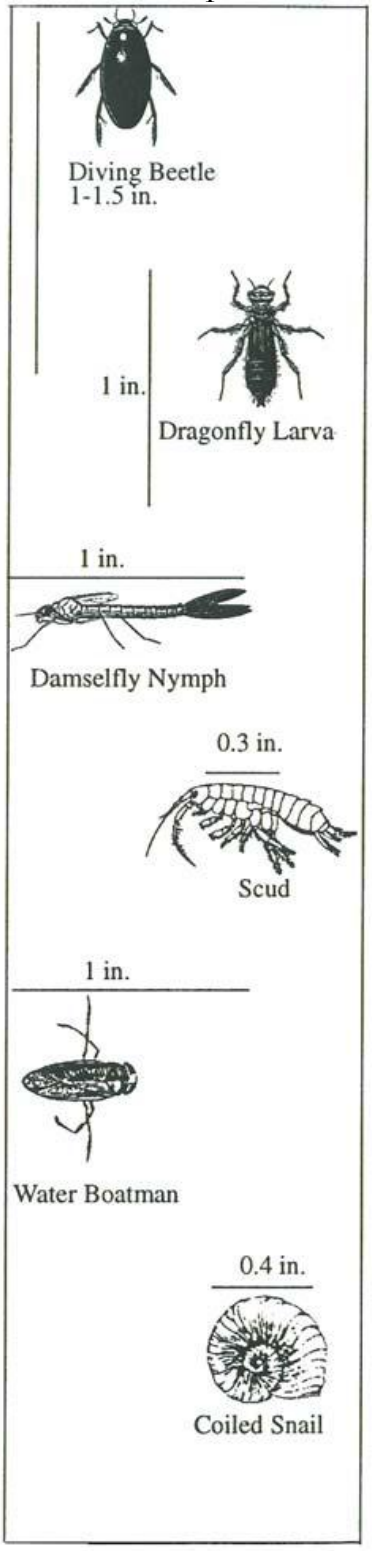
1. If time permits, sample aquatic insects and invertebrates from more than one lake at Bottomless Lakes State Park and compare results.
2. Compare aquatic invertebrate and insect samples from both Bitter Lake and Bottomless Lakes State Park.

Water Ways
Aquatic Insect and Invertebrate Key

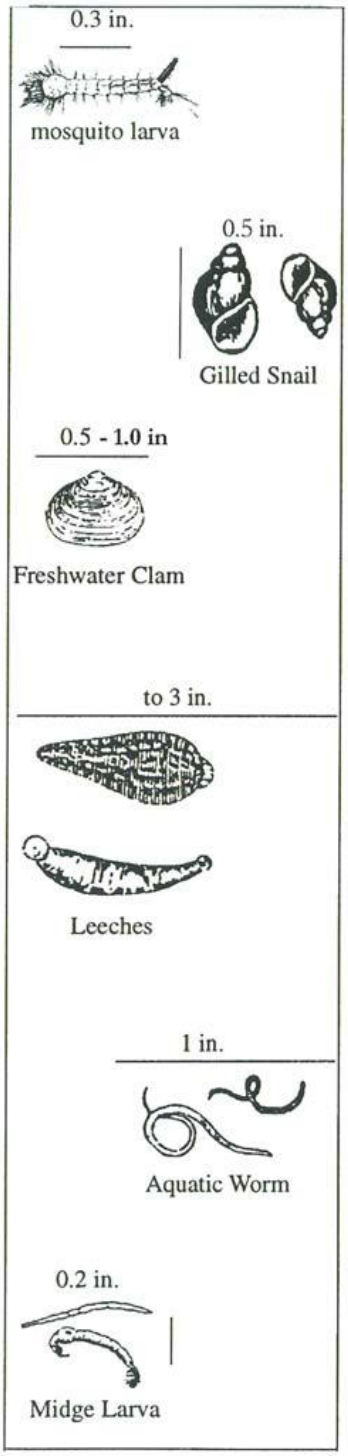
Group 1



Group 2



Group 3



Water Ways / Fly in my Water
Vocabulary

Aquatic Insects: insects living some portion of their life cycle in the water. As insects, they possess segmented bodies supported by an exoskeleton, a hard outer covering made mostly of chitin. The segments of the body are organized into three distinctive but interconnected units, or tagmata; a head, a thorax, and an abdomen.

Chemicals: often defined as any material with a definite chemical composition.

Ecosystem: a natural unit consisting of all plants, animals and micro-organisms in an area functioning together with all of the non-living physical factors of the environment.

Invertebrates: animals lacking a vertebral column, or spine.

Indicator Species: any biological species that defines a trait or characteristic of the environment. For example, a species may indicate an environmental condition such as a disease outbreak, pollution, species competition or climate change. Indicator species can be among the most sensitive species in a region, and sometimes act as an early warning to monitoring biologists.

Identification Keys: a visual device that aids the identification of biological organisms.

Metamorphosis: a biological process by which an animal physically develops after birth or hatching, involving a conspicuous and relatively abrupt change in the animal's form or structure through cell growth and differentiation.

Pesticides: a substance or mixture of substances used to kill a pest. A pesticide may be a chemical substance, biological agent (such as a virus or bacteria), antimicrobial, disinfectant or device used against any pest.

Pollution: the introduction of contaminants into an environment that causes instability, disorder, harm or discomfort to the physical systems or living organisms they are in.

Quantitative Surveys: the collection of measurable information.

Saline: the salt content in a substance.

Sediment: any particulate matter that can be transported by fluid flow, and eventually deposited.

Temperature: the measurement of how hot or cold something is.

Turbidity: the cloudiness or haziness of a fluid caused by individual particles that are generally invisible to the naked eye, similar to smoke in air. The measurement of turbidity is a key test of water quality.

Water Ways / Fly in my Water
Teacher Evaluation

Your feedback will help make the Outdoor Classroom Program a long-lived success. Please help us improve this activity and the BWBL curriculum by taking a few minutes to provide some constructive answers to the questions below.

Date of field trip:_____ Location of field trip: _____

School/City: _____ Grade: _____ # students: _____

Your name: _____ Your phone or email: _____

1. In what capacity did you use this activity? (please check one) ____ field trip _____ classroom (pre- or post-field trip)
2. Who led the activity? (please check one) ____you _____another teacher _____agency staff
3. Please rate your overall impression of this activity.

1 2 3 4 5 6 7 8 9 10 (please circle one)
Poor Good Excellent

4. How well do you think it met the stated Goals/Objectives on the front page of the activity?

1 2 3 4 5 6 7 8 9 10 (please circle one)
Poorly Fairly well Right on target

5. How well did it compliment/support classroom study?

1 2 3 4 5 6 7 8 9 10 (please circle one)
Poorly Fairly well Right on target

E1. What do you believe your students gained from this activity in terms of learning?

E2. How did you assess learning from this activity?

E3. What would you suggest as a practical assessment for future revisions of this activity?

E4. What else would you suggest to improve this activity and/or the BWBL curriculum?

Please fax this completed form to (505) 476-3361, Attn: Outdoor Classroom Program

Water Ways
Aquatic Insect Worksheet

Team/Name: _____ Date: _____

Once you've identified your aquatic insects, write down how many from each group you found in your water sample. This will help you determine the water quality of your sample.

Group 1
Sensitive – These aquatic insects cannot tolerate pollution or environmental factors that could affect water quality. Insects living in these waters often indicate unpolluted water, with colder temperatures and low levels of turbidity.

Number of insects found:

___ 3 or more insects ___ 1 to 3 insects ___ None found

Group 2
Somewhat Sensitive – These aquatic insects can tolerate some levels of pollution and other environmental factors that may indicate mildly polluted water, or water with slightly warmer water temperatures, lower dissolved oxygen levels, higher saline and higher turbidity levels.

Number of Species Found:

___ 3 or more insects ___ 1 to 3 insects ___ None found

Group 3
Tolerant – These aquatic insects have adapted to living in polluted water or with other environmental factors, which may indicate warmer water temperatures, lower levels of dissolved oxygen, higher saline and higher turbidity levels.

Number of Species Found:

___ 3 or more insects ___ 1 to 3 insects ____ None found