

WHAT IS IN SOURCE WATER?

9-12

OBJECTIVES

The student will do the following:

1. Observe pond and stream water samples for microorganisms and macroinvertebrates present in those aquatic ecosystems.
2. Categorize and compare the types of microorganisms in pond samples and stream samples (compare pond water samples with stream samples).
3. Distinguish between harmless macro- and micro-invertebrates and disease-causing organisms, if any.
4. Decide which pond appears to have better water samples.

BACKGROUND INFORMATION

Freshwater biomes include lakes, ponds, wetlands, and rivers. Most aquatic organisms live near the surface where nutrients and oxygen are plentiful. Different types of communities of organisms dwell successfully in bodies of freshwater, depending on temperature, humidity, and amount of light. Some freshwater invertebrates are protists, green algae, and monerans (bacteria and blue-green algae). Other invertebrates, such as mayflies, stoneflies, snails, riffle beetles, crayfish, and caddisflies, may also be abundant.

Bioassessment is a technique used to monitor water quality. Groups of students can conduct bioassessments. This type of testing is a supplement to chemical testing. Usually different species are found in differing proportions and can be used as indicators of water quality. Some tolerant species can survive drastic changes in conditions. Other intolerant species are affected even by small amounts of pollution. Populations change when water quality changes.

SUBJECTS:

Science (Biology, Ecology)

TIME:

1 to 2 class periods

1 week extension

MATERIALS:

jars

sample of "pond water"

sample of "stream water"

labels

medicine dropper (per group)

microscope (per group)

slides with cover slips

kick nets or D-ring nets

distilled water

jars and labels

rice

book on aquatic microorganisms (if available)

wallpaper paste

paper & writing implements

student sheets

Terms

algae: any various, primitive, chiefly aquatic, one-celled or multicellular plants that lack true stems, roots, and leaves, but usually contain chlorophyll. Algae are divided into three groups: chlorophyta (green), phaeophyta (brown), and rhodophyta (red), typically grow in sunlit waters in proportion to the amount of nutrients available, and serve as food for fish and small aquatic animals.

bacteria: typically one-celled, non-photosynthetic microorganisms that multiply by simple division. They occur in three main forms; spherical (cocci), rod-shaped (bacilli), and spiral (spirilla).

bioassessment: an evaluation of the biological condition of a waterbody using biological surveys and other direct measurements of resident biota in surface waters

biomes: area or groups of ecosystems with similar climates, soils, and communities

community: assemblage of populations of species living together and interacting with each other within a certain area

population: group of organisms of a single species living in a certain area and interbreeding (or interacting)

tolerance: the natural or developed ability to endure or resist the harmful effects of a substance

ADVANCE PREPARATION

- A. Collect samples of pond water in jars and label them with a unique name or location for each pond.
- B. If possible, take students to the nearest stream and utilize kick nets or D-ring nets to collect macroinvertebrates. Place organism-containing water in sorting pans by group. Place organisms in jars with alcohol if preservation is desired, otherwise return organisms to stream.
- C. Copy Student Sheets. (one set for each student)
- D. If testing five-day-old pond water samples, add a few rice grains to each jar to feed organisms.

PROCEDURE

I. Setting the stage

- A. Go over Microorganism and Macroinvertebrate Student Sheets.
- B. Go over the different zones in a pond that support life.
- C. Explain how to use wallpaper paste to slow down microorganisms (not needed for macroinvertebrates).

II. Activity

Part 1- Observations

- A. Prepare microscope slides of pond and stream water using medicine droppers and cover slips.
- B. Ask students to make observations, draw, and identify the organisms present in the samples, using the Student Sheets as the key.
- C. Let each student observe a variety of slides.
- D. Compare and contrast the pond water organisms from different ponds.

Part 2 - Bioassessment

- A. Have students identify the macroinvertebrates of the three groups according to their key for macroinvertebrate samples.
- B. Have students record names and numbers of different macroinvertebrates found in each group for each stream macroinvertebrate sample.
- C. Compare and contrast the results for different samples; determine the water quality.

III. Follow-up

- A. Repeat the same procedure after 5-10 days. (Keep jars warm and in indirect sunlight.)
- B. Record the changes in size, number, and species in the new samples and the 5-10 day samples.
- C. Discuss possible reasons for any differences that are observed in the samples.

IV. Extensions

- A. Is water quality different in the streams? Which is best? Why?
- B. Collect more information about pond life and freshwater flora and fauna. (library research)

RESOURCES

Arms, Karen, Environmental Science, Holt, Rinehart, and Winston, Inc., Austin, TX, 1996.

Chiras, Daniel D., Environmental Science, High School Edition, Addison-Wesley, Menlo Park, CA, 1989.

Cunningham, William P. and Barbara Woodworth Saigo, Environmental Science: A Global Concern, Wm. C. Brown Publishers, Dubuque, IA, 1997.

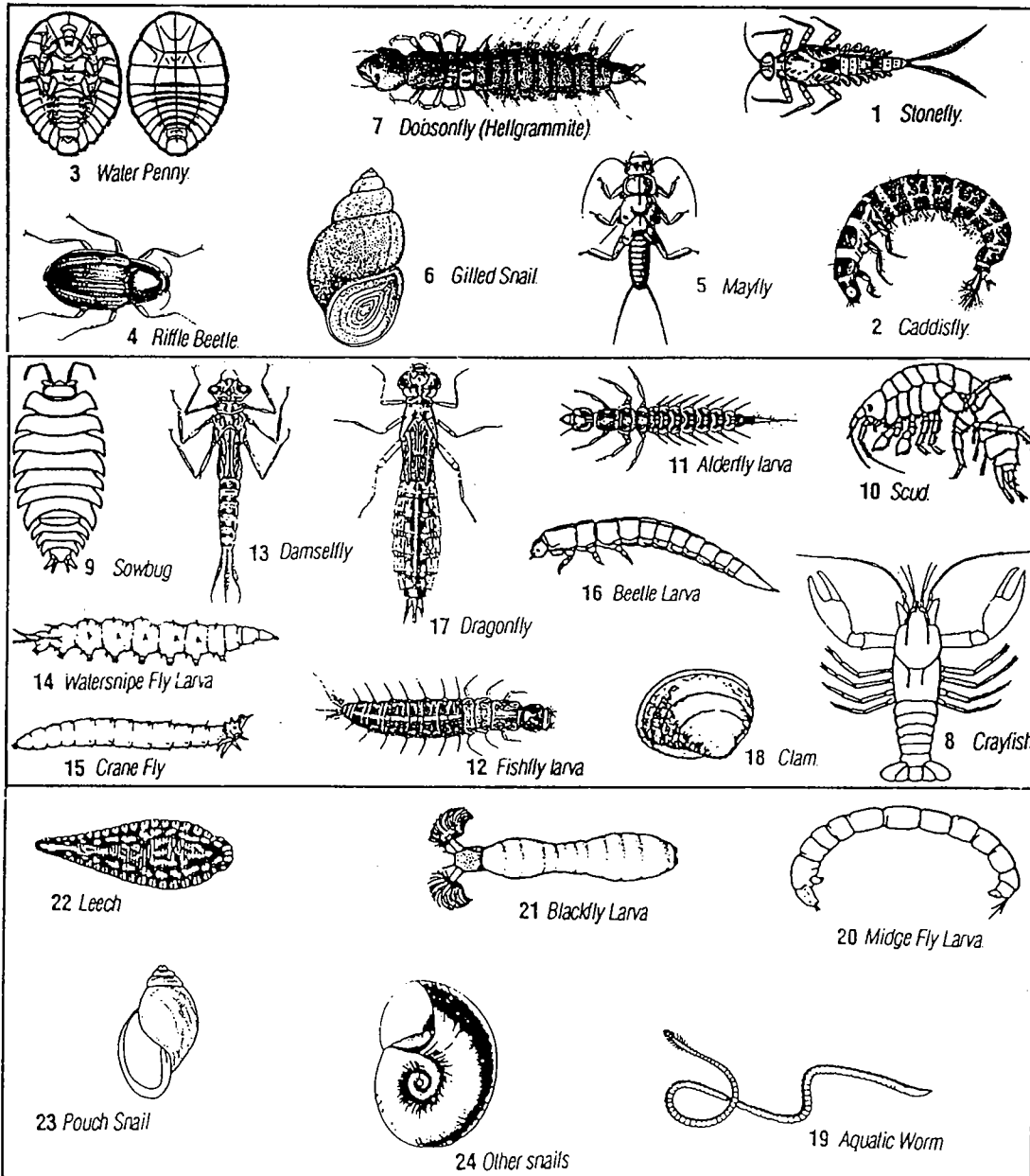
Enger, Eldon D. and Bradley F. Smith, Environmental Science: A Study of Interrelationships, 5th Edition, Wm. C. Brown Publishers, Dubuque, IA, 1983.

Nebel, Bernard J. and Richard T. Wright, Environmental Science: The Way The World Works, 4th Edition, Prentice-Hall, Englewood Cliffs, NJ, 1993.

MACROINVERTEBRATE GROUPS Beginner's Protocol PICTURE KEY

GROUP 1		GROUP 2		GROUP 3	
1.	STONEFLY	8.	CRAYFISH	19.	AQUATIC WORM
2.	CADDISFLY	9.	SOWBUG	20.	MIDGE FLY LARVA
3.	WATER PENNY	10.	SCUD	21.	BLACKFLY LARVA
4.	RIFFLE BEETLE	11.	ALDERFLY LARVA	22.	LEECH
5.	MAYFLY	12.	FISHFLY LARVA	23.	POUCH SNAIL
6.	GILLED SNAIL	13.	DAMSELFLY	24.	OTHER SNAILS
7.	DOBSONFLY	14.	WATERSNIPE FLY LARVA		
		15.	CRANE FLY		
		16.	BEETLE LARVA		
		17.	DRAGONFLY		
		18.	CLAM		

MACROINVERTEBRATE PICTURE KEY

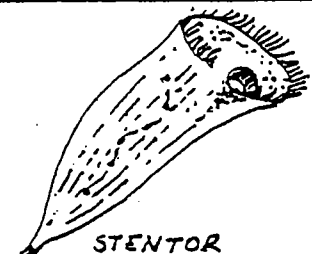
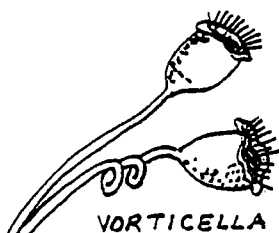
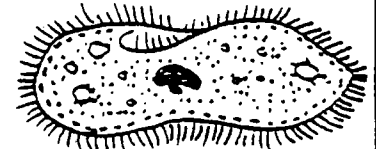
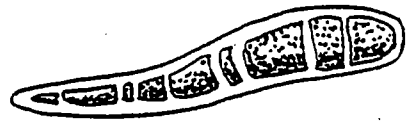
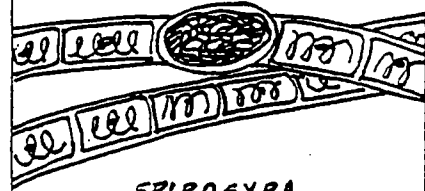
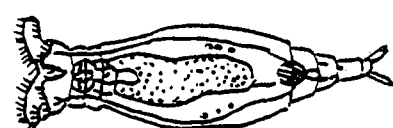
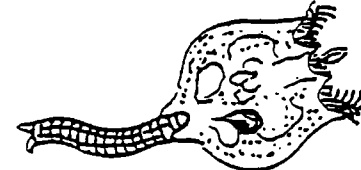
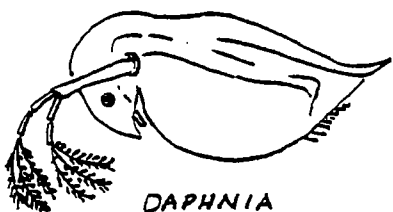
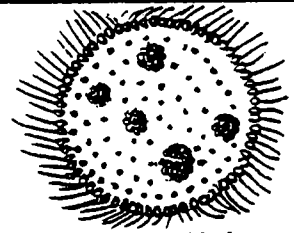
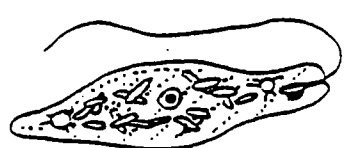


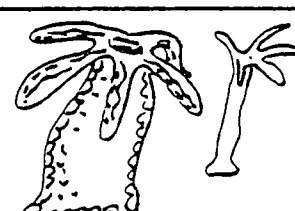
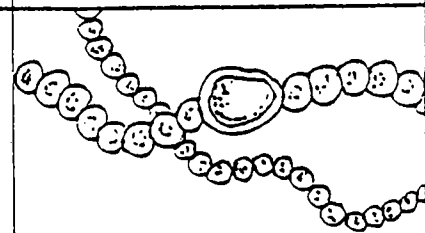
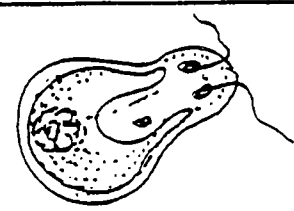
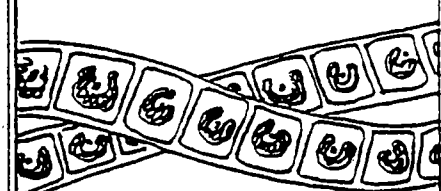
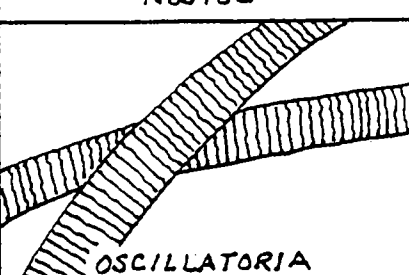
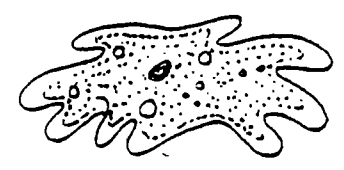


GROUP ONE

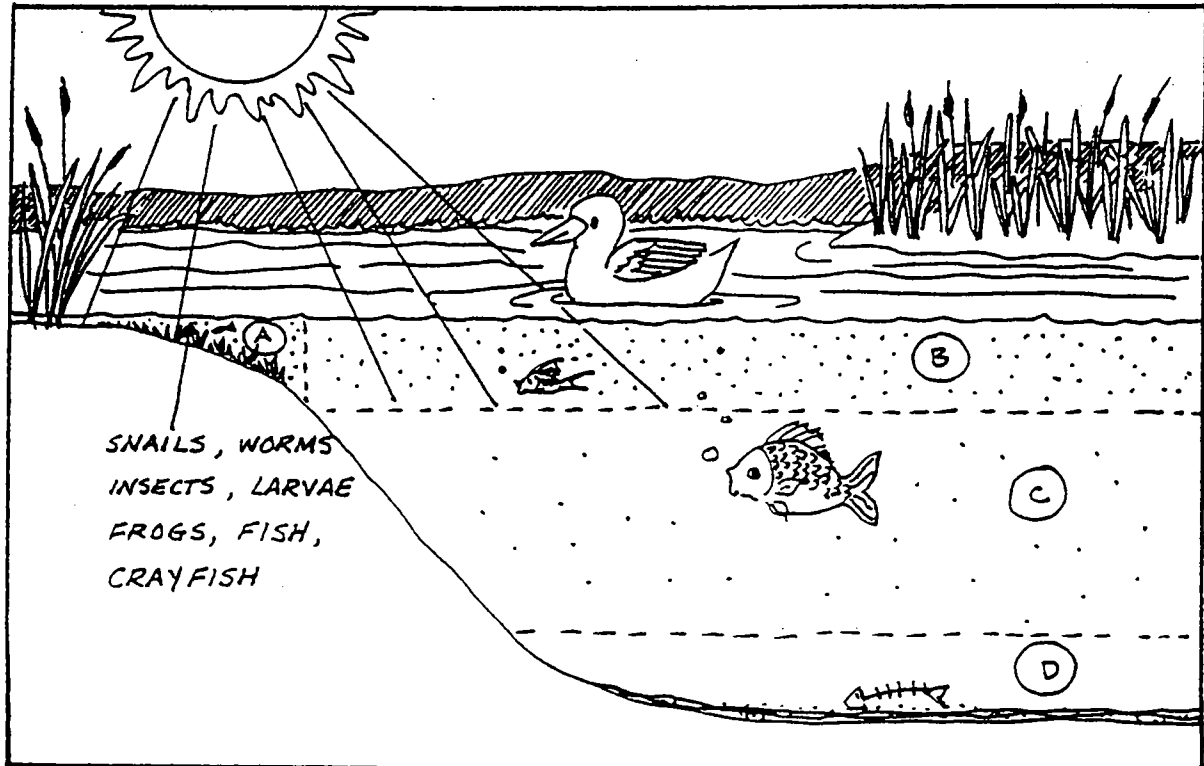
GROUP TWO

GROUP THREE

COMMON FRESHWATER ORGANISMS

 <p>STENTOR</p>	 <p>VORTICELLA</p>	 <p>PARAMECIUM</p>
 <p>MICROSPORA</p>	 <p>SPIROGYRA</p>	 <p>PHILODINA: ROTIFER</p>
 <p>KERATELLA: ROTIFER</p>	 <p>DAPHNIA</p>	 <p>VOLVOX</p>
 <p>EUGLENA</p>	 <p>DIATOMS</p>	 <p>CHROOCOCCUS</p>
 <p>HYDRA</p>	 <p>NOSTOC</p>	 <p>CHLAMYDOMONAS</p>
 <p>ULOTHRIX</p>	 <p>OSCILLATORIA</p>	 <p>AMOEBA</p>

A POND ECOSYSTEM



A pond or lake ecosystem is structured according to how much light is available.

- A. Shallow water at shore line; sunlight reaches bottom; life abundant and varied.
- B. Near surface; light penetrates for photosynthesis; phytoplankton, zooplankton abundant.
- C. Cooler, darker; bacteria and fish that feed in Zone B.
- D. Very dark and very cold, few bottomfeeders; many decomposers.