Hide and Seek

Through a field trip to a local river and some background in food webs, students collect, study, categorize macro-invertebrates, and then link their specimens to the rest of the animal kingdom.

Teacher Notes for Discussion

For a more successful field trip experience, provide students with field guides and class time to research some of the organisms they can hope to encounter. This will also help students make connections to the food web, which will help them complete the assessment.

This activity works best with students who have some background knowledge of the different types of food webs. Begin the instruction with an introduction or review of the vocabulary. Work the vocabulary into a discussion of food web interactions.

To ensure that students have enough time to classify and research specimens, have aquariums available in the classroom for each group to house their specimens until the following class time.

Related Standards and Benchmarks

Standard 7. Understands how species depend on one another and on the environment for survival

- knows ways in which species interact and depend on one another in an ecosystem
- knows that all individuals of a species that occur together at a given place and time make up a population, and all populations living together and the physical factors with which they interact compose an ecosystem
- knows factors that affect the number and types of organisms an ecosystem can support
- knows relationships that exist among organisms in food chains and food webs

Mathematics

Standard 4. Understands and applies basic and advanced properties of the concepts of measurement

- selects and uses appropriate units and tools, depending on degree of accuracy required, to find measurements for real-world problems

Objectives

After completing this lesson, students should be able to:

- identify macro-invertebrates commonly found in a river ecosystem.
- construct a realistic river-based food web.
- explain the diversity of life in a natural environment.
- collect and synthesize accurate scientific data.
- make inferences and predictions from data.

Time Considerations

Instructor preparation: one hour

Student activity: three to four classes

Teacher Preparation

Arrange for a field trip to a river or stream bank.

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Understand Your Mission

In this activity, you will study macro-invertebrates to better understand their link to the food web.

Learn the Lingo

benthic	of, relating to, or occurring at the bottom of a body of water
decompose	to break up into smaller parts by a chemical process, decay, rot
detritivore	an organism that eats decomposing or rotting material (e.g., worms)
ecology	the study of the relationship between organisms and their environment
macro-invertebrates	animals without a backbone or spinal support that are visible to the naked eye (e.g., insects, clams, lobsters)
organisms	living beings
parasitism	an intimate relationship between organisms of two or more kinds; especially in which one obtains benefits from the other; the host is often injured or killed by the parasite
predation	food is primarily obtained by the killing and consuming of animals
riffle	an area of water 3-12" deep with a rocky bottom where the water is flowing fast, creating ripples
sampling	a portion, piece, or single item that is representative of a whole
sessile	permanently attached or established; not free to move about (e.g., mussels and corals)
stream bed	the bottom of a river or stream
temperature	the relative hotness or coldness of an environment or organism
velocity	the rate per unit of time at which an object moves in a specified direction, speed (e.g., 55 mph)

Gather Your Supplies

- ❑ aquariums
- ❑ boots or old sneakers
- ❑ brushes
- ❑ buckets
- ❑ duct tape
- ❑ identification sheets
- ❑ (kick) net
- ❑ measured string
- ❑ resource materials
- ❑ sieves
- ❑ stop watch
- ❑ trays/pans (light colors work best-try ice cube trays)
- ❑ thermometers

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Background

A food web is made up of all food chains within an ecosystem. Food webs are divided into two broad categories: (1) a grazing web, which begins with green plants, algae, or photosynthesizing plankton, and (2) detrital web, which begins with organic debris. These webs are individual food chains. In a grazing web, materials typically pass from plants to plant eaters (herbivores) to flesh eaters (carnivores). In a detrital web, materials pass from plant and animal matter to bacteria and fungi (decomposers), then to decomposing matter-eaters (detritivores), and then to their predators (carnivores).

A river is full of life. Most people are familiar with animals and plants that live in the upper levels of the river—the water and the surface. Many plants and animals, called benthic organisms, also live on the river bottom or even under mud.

Each member of the ecosystem is vitally important to the overall health of the environment; however, the majority of the plants and animals in river ecosystems are overlooked because they are so hard to see. These ignored members of the ecosystem are as important, or even more important, than the larger species. Animals in this category include macro-invertebrates.

In freshwater, macro-invertebrates include insects, hydracarina (true water mites), mollusks (clams, snails and mussels), oligochaetes (worms), leeches, and others. In most freshwater environments, the larval insects dominate the macro-invertebrate community.

On your fieldtrip, you can expect to find flatworms, snails, mussels and clams, worms, leeches, water mites, mayflies, dragonflies and damselflies, stoneflies, true bugs, beetles, caddisflies, or midge flies.

Chart a Course for Exploration

Part A (you will need to work in groups of four and sample more than one area)

Work in groups to locate several areas of the stream or river with different bottom types (gravel, sand, and mud).

1. Write your observations in Table 1. Include water temperature and the velocity (rate of speed) of the water for each sample area. (To determine the velocity, measure how long it takes a floating object to travel one meter).
2. Use the buckets to scoop out a river bottom sample. Rinse the bucket and use it for each of the different river bottom types. Try to disturb the area as little as possible.
3. Pour the sample into a sieve. Add river water to wash out the sediment and expose the organisms.

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4. Place the organisms in light colored trays filled with river water.
5. Repeat this procedure for each bottom sample keeping the organisms from each area separate. Label the samples so you know from where each one came.
6. Identify the organisms and tally each type of organism found in each stream bed environment (see Table 1).

Part B: (you will need to work in groups of four and sample more than one area)

1. Note the conditions of the day and the stream on Table 2.
2. Locate a site that has a riffle.
3. Use the kick net to sample the area:
   Place the kick net several feet downstream from the riffle area. Have two group members hold the bottom edge of the net in contact with the streambed. Have two other group members stand upstream and disturb the bottom of the stream by moving their feet. Any organisms that are in the bottom sediments will be carried downstream and caught in the net.
4. Pick up rocks and, using vegetable brushes, wipe off and collect any clinging animals.
5. Carefully pick up the kick net and take it to the stream bank. Carefully remove all organisms and place them into a bucket or container. Use one container per sample.
6. Determine the velocity of the riffle by measuring how long it takes a floating object to travel one meter and record this information in Table 2.
7. Record the air and water temperature. (Record the air temperature first.)
8. Identify, record, and tally the type and number of each species found for each sample site, or take the animals to a classroom aquarium (one for each sample) for later identification.

Go Beyond

Activities that would ultimately harm or destroy these habitats often go unnoticed due to a lack of understanding about the important roles played by macro-invertebrates in the environment. Research the threats to macro-invertebrates caused by urban and highway runoff, land development, agriculture, pesticides, dams and reservoirs, oil spills, mine waste, or even global warming. Report your findings to the class.

Part C

Think about how these organisms fit into their environment. Do these organisms provide protection for other species? Do they depend on water for their entire lifecycle? Do they eat decaying plant matter? Do they interfere with other species? How do they fit into their food web? Does the shape of their body help them survive? Use the data you collected from Exploration A and B to design a food web for the river you studied. Label all organisms in the food web. Select two macro-invertebrates and write a one-page paper comparing and contrasting the two organisms.

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TABLE 1: RIVER BOTTOM MACRO-INVERTEBRATES
ENVIRONMENTAL OBSERVATION
WEATHER CONDITIONS
VELOCITY
AIR TEMPERATURE
WATER TEMPERATURE
GRAVEL
SAND
MUD
1. NAMES
2. HERBIVORE, CARNIVORE, OR OMNIVORE
3. PREDATORS OR PREY
TOTAL NUMBER OF ORGANISMS

TABLE 2: RIFFLE MACRO-INVERTEBRATES
STREAM CONDITIONS
DAY CONDITIONS
VELOCITY
TEMPERATURE
SPECIES
TOTAL NUMBER OF ORGANISMS
SITE #1
AIR:
WATER:
SITE #2
AIR:
WATER:
SITE #3
AIR:
WATER:

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	EXPERT	PROFICIENT	NOVICE
FOOD WEB	❑ contains 10 organisms ❑ chart is complete and accurate	❑ contains 5-10 organisms ❑ chart is motly filled out	❑ has fewer than 5 organisms ❑ chart is incomplete
ESSAY DESCRIPTION	❑ describes similarities and differences between organisms ❑ describes how their environments are different ❑ describes how they are suited (adapted) to their environment	❑ describes how they fit into the food web ❑ describes similarities and differences between organisms ❑ describes how their environments are different	❑ describes what role they play within their environment ❑ essay is incomplete ❑ lacks information on organisms, environment, and the food web
ESSAY CONTENT	❑ well written and organized ❑ fewer than three G.U.M. (grammar, usage, mechanics) errors	❑ does a good job comparing and contrasting the organisms, but it needs better organization ❑ contains 3-4 G.U.M. errors	❑ not well organized ❑ contains 5 or more G.U.M. errors

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