

# Biomes: Freshwater & Seawater

Grade Level: 6-8

Subject: Ecology

Duration: Two to three class periods

## Objectives

Students will

- conduct fieldwork to determine water quality of a freshwater habitat;
- observe an organism's behavior and adaptations; and
- answer questions about the differences between habitats with still and flowing water.

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## Materials

- field guides of pond life or freshwater life
- small fish nets, long-handled dip nets, kick seine or other nets
- collecting buckets, preferably white
- pH paper
- thermometers, preferably without mercury
- meter sticks or tape measures
- fish floats, leaves, or any objects that will float
- stopwatches or watches with a second hand
- magnifying glasses or bug boxes
- old shoes or boots

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## Procedures

1. Explain that scientists consider freshwater habitats to have salinity, or saltwater content, of less than .005 percent. Freshwater habitats are ponds, lakes, bogs, rivers, streams, creeks, marshes, swamps, or even puddles and drainage ditches. A reservoir is an artificial freshwater resource.
2. Brainstorm with students a list of freshwater habitats close to school. Ask students to hypothesize about the health of a nearby habitat and its diversity of life.  
  
Would students consider it healthy or unhealthy?  
Why? Explain that some organisms can tolerate a polluted freshwater environment.
3. Introduce the word "macroinvertebrate" to the class. Explain that this is an animal without a backbone living in one stage of its life cycle, usually the nymph or larval stage. Visible without a microscope, macroinvertebrates can spend a few years living in a freshwater habitat. Many are benthic organisms, or bottom dwellers.
4. Explain that scientists determine a freshwater habitat's health by the number and type of its organisms. The water quality of such a habitat is good when it is rich in oxygen and supports a variety of organisms. Water quality is fair when it has less oxygen and low levels of pollutants, and poor when it has high levels of pollutants. Some organisms can survive only in freshwater of good quality, while others can live in any quality.
5. Review the chart of organisms and the quality of water their presence indicates (below). The presence of stonefly larvae indicates good water quality because they are highly sensitive to chemical and physical changes. But leeches can live in any water, so their presence may indicate poor quality.

Good water quality	Fair water quality	Poor water quality
Mayfly larvae	Crayfish	Aquatic worms
Stonefly larvae	Scud	Leech
Caddisfly larvae	Dragonfly nymph	Pouch snail
Dobsonfly larvae (Hellgrammite)	Cranefly larvae	Midge fly larvae
Water penny	Clam	Blackfly larvae
Riffle beetle	Damselfly larvae	Carp
Trout	Sow bug	Catfish

- Divide students into teams of three or four. Explain that students will study shallow and deep areas of the freshwater habitat. Shallow water in a stream is no higher than the ankle, and deep water reaches the knee.
- Review safety precautions to follow during fieldwork. Wear old boots that will keep feet dry; remember wet surfaces, such as rocks with algae, are slippery; check depth before stepping into water; handle organisms gently and return them to the habitat alive; be aware that some organisms can bite or pinch; never drink the water.
- Have each team gather equipment and choose a place to work in the habitat. Have students observe the water's edge and surface, and look through the water to the bottom of the habitat. Have the students record their observations on a data sheet.
- Have students measure the water temperature with a thermometer and record depth with a meter stick. They will measure the velocity of flowing water by recording the distance a float travels in 10 seconds, and measure the water's pH with pH paper. They should record all data on their data sheets.
- In a stream, have students collect macroinvertebrates in riffles, or areas with higher oxygen content.
- Students should place a kick seine net or a large net with a small mesh downstream. Have them hold the net so it rests on the bottom of the stream.
- Have students dislodge organisms by disturbing the stream bottom and rubbing rock surfaces. After a few minutes, students will raise their nets and gently put organisms into a bucket. In still water, students must carefully sift through mud or sand in the net. Students should identify and count the organisms, and record their data before releasing them.

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## Evaluation

Use the following three-point rubric to evaluate students' work during this lesson.

- Three points:** Students worked exceptionally well in the field and completed data sheets accurately with detailed observations; answered the questions completely and shared observations with the class; demonstrated a clear understanding of the fieldwork.
- Two points:** Students worked somewhat carefully in the field and completed data sheets, but answers lacked detailed observations; completed most of the questions and demonstrated a general understanding of the fieldwork.
- One point:** Students did not engage in fieldwork and partially completed the data sheets; answered some of the questions, but did not demonstrate an understanding of the fieldwork.

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## Vocabulary

### benthic

**Definition:** Relating to the bottom of a body of water

**Context:** Organisms are benthic dwellers if they live on the bottom of freshwater habitats.

### biodiversity

**Definition:** The number and variety of organisms found within a specific geographic region

**Context:** A freshwater habitat's health can be determined by its biodiversity.

### habitat

**Definition:** The place an animal or plant normally lives

**Context:** Trout live in salty and freshwater habitats.

**larva (plural: larvae)**

**Definition:** The newly hatched, wingless, often wormlike form of many insects before metamorphosis

**Context:** Fly larvae are macroinvertebrates living in freshwater habitats.

**macroinvertebrate**

**Definition:** An animal without a backbone usually in a nymph or larval stage

**Context:** Scientists determine freshwater habitat health by the quantity and diversity of macroinvertebrates.

**riffle**

**Definition:** A stretch of choppy water

**Context:** Macroinvertebrates thrive in riffles, which have more oxygen than still water.

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## Academic Standards

The National Academy of Sciences provides guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K–12. To view the standards, visit <http://books.nap.edu>.

This lesson plan addresses the following national standard:

- Life Science: Populations and ecosystems

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## Credit

Discovery School staff (based on lesson plan by Mary C. Cahill, middle school science coordinator, Potomac School, McLean, Virginia)