



Macroinvertebrate Lesson

Concept

Aquatic macroinvertebrates (organisms that live in water and do not have a backbone) can indicate water quality.

Objective - Students will:

- 1) collect aquatic macroinvertebrates using appropriate collection procedures;
- 2) identify aquatic macroinvertebrates collected;
- 3) apply the given mathematical formula to assess water quality and;
- 4) understand diversity and food web interactions.

Time

1 and 1/2 hours

Materials: Earth Camp Teacher Assistant will provide materials
For instruction:

- Laminated poster, “Is the Creek Clean or Polluted?”
- Dry erase marker

Group Materials:

- 1 bin for collecting bugs
- “Is the Creek Clean or Polluted?” bug identification sheet
- Wax pencil

Materials for Student Pairs:

- Magnifying viewer
- Forceps

INTRODUCTION:

1. Explain Important Safety Rules

- Discuss avoidance of **snake habitat** (plants and brush) and **snakes**. Move backward slowly away from the snake if one is near. Do not yell, run, or wave arms. When a safe distance from the snake (5 to 6 feet), sit quietly and watch the snake. If a snake is seen in the water, get out of the water.
- Be aware of **poison ivy**.
- **DO NOT THROW ROCKS**. You might hurt someone or something in the water.

2. Watershed Information

- Review the definition of a **watershed** (area of land that drains to a creek). Identify the watershed you are in.
- Tell students to observe signs of flooding, volcanic ash if present, and fossils while walking down to the creek.

3. Geology

- Ask students to identify the type of rock surrounding the creek? (**Limestone**)
- Discuss examples of **erosion** and **deposition**.

4. Identifying Macroinvertebrate Habitat

- Ask students why **oxygen** is important in the creek? (organisms breathe it) Where does the oxygen organisms breathe come from? (plants, algae, bubbles) Point out the bubbles that oxygenate the water at the waterfall and downstream at the **riffle** where the water is flowing over the rocks.
- Ask students why the macroinvertebrates are important to the creek? (they are food for fish) Without oxygen and macroinvertebrates, what would happen to the creek? (the **food web** would break down) Tell students they will look for macroinvertebrates at the shallow, bubbly, rocky area (riffle) because it is their habitat. Riffles provide protection from predators and are full of oxygen (bubbles).

5. Purpose of the Macroinvertebrate Test

- One way to check the health of a creek is to identify and count the variety of tiny water macroinvertebrates. Pollutants in the water can kill the sensitive water macros. A chemical test will not identify pollution in the water after it has washed downstream, but the water macroinvertebrate community will change because the pollution would cause sensitive macros to die. If sensitive water macros are not living in an area where they should be, then it is a sign something in the environment is not healthy. You will be collecting and identifying water macroinvertebrates to determine the health of the creek.

PROCEDURE:

1. Teach Macroinvertebrate Count_ (Use the large poster)

- Look at the macroinvertebrates in the top green section of the poster. These are sensitive macros because they can only live in a healthy creek. They are worth 3 points. The macros in the middle yellow box can tolerate a little bit of pollution without dying, but are still sensitive because they cannot live in heavy pollution. They are worth 2 points. The macros in the bottom blue box can tolerate pollution but they are also found in a healthy creek. They are worth 1 point.
- Finding all categories of macroinvertebrates is best because it shows a diversity of organisms. If there are no macros found from the excellent or good category, then the creek is considered unhealthy. When there is not a good diversity of macros in the water, it affects the food web of the creek. Animals that depend on the macroinvertebrates in the water for food could lose their food supply. People also depend on the aquatic food web because we eat fish.
- Finding a macroinvertebrate in the poor water quality group does not necessarily mean the creek is polluted; however if it was the only group of macros found, then the creek would be considered polluted.

- Demonstrate how to check off the type of macroinvertebrate found on the worksheet. Emphasize the importance of correct identification. Discuss how to tell them apart by looking at their structures (i.e. count number of tails, does it have legs?)

Demonstrate How to Collect Macroinvertebrates

- Go to a spot near the creek for demonstration.
- Show the students how to fill the bin with 1-2 inches of clear water for holding the macroinvertebrates after they've been collected.
- Tell the students they will work with a partner in their group. Demonstrate by picking a partner and having them hold a magnifier with creek water. Bring a pair of forceps, and wade into the water with your partner. Explain to students the procedure as you bend down to pick up a rock sitting on the bottom of the creek (not buried), in a shallow area with running water (to bring oxygen). Lift the rock out of the water and inspect the bottom for movement or shapes. When a macro is spotted, use the forceps to carefully remove it and place it in your partner's magnifier.
- Walk slowly and carefully to spots where you think macroinvertebrates are living so you don't kick the macros downstream.

IMPORTANT RULES

- DO NOT PLAY OR SWIM IN THE WATER.
- DO NOT DROP ROCKS OR SPLASH IN THE WATER.
- DO NOT GET IN WATER DEEPER THAN YOUR KNEES (macroinvertebrates don't like the deeper water)
- DO NOT HARM THE ANIMALS.
- Note: If someone is too scared to go in the water or does not have water shoes, macroinvertebrates can be found under rocks in the water near the edge of the creek.

3. Demonstrate Macroinvertebrate Identification and Documentation

- Use the Bug ID sheet to help the student identify the macroinvertebrate collected.
- Check off the macro found on the worksheet.
- Reward students (EC stamp) for identifying correctly (this will help them stay focused on identification)
- Put the macros in the collection bin. Look for more in the water.

4. Activity

- Divide class into **three groups** each with an adult leader. Give each group materials. Assign one group an upstream site, one group a midstream site, and one group a downstream site so everyone is not crowded and collecting in the same area.
- Allow time for everyone to collect, identify and document (**20 minutes**). Adult leaders should actively keep students on task. NO SWIMMING!!
- **NOTE:** When the majority of students start to play, usually enough time has passed for their interest in the activity. If one or two students are disrupting the activity, ask them to sit out..

5. Final Calculation of Water Quality Rating

- Gather the class together (**SIT DOWN**). Use the poster to check off all the macroinvertebrates found by every group. Ask students to check off on their worksheet any additional macros found by the class that might not have been found by their group. If there is an especially interesting macro, send the viewer around for everyone to observe. Add up score and rate the creek (note: only calculate 1 of each type of macro).
- **NOTE:** Macros we don't often find include stonefly nymphs, beetle larva, leeches. If a student says he/she found one of these, check it.
- Remind students that this activity can be done at their own creek to test water quality.
- Carefully put macros back in the creek.