

Title

Macroinvertebrates and Stream Health

Overview

Students identify bioindicator species and learn about their importance to ecosystem health. Matching each species to a macroinvertebrate Identification chart, students are able to determine the water quality index (WQI) value of each sample container, representing different tributaries of the Mississippi River.

Objectives

- Students can describe the various roles of aquatic macroinvertebrates in the ecosystem.
- Students can use a key to evaluate the health of a stream based on its macroinvertebrate biodiversity.
- Students understand that streams, due to their reduced water volume, are more susceptible to the effects of pollution than large rivers.
- Students can identify types of pollution that are common in streams (soil erosion due to mining and logging, acidic runoff from mines, nutrients from agriculture, etc.).
- Students can propose a solution that will protect streams from the pollution.
- Students can identify benthic macroinvertebrates that are used to study water quality.

NGSS

- HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
- HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Key Terms

- Bioindicator- A living thing that indicates the health of the ecosystem
- Benthic zone- The ecological region at the lowest body of water
- Macroinvertebrate- An animal without a backbone that can be seen with the unaided eye

Materials (per group)

- Prepared sample of macroinvertebrates in alcohol
- petri dish
- Stereomicroscope
- Macroinvertebrate ID cards
- white erase marker
- Macroinvertebrate Identification chart

Preparation/Class set-up

- Projector should be turned on and PowerPoint presentation ready prior to class.
- Students will sit in groups at each table.
- Samples of macroinvertebrates in alcohol in glass vials should be ready to use, each labeled with a letter A-H
- Teachers should be familiar with the identity of all macroinvertebrates in the prepared samples so that they can help students identify the sample easily themselves without giving away the answers.
- Teacher will need to draw a simple river with tributaries from which the samples came from on the board; this can be done during the activity, or ahead of time if the teacher prefers.

Activity

- The teacher will introduce the topic of benthic macroinvertebrates using the PowerPoint “Benthic Macro Breakdown” and explain their importance in the ecosystem, including the role they serve as biological indicators of stream health.
- The teacher and volunteers will distribute the following to each table:
 - a vial of macroinvertebrate specimens
 - ID cards to help students identify macros
 - A viewing device: microscope with petri dish
 - Forceps (or small paint brushes) for handling macros
- Each student group will have time to view the specimen sample vials.
- Next, students will use the sink to add enough water to cover the bottom of their petri dishes.
- Students will carefully remove the specimens from the jar using the forceps and place them into the petri dish. If a microscope is available, observe the specimens under the microscope. Students identify macroinvertebrates in their sample and circle them on their sheet if they are present in the sample. They will then identify the water quality index value (excellent, good, fair, or poor) and record that on their laminated sheet.
- Students must carefully put the specimens back into the glass vials using the forceps and seal the glass vial.
- Draw a pseudo river system on the board and label each tributary according to each sample. Go over results of each sample jar and write in the WQI value as you go.

- Facilitate discussion on the importance of stream health and their connectedness to major river systems.