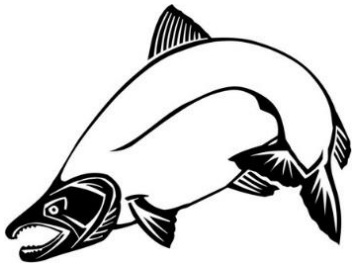
Macroinvertebrate Field Study (Nearby Stream)



Purpose: In the field, students design and implement a macroinvertebrate sampling experiment to determine the stream health.

Objectives:

Students will:

- Make and record observations about the biotic and abiotic components of the field site, including vegetation, substrate, weather, water turbidity, depth, and temperature.
- Use observations to form a hypothesis about the health of the stream.
- Determine and demonstrate a strategic sampling technique, using nets to collect macroinvertebrates.
- Correctly identify at least 3 aquatic macroinvertebrates using dichotomous keys.
- Use survey data to determine the health of the stream.
- Write a report summarizing the field study, including observations and measurements, hypothesis, sampling techniques, macros found, and results.

Materials:

- Biotic Index datasheets
- Field supplies (nets, ice cube trays, hand lenses, thermometers, etc. See Inventory list in kit for complete list)
- Macroinvertebrate Keys (several to choose from)
- Clothes/shoes that can get wet (not provided)
- Student field journals (not provided)

Time Required: 4+ hours (multiple days)

Appropriate grades: 5-8

NGSS and Common Core Standards:

CCSS.ELA-LITERACY.W.5.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.

5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms

MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations

CCSS.ELA-LITERACY.W.7.1 and CCSS.ELA-LITERACY.W.8.1 Write arguments to support claims with clear reasons and relevant evidence.

ENVIRONMENTAL EDUCATION GRADUATE PROGRAM
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Activity:

Introduction	• Prior to heading into the field, review the concepts of watersheds, macroinvertebrates, and water quality (see *Model Watersheds* and *Biotic Index* lessons provided in the binder). • Encourage students to begin asking questions about your local watershed and nearby streams. For example: "Where does this stream come from? How does that parking lot/mall/cattle pasture/forest affect the stream? What lives in this stream? How do I know if this stream is healthy?" • Design the Survey: lead students in designing the survey. Narrow down questions to investigate. Review elements of a scientific study such as forming hypotheses, consistent data collection, proper use of equipment, and recording and analyzing data. • Select a safe site for your field survey. Water should be shallow and slow enough for students to enter safely. • Have students trace their stream on a watershed map and note factors that may affect stream health-major tributaries, land use etc. Research the stream utilizing resources such as the Oregon Department of Fish and Wildlife, US Fish and Wildlife Service, Rogue Riverkeeper and watershed organizations in your area.
Body	<u>In the field:</u> • Upon arrival, set up a station for sorting and identifying the macros. Include the ice cube trays and keys. Review stream safety with students. • Initial observations and preliminary data: Have students make initial observations of the site such as vegetation (presence/absence; trees/shrubs; native/invasive), substrate type (sand/gravel/cobble), turbidity (water clarity) and current weather. Have students use the thermometers provided to measure the temperature of the water. Measure water depth by placing a stick vertically in the water and mark the waterline. After removing the stick from the water, use a measuring tape to measure from the base of the stick to the water line. Record observations in field journal. • Form Hypotheses: Based on their observations, preliminary data, and prior in class research on the stream, have students form hypotheses about the health of the stream.

	• Divide students into pairs or teams. Each team should have an aquarium net and a container (fill with stream water). • Have student develop a consistent survey protocol to make sure they are all collecting data the same way. One student should stand upstream and pick up a rock. The student with the net should stand downstream to collect any macros that might become dislodged from the substrate. Students may also brush off rocks with their hands. Holding onto the net pouch students can flip the pouch inside out into their collection container. Remind students to handle macros with extreme care. • Explore the stream and collect macros! • Once students have macros in their containers they can bring them to the sorting and ID station. Have students gently sort their macros into ice cube trays-use pipettes for tiny macros. Use the keys to ID the macros. Encourage students to make observations of the different features of each macro using the hand lenses and bug viewers. • Have each pair/team record their macros in their field journal. Return all macros to their stream homes following identification and data recording. • At the stream or back in the classroom, categorize the macros found into pollution tolerance categories-Class I, II, or III-sensitive, somewhat sensitive, or tolerant (see biotic index classroom activity for examples). Using this data, determine the health of your stream site. Does your data support your initial hypothesis? What factors might contribute to the types of macros you found and the water quality at your site? • Students should write up a report on their field study, including all of their observations, measurements, hypotheses, collection techniques, and results.
Closure	• After analyzing class data from the field, discuss the consequences of your findings. • If the water quality at your site is impaired, what can your class do about it? Encourage students to participate in watershed health initiatives both at school and at home. Explore how water is used in your classroom and school and ways your class can conserve water. Have students research local watershed organizations and become involved in restoration projects in your area.

Modifications:

- **Elementary:**
    - Have the whole group work together to make observations, measurements, and collect macros. Alternatively have adults or older students assist.
    - Instead of a report, have students draw a picture of the stream and write one paragraph outlining the results.
    - Instead of individual field journals, have one large class chart to enter data on.
    - If the water quality at your site is impaired, brainstorm as a class what you can do about it.
- **High School:**
    - Have students set up a long term field study, visiting the stream to monitor changes in stream health over time.
    - Have students measure turbidity and perform vegetation sampling.
    - Select several different sites and compare:
        Different substrates: sand, gravel, cobble
        Vegetation: with vegetation, without vegetation
        Different streams: sites with similar characteristics in different streams
        Confluences: sites upstream and downstream of stream confluences
    - Water Quality testing: The SEEC office also has Water Quality Kits where students use chemical tests to determine water quality factors such as pH, dissolved oxygen, nitrogen and more. Use these tests alongside your macroinvertebrate sampling.