

Instructor Guide

Spring Days 2-4: Field Monitoring

Overview

During these field investigation days, students work in teams to collect and record stream health data at designated study sites using protocols from the Stream Team Field Guide. Building on prior training, they measure water chemistry, turbidity and flow, *E. coli* levels, and macroinvertebrate communities, while also documenting habitat conditions and weather. The focus is on accuracy, safety, and consistent methods to ensure reliable data over time. Samples and data are then brought back to the classroom for processing, with time set aside for macroinvertebrate sorting and identification immediately after sampling or during a later class period.

Standards Alignment

AFNR Natural Resource Systems Career Pathway Standards, Common Career Technical Core (CCTC)

NRS.01. Plan and conduct natural resource management activities that apply logical, reasoned, and scientifically based solutions to natural resource issues and goals.

NRS.01.02. Classify different types of natural resources in order to enable protection, conservation, enhancement, and management in a particular geographic region.

(NRS.01.02.04.a., NRS.01.02.04.b., NRS.01.02.04.c., NRS.01.02.05.a., NRS.01.02.05.b., NRS.01.02.05.c.)

Michigan Science Standards, High School Performance Expectations

HS-ESS2-5. Plan and conduct an investigation of the properties of water and its affect on Earth materials and surface processes.

Learning Objectives

- Students will apply consistent, standardized sampling protocols to accurately measure, record, and document stream flow, turbidity, and *E. coli* data at the study site using Stream Team tools and data sheets to produce reliable stream health data.
- Students will collect, sort, and identify macroinvertebrate samples from their study site to evaluate overall stream health.
- Students will collaborate effectively within field teams by fulfilling assigned roles and supporting safe, efficient data collection.

Materials

- Stream Team Field Guide (1 per student)
- Stream Team Field Data Sheet (found in field guide) (1 per student or group)
- Writing instrument
- Field monitoring kits (1 per group)
 - *General Stream*
 - Pole sampler
 - Oakton water chemistry probe
 - Flow meter
 - Turbidity tube
 - Deionized/distilled water squirt bottle (for rinsing probe after use)
 - *Macroinvertebrates*
 - D-nets (2)
 - White sorting tray
 - Forceps (2)
 - Small bottle of ethanol (preservative)
 - *E. coli*
 - Gloves!
 - Hand sanitizer
 - Lunchbox (black fabric) with 4 pre-labeled sampling bottles
- PocketMacros app
- Macro ID cards/ pictures

Advanced Preparation

1. Assign members of each monitoring team to roles based on group size, combining roles as needed to ensure coverage of:
 - a. Water chemistry
 - b. *E. coli*
 - c. Turbidity and flow
 - d. Macroinvertebrate collection (2 students)
 - e. Data recorder
2. Check that sampling equipment is packed and ready.
3. Review stream site conditions, including weather, and remind students about field safety measures.

Lesson Sequence

Time period: three class periods, one day per week for three weeks.

Teams, Safety Check, and Travel to the Study Site (10 minutes)

1. Confirm roles within each team and redistribute team members if needed to account for absences. Each team should have a minimum of two students. (This is a safety requirement. No student should be in the stream without another teammate on the land.)
 - a. Divide students into teams and assign the team roles:
 - water chemistry sampler (uses either a pole sampler or wades into the stream)
 - macroinvertebrate sampler (uses the d-net to sample for macroinvertebrates)
 - instrument operator (uses the Oakton multiparameter pocket tester)
 - data recorder (fills in the data sheet)
 - equipment specialist (responsible for rinsing the probe after use and helping the macroinvertebrate sample to remove their samples from the D-net into the tubs)
- Notes:
- Students may take turns filling in the data sheet, so all students have the opportunity to participate in sampling procedures
 - Roles may need to be combined if teams are small.
 - Roles should be switched with each field site visit so that students have the opportunity to try multiple jobs.
2. Review safety procedures. Remind students to watch out for deep water, moving currents, and to stay within sight of each other.
 3. Have each team grab their gear and head to the field sites!

Explore: Field Sampling (40 minutes)

1. Assign students to their sampling location on the stream.
2. Remind students that you are available to review and model all sampling protocols. Emphasize to students the importance of consistent technique, including proper probe rinsing with DI water, and avoiding sediment disturbance, especially for *E. coli* and turbidity samples.
3. Student groups should begin following the established field protocols for water chemistry, flow/turbidity, macroinvertebrates, and *E. coli* as outlined in the Stream Team Field Guide. Students should also observe and record habitat features,

physical conditions, and weather, as indicated on the *Stream Team Field Data Sheet*. Each group needs to complete every section of the data sheet, with particular attention to the site ID, date, and other required header information.

You may suggest a specific order for the measurements, such as collecting macroinvertebrates last. Students should be reminded that while in the field, they should focus on following correct sampling procedures and recording data and observations on the *Stream Team Field Data Sheet*. Identifying and sorting macroinvertebrates following the Lab Protocol for *E. coli* sampling is meant to take place back in the lab or classroom.

4. As students begin their sampling, circulate from group to group. Guide site observations by prompting students to look closely at habitat features, weather conditions, and overall stream health. Encourage students to consider what they have seen on previous visits.

Sample Discussion Questions:

- *What stands out about the stream flow today?*
- *How might today's weather affect our readings?*

5. Stop by each group to check that students are filling in all sections of the data sheet, especially the site ID, date, time, and weather, to ensure complete and accurate data sheets.

Sample prompts:

- *Walk me through the top section of your data sheet. What information have you included so far?*
- *How would you describe the weather right now? Did you record that on your sheet?*
- *If someone else picked up your data sheet, would they be able to easily read your numbers and notes?*
- *What units are you using for this measurement? Did you write those units on your data sheet?*

6. Circulate and coach during fieldwork by moving among groups to observe their technique, answer questions, and provide immediate feedback/corrections. During this time, also watch for safe movement in the stream and the surrounding area. Reinforce careful handling of equipment and samples.

Sample prompts:

- *Will you show me how you are using that tool?*
- *Is everyone staying aware of their footing and the stream flow here?*

- *Let's make sure we are handling samples gently.*
- *What questions do you have about the procedures you are following as you collect your data and samples?*

Note: If Stream Team Trainers are present, work with trainers to support students. Trainers may help organize tasks, model field protocols, check probe rinsing, and monitor safety. Encourage students to ask trainers questions and learn from their expertise.

Wrap Up, Equipment Care, and Travel to Classroom (10 minutes)

1. Check that nets are cleaned and rinsed correctly.
2. Rinse multimeter probes with DI water.
3. Ensure macroinvertebrate samples collected from each station are placed in trays to bring back to the classroom for sorting and analysis.
4. Double-check that all data sheets are complete and legible.
5. Pack up supplies.
6. Return to the classroom, transfer *E. coli* samples to the cooler for transport to the lab, and store remaining samples and supplies.

Extending the Fieldwork into the Classroom: If time permits on the same day as the macroinvertebrate sampling, sorting can be done in the field or back in the classroom as outlined in the explain section below. To maintain the macroinvertebrates overnight, consider putting the collected samples into a covered 5-gallon bucket with a fish tank bubbler.

Explain: Macroinvertebrate Identification (30-45 minutes)

1. Students should sort their collected macroinvertebrate samples into groups using the techniques practiced during training. They should begin by placing specimens into water-filled sorting trays and separating them into broad categories such as worms, mayflies, caddisflies, stoneflies, and beetles
2. Students should use the *Datasheet In-Classroom Recording* instruction page of their Field Guide and the PocketMacros app to identify their collected macroinvertebrates. If needed, remind students of the main functions of PocketMacros, including the field guide, id key, and flashcards. Encourage students to collaborate with their peers if they are uncertain or have questions about identification while sorting macroinvertebrates.
3. Students should record their macroinvertebrate data in the online spreadsheet. The spreadsheet automatically calculates the Water Quality Rating for students (WQR). The online spreadsheet is based on the *Reference Sheet* of the Field Guide.