

Instructor Guide

Day 1: Understanding the Study Location

Overview

This day takes place in the field at the stream location where students will be analyzing water quality. Students will be introduced to the study location and the Stream Team trainers and will begin planning their investigation.

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.01.04. Apply ecological concepts and principles to aquatic natural resource systems. (NRS.01.04.01.a., NRS.01.04.01.b., NRS.01.04.01.c)

Michigan Science Standards, High School Performance Expectations

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

Learning Objectives

- Students will analyze the connection between land and water in a watershed by observing and describing key features of the study site and developing a focused driving question.
- Students will create an accurate, labeled visual representation of the study site to illustrate its key features and relationships.
- Students will evaluate the streambank and surrounding environment by identifying materials, erosion risks, pollution sources, BMPs, and plant communities, and explaining their impacts on water quality and aquatic life.

Materials

- Stream Team Field Guide (1 per student)
- Writing instrument (1 per student)
- Clipboard (1 per student)
- Waders (optional)

Vocabulary

- *Best management practices (BMPs)* – actions watershed residents can take to reduce water pollution.
- *Non-point source pollution* – water pollution that comes from numerous, diffuse sources.
- *Permeability* – the degree to which a substance, such as water, can pass through the Earth's surface into soil or groundwater.
- *Point source pollution* – water pollution that has a single, identifiable source.
- *Watershed* – an area of land that drains into a common body of water, and the body of water itself.

Advanced Preparation

1. Print and distribute student copies of the Stream Team Field Guide.
2. Assign students the "Connecting Land and Water: Understanding Your Watershed" section from the Field Guide as homework to prepare them for an in-class discussion on watershed concepts, including point and nonpoint source pollution, and Best Management Practices (BMPs).
3. Divide students into monitoring teams based on the number of sampling sites.
4. Locate and bring a local watershed map for your specific study site. Local watershed maps can be found using the [Michigan Sea Grant Watersheds in Your District App](#).
5. Establish clear outdoor safety and behavior norms with students before visiting the field site. Communicate the field visit plan, including specific instructions on what to observe, such as streambanks, vegetation, and potential pollution sources, and identify safe areas where students can walk and conduct their observations.
6. Gather clipboards, pencils/pens, and any other tools students will need to sketch or take notes in the field.

Lesson Sequence

Time period: homework (reading) prior to class and one class period, completed at field site.

Travel to the study site (5 minutes)

Engage: Understanding Watersheds (10 minutes)

1. Begin by reviewing the concept of a watershed. Use visuals from the Stream Team Field Guide figures to help students visualize how land and water are connected in a watershed.
2. Lead a discussion on point source versus nonpoint source pollution. Encourage students to share and analyze real local examples they might observe near the study site, such as streambank erosion or runoff from nearby roads or farms.

Sample discussion questions:

- *What might be some examples of point source pollution near us?*
 - *How is nonpoint source pollution different?*
 - *Why might nonpoint source pollution be harder to control?*
 - *Have you noticed any signs of pollution or erosion around local streams?*
3. Discuss the impact of land use practices on stream health. Explain the role of Best Management Practices (BMPs) in protecting water quality, using relatable examples from the local environment.

Sample discussion questions:

- *How do you think farming or construction near streams might affect water quality?*
- *What are Best Management Practices (BMPs)?*
- *Can you think of ways people can protect streams from pollution?*
- *Why is it important to protect plants and soil along streambanks?*

Explore: Observing Watershed Features with Field Observations (10 minutes)

1. At the field site, help students identify and discuss visible features, such as:
 - Streambed materials (sand, gravel, rocks, silt).
 - Streambank conditions (look for signs of erosion, undercut banks, or human impacts like footpaths or construction).
 - Vegetation (types of plants along the bank, density of plant cover, invasive species vs. native plants, and how roots help stabilize soil).
 - Possible pollution sources (storm drains, parking lots, roads, nearby agricultural fields, or lawns with fertilizer or pesticide runoff).
2. Encourage students to take photos or create quick sketches of key features to help them with their final drawing or diagram. Suggest students label their photos or add notes to remember what they observed. Remind students to capture both natural features (like stream curves, plant communities) and human-made features (culverts, bridges, or pollution sources).

Explain: Observation Notes and Reflection (15 minutes)

1. Prompt students to think about connections: *How might the land uses and physical features affect water quality?*
2. Instruct students to answer questions 1-5 in the Field Guide lesson Connecting Land and Water: Understanding Your Watershed, using their field observations and any maps/figures.
3. Work with each monitoring team to draft their *Driving Question or Phenomenon*.

Elaborate: Drawing Their Site Map (10 minutes)

1. Have students create a labeled diagram of their study location, including:
 - a. Nearby land uses
 - b. Likely point and nonpoint source pollution risks
 - c. Any BMPs they observed
 - d. Stream flow direction and topography cues

Travel to Classroom (5 minutes)

Optional Extension

Ask each group to share their *Driving Question* with the class. Facilitate a short discussion about which site features or risks they think are most important to monitor this season.