

**Reading the River
Summer 2006**

**Conducting a Stream Assessment
Unit Plan**

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Conducting a Stream Assessment

Grade Level: 6th Grade

Lesson Context: This unit will be taught as a portion of the sixth grade study of Life Science and the environment. This unit will be taught in April or May due to the outdoor nature of this unit. Also, macro-invertebrate collection will be better at this time of year.

Objectives:

The students will be able to:

- ◇ Identify and describe the major biotic and abiotic factors affecting a stream habitat.
- ◇ Use scientific tools to assess water quality parameters including: dissolved oxygen, pH, conductivity, temperature, and fecal coliform counts.
- ◇ Collect and identify macro-invertebrates in order to calculate a bio-index value.
- ◇ Conduct a habitat assessment using scientific tools.
- ◇ Draw conclusions about habitat quality using observations and collected data.

Program of Studies:

Scientific Inquiry

- ◇ S-4-SI-1: Students will ask simple scientific questions that can be answered through observations combined with scientific information.
- ◇ S-4-SI-2: Students will use simple equipment (e.g., plant lights), tools (e.g., rulers, thermometers), skills (e.g., describing), technology (e.g., electronic media), and mathematics in scientific investigations.
- ◇ S-4-SI-3: Students will use evidence (e.g., descriptions) from simple scientific investigations and scientific knowledge to develop reasonable explanations.
- ◇ S-4-SI-4: Students will design and conduct different kinds of simple scientific investigations.
- ◇ S-4-SI-5: Students will communicate (e.g., graph, write) designs, procedures, and results of scientific investigations.
- ◇ S-4-SI-6: Students will review and ask questions about scientific investigations and explanations of other students.

Characteristics of Organisms

- ◇ S-4-LS-1: Students will understand that organisms have basic needs (e.g., air, water, nutrients, light) and can only survive when these needs are met.

Life Cycles of Organisms

- ◇ S-4-LS-5: Students will understand that organisms have life cycles that are different for different organisms.

Organisms and Their Environments

- ◇ S-4-LS-7: Students will understand that organisms' patterns of behavior are

related to the nature of organisms' environments. There are many different environments (e.g., deserts, rain forests) on Earth that support different types of organisms.

Core Content:

- ◇ SC-06-2.3.3: Students will compare constructive and destructive forces on Earth in order to make predictions about the nature of landforms.
- ◇ SC-06-3.4.2: Students will make inferences about the factors influencing behavior based on data/evidence of various organisms' behaviors.
- ◇ SC-06-3.5.1: Students will explain that biological change over time accounts for the diversity of species developed through gradual processes over many generations.
- ◇ SC-06-4.7.1: Students will describe the consequences of change in one or more abiotic factors on a population within an ecosystem.

Materials:

- ◇ pH test kits
- ◇ Dissolved Oxygen test kits
- ◇ Conductivity Meters
- ◇ D-Nets (any other dip net) for Macro-invertebrate collection
- ◇ Pans
- ◇ Macro-invertebrate identification charts
- ◇ Bio-index calculation sheets
- ◇ Fecal coliform collection supplies
- ◇ Petri dishes with agar gel
- ◇ Incubation device
- ◇ Habitat assessment sheets
- ◇ Field Notebooks
- ◇ Writing utensils
- ◇ Tape measure
- ◇ Stream site/Field Station Site
- ◇ Waders or Water Shoes
- ◇ Chalkboard or Overhead Projector
- ◇ Tweezers
- ◇ Magnifying Glasses
- ◇ Computers
- ◇ Thermometers
- ◇ Materials to create a variety of stream scenarios (plants, blue paper, rocks, leaves, sediment, logs, organisms, garbage, etc)

Accompanying Handouts:

- ◇ Habitat Assessment Charts
- ◇ Bio-index Charts
- ◇ Macro-invertebrate identification keys

*These are available in a variety of formats. Use the version that will be most appropriate for the students participating in this unit.

Activity Procedure:

Day 1: The students will participate in an interactive discussion reviewing background knowledge about ecosystems, habitats, food chains, food webs, and organisms. The students will then learn the vocabulary terms biotic factors and abiotic factors. The students will then participate in an outdoor lab activity finding a variety of biotic and abiotic factors in the wooded area around our school.

Day 2: The students will learn about water quality parameters and will learn how to properly conduct each of the water quality tests that will be associated with the habitat assessment. The students will then complete a trial water quality assessment using the aquarium in the classroom. Students will discuss their results/ findings and draw conclusions about the aquarium habitat in the classroom.

Day 3: The students will learn about macro-invertebrates and their important function as bio-indicators in aquatic ecosystems. The students will use the macro-invertebrate identification keys, preserved specimens, and the bio-index calculation sheets to complete a trial run of macro-invertebrate studies. Each group of students will have a different collection of insects at their table and a different “mock” stream set up. As a result, each group should calculate a unique bio-index value. The students will then draw conclusions about the possible reasons for the bio-index they were able to calculate based on the characteristics of their “mock” stream. The students will also learn a variety of collection methods through a photo slide show.

Day 4: The students will learn how to properly use the habitat assessment tool. The students will participate in an outdoor laboratory activity in which they will assess the stream habitat at the back of our school. The students will compare their scores and discuss possible areas of error or any habitat parameters that may be unclear or confusing.

Day 5: The students will visit 12 Mile Creek at the Thomas More College Biology Field Station and will conduct a complete bio-assessment of this Ohio River tributary. Students will be placed in groups of 4 and each group will be responsible for an

assessment. Once all of the data has been collected, the students will compare their results. The students will share their findings and as a class we will discuss any discrepancies or error found in the data.

Day 6: The students will complete a detailed laboratory report discussing their findings, drawing conclusions, and posing future questions. The students will also write a letter to the community around this creek notifying the community of their findings and suggesting possible changes the community can make to further improve the quality of their stream.

Definition/Explanation of Concepts:

Vocabulary covered in this unit: Biotic Factor, Abiotic Factor, pH, Dissolved Oxygen, Conductivity, Macro-invertebrates, Identification Key, Bio-index, Bio-indicator, Fecal Coliform, Temperature (Celsius and Fahrenheit), Water Quality, Bio-assessment, Stream, Fauna, Flora, Riparian Zone, Vegetative Cover, Sedimentation, Pollution.

This unit covers a large amount of material prescribed by the Program of Studies and the KY Core Content in a rather brief period of time. The material is covered completely and is supplemented throughout this unit with hands-on, real-world connections. These experiences will improve student understanding of these rather complex topics.

This unit is important for students because it raises awareness of the importance of aquatic habitats that students interact with in their own communities. By allowing the students to participate in a true scientific inquiry project in a local area the students will gain a greater appreciation for the environment they live in. Also, the students will be playing an active role in a conservation effort and will feel a greater connection to their environment. This greater connection will increase student learning and retention of knowledge. It will also heighten student interest due to the proximity of this project to their school, homes, and community.

The hands-on and field-related portions of this unit will equip students with the knowledge and tools to play an active role in conservation within their own neighborhoods and communities. The knowledge and experience they will gain through this unit will allow them to continue their studies outside of the classroom environment and will allow them pass on their new skills and knowledge to other community members. This unit provides a powerful tool to each student as a result of the large amount of real-life connection and hands-on experience.

By using a variety of habitat assessment strategies and combining all of these different data media, the students will be able to see the interdependent relationship found in an ecosystem between both biotic and abiotic factors. They will also see the relationship between a variety of complex factors in an ecosystem. Students will also explore and identify the effects that a change in one portion of an ecosystem can have on the other parameters of the ecosystem. This unit allows students a unique opportunity to explore all of the smaller pieces of an ecosystem and then put them together to see how they

interact to create a successful habitat.

Finally, the completion of complete bio-assessment step-by-step allows the students to follow the scientific process in its entirety. They will be thinking, acting, and questioning like real scientists. This unit will provide a concrete example of scientific inquiry for the students and will allow them to be involved in “real” science. The formal report and the informative letter will also allow the students to see how science affects the community and how it is an important component of everyday life.

Assessment:

- ◇ Monitor students during hands-on activities, classroom discussions, and outdoor laboratory activities.
- ◇ Students field notebooks will be reviewed and graded for accuracy and completion
- ◇ Students will complete a formal laboratory report that will be assessed
- ◇ Students will write an informative letter to the community that will be assessed
- ◇ A vocabulary quiz will be used to assess student learning

Reference:

This unit was developed through the use of information learned and collected throughout my own educational experiences. These experiences include: an Internship on the Ohio River through Thomas More College, Participation in the Reading the River Course 2006, and a Research Assistantship at The Ohio State University on Lake Erie Wetlands.

Lamotte Water Quality Kits

Identification Keys, Bio-index charts, and Habitat Assessment Charts were provided by the Reading the River Course and can be found in the following documents:

Kentucky Watershed Watch Program 2000:

Watershed watch biological stream assessment

Watershed habitat assessment protocols

Watershed watch water chemistry sampling methods