

8: Water Quality Monitoring Stone Creek and Juniata River



Students examine aquatic insects they collected from Stone Creek. The kinds and numbers of insects will give an indication of water quality.

Goal:

The students will conduct water monitoring tests on the Juniata River and Standing Stone Creek to determine their water quality.

Objectives:

1. The students will collect water samples from the Juniata River and/or Standing Stone Creek for any or all of the following:
 - Nitrogen
 - Phosphate
 - Dissolved oxygen
 - pH levels
 - Hardness
 - Alkalinity
 - Coliform bacteria
 - Biological oxygen demand.
2. The students will observe and look for stream sediment and erosion problems.

3. Given a stream insects and crustaceans sheet, students will:
 - Identify the macroinvertebrate groups found in the water
 - Identify the water quality of the stream.
4. The students will collect data on the following:
 - Depth of water using line sounding device
 - Temperature
 - Turbidity (cloudiness of water)
 - Water speed
 - Water volume
5. The students will organize and keep records of collected data.
6. The students will explain the effect nitrates and phosphates have on aquatic life and vegetation of a stream.
7. The students will define "dissolved oxygen."
8. The students will explain the relationship between different levels of dissolved oxygen and diversity of aquatic life in a stream.
9. The students will decide if the dissolved oxygen levels in Standing Stone Creek and the Juniata River can support varieties of aquatic life.
10. The students will explain how coliform bacteria affects the oxygen level of water and aquatic life.
11. The students will participate in small groups.

Procedures:

Water samples are obtained during a field study of the Juniata River and/or Standing Stone Creek for evaluation. Personnel from the local waste treatment plant and/or high school students assist in the coliform bacteria, nitrate, and phosphate tests. Students conduct the tests for dissolved oxygen, pH, alkalinity, total hardness, macroinvertebrates, and the physical parameters of the streams, e.g., width, depth, velocity, volume, turbidity, and water temperature. The student's stream assessment includes documenting any environmental problems or concerns. Macroinvertebrate (aquatic insects) specimens are identified. The data are entered into a computer. The information gathered is used in various culminating activities related to identifying and resolving environmental degradation problems.

Assessment:

Performance Assessments, e.g., conduct water quality tests on stream, e.g., pH, dissolved oxygen, dissolved solids, turbidity; Teacher-Made Test; Alternative Assessment, i.e., fill water quality data sheet out for Juniata College and DEP Bureau of State Parks

Resources to Implement:

Teacher handouts:

- Most Common Measured Water Quality Parameters
- Water Quality Data Sheet
- Water Hardness Instruction Sheet (for LaMotte kit)
- Dissolved Oxygen Instruction Sheet (for Hach kit)
- Stream Order (used with permission of Juniata College)
- Macroinvertebrate Identification Sheets (used with permission of Juniata College)
- Student Activities from the following resources:
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 - 1) Project WET-"Macroinvertebrate Mayhem" (pp.322-327)
 - 2) SWIMM-"Testing the Waters" (pp.157-178)

Slides:

- Standing Stone Creek- Location Shots (teacher created)

Videos:

- SOS Water Quality Monitoring (Izaak Walton League)

Literature:

- SOS Stream Insect & Crustaceans (macroinvertebrate ID sheet-Izaak Walton League)
- KARE Aquatic Macroinvertebrates
- Field Manual For Water Quality Monitoring, Mark K. Mitchell, M.S. and William B. Stapp, Ph.D (Fifth Edition), 1991
- Water, Water Everywhere Water Quality Factors Reference Unit (Hach)
- Monitor's Guide to Aquatic Macroinvertebrates, Save Our Streams, Izaak Walton League

Equipment:

- Water Monitoring Kits (e.g., dissolved oxygen, water hardness, phosphates, nitrogen, alkalinity)
- Water Monitoring Meters (e.g., dissolved oxygen, pH, dissolved solids)
- One fecal coliform test kit
- Thermometer
- Seine net and pools
- Dip net
- Collection pans/buckets
- Forceps
- Magnifying glass (for field study identification)
- Metric tape measure
- Meter stick
- Hip boots
- Safety glasses
- Stop watch
- pH 7.0 Buffer solution
- Others as supplied by Biovan from Juniata College
- VCR/TV
- Microscopes (for identifying insects at school)

- Small Petri dishes
- Camera (optional for creating slides/prints of identified bugs)
- Film (print and/or slide)

Field Study:

- Standing Stone Creek
- Juniata River



Juniata College Science in Motion instructor, David Howe, teaches students how to conduct a water quality monitoring test.

Posters:

- Macroinvertebrates

Maps:

- Numerous (local and regional)

PA Academic Standards for Environment and Ecology:

- 4.1. Watersheds & Wetlands
 - Explain the role of the water cycle within a watershed
 - Understand the role of the watershed
 - Describe changes that occur from a stream's origin to its final flow
 - Categorize stream order in a watershed
 - Explain the relationship among landforms, vegetation and the amount and speed of water
 - Explain the relationship that exist within watersheds in the United States, e.g., Standing Stone Creek, Juniata River, Susquehanna River, Chesapeake Bay
 - Explain the effects of water on the life of organisms
 - Describe the physical characteristics of a stream and determine the types of organisms found in aquatic environments
 - Analyze the parameters of a watershed, e.g., physical, chemical and biological
- 4.3. Environmental Health
 - Identify how human actions affect environmental health, e.g., pollutants
 - Identify an environmental health issue
 - Describe how human actions affect the health of the environment, e.g., land use
 - Explain how multiple variables determine the effects of pollution on environmental health, natural process and human practices
 - Explain biological diversity
 - Explain biological diversity as an indicator of a healthy environment
- 4.6. Ecosystems and their Interactions
 - Understand that living things are dependent on nonliving things in the environment for survival
 - Explain the flow of energy and matter from organism to organism within an ecosystem
 - Identify how ecosystems change over time
 - Explain how ecosystems change over time
- 4.8. Humans and the Environment
 - Explain how human activities may change the environment
 - Explain how human activities may affect local and regional environments
 - Analyze how human activities may cause changes in an ecosystem