

Bio-Assessment of Two Local Streams

Reading the River 2003

Advanced Biology 10th Grade
Campbell County High School
Campbell County School District
Campbell County

Rick Straus

Description of Curriculum Plan-

1. Students will be able to address biodiversity of a stream and how that is one of the most important indicators of stream quality.
2. Students will be able to conduct biotic and abiotic tests of the stream that will lead them to conclusions about stream quality.
3. Students will have to identify and classify macroinvertebrates and quantitatively put in a group taxa that will directly indicate stream quality.

Core Content for Assessment-

SC-H-3.4.3

Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their relationships. Species is the most fundamental unit of classification. The comparison and analysis of their internal and external structures and the similarity of their chemical processes classify different species.

SC-H-3.5.1

Atoms (e.g., carbon, nitrogen) and molecules (e.g., water) cycle among the living and nonliving components of the biosphere.

SC-H-3.5.3

Organisms both cooperate and compete in ecosystems. Often changes in one component of an ecosystem will have effects on the entire system that are difficult to predict. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundred or thousands of years.

SC-H-3.5.5

Human beings live within the world's ecosystems. Human activities can deliberately or inherently alter the dynamics in ecosystems. These activities can threaten current and future global stability and, if not addressed, ecosystems can be irreversibly affected.

Materials (class of 24 divided into 4 groups of 6)

- Thermometer (4)
- Water collection containers (8)
- 100' tape measure
- Meter stick
- Forceps (4)
- D-Frame Nets (4)
- Dissolved Oxygen Test Kit
- pH Test Kit
- Dissecting Microscopes
- Orange

Implementation of Procedures

1. After lecturing over biotic and abiotic factors that lead to stream quality the class of 24 will be divided into 4 groups of 6.
2. Designated streams (Twelve mile creek and Four mile Creek) will be assigned to each group.
3. Group one will sample a riffle of Four Mile Creek
Group two will sample a run of Four Mile Creek.
Group three will sample a riffle of Twelve Mile Creek.
Group four will sample a run of Twelve Mile Creek.
4. Each group will take a water sample back in the lab at school, to test pH and dissolved oxygen.
5. Each group will measure both air temperature and water temperature at the surface of water.
6. Each group will measure the velocity of their given sample area by measuring the time it takes a orange to travel 5 meters through the sampling area.
7. Each group will measure the average width and depth of their sampling area.
8. Each group will be assigned a 1-meter square area to sample macroinvertebrae and fish.
9. Students will first place the d-frame net at the bottom of the stream and kick around upstream of the net for 60 seconds to collect macroinvertebrae and fish.
10. Students will also pick up all the rocks in the 1-meter square and capture all of the macroinvertebrae on them with forceps.
11. All of the macroinvertebrae will be placed in a sampling bottle and taken back to the lab for identification.
12. Back at the lab students will perform pH and dissolved oxygen test.
Macroinvertebrae will be identified and be tallied up on the Kentucky Water Watch Biological Monitoring Assessment Report given to the students as a handout.
13. All Data will be recorded on a Data sheet that will be provided.

Definition/Explanation of Concept/Skill

Both biotic and abiotic factors can lead to the quality of a stream. Abiotic factors such as pH and dissolved oxygen can tell us the quality of a stream and are direct factors of what kind of organisms live in the stream ecosystem. Dissolved oxygen and pH affects virtually all chemical and biological processes occurring in a stream.

Not only can you tell the quality of a stream by the abiotic factors, but you can also determine stream quality by the kind of organisms that live in the stream ecosystem. One of the best way to judge stream quality is by a measure of the of the macroinvertebrae species. Macroinvertebrae are one of the best bio-indicators of stream quality. By measuring the species and numbers of macroinvertebrae in a stream you can draw many conclusions on stream quality.

Accompanying Materials/Handouts

- pH Handout
- Dissolved Oxygen Handout
- Kentucky Water Watch Biological Monitoring Assessment Report Handout
- Stream Insects & Crustaceans Identification Handout
- Kentucky Water Watch Macroinvertebrate Identification Key Handout

Method of Assessment

Students will be assessed by three different grades. First will be a participation grade (20%) for their participation during data collection and lab analysis. Second they will be graded on the integrity and clarity of the data (10%) they recorded on their data sheets. Finally they will be tested on the material along with the following assessment question (70%):

Both biotic and abiotic factors can lead to the quality of a stream. Explain to me what abiotic and biotic factors lead to the quality of a stream.

If I were to tell you that a stream had a pH of 7.3, dissolve oxygen of 218, and a large amount of aquatic worms, crayfish, damselfly nymphs, and leeches were found in a sample stream. What condition is this stream in? What are the factors that tell you it is in this condition and why?

Rubric is on following page

References:

“Watershed Watch – Water Sampling Methods”, Kentucky Water Program, 2000

“Watershed Watch – Biological Stream Assessment, Kentucky Water Program, 2000

Rubric Assessment for Bio-assessment of Two Local Streams

100 pts

Advanced Biology

Mr. Straus

	Beginning (70% or Less)	Developing (80-90%)	Competent (90-100%)
Participation 20 pts	Minimal or no participation at all in sampling and testing.	Some participation but not equal to other students in sampling and testing.	Participates in all sampling and testing.
Data Sheet 20 pts	Data sheet unclear and incomplete.	Data sheet complete but unclear.	Data sheet complete and clear.
Open Response 60 pts	Most information is not clear, accurate, or thorough.	Most information is clear, accurate, and thorough.	All information is clear, accurate, and thorough.