

**Reading the River, Summer 2001**

**“From the Headwaters”**

**A Unit for Grade 7 Science**

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## **Lesson Title**

From the Headwaters

## **Objectives**

In this lesson, students will:

1. Conduct chemical and biological assays and analyze data
2. Construct a qualitative habitat key
3. Produce a map
4. Produce a presentation of findings
5. Identify problems and propose realistic solutions

## **Program of Studies**

### Scientific Inquiry

Use appropriate equipment, techniques, technology, and math in scientific investigations.

Communicate results of scientific findings

### Conceptual Understandings

Structure of the Earth System: landforms are a result of a combination of constructive and destructive forces.

Population and Ecosystems: investigate factors that affect the number and diversity of organisms in an ecosystem.

### Applications/Connections

Science in Personal and Social Perspectives: describe individual's roles and responsibilities in environmental issues.

Recognize how science is used to evaluate results of scientific investigations.

## **Core Content**

### Structure of the Earth System: Lithosphere, Hydrosphere, Atmosphere

SC-M-2.1.2 Landforms are a result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of sediments, while destructive forces include weathering and erosion.

### Populations and Ecosystems

SC-M-3.5.2 Populations of organisms can be categorized by the function they serve in an ecosystem. All populations living together and the physical factors with which they interact compose an ecosystem.

SC-M-3.5.4 The number of organisms an ecosystem can support depends on the resources available and the abiotic factors.

### **Materials**

1. Water Watch forms for collecting chemical and biological data, Visual Survey Checklist forms, Riparian Zone handouts (to be prepared by students), and macroinvertebrate identification keys.
2. Water monitoring kits and / or equipment to test water temperature, pH, DO, chlorides, nitrates, and nets for sampling macros.
3. Maps of river systems and GPS's.
4. Digital cameras and computer technology to produce power point presentations.
5. Art supplies, including poster board and markers.
6. Free-standing display for investigation results.

## Activity Procedure

1. Discuss with students what they already know about the water cycle. Ask students to explain why Boyle County is at the headwaters of so many streams. Explain how problems may originate here in the headwaters, but not become evident until farther down stream. Discuss what students already know about food chains and food webs and the importance of diversity in the stability of the system. Explain how this diversity will be one of the indices that we will use to determine the health of the stream.
2. Trips will be made to each of the two river systems once a month. Trips will occur after school and on Saturday mornings. Four to six students will go each trip to conduct chemical and biological assays. Results will be discussed in class the following day and graphs of the data will be made and posted. Monthly variations will be identified and discussed. The data from the two rivers will be compared and contrasted.
3. Each river will be walked from its headwaters to its most mature point in the county. The river will be photographed and the riparian zone and land uses in the watershed will be plotted on the river's map. Riparian zones and land uses along each river will be compared/contrasted. Students will predict any correlation that they feel may exist between stream quality, as assessed by chemical and biological assays, and the riparian zone quality and land uses.
4. Students will identify what they see as human impacts on the river systems. They will propose solutions to the problems.
5. Speaker from the Division of Water will discuss conditions of watersheds in the state, giving students a look at the bigger picture. Students will have opportunity to broaden their knowledge on the possible cause/effect of various human activities.
6. Local soil conservation officer will speak to us about major watershed issues in our county and what practices are being implemented to improve water quality.
7. Students will discuss any actions that they would like to see taken if any problem areas are identified in the two river systems surveyed.
8. Students will put together a power point presentation of findings and possible proposals for action to be presented to our soil conservation board.

## **Definition/Explanation of Concepts**

Due to elevation of our county relative to the elevation of the surrounding counties, we find ourselves at the headwaters of Clark's Run, Chaplin River, North Rolling Fork, and the Salt River. Land use varies widely in our county. The land uses that we will find along the two rivers that we will study, Clark's Run (part of the Dix River system) and the North Rolling Fork, will differ. We will see how each river has been impacted by human activities: logging, gravel removal, farming practices, residential developments, industrial growth, and the wastewater treatment plant. The students will also see that our study will be influenced by so many factors beyond their control, that any conclusions from our study will be inferred. The many uncontrolled variables will be identified. Any problems that we cause up river will not disappear, but continue to cause problems downriver.

Land use practices that are detrimental to the quality of the watershed are often times difficult to change. Farming practices could be improved, but it is usually at a cost. When discussing habitat protection and/or improvement, costs are ascertained in two different ways – environmental costs and monetary costs. Logging and gravel removal practices result in habitat destruction, but they also involve the livelihoods of people in the community. Choices have to be made. The students should see that there usually are no easy solutions to any of the problems that we identify. If they do want to exact change, it will require diplomacy and compromise. During this process, I would like them to learn where to go to try to bring about change, what governing bodies should be contacted, and how.

## **Assessment**

1. Students will demonstrate their ability to complete a biological index for the data collected.
2. Students will demonstrate their ability to compare the chemical data to standard graphs for each of the parameters tested and determine what type of water quality is inferred.
3. Students will work in small groups and develop impact statements for their stream and share them with the class.
4. Students will design proposals for responding to any problems identified and share it with their class.
5. The power point presentation will be a project of a group and it will be evaluated by a rubric.

\*\*\*All river walks and trips to the rivers for testing will be voluntary.

## **Lesson Context**

This lesson will begin in the last week of September and continue until the last week of June. We will average working on this lesson 4 to 5 days a month. Our course of study during the school year goes from chemistry to geology to astronomy/physics to

environmental education. These serve as focus areas, but the interrelated nature of science is stressed throughout the year. Connections will be made between our river studies and our current areas of emphasis.

**Sources for This Unit**

Kentucky Natural Resources and Environmental Protection Cabinet (1986). *A Field Guide to Kentucky Rivers and Streams*.