

A DAY BY THE BUFFALO

WATER QUALITY – At the Water’s Edge

One way to determine the health of a river is to look at what organisms are living in it. Students learn how to identify and inventory organisms through actual hands-on activities. This knowledge can be applied to any body of water.

TEACHER BACKGROUND

The health of a river can be, in part, judged by the diversity of organisms that the river is able to support. Certain aquatic insects are only able to thrive under excellent water quality conditions. In turn, only *macroinvertebrates* that are pollution-tolerant are able to survive in poor water quality conditions. Thus, by counting the number and kind of macroinvertebrates present, you can get a general idea of the *water quality* of a river.

Aquatic insects serve as food for fish and other aquatic organisms. The absence or presence of these insects determines the presence of other animals in river *food chains*. The smallmouth bass that fisherman love to catch depend on these insects to live and grow.

Water flowing into the river from the surrounding *watershed* contributes to the quality of water and life. The river channels water, sediments and pollutants, that flow off the surrounding hills. If pollution levels get too high, certain insects may die off affecting the populations of fish and other organisms dependent on a clean river.

These topics will be explored through activities dealing with a watershed, the types of macroinvertebrates present in the river, the impact these organisms have on other *aquatic species*, as well as through actual sampling of the river’s macroinvertebrates.



CLASSROOM: PRE-VISIT ACTIVITIES

Activity 1. Wonderful Water

STATE STANDARD

Social Studies - Strand: Geography

Standard 1. Physical and Spatial

Students shall develop an understanding of the physical and spatial characteristics and applications of geography.

OBJECTIVES

Student will:

1. describe where their water comes from.
2. identify on a map where the school's water source is located.

MATERIALS

- paper and pencil, or chalkboard, or dry erase board
- brainstorming

ACTIVITY

Have the students explore the origins and uses of water in their daily lives, by asking:

1. Where does the water in their home or school come from?
2. What uses do they or their families have for it? (List as many as the class can suggest.)
3. What happens to the water when it leaves their home or school? Do humans handle it (treated) or does it go directly back into the environment?
4. Where does it eventually go? (Think hydrologic cycle.)

NATIONAL RIVER: ON-SITE ACTIVITIES

Activity 2. At The Water's Edge

STATE STANDARD

Science - Strand 2: Life Science

Standard 2. Living Systems: Characteristics, Structure, and Function

Students shall demonstrate and apply knowledge of living systems using appropriate safety procedures, equipment, and technology.

OBJECTIVES

Students will:

1. define **watershed** and describe how much of the Buffalo River's watershed is within the National River boundaries.
2. define **macroinvertebrates** and list two common types found in the river.
3. describe a simple **food chain** that might be found in a river or stream.
4. find and identify at least two macroinvertebrates at the park.
5. explain the relationship between the macroinvertebrates found in the water and the **water quality** of the river.

MATERIALS (to be provided by park rangers)

- rubber boots
- buckets
- dip nets
- ice trays
- shallow, flat plastic container

MATERIALS (student needs to bring)

- drinking water
- towel

ACTIVITY

Be prepared to GET WET and spend approximately one hour with a ranger, wading the water's edge, learning about **macroinvertebrates**. You will record your findings and apply them to an analysis of the quality of the water and its ability to sustain a diversity of life.



CLASSROOM: POST-VISIT ACTIVITIES

Activity 3. Let's Take A Closer Look

STATE STANDARD

Social Studies - Strand: Geography

Standard 1. Physical and Spatial

Students shall develop an understanding of the physical and spatial characteristics and applications of geography.

OBJECTIVES

Students will:

1. locate Arkansas on a map.
2. locate Buffalo National River on a map.
3. determine what *watershed* their school is in (locate and name the stream).
4. determine what watershed their homes are in (locate and name the stream).

MATERIALS

- maps: U.S., Arkansas, drainage maps, topographic maps

ACTIVITY

1. After locating Arkansas on the map, begin to look at rivers and their *tributaries*.
2. Using a map explain why large rivers in our area flow west to east as they make their way to the next body of water (run downhill). Look at how smaller watercourses combine with larger watercourses. Try to determine the elevation gradient from a topographic map (how much the watercourse falls in a given distance). Develop a map reading activity to do with the class using the topographic map in Figure 3-1 or one of your own choosing. Read the elevation at point A and point B, determine the difference, and establish that height in a relationship to the distance between point A and point B for Highway 7. Now try it for Spider Creek between point C and point D. Can you determine which part of Spider Creek or Highway 7 is steeper from looking at the contours of the map?
3. Could it be reasoned (generally) that a steeper watercourse would have a smaller square mile watershed and a gentle watercourse might have a larger watershed? Do you think there is a relationship between the size of the stream and the size of the watershed?

4. Color or shade in the area on your topographic map that would correspond to the watershed area of each particular body of water the class has identified. Test the above hypothesis (#3) by tracing the outline of the different watersheds on graph paper and establish the square mileage or the relative area size of each.
5. For extra credit and additional math practice, make additional comparisons, such as size of watershed vs. length of watercourse; size of watershed vs. gradient of watercourse; develop the concept that as you travel downstream the watershed of the main branch increases in size by the addition of each tributaries' watershed. Contemplate what affects the water quality of the Arkansas River at Little Rock, or the Mississippi River at New Orleans (think watershed).
6. Do you think there is a relationship between the gradient of a stream and its use (kayaking, canoeing, and navigation)?

Figure 3-1



KEY WORDS

macroinvertebrate, water quality, food chains, watershed, tributaries, aquatic species

RESOURCES

See Appendix D for materials on watersheds and macroinvertebrates.

Internet resources:

- Macroinvertebrate keys: www.people.virginia.edu/~sos-iwla/Stream-Study/Key/MacroKeyIntro.html
- Stream Ecology and Water Education bibliography: www.habitat-restoration.com/restedu.htm
- Lawrence Hall of Science lessons: www.lhs.berkeley.edu/GEMS/gemspubs.html

Missouri Department of Conservation. *Life Within the Water* (macroinvertebrates); *Missouri Fishes*. P.O. Box 180, Jefferson City, MO 65102.

Reid, George K. *Pond Life*. Golden Guide pocketbook series. Golden Press. New York.

Robison, Henry W. and Thomas M. Buchanan. 1988. *Fishes of Arkansas*. The University of Arkansas Press. Fayetteville, AR.