Down By the River

A lesson on water quality and watersheds

Teacher Guide

Grade Levels: 4-8
Subject Areas: Science, Social Studies
Duration: Two 50 minute class periods, with Internet research assignment between (in class or as homework)

Objectives: Students will
1. Demonstrate understanding of how a watershed works
2. Distinguish between point and nonpoint source pollution
3. Recognize how everyone plays a part in maintaining water quality
4. Research management practices to reduce pollution
5. Conduct a simple research project and document their sources appropriately.

Show-Me Standards
Process:
Goal 1.4 Ability to use technological tools to locate and select information
Goal 2.1 Ability to make a written, visual, and oral presentations
Goal 4.7 Ability to identify and apply practices that preserve the health of self and others
Content:
Science 5: Knowledge of changes in ecosystems and interactions of organisms with their environments.
Science 8: Knowledge of the impact of science, technology, and human activity on resources and the environment.
Social Studies: 6: Knowledge of the relationships of the individual and groups to institutions.
Social Studies 7: Knowledge of the use of the tools of social science inquiry

Materials:
Print copies of the Bryant Creek Watershed map for each student. The maps are available from the Project. E-mail your request to schoolsupport@watersheds.org; allow three weeks for delivery.
Markers or color pencils
Copies of "Citing Online Sources" for each student

Preparation:
1. To complete the research component, students will need to use a computer with Internet access on an individual basis. Make whatever arrangements are necessary and allow adequate time for the students to use the computers. If a computer research project is not practical, use conventional research sources.

2. Review the following Atlas articles and decide which you will need to assign as background reading, depending on class topic and knowledge base:
What is a Watershed?
Bryant Watershed Introduction
What is Nonpoint Source Pollution?
The Connection Between Nonpoint Source Pollution and Karst
The Karst Movie (Flash required)
What You Can Do to Reduce Nonpoint Source Pollution

(Note that this article will be used to initiate a research project. You may want to print it as a handout).

For instructions on printing Atlas material, see **Tech Tips for Teachers**

Procedure:
1. With a mysterious air, ask students to gather three nonbreakable nonvaluable items (anything from books to paperclips) from their desks or bookbags, and to form two parallel lines three feet apart and facing each other. Divide the lines into three parts. Have students in the back third of the lines stand. Ask the students in the middle third to sit on chairs, and the last third to sit on the floor. Have them put their three items on the floor and then extend their arms out in front of them and wave them up and down. Now starting at the back pass a wave down the line. Can anyone guess what this demonstrates? Give hints until they guess they are a river. Where are the headwaters? Where is the mouth?

2. Have everyone pick up their items. Explain that on a count of three, the very last students at the back of the line will each hand one of their three items to the person next to them. That person will hand that item and one of their own to the next and so on down the lines. When passing items, students should continue to hold onto the two items they are reserving, and should try to keep anything from falling on the floor. The first person in line will place the items in a tub or just in a pile on the floor. Complete the first round of passing. Can anyone guess what the passed items represent? (*Pollution*)

3. Rotate each group one position "down river" and initiate a second round of passing. This time, have students pass two items each down this time. How was this different than the first time? Was it harder? What happened as the items were passed down? How the ones lower in the line feel? How is this like water pollution?

Look at the pile created. How many of the items are easily distinguishable? Which items are there many of? Can you tell which items belong to which students? How is this like water pollution? (*In point source pollution, a specific source can be identified. Nonpoint source pollution is wide spread and the source can not be identified.*) Return students to their seats.

4. Ask students to define watershed and give some examples. Hand out the small maps. As students follow along at their desks, use the poster map to identify the watershed boundaries, the creek, and major tributaries. Ask for a definition of karst, and for examples of karst features with which they are familiar. What karst features are in the Bryant Creek Watershed? Have students find them on the map.

5. Ask students to name the uses of land in the Bryant Watershed and surrounding area. Land use and natural features are principal factors in the water quality of streams and rivers. In a karst region like the Ozarks, ground water quality is also easily compromised by pollution. Have students define and then give examples of both point and nonpoint source pollution.

6. For the next class session, have the students research one contributor to nonpoint source pollution in our area. Tell them to look for methods (Best Management Practices) of preventing or controlling that particular nonpoint source pollution, and for any resources that might help them do so. Their starting point will be the article: **What You Can Do to Reduce Nonpoint Source Pollution**

Review internet research skills as necessary depending on the skills of the group;

go over the **Citing Online Sources** handout with the students. Less skilled students might just follow a link or two in the Atlas article, while more experienced students might be encouraged to search for more material. Ask them to prepare a short presentation on their findings, appropriately documenting their sources. Encourage them to illustrate their reports with drawings or photographs clipped from the websites they visit.

Second session

Review the students' work ahead of time so that you can select some to give their reports to the class. Did students researching the same topic find different solutions? Let the class compare and contrast different methods. Submit the best of your students' work for inclusion on the Atlas.

For details on submitting your work, see **Sending Us Material**
www.watersheds.org/sending.htm

Evaluation

Use the student's written reports to evaluate their understanding of the concepts in this lesson. Check as well for appropriate citation technique.

Extensions

1. Have students work together to design a development plan for an area in the local watershed that includes Best Management Practices to minimize nonpoint source pollution.

2. Are there local developments that might be affecting water quality? (Road construction, new buildings, parking lots, housing development, logging). Ask a city or county official to speak to the class about what Best Management Practices are in place.

Source: This lesson is adapted from the Project Wet curriculum lesson "Sum of the Parts" on page 267 of the Project Wet workbook. For more information on the Project Wet curriculum, contact the regional office of the Missouri Department of Conservation.

The development of content for this lesson plan was funded through the Missouri Department of Natural Resources. U.S. Environmental Protection Agency Region VII, through the Missouri Department of Natural Resources, has provided partial funding for this project under Section 319 of the Clean Water Act.