

Missouri River Basins and Watersheds

Lesson Abstract

Summary:	Students identify the basins and watersheds of Missouri using maps and construct their own watershed and basin pattern systems with colored yarn.
MO GLE:	SC 4.1.D.6; 5.1.A.6,8;5.2.A.6;5.3.A.6
Subject Areas:	Science, Social Studies
Show-Me Standards:	Goals – 1.6, 3.5 Strands – SC 5, 8; SS 7
Skills:	Observation, compare and contrast, analysis, synthesis
Duration:	1 class period (50 minutes)
Setting:	Classroom
Key Vocabulary:	Basin, watershed, channel, drainage, tributary, first order stream, second order stream, third order stream, fourth order stream.

Rationale:

Basins contain all the watersheds which eventually drain into a given river system. This drainage pattern, in turn, defines a basin's boundaries. Watersheds within a basin are outlined by the geology, land forms and topography of an area which determine these surface drainage patterns. The land use practices within a basin's watersheds work together with the topography and geology of an area to affect the water quality and quantity of a basin.

The activity allows students to determine the basins in Missouri and their respective watersheds through hands-on activities.

Student relevance:

- Students all live in a basin and watershed.
- Students are dependent on the water quality within watersheds and basins.

Learning Objectives:

Upon completion, students will be able to . . .

- Identify the three Missouri River basins and their boundaries.
- Explain that basins are composed of individual watersheds which define each basin.
- Determine watershed boundaries by examining maps of river systems.
- Explain an order streams system.

Students Need to Know:

- Water flows downhill.
- General Missouri topography.
- Missouri's five physiographic regions.
- Tributaries feed into larger river systems.
- Basins are determined by a river system's drainage patterns which are the result of the topography and geology of a given basin and its component watersheds.

Teacher Need to Know:

- The location and names of the three main basins of Missouri (see the *USA/Missouri Basin Map* in lesson).

Resources:

Missouri Water Atlas

Available from the Missouri Department of Natural Resources, Division of Geology and Land Survey, P.O. Box 250, Rolla, MO 65402, (573)368-2125.

Website for DNR publications:

<http://www.dnr.mo.gov/geology/adm/publications/pubscatalog.pdf>

Materials Needed for Lesson:

Transparencies

USA/Missouri Basin map (make from provided copy)

Rivers of Missouri map (make from provided copy)

Watersheds of Missouri map (make from provided copy)

Stream Order Diagram (make from provided copy)

Stream Order Diagram Key (make from provided copy)

Maps

Missouri Highway map (one for every three students)

Handouts

Rivers of Missouri map (make from provided copy)

"*The Watershed*" article (make from provided copy)

Other Materials

Colored pencils

Four different colors of yarn (one ball of yarn per color)

One pair of scissors per group

Glue, poster board or butcher paper per group (optional)

Procedure:

Part One: Basin Line Activity

- Discuss the old fashioned water basin used before the days of running water.
- Discuss the basin dishes students have seen in old western films, antique stores, or perhaps at home.
- Draw a bowl on the board and explain to students that the earth's land surface is much like a series of basins that are interconnected.
- Ask students to speculate how these basins may be shaped (opposed to being round) and what land forms may represent different parts of the basins.
- Explain to students that no matter where they are standing or live, they are always within a water basin which is composed of smaller basins or watersheds that feed the main river of a designated basin.
- Pass out a copy of the *Missouri Highway* map to small groups of students (three to four per group).
- Ask students to examine the map carefully and try to locate the three basins in Missouri by carefully examining the river drainage patterns. (If USA atlases are available, these may be used as well).
- After students have come to the conclusions, show them the copy of the transparency *USA/Missouri Basin* map.
- Examine the transparency and question students about their observations.
- Ask student groups to outline the three basins on the *Missouri Highway* maps using either colored pencils, markers, string, or yarn. (Use string or yarn if the maps will need to be used by other classes for the same activity). Be sure students understand that they need to observe the river flow direction.
- Allow the groups to compare and contrast their basin outlines.

Part Two: Watershed Focus

- Pass out *The Watershed* brochure, read and discuss.
- Using the *Missouri Highway* maps, have students locate their home area and determine their basin and watershed.
- After students have come to their conclusions, show them the copy of the transparency *Watersheds of Missouri* map.
- Discuss how their basin and watershed is part of a designated Missouri region.
- Pass out the *Rivers of Missouri* handout and have students locate the river on the map that is closest to their community (they may refer to the *Missouri Highway* map as well).
- Place a transparency of the *Rivers of Missouri* map on the overhead.
- Through questioning, ask students to help you outline the community's basin and watershed on the map with a transparency marker pen.
- Discuss the stream river pattern within the community's watershed and basin.

- Place the *Stream Order Diagram* on the overhead and have a student volunteer outline the watershed on the diagram. Explain the following terms to the students after identifying and defining tributaries.

First Order Stream – a natural channel in which no other channels feed into it.

Second Order Stream – a natural channel created when two “first order” streams intersect.

Third Order Stream – a natural channel created when two “second order” streams intersect.

Fourth Order Stream – a natural channel created when two “third order” streams intersect.

(Note: When a lower order stream intersects a higher order stream, the ordering system does not increase. Inform students that this process of ordering continues along the same principle.)

- Have students identify stream orders on the *Stream Order Diagram* (display *Key* to compare).
- Designate each color of yarn as a different order of a stream (for example, green yarn is first order streams, yellow is second order streams and so on.)
- Have students create their own watershed with the yarn by following the stream order system taught above.
- Allow students to cut the yarn to make their own watershed patterns.
- After each group has constructed their stream order watershed with the yarn, have the groups rotate from pattern to pattern in order to analyze every other groups’ watershed for accuracy and differences.
- Discuss the activity and have students do one or more of the following activities:
 - 1) Glue their patterns onto large paper or poster board, cut out the watershed, and combine watersheds from the different groups to make a basin.
 - 2) Trace their pattern on typing paper, make copies for the other groups, and construct a basin with all the watershed patterns. (Students will need to cut and trim accordingly to fit watersheds together.)

Evaluation Strategies:

- Have students outline the rest of the watersheds in Missouri on the *Rivers of Missouri* map and/or shade each Missouri basin on the map with a different color.

Extension Activities:

- Contact the Missouri Department of Natural Resources, Division of Geology and Land Survey, and ask to receive free outdated Missouri topographic maps. Pass out these maps to students and have them identify and outline stream patterns and thus watersheds.

- Have students identify first, second, third and fourth order streams on the maps. (Note: The concept of contour lines should be introduced before conducting this activity.)
- Have students identify the habitat in a given basin; based on those characteristics which animals could survive there?

Suggested Scoring Guide:

Missouri River Basins and Watersheds

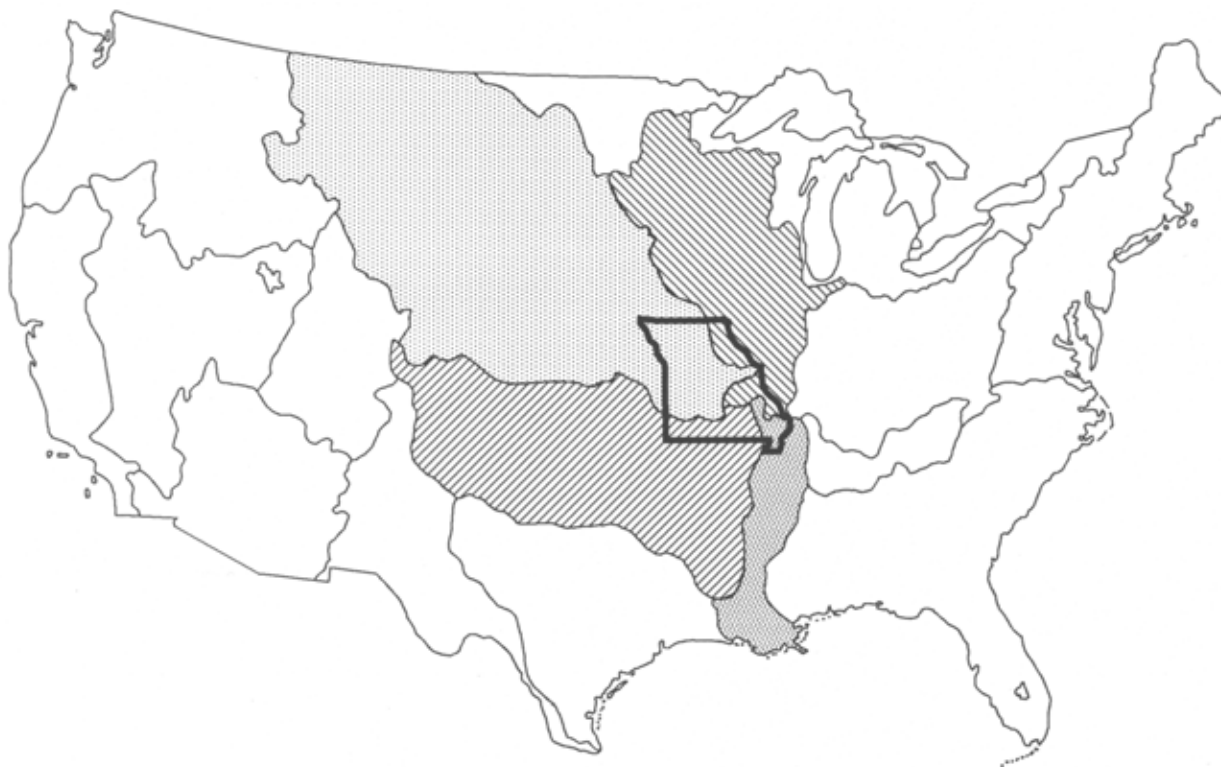
Teacher Name: _____

Group Name: _____

CATEGORY	4	3	2	1
Time management	Group defined own approach, effectively managing activity.	Defined useful roles not mentioned before hand. Group adjusted roles to maximize individual capabilities and interests.	Group made specific efforts to involve all group members.	One or more students in the group did not participate in or contribute to the activity
Role Performance	Each student in the group can clearly explain what information is needed by the group, what information s/he is responsible for locating, and when the information is needed.	Each student in the group can clearly explain what information s/he is responsible for locating.	Each student in the group can, with minimal prompting from peers, clearly explain what information s/he is responsible for locating.	One or more students in the group cannot clearly explain what information they are responsible for locating.
Worked together as a team and all ideas were valued	Group independently identifies at least 4 reasonable, insightful, creative ideas/questions to pursue when doing the research.	Group independently identifies at least 4 reasonable ideas/questions to pursue when doing the research.	Group identifies, with some adult help, at least 4 reasonable ideas/questions to pursue when doing the research.	Researchers identify, with considerable adult help, 4 reasonable ideas/questions to pursue when doing the research.

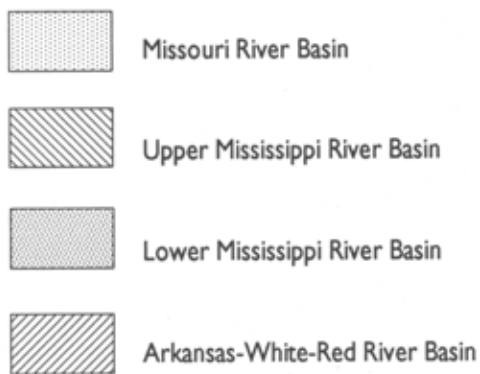
Rubric Made Using: **RubiStar** (<http://rubistar.4teachers.org>)

USA/Missouri Basin Map



MISSOURI IN THE MISSISSIPPI RIVER SYSTEM

Major River Basins



Source: *Missouri Water Atlas*, 1986, Missouri Department of Natural Resources, Division of Geology and Land Survey

Rivers of Missouri Map

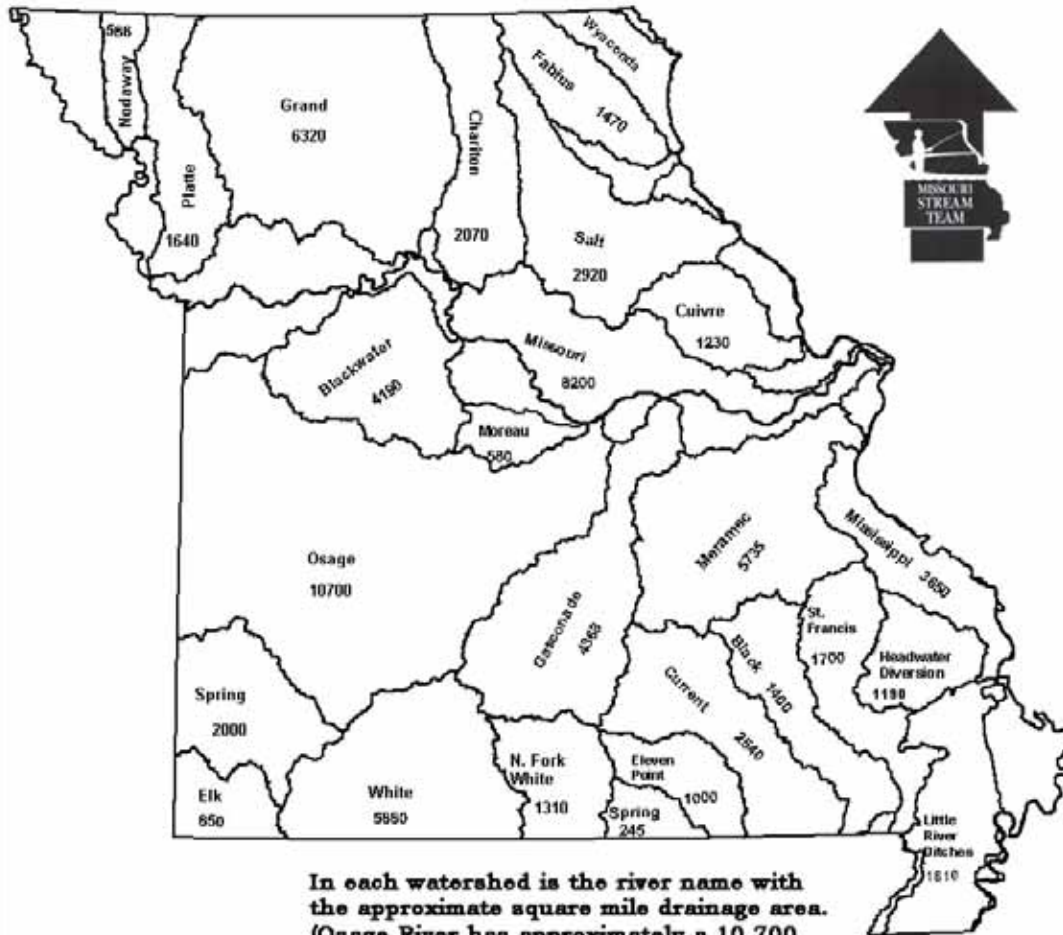


HYDROGRAPHY

Major Water Resources in Missouri

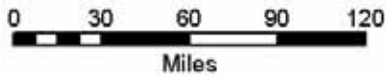
Source: *Missouri Water Atlas*, 1986, Missouri Department of Natural Resources, Division of Geology and Land Survey

Watersheds of Missouri



In each watershed is the river name with the approximate square mile drainage area. (Osage River has approximately a 10,700 square mile drainage area.)

Legend
 8 Digit Watersheds of Missouri



Map created by Garry Gunder
 for Stream Team Activity Guide
 Missouri Dept. of Conservation

Stream Order Diagram



Stream Order Diagram Key



The Watershed

The watershed is an area of land that drains into a stream. This includes both the surface runoff and groundwater. Because a stream is made up of drainage water, it is a product of the land above it.

If the land is misused or pollutants are spilled, the receiving stream will be degraded. Although simple, the most important concept in stream management is that *every stream is the product of its watershed and each of us lives in a watershed*. Each one of us is linked to a stream regardless of our occupation or way of life. How we use the land is ultimately reflected in the condition of the stream.

Watershed management includes all of the land uses and activities of rural and urban living. Each watershed has its own runoff patterns which are dependent upon the types of plants and trees and the natural slope of the land.

A timbered or native grass watershed delivers its runoff slowly and over a long time period. Watersheds with a lot of timber clearing or the construction of many paved streams and parking lots allow water to runoff fast, which results in larger, more frequent floods. Faster runoff increases erosion both on the land and in the stream channels below.

In urban areas, flood plains make good locations for parks, ball diamonds, football or soccer fields, and industries which can withstand periodic flooding. In rural Missouri, flood plains make good pastures or areas for growing timber products such as pecans and walnuts. Row cropping can be acceptable if the stream channel, and other channels that carry water during floods are protected with a corridor of trees on both sides.

Most watershed changes speed runoff, but conservation can reduce their bad effects. Some landowners build terraces and use strip cropping. Towns use stormwater control measures, such as retention basins, to help slow runoff.

A natural watershed delivers some nutrients and sediment, such as soil, sand, and gravel to the stream. But some watershed practices increase these amounts to harmful levels. Row cropping of erodible land, careless handling of household and industrial chemicals, construction sites with uncontrolled erosion, and strip mining pollute runoff waters and degrade the receiving stream.

Some Missouri farmers are doing a good job of maintaining runoff water quality by removing erodible land from production, but this is still a major pollution source. Reclamation of strip mined lands has also been effective and homeowners are becoming more conscious of the need for careful use and disposal of chemicals. An effort to stop poor land use and other polluting activities will result in healthier streams.

This article was written by Bill Turner, Missouri Department of Conservation, and printed in the pamphlet "Understanding Streams."