

DRAINING THE LAND

Students identify the different parts of a river. Then students use a topographic map to determine gradient and predict new channel formation.

TEACHER NOTES FOR DISCUSSION

Discuss vocabulary words and point out or give examples of the different river structures.

If your students have not used a topographical map, take a few minutes to explain how direction and the layers of elevation are identified.

Maps available by writing to:
U.S. Geological Survey
Box 25286
Denver Federal Center
Denver, CO 80225

RELATED STANDARDS AND BENCHMARKS

Science

Standard 2. Understands basic Earth processes

- knows how landforms are created through a combination of constructive and destructive forces

Geography

Standard 1. Understands the characteristics and uses of maps, globes, and other geographic tools and technologies

- uses thematic maps

Standard 3. Understands the characteristics and uses of spatial organization of Earth's surface

- knows patterns on the landscape produced by physical processes
- understands the spatial organization of places through such concepts as location, distance, direction, scale, movement, and region
- knows different methods used to measure distance

Objectives

After completing this activity, students should be able to:

- identify the parts of a river.
- demonstrate their ability to interpret maps and translate information from one source to another.
- work cooperatively with other students to construct and analyze watershed maps.
- test and interpret a hypothesis.

Time Considerations

Instructor preparation:
15 minutes

Student activity:
one to two classes

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UNDERSTAND YOUR MISSION

In this activity, you will discover how variable water flow will change the course and shape of a river. By understanding how a river forms and its different parts, you will also be able to predict changes in the course of a river over time.

LEARN THE LINGO

channel	the bed where a natural stream of water flows
confluence	the place where two or more rivers or streams come together
discharge	rate of flow
divide	a ridge separating two sections of land each drained by a different river system
drainage basin	the area of land from which water is carried away by rivers and streams
gradient	elevation divided by distance (ft/ miles)
gravity	the force that one mass exerts upon another mass
levee	an embankment or earthen ridge that prevents flooding
neck	narrow passage connecting two bodies of water; a strait
oxbow	a bend in a river that resembles a U-shaped ox harness
revetment	a facing, usually stone or cement, built to sustain an embankment
sediment	the matter that settles to the bottom of a liquid; usually sand, rock, or gravel
tributary	a river or stream that flows into a larger river or stream
watershed	the region or area that drains water into a lake, or river system
wing dam	a structure built perpendicular to the river bank for diverting the current of a stream

Gather Your Supplies

- calculator
- ruler
- paper
- pen/markers
- topographic maps of meandering rivers

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BACKGROUND

A river makes its own bed, but not like you make yours. A river carves its bed out of the surrounding landscape. How deep or how wide it makes its bed depends on the type of material in the bed and the amount of water and discharge flowing through the bed.

Every second the Mississippi River delivers over 500,000 cubic feet of water into the Gulf of Mexico. Most of this water originally fell as some form of precipitation as far away as Canada. The water's journey to the sea takes several weeks as it flows through small creeks, onto larger streams, and then onto still larger rivers until, eventually, it reaches the ocean. Drawn by the force of gravity, running water is the principal landscape modifier at work on the Earth's surface. Sediment constantly breaks away from the land and is deposited downstream by the river.

Over time a distinct drainage pattern develops. Usually appearing like branches on a tree, tributaries flow into a larger stream at a confluence. A stream or river and all its tributaries make up a drainage system and the land that it drains is the drainage basin or watershed. Watersheds vary in size; small streams drain water from smaller land areas, and larger streams have correspondingly large watersheds.

CHART A COURSE FOR EXPLORATION

Part 1: Identification

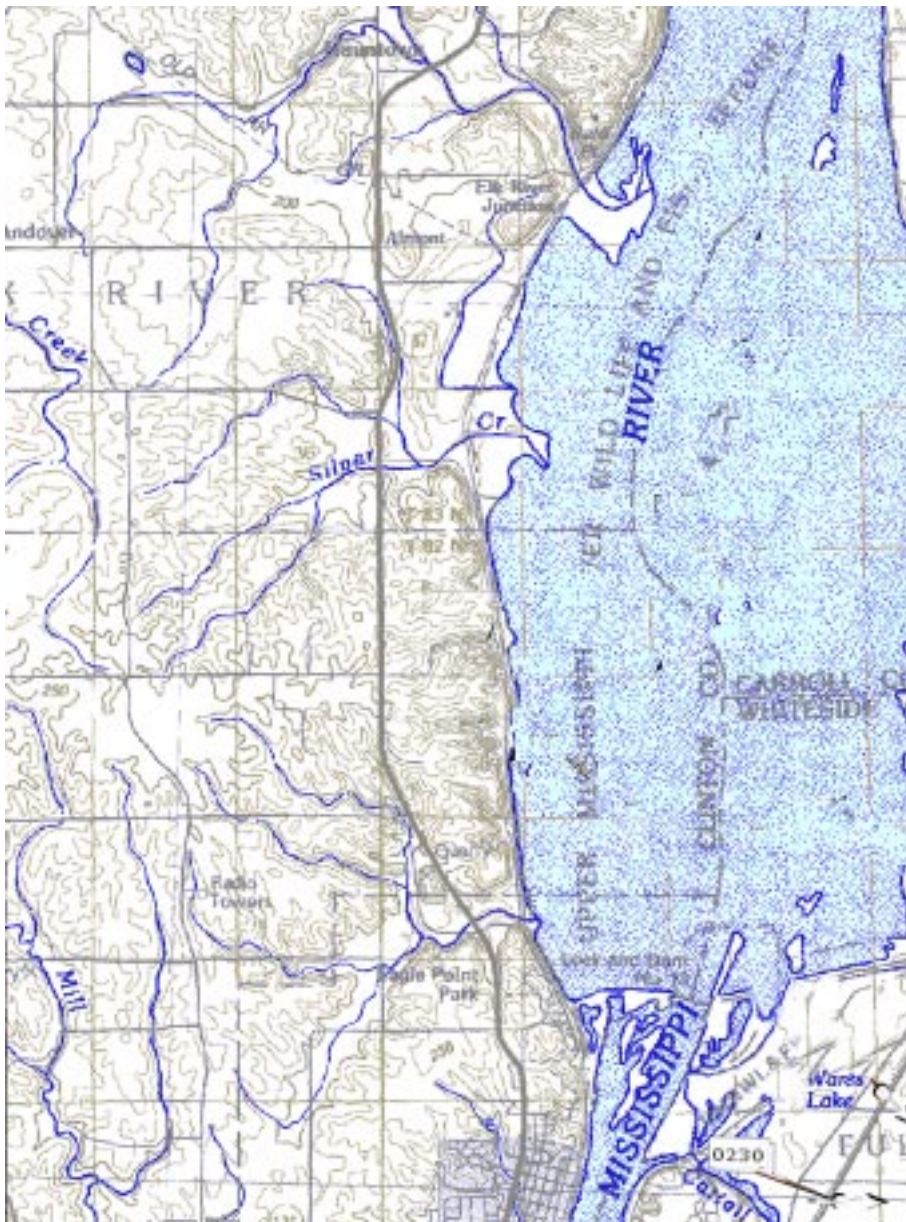
- A. Use the map provided of Clinton, Iowa, to identify the following parts of a stream, creek, or river:
 - source
 - mouth
 - confluence
 - tributary
 - oxbow
 - neck
- B. Show the direction the Mississippi River flows.

Part 2: Prediction and Calculation

- A. Use a topographical map to determine the gradient for the entire stretch of a channel identified on your map.
- B. Suppose the discharge increases enough that water spills (floods) out of the main channel and begins to flow across the necks in a downstream direction.
- C. In which area will erosion most likely form a new channel?
Why? (Tip: Look at the different elevations.)

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- D. Sketch or diagram a model of the river with its new channel.
- Show where an oxbow lake might be located.
 - Determine the new gradient for the river.
 - Is it higher or lower, on average?
 - Is the gradient the same over the entire length of the river?
 - Where is the gradient the highest?
 - If the discharge returns to pre-flood level, how will the river adjust its channel to return to an average gradient equal to pre-flood conditions?



Go Beyond

Compare old and recent maps of the Mississippi River. Has the river changed its course? Identify the control structures such as levees, wing dams, and revetments. How have these control structures changed the river?

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Look at a map containing the rivers of Iowa. Answer the following questions.

1. In what direction are the rivers and streams that flow into the Mississippi River in Iowa flowing? How can you tell?
2. Do most of the streams flow in the same direction or are there differences in flow patterns within the state?
3. Why do some parts of the state have more streams and rivers than other parts?
4. Why are some tributaries larger in area than others?

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