

Sediment Deposition

LET THE RIVER RUN

TEACHER



Activity Overview

In the Mississippi River, sediment such as soil, rocks, and plants are swept downstream by the force of the river. When the river flows into the quiet Gulf of Mexico, most of the sediment is deposited. As sediment accumulates over time, it forms deltas. The Mississippi has formed many distinct deltas over the last 7,000 years. These deltas have become coastal Louisiana. Today, sediment deposition by the Mississippi River is no longer building Louisiana's land at the rate it once did. Instead, for the last 100 years, Louisiana's coastal land area has been shrinking.

In this activity, students will examine changes in sediment deposition at locations along the Mississippi River. Students will use data collected at two stations by the U.S. Geological Survey (USGS). Students will import data and use the TI-73 Explorer™ to graph and analyze the monthly and annual changes in sediment deposition at locations in the upper and lower Mississippi River.

Conclusions: Sediment deposition is high in the spring and low in the late summer. Sediment deposition changed between 1950 and 1980 mainly due to the construction of a dam on the Missouri River above Omaha.

Activity at a Glance

Grade: 6–9
Subject: Science
Category: Physical Science, Earth Science
Topic: Deposition, River Systems

Time Required

- Two 45-minute periods

Level of Complexity

- Medium

Materials*

- TI-73 Explorer™
- TI GraphLink cable



TI-73 Explorer™

* This activity has been written for the TI-73 Explorer™ but you can easily substitute the TI-83 or TI-83 Plus. Also see Appendix A for steps on how to transfer DataMate to your graphing device and how to use DataMate for data collection.



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Concept Background

- Sediment deposition has an annual pattern. It tends to be high in the spring when high rainfall and snowmelt cause an increase in the process of erosion. During the late summer months, low rainfall contributes to low sediment deposition. Locations in the upper Mississippi River may receive precipitation in the form of snow during the winter months. At the same time, precipitation in the lower Mississippi may be in the form of rain. Snowfall does not have an impact on sediment deposition until it melts, while the impact of rainfall is more immediate.
- The Mississippi River is the stem of a major river system. All the tributaries that feed into the Mississippi River carry with them a sediment load. As the Mississippi flows south, more and more tributaries feed into the stem contributing to the increase in sediment deposition. This system drains about 40 percent of the continental United States. Refer to the research article for a map and more information on the Mississippi River System.
- Sediment deposition is important for the process of land formation in southern Louisiana. Over the last 7,000 years, the deltas in coastal Louisiana have formed as a result of sediment deposition. However, deposition in the Mississippi River is no longer building land at the rate it once did. The decrease in the rate of sediment deposition is contributing to land loss in coastal Louisiana.

Preparation and Classroom Management Tips

- You will need to import the deposition data using the TI Data Editor. Once imported, the data can be transferred to student calculators by following the steps in the student activity. To import the data, use the following steps:
 1. **Download and install TI Connect™ to your computer.**
 - a. Go to <http://education.ti.com/us/product/accessory/connectivity/down/download.html>.
 - b. Follow directions to download the software installer to your computer.
 - c. Double-click the installer and follow the directions to set up TI Connect™.
 2. **Transfer the data (deposition.73g) from the computer to your TI-73 Explorer™.**
 - a. Connect the computer and the TI-73 Explorer™ with the TI Graph Link cable.
 - b. Drag the data file (deposition.73g) and drop it on the TI Connect icon which is installed on your desktop. *Note: If you are using the TI-83 or TI-84 family of calculators use the data file deposition.83g.*
- Sediment deposition data is measured in units of millions of metric tons.
- Students may need help answering Questions 5–8 in Part E.
- This activity works well with students working in groups or as a demonstration.
- Encourage students to answer the questions in Data Analysis in their journals.
- Create your own student questions for use on your students' TI graphing devices using the Texas Instruments StudyCard applications.

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National Education Standards

Science Standard A: Science As Inquiry

Students should understand scientific inquiry and develop abilities necessary to perform it.

Science Standard B: Physical Science

Students should develop an understanding of properties and changes in matter, motions and forces, and transfer of energy.

Math Standard: Data Analysis & Probability

Students should develop an understanding about how to collect, organize, display, and interpret data.

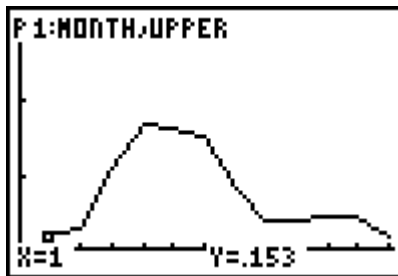


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Part B — Examine Monthly Sediment Deposition: Upper Mississippi River

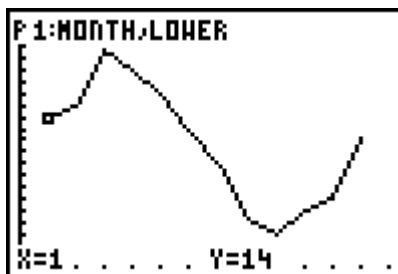
Data Analysis



- 1 Q. During which month was the greatest sediment deposition in the upper Mississippi River?
A. *The greatest sediment deposition in the upper Mississippi River was in Month 4 or April.*
- 2 Q. During which month was the least sediment deposition in the upper Mississippi River?
A. *The least sediment deposition in the upper Mississippi River was in Month 1 or January.*
- 3 Q. During which months did sediment deposition in the upper Mississippi River increase?
A. *Sediment deposition increased in the upper Mississippi River between August (Month 8) and November (Month 11) and between January (Month 1) and April (Month 4).*
- 4 Q. During which months did sediment deposition in the upper Mississippi River decrease?
A. *Sediment deposition decreased in the upper Mississippi River between April (Month 4) and August (Month 8) and between November (Month 11) and December (Month 12).*

Part C — Examine Monthly Sediment Deposition: Lower Mississippi River

Data Analysis



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Vocabulary

Delta A deposit of sediments, usually triangular in shape, that forms at the mouth of a river when the river's speed decreases and sediment settles out of the water.

Deposition The process by which sediments settle out of water.

Distributaries A river channel that flows away from the river.

Drainage Basin The area drained by a river and all of its tributaries.

Erosion The removal of soil and rock material by wind or water.

Gravity The force of attraction between two masses; the force that pulls an object toward the Earth.

Hydrology The patterns of water flow in a system.

Mouth The place where a river flows into another body of water.

Particle A very small piece of soil or sediment.

Sediment A solid material that has fallen out of a liquid.

Source The area where a river begins.

Stem The main channel of a river.

Suspension A combination of solid particles and liquid, in which certain particles of the solid do not fall to the bottom for a long period of time because they are too light to overcome the movement of the liquid.

Tributaries Rivers or streams that flow into larger rivers or lakes.



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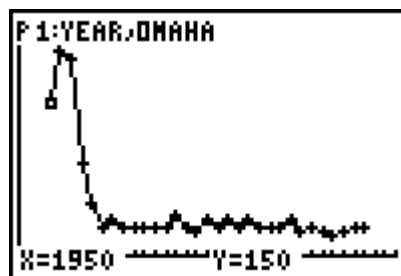
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- 1** Q. During which month was the greatest sediment deposition in the lower Mississippi River?
A. *The greatest sediment deposition in the lower Mississippi River was in Month 3 or March.*
- 2** Q. During which month was the least sediment deposition in the lower Mississippi River?
A. *The least sediment deposition in the lower Mississippi River was in Month 9 or September.*
- 3** Q. During which months did sediment deposition in the lower Mississippi River increase?
A. *Sediment deposition increased in the lower Mississippi River between September (Month 9) and December (Month 12) and between January (Month 1) and March (Month 3).*
- 4** Q. During which months did sediment deposition in the lower Mississippi River decrease?
A. *Sediment deposition decreased in the lower Mississippi River between March (Month 3) and September (Month 9.)*
- 5** Q. Based on the information in the research article, why do you think the monthly amount of sediment deposition is always greater in the lower Mississippi River than the upper Mississippi River?
A. *The Mississippi River is the stem of a system that includes many tributaries such as the Missouri River and the Ohio River. When these tributaries flow into the Mississippi, they carry along sediment loads. In the upper Mississippi River, few tributaries flow into the river so sediment deposition is low. In the lower Mississippi, many tributaries have joined the Mississippi and sediment deposition is high.*

Part D — Examine Annual Sediment Deposition: Omaha Region

Data Analysis



- 1** Q. During which year was the greatest sediment deposition in the Missouri River — which flows into the upper Mississippi — near Omaha?
A. *The greatest sediment deposition in the Missouri River near Omaha was in 1951.*



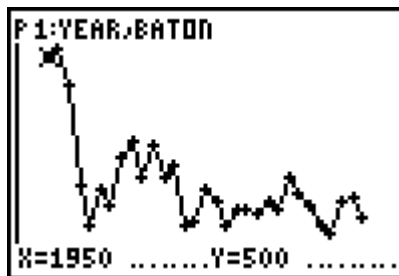
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- 2** Q. During which year was the least sediment deposition in the Missouri River near Omaha?
- A. *The least sediment deposition in the Missouri River near Omaha was in 1977.*

Part E — Examine Annual Sediment Deposition: Baton Rouge Region



- 1** Q. During which year was the greatest sediment deposition in the lower Mississippi River near Baton Rouge?
- A. *The greatest sediment deposition in the lower Mississippi River near Baton Rouge was in 1951.*
- 2** Q. During which year was the least sediment deposition in the lower Mississippi River near Baton Rouge?
- A. *The least sediment deposition in the lower Mississippi River near Baton Rouge was in 1977.*
- 3** Q. Compare the maximum value for sediment deposition in the Missouri River near Omaha and the Mississippi River near Baton Rouge.
- A. *The maximum value for sediment deposition in the Mississippi River near Baton Rouge was greater than in the Missouri River near Omaha. Students should note that the maximum sediment deposition in both locations occurred on the same year.*
- 4** Q. Compare the minimum value for sediment deposition in the Missouri River near Omaha and the Mississippi River near Baton Rouge.
- A. *The minimum value for sediment deposition in the Mississippi River near Baton Rouge was greater than in the Missouri River near Omaha. Students should note that the minimum sediment deposition in both locations occurred on the same year.*
- 5** Q. Dam construction was started on the Missouri River above Omaha in 1947 and completed in 1954. Based on the information in the research article and in your graphs, what was the impact of dam construction on sediment deposition in the Missouri River near Omaha?
- A. *As dam construction neared completion, sediment deposition in the Missouri River near Omaha decreased. In the 26 years following dam completion, sediment deposition remained low. The dams trap sediment so less sediment flows down the river.*



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- 6** Q. The Missouri River, a tributary of the Mississippi River, has been the principal supplier of sediment to the Mississippi since the last ice age. Did dam construction on the Missouri River have an impact on sediment deposition in the lower Mississippi River? Explain.
- A. *Dam construction did have an impact on sediment deposition in the lower Mississippi River. Sediment deposition in the lower Mississippi River was lower for all years after dam construction on the Missouri River.*
- 7** Q. Based on the research article, what is the impact of decreased sediment deposition on Louisiana's coastal land area?
- A. *Decreased sediment deposition is one of the factors contributing to the shrinking of Louisiana's coastal land area. The formation of coastal land area depends on the deposition of sediment. The rate of land building from sediment deposition is not keeping pace with the rate of subsidence and the effects of other natural and human factors.*
- 8** Q. Based on the research article, describe what is being done to stabilize sediment deposition in Louisiana's coastal wetlands.
- A. *A variety of projects are being done to stabilize sediment deposition in Louisiana's coastal wetlands. Building structures such as fences or rock walls slow wave erosion and trap sediment. Sediment from the ocean floor is used to build up eroded beaches. Grasses are planted to hold soil in place. Larger scale projects that aim to restore part of an area's original hydrology are also being done so that the river water can build land again.*

