

## River Erosion

**T**his activity challenges students to create a model demonstrating how flooding affects the amount of material eroded by a river. To do this, students must apply the concepts they have learned about the factors that determine a river's speed and thus its rate of erosion.

### ◆ Expected Outcome

Since students are asked to investigate flooding, their experiments should involve changing the model river's *volume*, not its slope. Students should also realize that they need to run at least two tests—one to represent the river with “normal” volume (the control) and a second test with an increased amount of water to represent flood conditions. In addition, students must devise a method for quantifying the amount of material eroded in each test. This could be done simply by filtering the runoff water through a paper towel and measuring the volume of the solid material that was trapped by the filter.

### ◆ Content Assessed

This activity assesses students' understanding of the factors that affect a river's speed and how rivers cause erosion.

### ◆ Skills Assessed

developing hypotheses, designing experiments, interpreting data, drawing conclusions

### ◆ Materials

- ◆ Give each student a large rectangular pan or tray with sides high enough to prevent spillage. Also provide each student with several wooden blocks, a large beaker, a funnel, and paper towels. If you do not have a beaker for every student, you can use large measuring cups.
- ◆ Make sand, fine gravel, and small pebbles available in separate containers for students

to share. Provide access to water and to extra paper towels for wiping up spills.

### ◆ Time

40 minutes

### ◆ Safety

Caution students to wear safety goggles and to handle the beakers carefully. Tell them that if a beaker breaks, they should immediately tell you and should not touch the pieces.

### ◆ Monitoring the Task

- ◆ Review students' hypotheses and drawings to make sure they recognize that they must test the relationship between water volume and the amount of material eroded. If any students have incorrectly focused on the river's slope, ask them to explain what happens when a real river floods and how they could show that with a model. If any students have planned only one test, ask them to explain how they would be able to compare erosion during “normal” flow with erosion during flooding.
- ◆ When students mix the sand, gravel, and pebbles, encourage them to use more sand than gravel and more gravel than pebbles.
- ◆ Alert students not to raise the end of the pan or tray too high.
- ◆ Provide spring scales or balances so students can weigh the filtered material instead of measuring its volume, if they wish.
- ◆ Provide containers for collecting the wet sand, gravel, and pebbles. If you want to save the materials for use again, let them dry thoroughly before you store them.



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In assessing students' performance, use the following rubric.

	4	3	2	1
<b>Designing and Constructing the Model</b>	Student conducts three or more tests with different water volumes, holding all other variables constant; measures eroded materials precisely.	Student conducts two tests, one with a given water volume and the second with an increased water volume, maintaining a constant slope; measures eroded materials fairly accurately.	Student conducts only one test with a given water volume; does not measure eroded materials accurately.	Student conducts one test without controlling water volume; does not measure eroded materials.
<b>Concept Understanding</b>	Student demonstrates mastery of the concepts that underlie the model, including the relationship between a river's volume and its speed and between its speed and the amount of materials it erodes.	Student demonstrates an adequate understanding of the concepts that underlie the model, including the relationship between a river's volume and its speed and between its speed and the amount of material it erodes.	Student demonstrates only a partial understanding of the concepts that underlie the model, including the relationship between a river's volume and its speed and between its speed and the amount of material it erodes.	The student demonstrates little or no understanding of the concepts that underlie the model, including the relationship between a river's volume and its speed and between its speed and the amount of material it erodes.



## PERFORMANCE ASSESSMENT

### River Erosion

#### ◆ Problem

How can you build a model to show how river flooding affects erosion?

#### ◆ Suggested Materials

large rectangular tray or pan  
mixture of sand, gravel, and pebbles  
several wooden blocks  
water  
100-mL beaker  
pitcher or watering can  
funnel  
paper towels

◆ Safety   *Review the safety guidelines in Appendix A.*

#### ◆ Devise a Plan

1. Study the materials. Think of a way you could use them to make a model showing how flooding affects the amount of material eroded by a river. Consider what you have learned about the factors that affect a river's flow. Develop a hypothesis about how flooding affects erosion. Write your hypothesis on a separate sheet of paper.
2. Make a quick sketch of the setup you plan to use.
3. Try your plan. Experiment with the materials until you have a good model to test river erosion.

#### ◆ Analyze and Conclude

*Answer the following items on a separate sheet of paper.*

1. Draw your model. Label your drawing to tell which variable you changed and how you changed it. Explain why you changed that variable.
2. How is your model similar to real river flooding? How is it different?
3. What conclusion can you make about flooding and river erosion?

