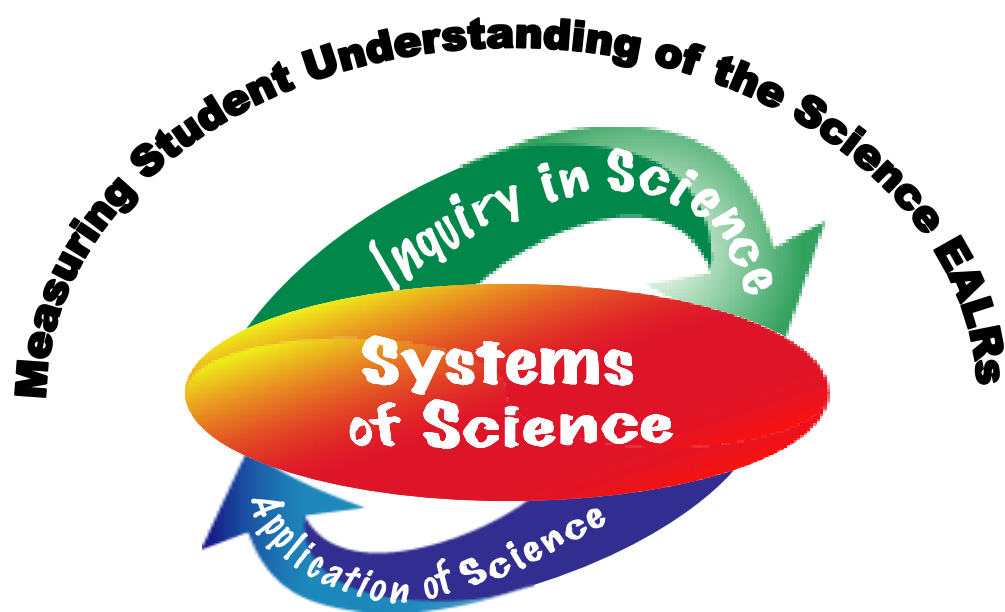


Soccer Soaker

Middle School
Application: Challenge
Powerful Classroom Assessment (PCA)



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Directions: Use the following information to answer questions 1 through 10.

Rachel and José decided to help their town choose a site for a new soccer field. All four possible sites for the soccer field are next to the river that flows through the town. Rachel and José focused on finding the site that would probably not be affected by a flood. They documented the process they used as follows.

Problem: Select a site for a new soccer field that will not be affected by the river flooding.

Gather Information: Survey and map the sites. Note the types of sands, rocks, and soil. Evidence of past flooding was observed at each site. Investigate the measures that have been taken to prevent flooding such as remodeling the bridge and adding boulders to the riverbanks.

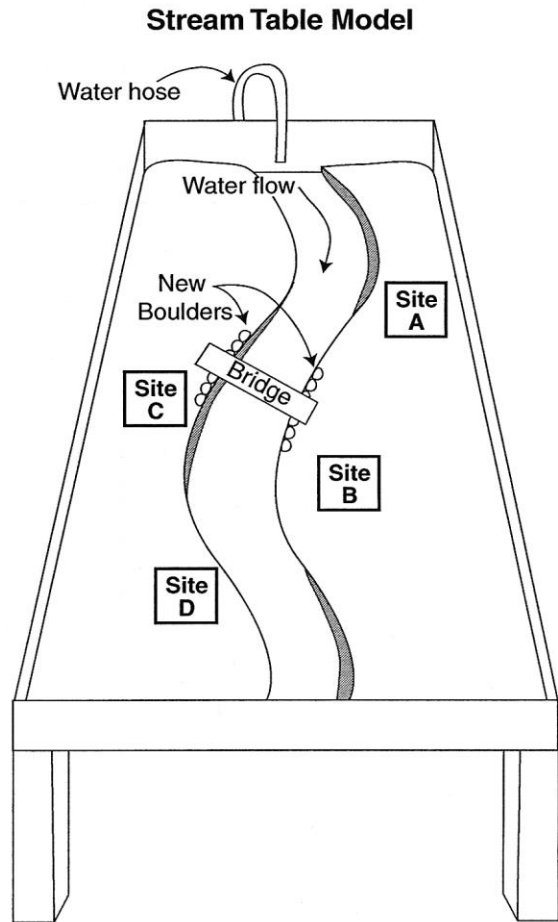
Explore Ideas:

- ✓ Add more boulders to the riverbank.
- ✓ Use a stream table.
- ✓ Observe all of the sites for a year.

Plan Summary: Use the stream table because the stream table can be set up to be a model of the different sites and the river.

Steps to do the Plan:

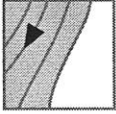



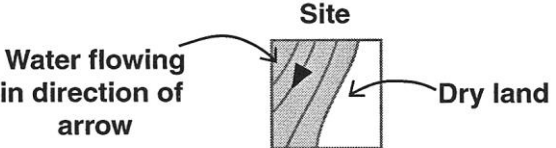
1. Using information from the site survey, build a model of the river using the same sands, rocks, and soil from the actual river as shown in the Stream Table Model diagram.
2. Run water in the model stream for 10 minutes.
3. Observe and record the effect of the flowing water on the four sites.
4. Select the site in the model that is least affected by flooding.



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Test Solution:

Site vs. Flooding

Site	Flooding on Site	
	Sketch	Description
A		Almost half the site flooded as the riverbank eroded away.
B		More than half the site was flooded as water flowed down from site A.
C		The site remained dry during the 10 minutes of water flowing.
D		A small corner of site was flooded as riverbank eroded away.
<p>Legend:</p> 		



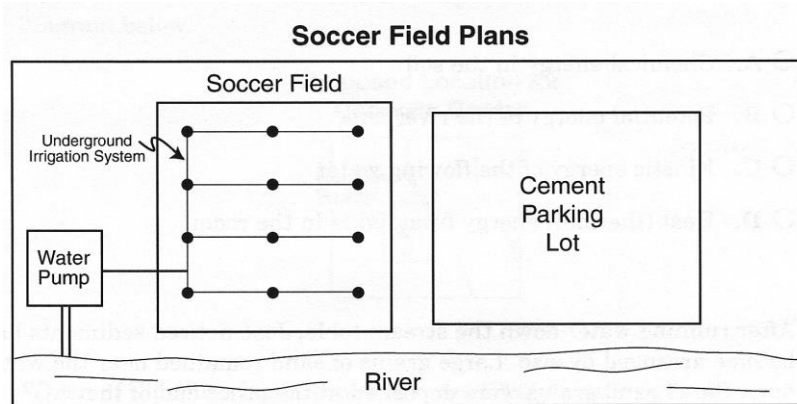
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- 1 Based on Rachel and José's test results, which site was probably least likely to flood?
- A. Site A
 - B. Site B
 - C. Site C
 - D. Site D
- 2 Rachel and José would like to use their Stream Table Model to solve other problems in their community. Which question could best be investigated using only their Stream Table Model?
- A. How does the shape of the land affect how fast the river flows?
 - B. How does vegetation type affect the health of the river?
 - C. Which type of canoe is easiest to navigate in the river?
 - D. Which river location would support the most fish?
- 3 Which change to the Stream Table Model would make the test results more valid?
- A. Move the bridge upstream of the four proposed sites.
 - B. Turn on the water hose for a longer period of time.
 - C. Move the sites most affected by the water flow.
 - D. Straighten the path of the river.



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4 The plan for the soccer field is shown below.



The plan includes the following three parts:

- ✓ A large grass field will be planted.
- ✓ Water will be pumped from the river to irrigate the field.
- ✓ A parking lot will be built beside the field.

Choose **two** of the parts listed above and explain how **each** part could affect the river system.

- Choose **two** of the parts listed above.
- Describe how **each** part could harm the river system.

One part:
Other part:

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5 Which of these energy forms caused riverbank erosion in the Stream Table Model?

- A. Heat energy from lights in the room
- B. Kinetic energy of the flowing water
- C. Potential energy of the riverbank
- D. Chemical energy in the soil

6 After running water down the stream table, José noticed sediments had been sorted by size. Large grains of sand remained near the water hose. Small sand grains were deposited at the other end of the stream table.

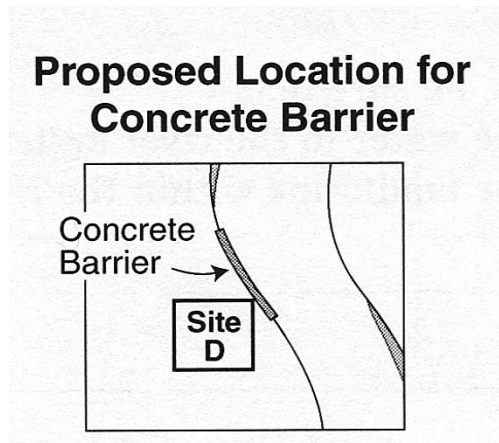
Which of the following statements describes why sand grains on the stream table were sorted by size?

- A. The large sand grains were more dense than the water.
- B. The large sand grains gained kinetic energy from the water.
- C. The small sand grains were light enough to be easily moved by the water.
- D. The small sand grains gained mass as they were moved downstream by the water.



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- 8 The Stream Table Model shows a section of riverbank in front of Site D, which is the planned location for a large concrete barrier as shown in the diagram below.



Which of the following effects will **most likely** result right after the barrier is built at this site?

- A. The overall water level of the river will drop.
- B. The direction that water flows in the river will change.
- C. The amount of water that flows past this site will increase.
- D. The amount of erosion that occurs at this site will decrease.



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- 9 The stream table Rachel and Jose used slopes downward from the end with the water hose to the bottom where the water runs off the table. Where is the potential energy of the water in the stream table model the greatest?
- A. Site A
 - B. Site B
 - C. Site C
 - D. Site D



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- 10** When the soccer field and parking lot were built, the river bank was cleared of vegetation. This caused an increase in soil erosion of the river bank when the river was running fast. Describe how you would scientifically design a solution to the new erosion problem using any tools and some or all of the materials listed below.

Only these materials may be used: gravel, rocks, plastic sheets, wooden boards, nails, grass seed, trees, compost, and soil.

Be sure to describe the following stages of your design process:

- **Gather Information:** Describe the information needed and how to collect that information.
- **Explore Ideas:** Describe several ideas, including any useful scientific concepts.
- **Plan Summary:** Write a summary of the plan, including **reasons** for choosing this solution.
- **Steps to Do the Plan:** Write the steps, including all the materials used in the Plan Summary and in the Diagram of Solution.
- **Diagram of Solution:** Make a labeled diagram.
- **Test Solution:** Describe the process to measure or observe how well this solution may solve the problem.

Problem: Reduce the amount of erosion on the river bank using a method that will allow
vegetation to return.
Gather Information:
Explore Ideas:



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Plan Summary:
Steps to Do the Plan:
Diagram of Solution:
Test Solution:

