



# COASTAL EROSION Activity

## INTRODUCTION

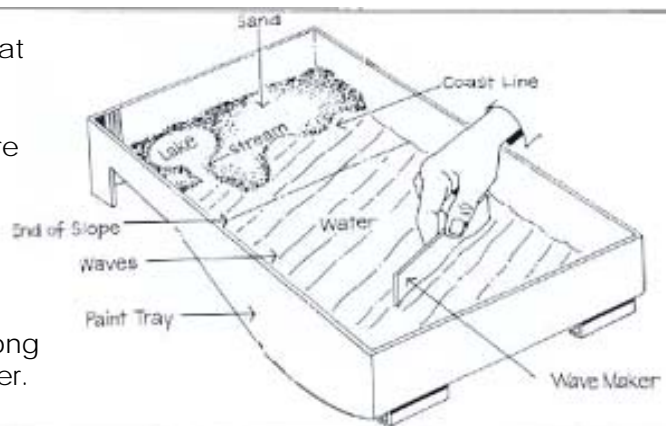
Coastal lands are constantly changing in response to wave action. As a wave approaches the shore, it breaks and releases stored energy, causing erosion and the transport and deposition of sediments. Waves breaking at the base of a sea cliff can cause it to erode and collapse into the sea. Waves breaking at an angle to the coast can create longshore currents, which transport sediment along the beach. Rivers supply new sediment to the coast which can form deltas or be moved along the coast by longshore currents. Coastal erosion depends on the stability of shoreline sediments, the intensity and frequency of storm waves, and the exposure of coastal lands. The following activity is designed to provide students with an understanding of coastal erosion caused by waves.

**OBJECTIVES** - Students will:

1. Model and observe how waves affect the movement of sand on a coastline.
2. Observe how rivers provide sand to the coast.
3. Observe the effect of coastline shape and manmade structures on the movement of sand

**MATERIALS** - Each group of three students will need:

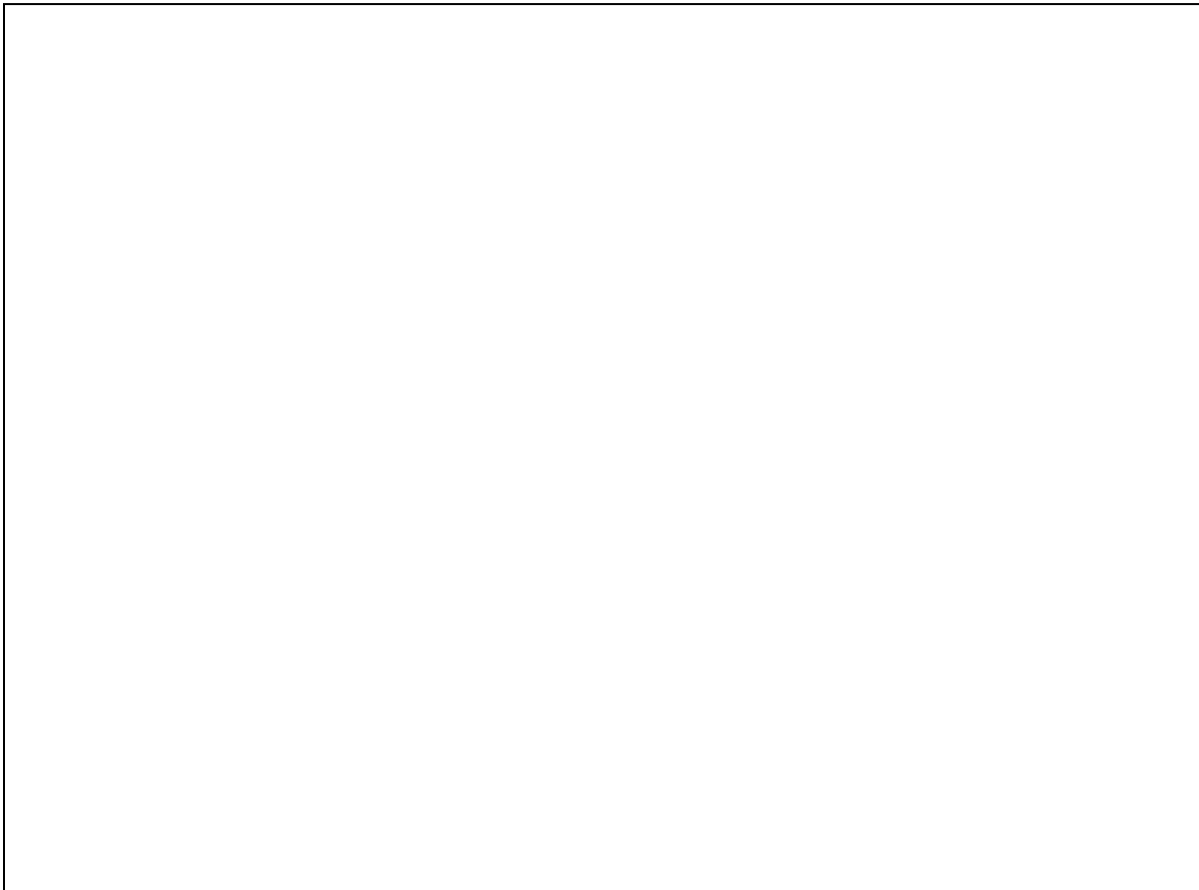
- One large rectangular container at least 35 cm by 28 cm.
- 700 mL of moist play sand.
- 50 mL of a different color or texture sand, such as silica sand.
- 700 mL of water.
- One 15-cm-long flat object for a wavemaker. One-half of a 30-cm ruler or paint stir-stick works well
- One stick, approximately 10 cm long by approximately 1 cm in diameter.
- A metric ruler.
- Four rocks, each about 1 to 2 cm.
- Paper and pencil.
- Graduated cylinder or measuring cup.



## PROCEDURE

1. In your group of three, move to a lab station where you will find the following materials
  1. a rectangular container,
  2. 700 mL of moist play sand,
  3. 50 mL of moist, different colored or textured sand,
  4. 700 mL of water,
  5. one wavemaker, and
  6. a graduated cylinder or measuring cup.
2. Spread the 700 mL of play sand in the container. It should cover not more than 15 cm from the long side of the container. This side of the container should then be elevated approximately 2.5 cm. The sand represents a beach. Shape your model beach any way you would like. Add approximately 600 mL of water to the bottom part of the container where there is no sand. The water represents the ocean. Draw a diagram of the model beach they created (diagram 1).

Diagram 1: Model Beach



- Using the wavemaker, each person in your group should take a turn creating waves in the ocean. Holding the wavemaker horizontally, you should use a sharp, short, pushing motion with the wavemaker, pushing the wave at an angle to the beach. Each person should make approximately 20 waves. After each person has taken a turn making waves, make a second diagram of the beach (diagram 2). Compare your "before-and-after" diagrams and describe how the shape of the coastline changed.

Diagram 2: Model Beach after Wave Action



Describe how the shape of the coastline has changed:

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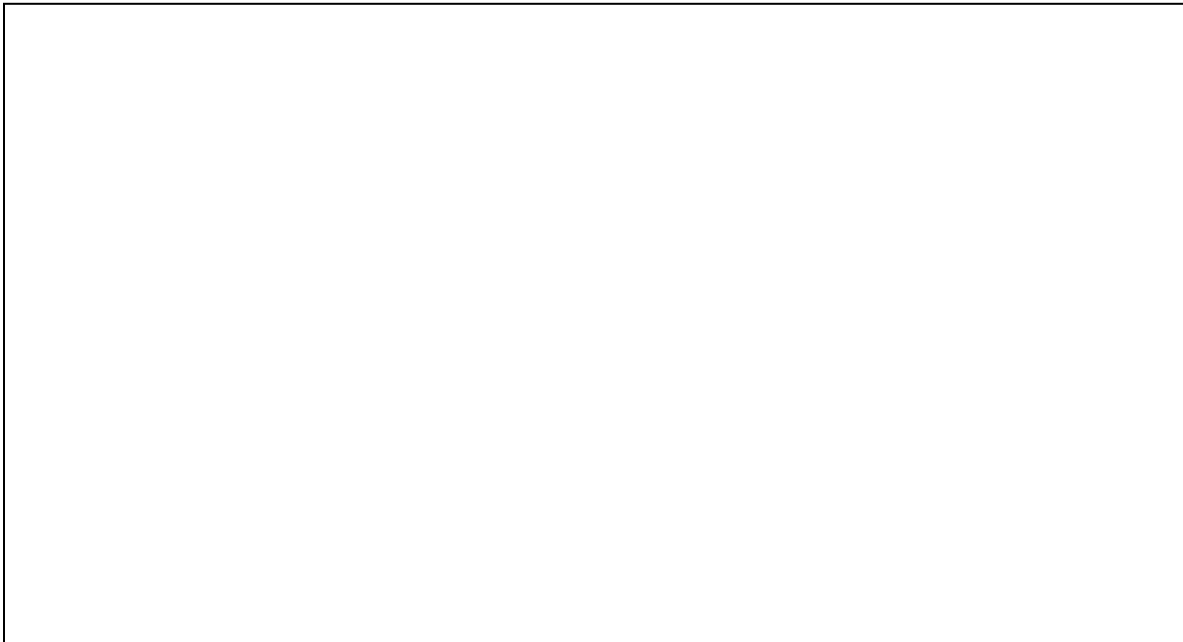
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4. Make a small crater and ditch in the sand. The crater should be approximately 8 cm wide, should expose the bottom of the container, and should be located at the top of the model. The ditch should be approximately 4 cm wide, should expose the bottom of the container, and should connect the crater and the ocean. The crater represents a lake, and the ditch represents a river. Place 50 mL of moist, different colored or textured sand in the crater and ditch. Slowly pour 100 mL of water into the crater until this different sand is washed down to the ocean. Write down and draw your observations (diagram 3) of what happened to this sand. A delta should form where the sand was deposited at the ocean. Then, continue to make waves as described in step 3. Try to make the waves at the same angle to the beach as before. What happened to the delta?

Diagram 3: Model Beach with Lake & River Added



What happened to the sand?

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What happened to the delta when you created more waves?

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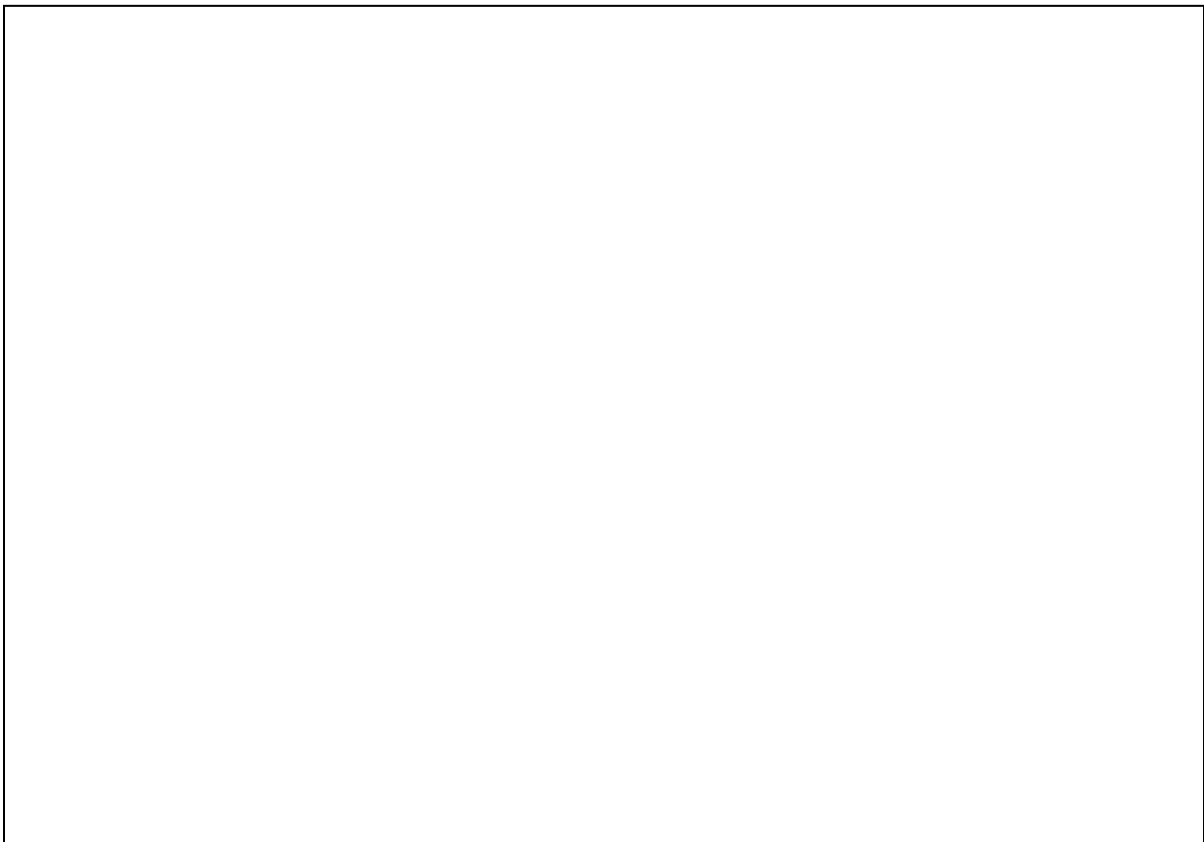
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5. You group should now brainstorm ways to keep the "Class Beach" (in the wave tray) from eroding. Using the rocks and the 10-cm stick, you can construct a wall, jetty, or any barrier you like to prevent the beach from eroding. These structures can be placed anywhere you like. After these structures are constructed, you need make waves as described in step 3. Again, try to make the waves at the same angle to the beach as before. Draw a diagram of the beach (diagram 4).

Diagram 4: Model Beach with Erosion Prevention Structures



## QUESTIONS

Answers to the following questions *in complete sentences*:

1. Compare diagrams 1 and 2. Were there any changes in the shape of the beach? Describe these changes and the cause of the changes.

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2. In which direction did the sand move (which direction was the longshore current)?

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3. The sand deposited from the river created a *delta*. What happened to the delta when the storm waves came in contact with it?

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4. Identify a major river delta in the world that has not been removed by waves.

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Answer the following questions about the erosion control methods used by your class:

1. Were any of the structures effective in reducing beach erosion? Which ones & why?

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