

COASTAL EROSION



BENCHMARK and TASK

SC.G.2.2.3 The student understands that changes in the habitat of an organism may be beneficial or harmful.

- The student infers that changes (e.g., natural hazards, such as earthquakes, landslides, wildfires, volcanic eruptions, floods, storms) in an ecological system usually affect the whole system, because one part of the environment cannot be altered without affecting the others.

KEY QUESTION

How do waves affect the movement of sand and buildings along a coast?

BACKGROUND INFORMATION

Oceans are the largest geographic feature on the surface of the earth, covering approximately 70 percent of the earth's surface. As a result, oceans have a tremendous impact on the earth, its climate, and its inhabitants. Much of the world's population lives on or near a coast. Coastal **environments** are dynamic, and they constantly change due to natural processes and to human activities.

Storms can change the shape of the shoreline and destroy buildings, roads, and homes. Hurricanes can greatly modify the shape of coastal areas, cause major flooding, destroy property, and take lives. The sediment that forms a beach or dune can come from rivers, cliff **erosion**, waves, or currents that flow along the shore. Extensive beach erosion can cause buildings to collapse into the ocean and dramatically change the shoreline.

Waves are the primary **energy** source that causes erosion of coastal lands; the larger the waves, the greater their erosive power. Most waves are created by winds blowing across the surface of the ocean. Large storms generate destructive ocean waves. Breaking waves can undercut cliffs and break down rocks into smaller and smaller pieces. Sediments can be eroded from one location and deposited in another in a process called **deposition**. Coastal erosion depends on the stability of shoreline sediments, the intensity and frequency of storm waves, and the exposure of coastal lands.

MATERIALS

Per group

- | | |
|--|-----------------------|
| 1 large paint tray or 1 rectangular pan, elevated | gravel (optional) |
| 1 liter of moist play sand | 1 waver (15-cm ruler) |
| 3 blocks to represent houses or buildings
(e.g., cubes, Dominoes) | |

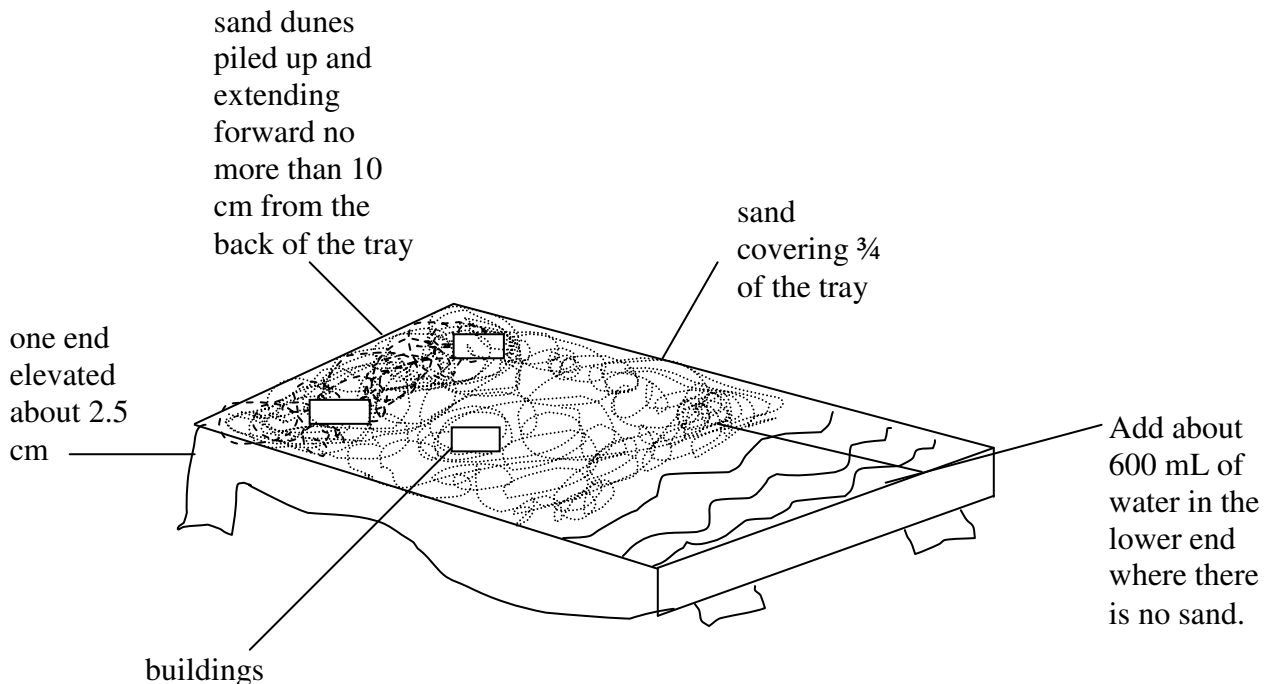
Per student

1 sheet of 11 x 17 drawing paper
crayons/colored pencils
1 ruler

TEACHING TIPS

1. Request a copy of the poster, grades 3-5, entitled *Oceans – Coastal Hazards: Hurricanes, Tsunamis, Coastal Erosion* by writing to: U.S. Geological Survey, Branch of Information Services, Box 25286, Denver Federal Center, Denver, CO 80225 or call 1-888-ASK-USGS. This poster is one in a series of water-resources education posters and contains a visual to accompany the following activity along with the activity written in its entirety.
2. You may wish to set up an area outside for this activity.
3. Assemble one of the models and try the activity prior to the lesson (see diagram):
 - Spread half of the sand evenly over $\frac{3}{4}$ of the elevated section of the paint tray from the top edge down. Leave the lower $\frac{1}{4}$ of the tray empty. (Note: If you are using a large, rectangular pan, elevate one end of the pan about 2.5 cm.)
 - Add the remaining sand to the back 10 cm of the tray to form dunes or cliffs.
 - Place the three blocks and gravel (optional) anywhere in the sand to represent buildings.
 - Add 600 mL of water to the bottom of the pan in the area with no sand.
4. Experiment with the waver before instructing the students in its use.

COASTAL EROSION MODEL



ENGAGE

Begin with this scenario: *This summer during the month of July, I vacationed in a beach house, a place where I've been vacationing for many years. I noticed that the backyard doesn't seem to be as big as it was ten years ago. Is this possible? Why do you think so?*

EXPLORE (Part One)

Instruct students as they build their own coastal erosion model (see Teaching Tips).

EXPLORE (Part Two)

1. Have students divide an 11 x 17 piece of drawing paper into thirds and then in the first section, draw a picture of the model. They should include measurements of the widths of the beach and dunes and the position of the buildings.
2. Demonstrate the use of the waver by holding it horizontally and making short, sharp, pushing motions towards one corner of the tray at an angle. Waves should be small and break on the beach just before reaching the dunes.
3. Have each student per group make twenty waves using the waver. Make sure students always create waves in the same direction.
4. After each student has made waves, have them draw a second picture including the measurements of the widths of the beach and dunes, and the position of the buildings.
5. Repeat step four, but allow students to make waves big enough to reach the dunes. The larger waves represent stronger waves produced by storms.
6. Have students draw a third picture and again include the measurements of the widths of the beach and dunes and the position of the buildings.

EXPLAIN

Look at your first and second diagrams. What changes did you notice in the beach, dunes, or cliffs, and buildings? Tell what caused these changes.

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What is the process called when earth materials picked up from one place and deposited in a new location? (deposition – see Background Information)

Would you like to live in one of the houses located on your model? Why or why not?

How might animals that live along the shoreline be affected by coastal erosion? Do you think the changes would be beneficial or harmful to their habitat?

Why is it mandatory in certain areas to plant ground cover along the shoreline?

EXTEND/APPLY

Every few years, large ships anchor a short distance from the beach and pump tons of sand from the bottom of the ocean. The sand is pumped to extend the width of the beach. What are some reasons they might need to do this?

ASSESSMENT

Have each group use their observations to explain why they would or would not buy property along the coast.