

Modeling Beach Erosion

Below is an overview of the activity Modeling Beach Erosion (New Jersey Sea Grant Consortium, Education Program) to incorporate information learned from Dr. Herrington's presentation and subsequent discussion.

Lesson Overview

Students learn how the size of waves influences the shoreline, both by creating and destroying the shoreline. Further students learn that the construction of structures such as groins, which interrupt coastal processes such as the movement of sand along shore, can cause beaches to disappear.

Lesson Rationale

How does a beach form? A question that few students can answer, but most have been to the shore in the summer. This lesson uses investigations to reinforce that beaches are created and destroyed by the influence of waves and sand along the shoreline. Sand moves on and offshore as well as along the coastline to form beaches. The patterns in the movements of the sand on shorelines is related to the direction of on coming waves, the size of waves, and the lengths of time that waves interact with the shoreline. These concepts become real as students manipulate the variables of waves and see the effects on the shoreline. In addition students explore the influence of human structures on natural processes of shoreline movement. The construction of structures, like groins and seawalls, interrupts these natural coastal process that move sand along the shore as well as on and offshore. These disruptions can cause the beach to disappear or change. By comparing across multiple investigations of the relationships between waves and the shoreline, with and without different human structures, students gain a broader understanding of the realities of shoreline processes in New Jersey.

Key Concept

Students explore how both natural and human structures mold and redistribute the sediments of the shoreline.

MODELING BEACH EROSION

BACKGROUND The physical properties of the ocean including waves, winds, tides and currents shape, mold and redistribute the sediments of the shoreline. Human intervention, in the form of seawall, jetties and groins, were designed in an attempt to control beach erosion and manipulate the shoreline. Using models, we can study the effect of waves, currents and human-made structures, such as groins and seawalls on a beach.

- PROCEDURES**
1. Each team will be responsible for modeling ONE of the four diagrammed beachfront situations in the trays provided. Your team will need to provide measurements of your "beach" BEFORE and AFTER wave action. Your team will also be responsible for a drawing of your beach AFTER wave action.
First your team will need to build one of the four beachfront situations, using sand, brick, rocks, etc. Record the dimensions of your beach in the "before" diagram.
 3. Next add about one inch of water to the tray. The water should surround, not submerge your shoreline. **GENTLY** rock the tray up and down from one side to create waves. Count 25 waves then record your results noting new dimensions and shape in the space provided for "after" diagrams.
 4. Provide a report to the rest of the class describing your results.
 5. If time permits, try and model your own beachfront situation and observe the effects of wave action on it. Try to design a structure to preserve your beachfront and test its' effectiveness under wave action. Use the worksheet "MODELING BEACH EROSION: POSSIBLE SOLUTIONS" to record your results and ideas.

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**The Education Program at the
New Jersey Sea Grant Consortium**

22 Magruder Road Fort Hancock, NJ 07732 732-872-1300 njseagrants.org

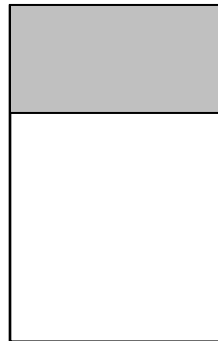


BEACHFRONT SITUATIONS BEACH 1:

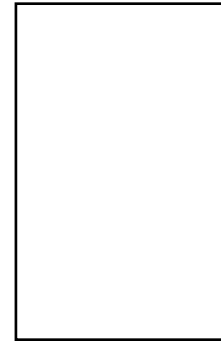
Beach under wave attack

Observations:

SET UP



AFTER

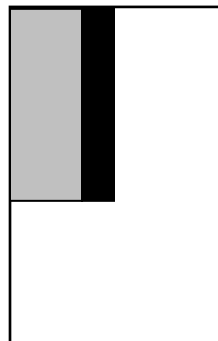


BEACHFRONT SITUATIONS BEACH 2:

**Beach with seawall and
longshore current**

Observations:

SET UP



AFTER



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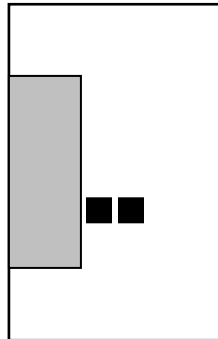


BEACHFRONT SITUATIONS BEACH 3:

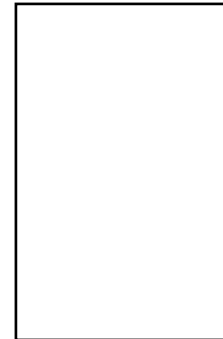
Beach with groin and
longshore current

Observations:

SET UP



AFTER

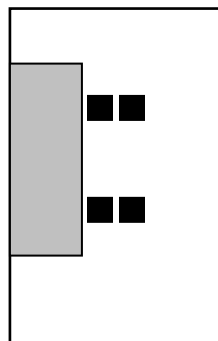


BEACHFRONT SITUATIONS BEACH 4:

Beach with several groins

Observations:

SET UP



AFTER



The New Jersey Sea Grant Consortium (NJS GC) is an affiliation of colleges, universities and other groups dedicated to advancing knowledge and stewardship of New Jersey's marine and coastal environment. NJS GC meets its mission through its innovative research, education and outreach programs. For more information about NJS GC, visit njseagrants.org.

MODELING BEACH EROSION: POSSIBLE SOLUTIONS

DATE: _____ SCHOOL: _____

Team Members: _____

Humans have built various structures (i.e. seawalls, jetties, artificial reefs, groins) and designed projects in an attempt to control and manipulate our shorelines. A perfect solution has not been developed yet, but it is certain that attempts to control beach erosion will continue. You have modeled some of the traditional attempts at shoreline protection and have discovered their success and failure. You have also studied some of the physical properties of the ocean that work daily upon our shoreline. Using your knowledge, imagination and creativity, create and test your own shoreline protection solution. Record your results in the space below. GOOD LUCK and GOOD THINKING!!

BEFORE

AFTER