



Beat the Surge [MC]

Adapted from Learn NC

Grades: 6-8

Time: 45 minutes to 1 hour

Goals: To understand the biological processes of shoreline erosion and how humans have attempted to prevent erosion over time.

Objectives:

Students will be able to: define the different man-made and natural structures used to prevent the erosion of a shoreline; explain the effects these structures have on erosion rates and natural movement of barrier islands; and describe the differences in erosion during normal tides, spring tides, and storm surges during nor'easters and tropical storms.

Materials:

- Extra-long plastic bins
- Sand of different grain sizes
- Pitchers of water
- Large rocks
- Pieces of wood
- Gravel
- Sticks or twigs
- White paper
- Pencils or pens

Procedures:

1. Pre-Activity (introduction): Have the students define erosion in their own words. Introduce the terms scarp and escarpment as well as storm surge and coastal flooding. Explain what could happen (and what has happened) on the barrier islands along the Atlantic coastline during high impact and high intensity storms and explore the differences between the daily and seasonal erosional patterns of the coast.
2. Activity: Divide the class into groups of 5-6 students each, passing out all the materials to each group. Instruct them to build a barrier beach using the sand on one side of the bin. They can choose to use fine sand or coarse sand, but remind them that they will get different results and to note this on their papers. They are permitted to construct a basic dune system, but have them gently slope it downward into the bin. The empty side is for them to pour water into, up to the lowest edge of the sand. Instruct them to gently rock the bin to create slow waves, representing the daily flow of tides. Instruct them to write down their observations. They may use rulers instead of rocking the bins to create waves as well.



Ask them to think about the types of structures they have seen being used to fortify beaches to stop them from eroding. You can give them examples such as bulkheads, groins, jetties, sea walls, dunes, etc. Their next task will be to test the remaining materials, as examples of these structures, to see how they hold up to normal daily tidal fluxes as well as heavy storm surges. They may use them in combinations as well, but remind them to write down all of their results. Urge the students to generate waves but try not to overflow the bins. To get the best results, this experiment can be taken outside so the students can create larger waves.

3. Post-Activity (review): Discuss how these structures altered the erosion rates and the noticeable changes to the shoreline. Use storms such as Katrina in Louisiana and Sandy in New Jersey to explain how these storms altered the shorelines and how these states chose to fortify their beaches. Elaborate on how we can look ahead to the future and alter not only our perception of beach erosion but also of storm surges and protection.

Key Words:

Beach erosion

Storm surge

Bulkhead

Jetty

Groins

Sea wall

Dunes

Hardened structures

Temporary structures

Background Information:

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A natural barrier island ebbs and flows, just as tides will do daily. On one side of the island, waves, currents, tides, and winds will erode the sand away; on the other side, the sand will accrue. Barrier islands will change shape and appear to move closer to the mainland and north and south parallel to the coastline as time progresses. Because of this natural shift in the landscape, and the overdevelopment of these islands, decision makers have added hardened structures to literally stop an island from moving altogether.

These structures, such as rock sea walls, bulkheads, groins, and jetties, were once thought of as permanent solutions to the problem of barrier island movement and erosion. What decisions makers failed to realize was that these hardened structures not only continued to allow coastal erosion to occur, it exacerbated the problem. If you place a hardened structure next to one piece of property, the erosion to the neighboring property would increase. In the case of groins along the New Jersey coastline, for example, an aerial photo would reveal a series of eroded beaches. This is one reason beach replenishment is funded every three to five years.

When storm surges, hurricanes, and tropical storms come in contact with barrier islands, they are slowed down and their power is slightly diminished. The purpose of a barrier island is to act as a “barrier” for the mainland. When coastal erosion, due to the placement of hardened structures, occurs, these natural phenomena have no place to go but directly onto the mainland. Since the mainland is much more developed than a barrier island, this causes much more damage.