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Acknowledgments: The development of this lesson plan was made possible by the generous support of the TD Bank Charitable Foundation and the Jersey Shore Partnership.

Shrinking Shorelines

OVERVIEW: In this activity students will build a model of a salt marsh and the land surrounding it out of clay. Students will use this model to see what happens to salt marshes when the sea level rises and how the slope of the land and the location affect the marshes survival.

OBJECTIVES: Observe the effects on salt marshes from sea level rise.

GRADE LEVEL: 5th-12th grades

BACKGROUND: Regardless of the reason scientist can almost all agree the sea level is rising. A significant rise in sea level could have a dramatic effect on our coastline. Seventy percent of the world's population lives within 100 miles of the coast. If the height of the oceans increases, even if just under a meter, many of the world's largest cities will be under water. Scientists also estimate that approximately two-thirds of the coastal wetlands in the United States will be lost if the sea level rises just 1 meter.

Loss of wetlands, due to sea level rise will be most severe in areas with small gradients. This means the elevation of the coastal land doesn't change very much. Salt Marshes will be especially affected because of their gentle gradient. Salt marshes, depending on their location, may be drastically changed or even drowned by an increase (rise) in the global sea level. Salt marshes are wetland ecosystems found along an open coastline or within an estuary. The mass of plants and animals (biomass) that is produced naturally on an acre of salt marsh is greater than what is produced on fertilized farmland.

Organisms need specific conditions to thrive or survive. Scientists predict these conditions will be altered as the climate changes. In a salt marsh, there is a delicate balance between salinity, dissolved oxygen, turbidity, bottom composition, and temperature. A change in any of these factors may affect the health and survival of the marshes themselves but may also lead to the death, migration, or ill health of the organisms living in the marshes.

Not only the people living on the coasts will be affected if salt marshes die or are destroyed. Because a large number of fish species and shellfish depend on salt marshes for food and shelter during some part of their life, all consumers of these products will be affected. From one-half to two-thirds of the food fish harvested from the Atlantic and Pacific Oceans spent part of their lives in salt marshes or estuaries. To protect our salt marshes and other wetlands, we must first recognize their importance and then understand how what we do will affect these areas.

MATERIALS:

Clear Plastic Shoebox or Tupperware like container for each group
Clay for each group of 2-4 students
Metric Ruler
Grease pencil, dry erase markers or crayons
Toothpick
Water
Clear transparency and 2 different color transparency marker

PROCEDURE:

1. Using the metric ruler and a black grease marker or dry erase marker, mark draw lines on the inside of the box at .5cm, 1 cm, 1.5 cm, 2 cm, 2.5 cm, 3cm starting from the bottom.

2. The .5 cm mark represents the current global sea level. Use the clay to form a coastal landscape in the bottom of the shoebox. All water areas such as estuary, rivers and ocean will be left empty. You can create a salt marsh by creating an area with a height only a bit above the .5 cm line, then with more clay gently create a slope up to higher land elevations that will be well above the .5 cm up to the 3 cm line. You may use the ruler when creating your landscape instead of the lines inside the box if easier.

3. Add water to the areas that should contain water (such as estuary, or river) maker sure the water level reaches the .5 cm line.

4. Place your transparency sheet over the top of the shoebox. Have group members hold as still as possible. Look straight down into the shoe box and draw a line where the water meets the clay as you look straight down upon the coastline. Mark this line as CSL (current sea level)

5. Discuss with your team members what will happen when water is added to the 1 cm line. What do you think will be the highest point on land that the water will reach? Use a toothpick to draw a fine line from left to right across the clay wherever you think this high point will be. This line will represent where you predict the new coastline will be.

6. Using the same transparency sheet, place over the same area as you did in Step 4 and draw your new predicted coastline (trace over the line you drew with the toothpick). Mark this line as P1 (prediction for first water level rise)

7. Slowly pour water into the container and on the clay coastline until it becomes level with the 1 cm line on the inside of the shoebox.

8. Observe your new coastline; this is the actual sea level rise. Was your predicted new shoreline correct; was it too high or too low? Discuss your

observations with team members. Place the transparency sheet over the top and draw the new actual coastline as in Step 4, mark with SLR1 (sea level rise 1)

9. Repeat steps 5-8 for the 1.5 cm line. Record the 1.5 cm lines on the transparency as P2 for predicted sea level rise and SLR 2 for the actual sea level rise.

10. Continue to repeat steps 5-8 for sea levels 2 cm, 2.5 cm, 3 cm. Make your predictions on the model and draw on transparency for each of these sea levels. Continue labeling your predictions and the actual sea level rise (P3, SLR3, P4, SLR4, etc).

The lines formed are called contour lines and are used on topographic maps to indicate elevation of land and water.

DISCUSSION:

1. How did your predictions compare with what you observed after the water was added. Were your predicted sea levels too high or too low?

2. Compare your results to different teams. What caused a model coastline to lose the most amount of land? Which model lost the least amount of land?

3. What could happen to our local coastlines if the global sea level rises 1 meter by 2100 as some scientists predict?

* ADAPTED FROM University of Rhode Island, Office of Marine Programs
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