Changes to Our Beach Due to Increased Severe Storms

Grade: Grade 8
Place of Focus: Riverhead and Devereux Beaches, Marblehead Mass
Citizen Science Protocol: Beach Profiling, Intertidal Biodiversity Monitoring Protocol

Massachusetts Curriculum Framework for Science and Technology/Engineering Standards

- **2-ESS2-2.** Map the shapes and types of landforms and bodies of water in an area.
- **2-ESS2-4 (MA).** Observe how blowing wind and flowing water can move Earth materials from one place to another and change the shape of a landform.
- **3-LS4-4.** Analyze and interpret given data about changes in a habitat and describe how the changes may affect the ability of organisms that live in that habitat to survive and reproduce.
- **4-ESS1-1.** Use evidence from a given landscape that includes simple landforms and rock layers to support a claim about the role of erosion or deposition in the formation of the landscape over long periods of time.
- **7.MS-LS2-4.** Analyze data to provide evidence that disruptions (natural or human-made) to any physical or biological component of an ecosystem can lead to shifts in all its populations.

Learning Objectives

By the end of the field lesson, students will:

- Create a beach profile for Riverhead or Devereux Beach
- Make detailed observations regarding the topography and ecological conditions of Riverhead or Devereux Beach
- Identify and record key species found at Riverhead or Devereux Beach

Pre-Visit Learning

Prior to the site trip, students should understand:

- What a beach is and what forces shape it
- History of the specific beach (human, geological, etc.)
- Introduction to the scientific method
- How climate change affects beaches
- How changing tides (high vs. low) affect beaches on a daily basis
- Understanding of the term “transect” and how they are used to map the topography of an area

Essential Questions

- How do beaches change over time?
- How does climate change impact dynamic coastal ecosystems?

Guiding Questions

1. How has the topography of Riverhead/Devereux Beach changed over time?
2. What effect do intense storms have on coastal ecosystems?
3. What effect do intense storms have on coastline topography?
4. What effect do rising ocean temperatures and sea levels have on coastal ecosystems?

Field Visit Preparations

Time

One school day, including travel time for one half of the grade, one school day to repeat with the other half of the grade (100-125 students each day).

Materials and Supplies

School provides:

- Clip boards
- Pencils, colored pencils
- Beach profiling kits (meter sticks, string, red tape)
- Intertidal biodiversity monitoring kits (string, stakes, wooden dowels)
- Field trip packets which include all data sheets, drawing paper, instructions for each station
- Thermometers
- Trash bags
- Trash grabbers

Students provide:

- Water, lunches, snacks
- Sunscreen
- Bathing suit and towel (optional)

Logistics

- There are restrooms on Devereux beach open in season or when the parks department is contacted for special groups off season.
- Riverhead and Devereux Beaches are within walking distance from the Middle School. There is ample parking for the school van or cars, if needed for select students and/or teachers and to transport materials.

(see next page)

Logistics (cont.)

- Ensure that students bring water, snacks, lunch and sunscreen (be sure to have some on hand as well). Swimsuits and towels are optional.
- Both beaches are relatively safe for bare feet - students may be more comfortable removing socks and shoes before taking beach profiles. Having towels to wipe off sand before putting footwear back on may be useful.
- Shade is available under the pavilion on Devereux Beach, if needed.
- Playground equipment will be off limits.
- Students will be pre-assigned groups of 5-6 students per group to switch through the stations. (About 20 groups: 7 at Riverhead, 13 at Devereux)
- Reflections will take place after lunch. After this time students can have unstructured beach exploration time, including swimming, weather permitting!
- Students will be dismissed from the beach.

Scientific Protocol

- Emery Rod beach profiling method (attached)
- Beach profiling Data Collection Sheet (attached)
- Coastal Life ID (website)
- Biodiversity Monitoring sheet, shellfish poster, and plant species sheet (most common species to be printed for viewing for students that need support)

Field Visit Outline

Introduction

Arrive at Devereux and Riverhead beaches (expected 8:40 AM) and gather with predetermined groups (groups of 5-6 students, two groups per Teacher chaperone) to review expectations of the day (20 minutes)

(see next page)

Introduction (cont.)

Class expectations

- Day of fun and observations
- Stay with group
- Stay on task, all are expected to participate
- Timed rotations through activities
- Playground is off limits
- Lunch and reflections to end the day
- Working snack allowed

Learning Tasks

Students will rotate through the following stations:

- **Station 1 *(Math and Science)*:** Beach profiling; high tide levels; air or water temperature; growth of marsh grass
- **Station 2 *(Science and Technology)*:** Biodiversity investigation
- **Station 3 *(ELA and Art)*:** Creative drawing and/or writing (student choice) of some aspect of their day – this may be a picture of a plant or an organism they found, a landscape, their interpretation of one of the activities or simply a representation of their mood, a poem, an essay on a topic related to the day, etc.
- **Station 4 *(Civics)*:** Beach clean up

Total of 2hrs, 40 minutes (40 minutes per rotation)
** Lunch on the beach in groups with chaperone (30 minutes) **

Reflection

Personal reflection in packet (15 minutes)

- 3-2-1 (learn/take with them, feel, question)

(see next page)

Reflection (cont.)

Personal reflection in packet (15 minutes - cont.)

- Questions for further investigation: students choose top 3 research questions they are interested in investigating further. They will be assigned one, hopefully of their choices, for follow up. Possible questions include:
  - How have storm intensities changed over time?
  - How have water temperatures in Marblehead harbor changed over the past century?
  - Does water temperature affect a species ability to survive?
  - What areas in Marblehead have frequent flooding and what are the projections for these areas in the next 50 years?
  - What strategies are being used to curb the impact of climate change on local beaches?
  - How can an 8th grader help scientists in their investigation of climate change in coastal communities?

Group reflection (15 minutes)

- Prompts may include:
  - Do they see their beaches differently?
  - Feelings they have about the day
  - How did their group work together? What went well, what could use some improvement?

Free exploration time in or out of the water (1 hour)

Closing circle and dismissal (15 minutes)

- Thank students for a job well done. Discuss roses and thorns. Remind them to bring packets to school the next day.

Post-Visit Learning

Using this data and experience, students will be able to apply the following skills in future units:

- Collect data and make detailed observations
- Create tables and graphs to best display the collected data
- Analyze and interpret data in tables and graphs
- Collaborate to gather and present scientific data
- Apply knowledge and understanding of climate change to predict changes and future conditions in coastal ecosystems
- Explore strategies to adapt to climate change in coastal settings

Full Unit Outline

This unit focuses on biodiversity and the impacts of climate change within a coastal ecosystem. The field visit lesson provides an opportunity for students to collaborate in gathering data and direct observations at a local beach. After the field visit, students will compare their data and create visual aids (tables and graphs) analyzing the changes in species numbers and beach topography before and after storm conditions.