

3-5 SCIENCE

PERFORMANCE TASK

STUDENT INSTRUCTIONS



TASK TITLE

Save Our Beaches! Coastal Flooding: Weathering and Erosion

INTRODUCTION

In the areas that are most affected by erosion, the coastline has lost more than 250 feet of beach in the past 50 years. The Ocean State is in trouble! Major storms are destroying our beaches. In the areas that are most affected by erosion, the coastline has lost more than 250 feet of beach in the past 50 years.

With your group, you will make observations of beach erosion in Rhode Island, research and compare different solutions, use a stream table model and create a presentation to convince others of the best method for reducing the impact of coastal weathering and erosion.

What steps will you take to protect our beaches?

SCORING CRITERIA¹

PERFORMANCE INDICATOR	BEGINNING	DEVELOPING	PROFICIENT	EXPANDING
#7 Earth and Space Sciences - Earth Systems and Human Impact: D Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. (4-ESS2-1)	Make observations of weathering and/or erosion.	Make observations and/or measurements to provide evidence of weathering and/or erosion.	Make observations and/or measurements to provide evidence of a cause and effect relationship between the rate of weathering/erosion and the environment.	Make observations and/or measurements from multiple forms of weathering and erosion and use them to provide evidence of a cause and effect relationship between weathering/erosion and the environment.
#7 Earth and Space Sciences -	Generate a solution related	Generate solutions to	Generate and compare multiple	Generate, compare, and evaluate multiple solutions



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$$\sqrt{\beta} \sqrt{e^-} \sqrt{100^\circ\text{C}} \sqrt{\Delta} \sqrt{p^+}$$

<p>Earth Systems and Human Impact: G</p> <p>Generate and compare multiple solutions to reduce the impacts of natural earth processes on humans. (4-ESS3-2)</p>	<p>to the impacts of natural earth processes on humans.</p>	<p>reduce the impacts of natural earth processes on humans based on scientific information.</p>	<p>solutions to reduce the impacts of natural earth processes on humans based on scientific information and the constraints and criteria of the design problem.</p>	<p>to reduce the impacts of natural earth processes on humans based on scientific information and the constraints and criteria of the design problem in order to make recommendations for improvement.</p>
<p>Problem Solving and Critical Thinking: 6</p> <p>Evaluate, justify and defend the relative effectiveness of the plan or process of approach.</p>	<p>Describe the data/information gathered from plan or approach and state whether the plan or process of approach was effective.</p>	<p>Identify relationships in data/information gathered from plan or approach and describe whether the plan or process of approach was effective.</p>	<p>Analyze patterns and trends to identify relationships in data/information gathered from the plan or approach and to evaluate the effectiveness of the plan or approach.</p>	<p>Justify a data collection strategy by analyzing strengths and weaknesses and critiquing the potential effectiveness of a range of solutions with consideration of real-life constraints.</p>

¹ Modifications were made to the Proficient and Expanding categories of Scoring Criteria for #7D to more accurately reflect the expectations of the Performance Indicator. The modified version is shown below.

If the decision is made to use this task, we advise using the modified Scoring Criteria. This may require the user to make adaptations to the task before administering it to students.

PERFORMANCE INDICATOR	BEGINNING	DEVELOPING	PROFICIENT	EXPANDING
<p>#7 Earth and Space Sciences - Earth Systems and Human Impact: D</p> <p>Make observations</p>	<p>Make observations of weathering and/or erosion.</p>	<p>Make observations and/or measurements to provide evidence of weathering and/or erosion.</p>	<p>Make observations and/or measurements to provide evidence of the effects of weathering or the</p>	<p>Use observations and/or measurements to explain the effects of weathering or the rate of erosion by</p>

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$\sqrt{e^-}$ $\sqrt{100^\circ\text{C}}$ $\sqrt{\beta}$ $\sqrt{\Delta}$ $\sqrt{p^+}$ $\sqrt{\quad}$

<p>and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. (4-ESS2-1)</p>			<p>rate of erosion by water, ice, wind, or vegetation.</p>	<p>water, ice, wind, or vegetation.</p>
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STUDENT DIRECTIONS AND MATERIALS

TASK DIRECTIONS

Save our beaches!

1. View the following resources displaying photographs of coastal Rhode Island independently.

Make observations to provide evidence of the effects of weathering or rate of erosion by water, ice, wind and vegetation.²

²The design team adjusted parts of the task based on their experiences administering it to students. The new directions for part 1 are as follows:

- As a group, view and discuss the following resources displaying photographs of coastal Rhode Island.
- Make observations to provide evidence of the effects of weathering or rate of erosion by water, ice, wind, and vegetations. Independently complete the data table describing your observations and inferences.

The team also decided to modify the data collection table using three columns instead of two. (The new column headings are shown below.) Additionally, they eliminated the four photos labeled as exhibits D and E from this part of the assignment.

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Evidence	Observations: What do you see?	Inferences: What do you think happened?
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	Evidence	Observations
A		
B		

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C														
D	<p>Frontal Erosion 1939-2012 - Browning Cottages, Moonstone Beach, RI</p>  <table border="1"> <thead> <tr> <th>Year</th> <th>Erosion (ft)</th> <th>Erosion (m)</th> </tr> </thead> <tbody> <tr> <td>1939</td> <td>-2.17 ft</td> <td>-0.66 m</td> </tr> <tr> <td>1951</td> <td>-1.80 ft</td> <td>-0.55 m</td> </tr> <tr> <td>2012</td> <td>-1.64 ft</td> <td>-0.50 m</td> </tr> </tbody> </table>	Year	Erosion (ft)	Erosion (m)	1939	-2.17 ft	-0.66 m	1951	-1.80 ft	-0.55 m	2012	-1.64 ft	-0.50 m	
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$$\sqrt{\beta} \sqrt{e^-} \sqrt{100^\circ\text{C}} \sqrt{\Delta} \sqrt{p^+} \sqrt{\quad}$$

E



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$$\sqrt{\beta} e^{-\sqrt{\Delta}} 100^{\circ}\text{C} \sqrt{p^+}$$

2. Research: Use the following websites, as well as the information provided below to research at least two solutions.

- [Kiddle](#)
- [Video](#)
- [Table](#)
- [RI Beach SAMP](#)
- [US Climate Resilience Toolkit](#)

Type	Definition	Diagram
Seawall	A rigid wall structure made of cement or other building materials placed parallel to a shoreline	 <p>Image courtesy of Geert Schotanus, Flickr https://www.flickr.com/photos/22410227@N04/2741781288/</p>
Rip Rap	Loose collections of large rock or cement blocks placed along a shoreline	 <p>Image courtesy of Greensheep, Wikimedia Commons http://commons.wikimedia.org/wiki/File:11-8-07_norap_photo.jpg</p>
Groin (or groyne)	A rigid structure often built perpendicular to the shoreline that interrupts water flow and movement of sediment	 <p>Image courtesy of Pkuczynski, Wikimedia Commons http://commons.wikimedia.org/wiki/File:Niechorze_Widok_z_latami_3_%28P%28%29_Kuczynski%29.jpg</p>
Breakwater	Offshore structures made of large boulders or cement blocks used to protect anchorages or harbor entrances from wave energy	 <p>Image courtesy of Claus Ableiter, Wikimedia Commons http://commons.wikimedia.org/wiki/File:Portofort_harbour_tour_entrance.jpg</p>
Jetty	A rigid structure built in pairs perpendicular to the shoreline to stabilize inlet channels	 <p>Image courtesy of WPPilot, Wikimedia Commons http://commons.wikimedia.org/wiki/File:Fort_Pierce_Inlet_Fort_Pierce_Florida_photo_D_Berney_Louis.jpg</p>

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$\sqrt{\beta} \sqrt{e^-} \sqrt{100^\circ\text{C}} \sqrt{\Delta} \sqrt{p^+} \sqrt{\quad}$

3. Generate an idea of another way you might be able to reduce the weathering and erosion rates at the beach.

Draw and/or describe your plan clearly in the box below.³

³The design team modified the answer space for part 3 to include two distinct boxes, one for the drawing and one for the description.

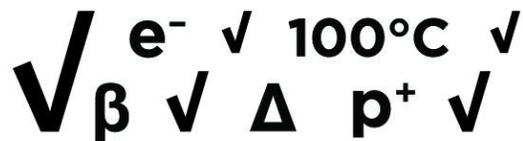
Drawing

Description

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4. Choose two of the methods you researched or generated and construct a model of each using the materials available in the classroom.
5. Conduct a **fair test** of the two models to investigate how well each helps reduce weathering and erosion of the beach. Collect and record observational data of the performance of each of your models. Stream tables are available to help you conduct your fair tests.⁴

Model 1 drawing/photo	Model 1 performance
Model 2 drawing/photo	Model 2 performance

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$\sqrt{\beta}$ e^- $\sqrt{100^\circ\text{C}}$ $\sqrt{\Delta}$ p^+ $\sqrt{\quad}$

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4 Directions for part 5 and the accompanying table were modified as follows:

5. Conduct a **fair test** of the two models. Complete and draw a labeled diagram for each model showing how it looked before and after the test. Write your observations (qualitative data) and include your measurements (quantitative data).

Model 1 Before Testing	Model 1 After Testing	Observations		
<table border="1" style="width: 100%; margin-bottom: 5px;"> <tr><td style="text-align: center;">sand</td></tr> <tr><td style="height: 40px;"></td></tr> </table>	sand			
sand				
Model 2 Before Testing	Model 2 After Testing	Observations		
<table border="1" style="width: 100%; margin-bottom: 5px;"> <tr><td style="text-align: center;">sand</td></tr> <tr><td style="height: 40px;"></td></tr> </table>	sand			
sand				

The team added a question to be completed after part 5:

6. Think about your results. How were the results similar and/or different?

6. Prepare a letter or a speech where you will be convincing town/state officials of the best method for reducing coastal erosion. Use the graphic organizer to plan your letter or speech. **5**

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5 Part 6 will become part 7. It was also slightly modified.

7. Prepare a letter or a speech where you will be convincing town/state officials. Make a claim of the best method for reducing coastal erosion. Use evidence and reasoning from your work to support your argument.

MATERIALS

- Stream table
- Plastic bins or foil pans
- Water
- Ruler to make waves
- Sand
- Rocks
- Popsicle sticks
- Clay
- Legos
- Paper towels rolls
- Straws
- Unifix cubes
- Computer

NOTE

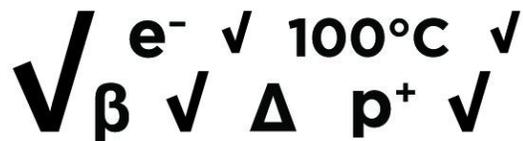
CHECKLIST

Your assessment must include:

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- Observations of coastal erosion pictures
- Your plan/idea for reducing erosion
- Observations of your models' test performance
- [CER graphic organizer](#)
- Letter or speech to town council (claim, evidence, reasoning)

STUDENT REFLECTION AND/OR GOAL SETTING

1. Think about how you have worked with your group on this task. Complete the following reflection.
[group reflection](#)
2. Think about your letter or speech. What goal can you set to improve your writing?
[writing goals](#)