



## Hawaii's Rocky Shore

### Concepts

Tides and cyclic environmental flux.

### HCPS III Benchmarks

SC.1.1.1

### Duration

45 minutes

### Source Material

MARE Rocky  
Seashores  
PRISM

### Vocabulary

*Intertidal zones:*

High tide zone

Low tide zone

Middle tide zone

Spray zone

(see "What is Rocky Shore" lesson)

## Intertidal Zones

### Summary

Students experiment with model seashore in the classroom and learn about the variation in tidal range caused by tide and slope angle of the shore.

### Objectives

- Students will explore some of the causes that form intertidal zones in different areas.

### Materials

For each group of students:

1 bin half filled with water

1 bucket of pre-measured water (1 gallon)

2 pieces of cardboard

1 ruler

1 pencil (2B or darker) or permanent marker

Draw the Tides worksheet (1/student)

### Making Connections

This lesson is a continuation of "What is the Rocky Shore" lesson. Students get a closer look on the physical environment of the shoreline through a hands-on activity.

### Teacher Prep for Activity

Prepare materials (see material list)

### Background

The tides are a result of the rising and falling of ocean surfaces due to the tidal force of the moon. Tides result in daily changes in water levels. The intertidal zone is the area along the shoreline, which is exposed at low tide and submerged during high tide. Ecologically, the intertidal zone is a diverse community where organisms are divided by the vertical zonation of the tidal zones. The **spray zone** is never submerged and only receives ocean water due to the splash from crashing waves. The **high tide zone** is only submerged briefly during the highest tides. The **middle tide zone** is regularly both exposed and submerged by the tide. The **low tide zone** is mostly submerged and only exposed to the air during the lowest tides. The distribution of diverse rocky intertidal organisms is dictated by zonation, as only certain organisms are adapted to live in each zone. Typical intertidal organisms in Hawai'i include crustaceans, mollusks, and enchinoderms.



## Procedure

1. Briefly go over vocabulary on the intertidal environment by introducing the new vocabulary. Write words on the ongoing Rocky Shores Vocabulary list.
2. Divide students into groups. Each group of students is presented with a bin of water (half filled), two pieces of cardboard that will be inserted into the water, and a small bucket of water to add to the bin. ALTERNATIVE: Demonstrate the experiment in front of the class. This is easier and requires less moving of bins of water, but students will not get the opportunity to conduct the experiment themselves. the two markings using a ruler. This is the size of the intertidal zone between low and high tides.
3. First, insert the cardboard into the water at a steep angle ( $> 60^\circ$ ) and mark where the surface of water meets the cardboard. Without taking out the cardboard, add the previous measured water to the bin. Mark where the surface of water meets the cardboard again.
4. Take out the cardboard from the bin. Measure the distance between the two markings using a ruler. This is the size of the intertidal zone between low and high tides.
5. Repeat the procedures again (remember to start from low tide again by pouring out the pre-measured water from the bin). This time, insert a new cardboard into the water in a low angle ( $< 45^\circ$ ). Compare the sizes of the intertidal zones. Ask the class if the steep slope has a larger or smaller tidal zone than the flatter slope.
6. Discuss the differences with the class. Can students give an example of a shoreline with steep angle on the island? And beach with a gentle slope on the island?
7. Review the vocabulary and reinforce the concept of different types of intertidal zones using this activity. Have students imagine the size of each intertidal zone fluctuating with the slope angle of the shore (and also with tides).
8. Pass out the Draw the Tides worksheet and allow students 10-15 minutes to complete the drawings of the tides from the class experiment and answer questions. Encourage students to work together and compare answers, as collaborating scientists do! As the worksheet says, assign the research question on what force causes the tides. Be sure to ask the students what they found out the next day. (ANSWER: Gravitational force of the moon).

## Assessments

Tidal zone demonstration completed

Presentation of tidal zone adaptation worksheet and completion of the Draw the Tides worksheet.

## Resources

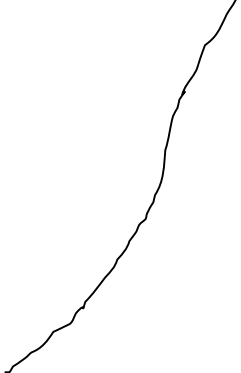
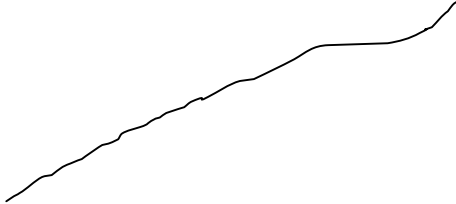
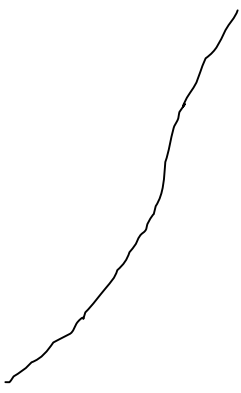
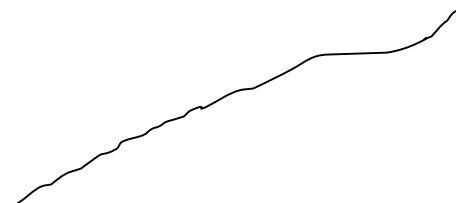
MARE Rocky Seashores



# Intertidal zone worksheet

Student name \_\_\_\_\_

Please draw where the water hits the land using a blue crayon.

Steep slope (CLIFFS)	Flat slope (BEACH)
<p data-bbox="240 625 453 695">High tide</p> 	<p data-bbox="813 625 1026 695">High tide</p> 
<p data-bbox="215 1031 428 1100">Low tide</p> 	<p data-bbox="837 1031 1050 1100">Low tide</p> 

Measure the distance between the high tide and low tide. Use a ruler!

The distance of the steep slope is \_\_\_\_\_ centimeters.



# **Intertidal zone worksheet**

**Student name** \_\_\_\_\_

**The distance of the flatter slope is  
\_\_\_\_\_centimeters.**

**Which slope has a bigger tidal zone?**

## **HOMEWORK:**

**Check out a book on the intertidal zone at the library or find information on the internet.**

**What forces effect the size of the tidal zones?**