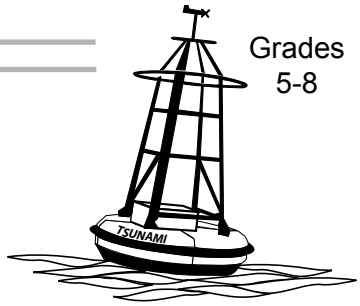
Sweet Tsunami Soil

Grades 5-8



Overview:

Students learn one way in which scientists determine the extent of an area that has been inundated by a tsunami: examining soil stratification.

Targeted Alaska Grade Level Expectations:

Science

[5-8] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

[6] SD2.3 The student demonstrates an understanding of the forces that shape Earth by describing how the surface can change rapidly as a result of geological activities (i.e., earthquakes, tsunamis, volcanoes, floods, landslide, avalanches)

[5] SD1.1 The student demonstrates an understanding of geochemical cycles by observing a model of the rock cycle showing that smaller rocks come from the breaking and weathering of larger rocks and that smaller rocks (e.g. sediments and sands) may combine with plant materials to form soils.

Objectives:

The student will:

- draw a cross-section of “soil;” and
- determine tsunami inundation by soil stratification.

Materials:

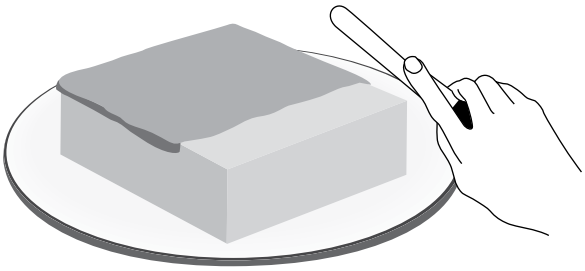
- 9” x 9” aluminum pan
- Chocolate (or other dark color) ready-made cake to fit in aluminum pan
- 1 container white frosting
- 1 bag Oreo cookies
- 1 Ziploc bag
- Knife, for cutting cake
- Small plates (1 per student)
- Materials for a chart to post in the classroom
- VISUAL AID 1: “Tsunami Inundation Deposits”
- VISUAL AID 2: “Soil Formation”
- STUDENT WORKSHEET: “Sweet Tsunami Soil”

Science Basics:

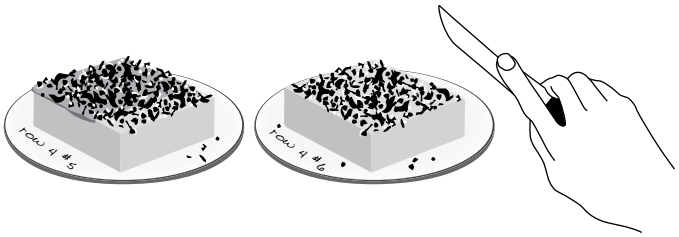
Tsunami inundation is the distance from the shoreline to the limit of the area flooded by the tsunami. Tsunamis carry ocean water and soil from the ocean bottom, depositing them on land when they inundate the shore. Scientists can use the information from tsunami deposited soils to determine the path of a tsunami and how far inland a tsunami has traveled. By taking core samples of soil, they can determine how long ago a tsunami struck a particular location. Tsunami inundation can also be determined from soil samples with specific characteristics, such as silt, often found at the bottom of bodies of water.

Activity Preparation:

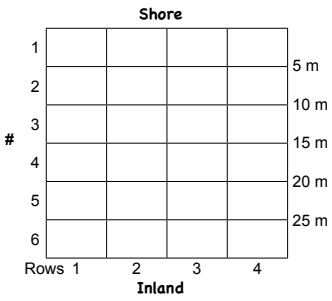
1. Slice the ready-made cake to fit into the 9” x 9” aluminum pan. The cake top should be relatively flat.
2. Spread the frosting over the cake, leaving about ¼ of the cake uncovered.



3. Place the Oreo cookies in the Ziploc bag and crush into crumbs. Sprinkle the crumbs evenly across the whole cake.
4. Slice the cake into four long rows, so that each piece includes a section of the cake with no frosting.
5. Slice the cake into columns, so that there are enough pieces for each student to have one.
6. Label the plates with the group number (1-4) and the number of the piece in the row.



7. Assume that the edge of the cake with frosting on it is the shoreline and the opposite edge is inland. Make a chart to post in the classroom that shows how far each piece (cross-section) is from the shore. Assume 5 meters per piece.



Activity Procedure:

1. Remind students that some of the ways that scientists determine the extent of tsunami inundation are eyewitness accounts, observations of damage to property and the environment, and testing soil salinity.
2. Another way scientists look for evidence of tsunami inundation is by examining soil stratification and sedimentary deposits. Show VISUAL AID 1: “Tsunami Inundation Deposits.” A tsunami carries with it sediment from other parts of the ocean. When it reaches shore, it deposits some of that sediment. Immediately after a tsunami, there is a great deal of mud and silt on the surface of the ground. As time goes on, that mud becomes covered with other soil, as well as plants such as grass.
3. Scientists can take core samples of the soil and examine the layers to determine if, and possibly when, a tsunami occurred.
4. Explain that normally soil forms over a long period of time. Show VISUAL AID 2: “Soil Formation.” Soil is formed from the weathering of rocks and minerals. Surface rocks break down from physical factors like deformation by heat and cold, assault by wind, rain, hail and ice, and the forces of water expanding into ice. The small fragments of rock can form new minerals, depending on temperature and rainfall. These minerals determine what kind of soil will form. The decay of plant and animal material changes the soil, making it thick and rich with nutrients.
5. When a tsunami occurs, it brings sediment from the ocean. Over time, new soil builds up over the tsunami-deposited sediment from the weathering of rocks and minerals.
6. Show students the cake. Explain that the cake represents the layers of soil several years after a tsunami and that the class will determine the areas of tsunami inundation based on the cross-section of “soil” layers.

7. Remove the slices of cake from the pan, one row at a time, placing them on the corresponding plates. Display a cross-section of cake and explain that the cake layer at the bottom represents the soil that existed before the tsunami; the white frosting represents the sediment carried onto land by the tsunami; and the Oreo crumbs represent the soil that developed since the tsunami occurred.
8. Divide students into four groups. Hand out the STUDENT WORKSHEET: "Sweet Tsunami Soil."
9. Provide each student with a piece of cake so that each group has one row of cake pieces. Instruct students to complete their worksheets using the distance chart created during the Activity Preparation above.
10. Ask students to share their results with the class. Was each group's inundation result the same distance? Would this occur in a real tsunami event? Discuss why or why not.

Critical Thinking:

Concept Mapping Method: A concept map illustrates connections between terms or concepts. Guide students to construct concept maps by writing words related to the day's activity and then drawing lines to connect the terms or concepts that share a relationship. Some concept maps may indicate multiple connections (for example a concept map of the carbon cycle). Concept maps help students to determine relationships and organize information.

Extension Idea:

Explore soil in more detail by taking soil samples from various locations in the community and comparing them.

Answers:

1-5. Answers will vary.
6. To determine tsunami inundation.
7. Observation of damage to the environment and property, eyewitness accounts, testing soil salinity, etc.

Name:_____

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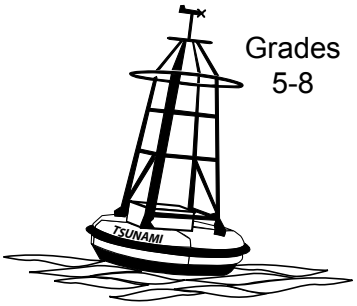

Student Worksheet

"Sweet Tsunami Soil" (page 1 of 3)

Directions: In the boxes below, draw the cross section of soil layers for your piece of cake and each cross-section given to your group. Depending on your group size you may not need to fill in all the boxes. If you need additional boxes, you may make them on a blank sheet of paper.

1. For each box, list the number of the cross-section (provided on the plate), and the distance the cross-section was taken from the shoreline (provided by the teacher).

#_____ _____meters

#_____ _____meters

#_____ _____meters

#_____ _____meters

Name:_____

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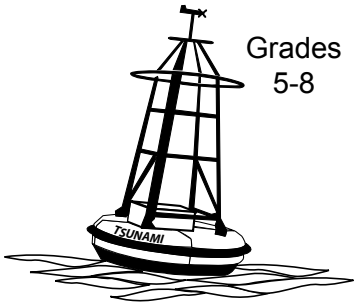

Student Worksheet

"Sweet Tsunami Soil" (page 2 of 3)

#_____ _____meters

#_____ _____meters

2. Circle the box that represents soil with no tsunami inundation.

3. Did the tsunami inundate an area that included your cross-section? _____

4. How far onshore did the inundation by the tsunami extend? _____meters

5. What evidence led to your conclusion?

_____

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_____

6. What is the purpose of studying soil several years after a tsunami?

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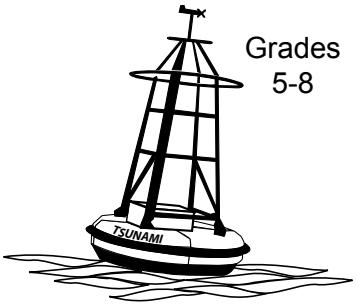
Name:_____

Grades 5-8



Student Worksheet

“Sweet Tsunami Soil” (page 3 of 3)

7. What other ways do scientist use to study tsunami inundation?

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