

LESSON 3

Beach In a Box

KEY CONCEPTS

Beaches are the result of natural processes acting upon rocks and other materials.

OBJECTIVES

Students will observe the variety of materials comprising a sediment sample.

Students will classify and group the different materials in a sediment sample.

Students will make inferences regarding the origin of the materials in the sediment sample.

PROCESS SKILLS

observing

classifying

inferring

KIT MATERIALS

- * 8 individually packaged Puget Sound sediment samples
- 8 paper plates
- 8 plastic teaspoons
- 32 hand lenses
- 32 probes
- a sample of basalt
- a small dropper bottle of vinegar
- a set of Puget Sound Habitat charts with accompanying teacher guide

- * **NOTE:** This lesson is written to be used with sediment samples taken from a mixed coarse beach with granitic rocks, a beach commonly found in Puget Sound.

NON KIT MATERIALS

overhead projector

VOCABULARY

beach - the materials on a shore of a body of water and which are transported by moving water either along the shore or off and on the shore

habitat - the area where a plant or animal normally lives and is usually characterized by a dominant plant or set of physical characteristics

mineral - a naturally formed substance that has a well-defined chemical composition and a characteristic atomic structure generally expressed in definite physical properties

rock - a solid mass of mineral matter formed naturally

sedimentary rock - rock formed of other rock fragments, mechanical, chemicals, or organic sediments

sediments - particles or aggregates of particles that are derived from the erosion of rock or from the eruptions of volcanoes

igneous rock - rock formed by the solidification of magma (molten rock material within the earth)

PROCEDURE

LESSON 3

HELPFUL HINTS

1. Begin by asking students to recall visits they have made to Puget Sound beach habitats. Ask several students to share descriptions of the beach habitats they have visited.
2. Divide students into working groups of four individuals. Explain to students that they will receive a sample collected from the top 2"-3" of a beach on Puget Sound.
3. Distribute a sample and a paper plate to each group. Instruct students to dump the sample onto the paper plate.
4. Distribute a hand lens to each student. Encourage students to examine the sample very closely and record observations.

QUESTION "What do your observations of this sediment tell you about the beach from which it was collected?"

ANSWER *Encourage supporting observations (using all the senses) for inferences drawn.*

5. Distribute a kitchen strainer and a plastic teaspoon to each group. Distribute an index card to each student. Have one student in the group use a kitchen strainer to separate a sand sample from the larger chunks of sediment. Each person in the team should receive one teaspoon of the sand sample on their index card. Encourage students to examine the sand carefully with a hand lens.

QUESTION "What do you see in the sand?"

ANSWER *Students will probably discuss the variety of colors and shapes of the individual sand grains. They may also see small pieces of shell in the sand sample.*

QUESTION "Why do you think the grains of sand are so different?"

ANSWER Most of the individual grains of sand are pieces of larger rocks that have, through water action and movement been broken into very tiny rocks or into the individual minerals that make up a rock. Some grains may be broken pieces of shell or other material from animals (such as pieces of a crab shell).

1. Encourage students to include descriptions of the physical characteristics as well as descriptions of the plants and animals present.
4. Students are using observations to draw inferences. Students may need help understanding the difference between an observation and an inference.

Observing involves using one or more of the senses in a personal perception.

Example: I observe white, chalky, irregular shaped chunks in the sediment.

Inferring involves suggesting explanations, reasons, or causes for events which have occurred. Inferences are drawn from observations.

Example: The beach that this sample came from must be inhabited by some kind of shellfish with shells (like clams).

PROCEDURE

LESSON 3

HELPFUL HINTS

6. Have students examine some of the rocks in the beach sample, looking for some of the same minerals that make up the sand grains.
7. Focus students on their individual sand sample. Explain that the mountains around Puget Sound are primarily granitic. Distribute a granitic rock to each two students. Review that the granite rocks found on a beach may have come from the mountains and been carried to the Sound by a river. The granite rocks may have also come from a cliff eroded into the Sound.

8. Distribute a probe to each student and challenge them to use the probe with a hand lens to begin sorting the individual grains of sand into like piles. Allow 3-5 minutes for sorting and discuss observations.

QUESTION "Did you find small piles of minerals (like quartz) that are present in the larger rocks in the sample?"

ANSWER *More than likely students will have a significant pile of quartz and other individual minerals that are present in the rocks in the sample.*

9. Demonstrate how to test the grains of sand with a magnet.

QUESTION "What can be inferred if some of the grains of sand are attracted to a magnet?"

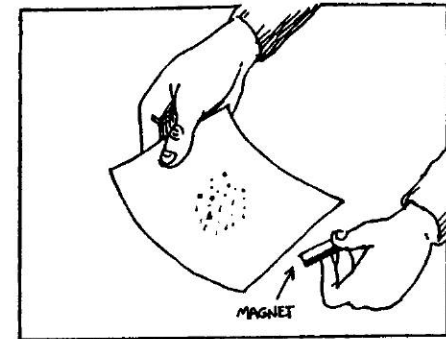
ANSWER *The grains of sand attracted to a magnet are probably tiny pieces of magnetite.*

10. Distribute the magnets (one to each two students) and have them test their sand samples for the presence of magnetite.

7. **GRANITE** is an igneous rock formed by the solidification of magma (molten rock material within the earth). Granite has a visibly crystalline texture formed essentially of **QUARTZ** (a mineral that occurs in colorless and transparent or colored hexagonal crystals).

BASALT is another igneous rock that is likely to be abundant in the sample. Basalt is the most common of the dark, heavy volcanic rocks. Its texture is so fine that these individual minerals are rarely seen.

9.



NOTE: Place the magnet under the paper to attract and move the grains of sand that are magnetic.

MAGNETITE - a black mineral that is an oxide of iron; ores of magnetite have the property of attraction.

PROCEDURE

LESSON 3

HELPFUL HINTS

11. Have a student from each group bend a paper plate or sheet of paper into a funnel shape. The funnel will be used to return the student samples to the original container. Instruct each student to pour their individual sand sample into the original container holding their group's beach sample.

QUESTION "Where do you think the material comes from that makes up a beach?"

ANSWER *Discuss students' ideas. See Helpful Hints for a list of sources.*

12. Emphasize moving water as the greatest source of energy for the movement of materials that make up a beach. Energy for transporting materials comes from:
1. the rivers and streams flowing off the land into the Sound, or
 2. waves and currents moving the water in the Sound.

Explain that in the next lesson students will investigate one cause of currents (moving water) in the Sound: rivers entering the Sound.

ADDITIONAL ACTIVITY - Habitat Charts

Students may be interested in the classification of beach habitats in the Sound. The type of beach sediment determines the dominant plants and animals in a beach habitat. For example, a sea urchin will not typically be found in a sand or mud habitat. It must have rocks to cling to with its tubefeet. The mud would clog its gills and it would not be able to breathe.

11. The sources of natural materials found on a beach are:

1. erosion and transport of materials from:
 - a. cliffs on the shoreline of the Sound. Many Puget Sound cliffs in the central and southern regions of the Sound are sedimentary deposits of mud and sand with rocks embedded in these deposits. These cliffs become eroded by high tides, coastal currents, and water running off the land.
 - b. mountains (brought to the Sound by rivers and streams)
2. biological - the shells, shell fragments, and other parts of animals. To confirm if small white pieces are shell fragments, place a drop of vinegar on the fragments. If they fizz, they are calcium carbonate shells dissolving in the weak acetic acid found in vinegar.

Other processes which may contribute to the formation of the coastline include: glaciation, plate tectonics, earthquakes, and volcanic activity.

NOTE: The sample of sediment included in the kit represents sediment from a mixed coarse beach.

A set of Puget Sound Beach Habitat charts have been included in the kit for display. The teacher guide accompanying the charts may be helpful in classifying beach habitats.