

Sand Systematics

Teacher's Guide

Subject: Integrated Science (Life; Earth-Space; Physical)

Topic(s): Wind Erosion, Deposition, Abiotic Factors

Summary: Students will conduct surveys at specific intervals along a transect line from the dune to the water's edge investigating sand distribution, origin, shoreline erosion (with reference to sand grain size), source (abiogenic vs. biogenic), etc. Students will also observe possible evidence of flora and fauna.

Objective(s): After completing the field lab, students will be able to:

1. Identify and compare sand grain types and sizes from the sample areas
2. Infer the rate of erosion of the beach studied and erosion factors

Ecosystem(s): Beaches/Dunes

Equipment:

- Equipment Buckets
- Field Microscopes
- Measuring Cups
- Nested Sieves
- Plastic Petri Dishes
- Sand Charts: Color, Composition, and Shape
- Clip Boards/Data Sheets
- Transect Tape

Background:

- Vocabulary: Refer to the *Beach Vocabulary Words* sheet
- Reference Material: *The Beach is Moving* (Sapelo NERR), <http://earthguide.ucsd.edu/earthguide/diagrams/coasts/beachprofile.html>, *HBSP Beach Profile Preparation* sheet and questions, profile graphs, and selected readings
- Post activity: "Have students form teams: developers, home-owners, and environmentalists, and conduct a debate on issues".
- Equipment Training: In-class demonstrations, *Equipment Match-up* sheet

Procedure (Engage; Explore; Explain)

1. Engage the students by asking a specific question that gets to the heart of the activity: **What happens to sand on a beach during a hurricane? How is sand created? Is sand the same throughout the world?**
2. Use the students' answers to ascertain what they already know, clarify any misconceptions, and then ask them to formulate their own hypothesis relating to their own expectations of the outcome of the lab.
3. Explain that a transect line has been set out perpendicular to the beach running from the dune to the water's edge. Students will collect and study sand samples every 3 meters along the transect line (running south to north).
4. Students will also observe and record any evidence of flora and fauna that may reside in the beach zone they're sampling from.

5. Collecting the sand:
 - a. Fill the measuring cup to the 2 cup mark with sand from the right side (if facing the ocean) of the transect tape at the selected intervals indicated on the data sheets.
 - b. Students should take the cup of sand and dump it into the nested sieve. Students should shake the sieve up and down, and then side to side for 30 seconds.
 - c. Next students will examine how many levels the sand passes through-larger grains will get stuck in the upper two levels while fine/smaller grains will pass through to the bottom two levels. **Upon first inspection, it may appear that the sand grains are all the same size from the various areas of the beach; however upon closer examination one will notice there are in fact different grain sizes.**
 - d. Next take a pinch of sand (from the sieve level that caught the most grains) and place into a petri dish under the field microscope to examine the average sand grain color, composition, (abiogenic vs. biogenic) and shape. Students should use the sand reference charts, and record all their observations and data.
4. After completing the lab, allow the students to answer the discussion questions as a group and explain their answers relating them to the concepts, processes and skills associated with the activity. Students should record their answers individually. At this time, facilitators can introduce/explain the specific concepts and explanations in a formal manner.

Sunshine State Standards:

Science: SC.C.1.3.2.7.2, SC.F.1.3.1.7.1, SC.H.1.3.1.7.1

Language Arts: LA.C.1.3.1.7.1, LA.C.1.3.4.7.4

Mathematics: MA.A.1.3.4, MA.B.1.3.1, MA.B.1.3.4, MA.B.2.3.1, MA.B.3.3.1, MA.B.4.3.1, MA.B.4.3.2, MA.C.1.3.1, MA.C.3.3.1, MA.C.3.3.2, MA.D.1.3.1, MA.D.1.3.2, MA.E.1.3.1, MA.E.1.3.3, MA.E.3.3.1

Social Studies: NATIONAL GEOGRAPHY STANDARD: #8

Climate Literacy: 5-a

Ocean Literacy: 2-c

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Student Data Sheet

General Information

Full Name:		Date:	
School (teacher):		Time:	
Latitude:		Longitude:	

Student Hypothesis and Rationale

If sand movement is influenced by abiotic factors then I will find (choose one: larger/smaller) particles of sand on the transect line closer to the dunes because _____

_____.

Field Observations/Measurements/Data

Sample Location	0 Feet	6 meters	9 meters
Size (Of the 4 sieve levels- which held the most from your sample?)			
Color (Refer to Sand Color Chart)			
Composition (More abiogenic or biogenic-Refer to Sand Composition Chart)			
Shape (Rounded or very angular? Refer to Sand Shape Chart)			
Evidence of flora or fauna (Sketch & label)			
Evidence of humans (Debris, etc.)			

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Assessment

1. Which sand size was observed most frequently in your group's data?

2. Which location had the highest quantity of coarse sand (0.5-1.0 mm) sand grain particles? What are some possible reasons why?

3. Was your hypothesis supported by your data? Whether your hypothesis is supported or not, what can you infer from your observations, measurements, and results?

4. How might sand grains differ from Florida to Hawaii? (Think about where sand comes from!)

5. Humans can have an effect on sand distribution and shoreline stability. What are some ways that people have changed these natural processes?

6. If all vegetation in the dune area was removed, how would this affect the formation/stabilization of the sand dunes? (Think about the dominant sand grain size you saw in this area.)
