

Sand Systematics

Teacher's Guide

Subject: Integrated Science (Earth-Space; Physical)

Topic: Sand Systematics

Summary: Students will examine sand color, grain size, shape, at multiple locations on the beach. This information will be used to help students identify the source of the sand, the wave energy at the beach and the physical processes that remove or deposit sand.

After completing the field lab, students will be able to:

- Objective(s):**
1. Characterize sand based on color, grain size, and shape
 2. Describe physical forces that remove or deposit sand
 3. Relate how the non-living factors affecting sand impact the presence of vegetation

Ecosystem(s): Beaches; Barrier Island

Equipment:

- Sand Sieves Sets
- Field Microscope
- 30 meter tape measure
- Plastic Petri dishes
- Sand Color Charts
- Sand Composition Charts
- Sand Shape Charts
- GPS Units
- Equipment buckets or containers

Background:

- Vocabulary: Erosion, Biogenic, Abiogenic, origin, composition
- Reference Material: [List useful references/materials]
- Equipment Training: Field Microscopes, GPS Units

Procedure (Engage; Explore; Explain)

1. Engage the students by asking a specific question that gets to the heart of the activity: "Is the sand on all beaches the same". 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.
2. 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 5 meters along the transect line (running west to east). Students will also observe any evidence of flora and fauna that may reside in the beach zone they're sampling from.
3. 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. 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. 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.
4. 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. 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.
5. Students should record data and answer assessment questions.
6. 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.A.1.3.1; SC.D.1.3.1, 5; SC.D.2.3.1; SC.H.1.3.4-7 **Language Arts:** LA.A.1.3.3; LA.C.1.3.1,4

Mathematics: MA.A.1.3.1; MA.B.2.3.1; MA.B.3.3.1 MA.C.1.3.1; MA.C.3.3.1; MA.E.3.3.1,2

Social Studies: SS.A.6.3.2; SS.B.2.3.9

Sand Systematics

Student Data Sheet

General Information

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

Student Hypothesis and Rationale

If waves can move larger grains of sand than wind can, we will find (choose one: larger or smaller) grains of sand near the water because _____

Field Observations/Measurements/Data

	Location 1	Location 2	Location 3	Location 4
Distance from water (meters)				
Grain Size (% in each category see Reference Chart)	Gravel: Fine gravel: Coarse sand: Fine sand: Silt & clay:	Gravel: Fine gravel: Coarse sand: Fine sand: Silt & clay:	Gravel: Fine gravel: Coarse sand: Fine sand: Silt & clay:	Gravel: Fine gravel: Coarse sand: Fine sand: Silt & clay:
Color (see Reference Chart)				
Composition (biogenic or abiogenic; see Reference Chart)				
Shape (rounded or very angular See Reference Chart)				
Evidence of plants or animals (sketch and label)				
Evidence of humans (debris)				

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Assessment

1. At the location farthest from the water (up the beach), what was the dominant (highest percent) sand size?
At the location closest to the water, what was the dominant sand size?

Farthest from water:

Closest to water:

2. How much more large grain sand was found at the site up the beach compared to the site closest to the water?

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

4. How might the sand be different on the other side of the island facing the mainland?

5. Describe some of the ways in which people impact the composition of the sand on the beach?

Portfolio Journal Prompt

Many people are attracted to Florida's beaches. Based on your experience, describe what you think the biggest attraction of the beach is for residents and visitors to Florida. If this field experience was your first visit to the beach, describe if the beach was what you expected it would be or if it was different than what you expected.

Sand Color, Shape and Size

Reference Chart

Color



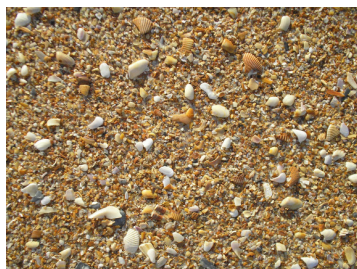
Mostly Gray



50% Orange and 50% Gray



75% Orange and 25% Gray



Mostly Orange

Shape



very angular



sub-angular

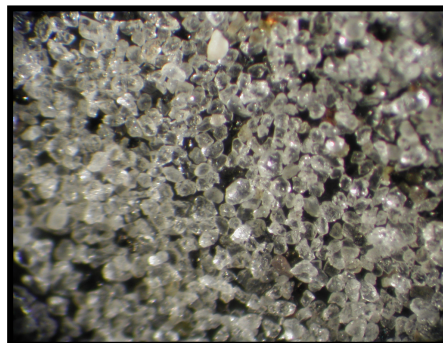


sub-rounded



well rounded

Origin



Abiogenic



Biogenic

Size

1st sieve = #5 mesh = gravel

2nd sieve = #10 mesh = fine gravel



Various Colors and Large Shell Fragments

3rd sieve = #60 mesh = coarse sand

4th sieve = #230 mesh = fine sand

Bottom pan = Silt and clay