

Water Action

Teacher's Guide

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

Topic: Longshore Drift

Summary:

Students will observe and measure various properties of ocean waves (wave type, direction of approach, frequency, and height) and investigate what impact these forces have on the physical/nonliving environment. Students will also measure the speed and direction of the longshore drift thus observing a long term process that helps to shape the local beaches

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

Objective(s):

1. Measure the rate of longshore drift
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): Coastal Areas, Beaches, Dunes

Equipment:

- | | | |
|--|--------------------------------|---|
| • Sea State charts | • Stopwatches | • Transect Tapes (to measure longshore drift) |
| • Breaker ID Charts | • 3 Oranges (longshore drift) | • Data Sheets/Clipboards |
| • Wooden Stakes | • GPS Units (tide stage) | |
| • Compasses | • Environmental Quality Meters | |
| • Measuring Rods (measure wave height) | | |

Background: (Pre-field Classroom Activity)

- Vocabulary: Waves, Shoreline, Longshore current, rip current,
- Reference Material: Earthguide diagrams: Beach Profile and Nearshore Circulation
<http://earthguide.ucsd.edu/earthguide/diagrams/coasts/nearshorecirc.html>
- Equipment Training: GPS units

Field Lab Procedure:

1. Engage the students by asking a specific question that gets to the heart of the activity: Ask students to speculate about how waves are formed. What happens when waves reach the shoreline? Are there different types of waves?
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. For this station, groups will walk near the water's edge just off the east end of their transect tapes. Students use Sea State Charts to analyze weather conditions and GPS units to determine the tide.
4. Record all observed data.
5. Drift Measurements:
 - a. First mark the starting point with a wooden stake.
 - b. Measure the speed and direction of longshore drift- Place an orange in the water and observe which direction it moves, and how far it travels in one minute.
 - c. Repeat this activity three times to get your drift rate average.
 - d. Measure the distance traveled by each orange in **meters** using the transect tape. (If ball washes ashore during trial, toss back in the water approximately where it was last floating). Take the average of the measurements to get your speed.
 - e. Take compass heading according to the direction the orange traveled.

6. Wave and Condition Measurements: Breaker charts are used to identify the type of wave breaking.
 - a. Students will figure wave frequency using a stopwatch and a measuring stick that has been stabilized into the beach sand by GTM staff.
 - b. Line up the top of the measuring stick, using your eyes, with the crest of waves breaking just offshore.
 - c. Count the number of wave crests that pass the top of the stick in one minute.
 - d. Students will repeat this activity for three minutes so they can figure the average wave frequency.
7. 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.

Science: SC.A.2.3.1; SC.B.1.3.6; SC.B.2.3.1; SC.C.1.3.1, SC.D.1.3.1,3,5; SC.H.1.3.4-7; SC.H.2.3.1

Language Arts: LA.A.1.3.3; LA.C.1.3.1,4 LA.C.1.3.1.7.1, LA.C.1.3.4.7.4

Mathematics: MA.A.1.3.4, MA.A.3.3.1, MA.A.3.3.2, MA.A.3.3.3, MA.B.1.3.2, MA.B.3.3.1, MA.B.4.3.1, MA.B.4.3.2, MA.D.1.3.1, MA.D.1.3.2, MA.D.2.3.1, MA.E.1.3.1, MA.E.1.3.2, MA.E.1.3.3, MA.E.3.3.1

Social Studies: SS.A.6.3.2, NATIONAL GEOGRAPHY STANDARDS: #4 & #7

Longshore Drift (Water Action)**Data Sheet****General Information**

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

Observations/Measurements:

Wind Direction: _____

Wind Speed: _____

Group	Measurements (in correct units)	Recordings
Sea State	Use sea-state chart to identify offshore conditions	
	Weather Conditions: (stormy, calm, sunny, windy)	
	Tide Status (Tide status; using celestial menu from GPS-rising or falling, etc.)	
Drift Measurements	Wave Direction: (coming from an angle or straight toward shore?)	
	Rate of longshore drift (average distance the oranges traveled in three minutes) *Average calculated back in class.	Trial # 1: Trial # 2: Trial # 3: Average: Drift Rate = Distance ÷ Time
	Direction of longshore drift (Compass heading)	
Wave Measurements	Wave type (Spilling, plunging, surging)	
	Wave Frequency * Average calculated back in class.	Trial # 1: Trial # 2: Trial # 3: Average: Frequency = # waves per minute

Longshore Drift (Water Action)

Assessment

Name: _____ Date: _____ School: _____

1. What direction was the longshore drift? Did all three oranges travel the same distance?

2. Using your three minute average speed, calculate how far the orange would travel in 5 hours (300 minutes):

3. If wave size is **dependent** on the distance wind can travel over the water, which coastline is likely to have larger waves most of the time, the east **or** west coast of Florida? Why? How could you test this hypothesis?

4. If a tsunami wave were to hit the coast of California, how might this affect their coastline differently than a Florida coastline?

5. Why do you think waves break in certain areas? (Ask any surfers in the class if you need help with this one!)

Portfolio Journal Prompt

Many people are attracted to Florida's beaches. Before you begin writing think about your favorite features of the beach. Think about the attractions the beach has for other residence and visitors to Florida. Describe what you think is the biggest attraction of the beach.