

LONGSHORE CURRENT

OVERVIEW During this activity, student experiment with a method to measure the speed of the **longshore current** at Sandy Hook.

OBJECTIVES Following completion of this lesson, the students will be able to:

- Determine the speed of the longshore current at Sandy Hook.
- Understand how this current is formed and its affect on sand migration and shoreline change.

GRADE LEVELS 5th -12th grades

NJCC

STANDARDS

New Jersey Science Indicators:

5.1: End of Grade 4: A1, A2, B1, B2; **5.3:** End of Grade 4: A1, B2, D1; End of Grade 8: A3; **5.4:** End of Grade 4: B1; **5.5:** End of Grade 2: A1, A2, B1; End of Grade 4: A1, A3, B1; End of Grade 6: C1; End of Grade 8: B2; **5.7:** End of Grade 2: A2; End of Grade 4: A1, A2; End of Grade 6: A1, A2; **5.8:** End of Grade 2: A3, B1; End of Grade 4: A1, C1, C2; End of Grade 6: B1; **5.10:** End of Grade 2: A1; End of Grade 4: A1, B1; End of Grade 6: B1;

New Jersey Indicators:

4.1: 2A1, 2A3, 4A1, 4A4, 4B3, 6A1, 6A6, 6B1, 6B6, 6C3, 8A2, 8A5; **4.2:** 2A2, 2D1, 2D2, 2D3, 2E1, 4D4, 4D5, 6E4, 8E1, 8E2, 8E3, 8E4, 8E5, 12A4; **4.3:** C3, C4, 2A1, 2A3, 4A1, 4A3, 12C1; **4.4:** 2A1, 2C1, 4A1, 4C1, 6A1, 6A2, 12A5; **4.5A:** 2, 3, 4, 5; 4.5B: 1, 2, 4; 4.5C: 1, 2, 3, 4, 6; **4.5D:** 2, 3, 5; **4.5E:** 1, 2; **4.5F:** 1, 4.

MATERIALS

- Tape measure to measure off 10 meters.
- At least one orange or piece of driftwood.
- A stopwatch or a wristwatch with a second hand.

PROCEDURES

Measure and mark off a 10-meter long line parallel to the ocean. Post one student each at the beginning and end of the line and instruct them to look straight ahead towards the water. Supply the student at the beginning of the line with a stopwatch or a wristwatch with a second hand. Go to the water's edge slightly south of the line and toss an orange or piece of driftwood into the breakers just behind the white foam at the top of the wave. When the orange passes the start line (or south end) the student there should start timing.

The students at the north end should signal the timekeeper as soon as the orange passes his or her post. The time is then recorded and using the worksheet included in this lesson plan, a calculation is done by taking the time elapsed and dividing it by the distance (10 meters). This gives the speed of the velocity of longshore current at Sandy Hook. It also can be converted into feet with 1 meter equaling about 3.28 feet.

BACKGROUND

Longshore currents affect shorelines by redistributing sand and sediment along their path. This redistribution is also known as **littoral drift**. The longshore current that affects Monmouth County's beaches (including Sandy Hook) starts around Manasquan and moves northward ending at the tip of the Hook.

Longshore currents form because waves are continuous and, in most cases, approach the shore at an angle. When a wave enters shallow water it is slowed by the rising sandy or rocky bottom that is rising upward making a shallow edge. This friction eventually causes breakers (the water you see toppling over at the water's edge). As one wave meets the shore and breaks, another wave is right behind it, preventing the broken wave from flowing backward. This causes a "build-up" of water at the shoreline. This "build-up" of water is then forced to form a current that flows parallel to the shore close to the water's edge. At Sandy Hook, the longshore current approaches from the south, carrying sand northward from the neighboring beaches.

VOCABULARY

Longshore Current – A current located in the surf zone and running parallel to the shore as a result of waves breaking at an angle on the shore. Can also be called littoral current.

Littoral Drift – The movement of sediment by the longshore current.

EXTENSIONS

In the classroom, take a flat-bottomed, rectangular tray (a kitty litter pan works well) and place sand inside it to build a beach. Place this beach halfway along the long side of the tray. Have students draw a picture of the original beach and measure it. Tell students you will be adding water (just enough to dampen the edges of your beach) to the model and then moving the tray to create wave action that simulates the longshore current (waves hitting the edge of beach at a slight angle). Prior to wave action, ask students to make predictions about what will happen. After predictions have been recorded, start wave action and observe changes. Re-measure your beach. Next add a brick or pile of rocks to stimulate a groin or seawall. Repeat this procedure, recording predictions and results of the wave action on the beach.

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The Education Program at the New Jersey Sea Grant Consortium

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CALCULATING THE SPEED OF THE LONGSHORE OR LITTORAL CURRENT

You can determine the speed of the longshore current by conducting the following simple group experiment. You will need a meter stick (or other measuring device) an orange or two, a watch with a second hand and a group of students. Use the other side of this worksheet to enter and calculate your data.

Procedure:

1. Measure off and draw a ten-meter line in the sand parallel to the ocean.
2. Position one student at each end of the line you have drawn. Position everyone else along the line. One student should assume the role of timekeeper and have a watch with a second hand.
3. Throw an orange (or a piece of driftwood) into the water, just behind the line of breakers, approximately 2 meters SOUTH of the beginning of your line. Note: The longshore current is closer to the shore than you might expect! All students should watch the orange as it moves.
4. When the orange passes the beginning of the line the timekeeper should start timing.
5. When the orange passes the person stationed at the end of the line, he or she should tell the timekeeper to stop timing. Record time on worksheet
6. If time permits, repeat this process again so you can calculate the average of the two (or three) trials.
7. Use the chart on the below to record results and observations. Using the formulas given, calculate the speed of the longshore current for both trials, and then calculate the average of the longshore current today.
8. This procedure is NOT foolproof. If your orange does not move north after a few minutes, try again. If you cannot get this to work at all, it may be due to weather conditions. Make observations of the factors that might cause this experiment to not work and record them on the bottom of this worksheet.



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SCHOOL: _____

TODAY'S DATE: ___/___/___ TIME OF DAY: _____ TIDAL STAGE: _____

WEATHER CONDITIONS: _____

WIND DIRECTION: _____ OBSERVATIONS: _____

	Trial 1	Trial 2	Trial 3	Average
Distance <i>(Length of Transect Line)</i>	10 Meters	10 Meters	10 Meters	
Distance of line in Feet <i>Hint: 1 meter = 3.28 Feet</i>				
Time <i>(in Seconds)</i>				
Speed of Current in Meters <i>(speed = distance/time)</i>				
Speed of Current in Feet <i>(speed = distance/time)</i>				
Direction of Current				

NOTES:

FORMULA: $SPEED = \frac{\text{Distance}}{\text{Time}}$



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