



Georgia 4-H at Camp Jekyll - Environmental Education Journal Questions

BEACH ECOLOGY

Key Words: *barrier island, erosion, accretion, long shore current, wrack, Georgia bight, waves*

1. a) Describe how dunes form.
b) Why are dunes important?
c) What holds dunes together?
2. a) Draw the shape of the Georgia bight.
b) How does the bight affect our coastline?
3. a) Which end of barrier islands tend to erode?
b) Which end of barrier islands tend to accrete?
4. What is the difference between univalve and bivalve shells?
5. Name two kinds of organisms you found on the beach.

Beach Ecology Vocabulary Defined

1. Barrier Island: an island positioned along the coast that provides a measure of protection for the mainland, as during hurricanes and from the energy of ocean winds and waves.
2. Erosion: the process by which the surface of the earth is worn away by the action of water, glaciers, winds, waves, etc.
3. Accretion: an increase by natural growth or by gradual external addition; growth in size or extent. (*Synonym: deposition*)
4. Long-shore current: a current that flows parallel to the shore within the zone of breaking waves (close to the beach); generated by the consistent angled approach of waves to the beach or coastline. The water in a longshore current flow up onto the beach at an angle and then drawn directly back into the ocean by gravity. As this water moves on and off the beach, it can “capture” and transport beach sediment back out to sea. This process, known as “longshore/littoral drift,” can cause significant beach erosion.
5. Wrack: the term for seaweed, cordgrass, driftwood, and other organic materials produced by coastal ecosystems that wash ashore on the beach (often comprised of dead *Spartina* marsh grass on Jekyll Island).
6. Georgia bight (also known as The South Atlantic Bight): a curve or recess in a coastline. The Georgia Bight extends from Cape Fear, North Carolina, to Cape Canaveral, Florida. At the center of this curve lies Georgia’s coast. Because the Georgia coast is the furthest western coastline on the Atlantic seaboard, the Georgia Bight serves as a giant funnel for water pulled by tidal action and driven by wind and waves. This creates a wedge of water resulting in six to ten-foot tidal

changes along Georgia's coast. Our coast marks the highest tidal fluctuations on the Eastern Seaboard behind the Bay of Fundy in Maine!

7. Waves: ocean waves are caused by wind moving across the surface of the water. The friction between the air molecules and the water molecules causes energy to be transferred from the wind to the water.

Beach Ecology Journal Question Answers

1. Dunes

- a. Describe how dunes form.
 - i. A dune is a mound of sand this is formed by the wind, usually along the beach or in a desert. Dunes form when wind blows sand into a sheltered area behind an obstacle. On our beach, the common obstacle is **wrack**, comprised mainly of the dead smooth cordgrass from the marsh. The wrack traps the sand and then decomposes providing nutrients for germinating windblown seeds from sea oats, railroad vine, and other coastal dune plants that stabilize and hold the loose sand in place.
- b. Why are dunes important?
 - i. Dunes are important because they provide flooding protection for inland areas from coastal water intrusion, especially here on **barrier islands**.
 - ii. Dunes absorb the impact and protect inland areas from high energy storms and act as a resilient barrier to the destructive forces of wind and waves.
 - iii. Dunes are a habitat which provides resources (like food, water, and shelter) for many island animals, including white-tailed deer, diamondback rattlesnakes, nesting shorebirds and sea turtles, and many more.
 - iii. Dunes serve as a deposit of sand to help replenish eroded beach sand after high tidal and storm activity.
- c. What holds dunes together?
 - i. Because they are made of sand, dunes are not static but are in a constant state of change. Dune grasses such as panic grass and sea oats are vital to the building and stability of the dunes. These plants can resist salt spray and burial by the sand. When wind strikes the blades of these grasses, its velocity is slowed, and sand is dropped, adding more sand to the dune system. Sea oats and panic grass can grow upward through the sand enabling the dunes to build higher. They also have extensive root systems that can extend downward as far as 30 feet, thus helping to stabilize the dunes. These root systems have propagation rhizoids that extend horizontally, making the sea oats less dependent on seeds for new growth.
- d. Draw the shape of the **Georgia bight**.
 - i. The shape of the Georgia bight is similar to an open parenthesis “(“
- e. How does the bight affect our coastline?

- i. Large tidal changes - Because the Georgia coast is the furthest western coastline on the Atlantic seaboard, the Georgia Bight serves as a giant funnel for water pulled by tidal action and driven by wind and waves. This creates a wedge of water resulting in six to ten-foot tidal changes along Georgia's coast. Our coast marks the highest tidal fluctuations on the Eastern Seaboard behind the Bay of Fundy in Maine!
 - ii. Protection from Hurricanes - Because of the Georgia coast's extreme western position relative to states north and south on the eastern coastline on the Atlantic seaboard, Georgia is often spared from impacts from tropical storms and hurricanes which are often steered to the north and south by the jet stream.
 - iii. Low energy waves – Waves travel longer across a gentle rising seafloor as they head into the Georgia bight and thus lose more of their energy to friction with the seafloor.
- 2. Barrier Islands
 - a. Which end of barrier islands tend to erode?
 - i. Since longshore current typically runs along the Southeastern coast from North to South (driven by prevailing north easterly winds), the north end of barrier islands tends to **erode**, or lose sediment, here in Georgia.
 - ii. Which end of barrier islands tend to accrete/deposit? As the longshore current continues flowing southward, the sediment **accretes/deposits**, or gains, at the south ends of the most Georgia barrier islands (large river systems can also bring large amounts of sediment to deposit on the north end of some islands).
- 3. What is the difference between univalve (gastropod) and bivalve shells?
 - a. Both are in the phylum **Mollusca** but are in different taxonomic classes.
 - b. **Bivalves** are mollusks that have a hinged, two-part shell joined by strong muscles (bi- meaning 'two'; valve meaning 'shell'). Clams, Oysters, and Scallops are bivalve mollusks. These three animals pull their shells closed by contracting powerful muscles near the hinge. To open these shells, they must relax their muscles.
 - c. **Gastropods** are the largest group of the mollusks with examples including snails, conchs, abalones, whelks, sea slugs, and garden slugs. Gastropods are sometimes called **univalves** (uni- meaning 'one'; valve meaning 'shell') because every animal in the group has one shell (one is the maximum- some have no external shell at all!)
- 4. Name two kinds of organisms you found on the beach.
 - a. Whelk, dwarf surf clams, sand dollar/five-holed key urchin, crab molt, seagull, etc.