

**Lesson Title: Barrier Islands of Mississippi and Alabama: Sandy Shores**

**Author:** Christopher Breazeale, Senior Educator, Institute for Marine Mammal Studies, Gulfport, MS

**Grade Level:**

4<sup>th</sup> - 8<sup>th</sup> Grades

**Activity Time:**

Two, fifty-minute classes

Day 1 – Teacher will familiarize students with vocabulary and review main concepts and ideas.

Day 2 – Sandy Shores Activity

**Subject Areas:**

- Life sciences
- Physical sciences
- Earth sciences

**Objectives:**

Students will:

- Investigate the formation of the barrier islands in Mississippi.
- Compare and contrast sand samples from different beaches.
- Observe and record data.

**Vocabulary:**

Barrier Island – elongated, narrow accumulations of sediment that form along coastlines and are separated from the mainland by a combination of bays and marshes.

Briny Lagoons – a slightly salty enclosed or partially enclosed body of water often found on barrier islands.

Deposition – the process by which material is added to a landform.

Erosion – the process by which Earth is worn away and removed by wind, water, or glaciers.

Littoral Drift – the transport of sediments along a coast at an angle to the shoreline.

Pine Savannah Forests – an area of pine forest on a coastal plain with an open understory usually near a wetland and characterized by acidic soil.

Pollution – the introduction of harmful material into an environment.

Primary Dunes – the closest dunes to the water, also called foredunes. These dunes have a lower diversity of plant life due to salt spray.

Salt Marsh – a wetlands area that is constantly overflowed with salt water

Secondary Dunes – sand that has built up behind primary dunes. These dunes can be very old and are relatively stable due to a high degree of biodiversity of plant life.

Sediment – is naturally-occurring material that is broken down by processes weathering and is transported by the action of wind, water, ice, or gravity.

Sedimentation – the process of depositing sediment in a particular area.

Transportation – the act of moving sediment from one area to another.

Weathering – the wearing away of rock and earth by natural processes.

**Materials (per group of four):**

Four samples of sand from different locales in small sandwich bags

Two magnifying glasses

Two bar magnets

One rock kits

One box of six or twelve colored pencils

Eight pieces of white copy paper

**Background:**

Along the Mississippi-Alabama Gulf Coast lies a chain of six islands often referred to as barrier islands. These islands are called "barriers" because they reduce the impact of hurricanes and storm surge while corralling sediments and nutrients "brought down" the watershed through multiple river systems. The names of these islands are (from east to west) are: Dauphin, Petit Bois, Horn, East Ship, West Ship, and Cat.

The barrier islands of Mississippi are unique because they are part of the National Park Service. The Gulf Islands National Seashore maintains the islands of Mississippi and the Florida Panhandle, as well as Fort Morgan on Dauphin Island. While the islands of Alabama and Florida are developed, the islands of Mississippi are considered wilderness with access restricted to boats and in the case of West Ship Island, a public ferry.

The barrier islands are located 5 – 20 km from the mainland and Dauphin Island is connected to the mainland by a high-rise bridge. The islands are dynamic in nature and move slowly in a westward direction. Longshore currents "pick-up" sand on the east end of the islands and deposit it on the west end in a process known as littoral drift. This process keeps the islands eroding at one end and "building-up" on the other.

Frequent storms and hurricanes also help shape the islands. Ship Island, for instance, was once one large island. But in 1969, *Hurricane Camille* cut the island in two. More recently, *Hurricane Katrina* cut through Horn Island leaving a shallow pass between the two halves. The National Park Service and the Mississippi Department of Marine Resources are currently working with other agencies to repair the damage done by *Hurricane Katrina* during the 2005 hurricane season.

The sand itself was originally eroded from the Appalachian Mountains. It is primarily silica-based. Quartz and feldspar are the two primary silicates that comprise the sand in Mississippi. Many other beaches are formed from carbonates.

Various rivers and streams bring the sediment to the Mobile Point Peninsula. Once the sand is in place (sedimentation), waves approaching from the south-southeast move the sand westward. There are four steps that lead to sedimentation. They are weathering, erosion, transportation, and deposition.

The islands are composed of several smaller habitats. These habitats include: beaches, primary and secondary dunes, briny lagoons, salt marshes, and pine savannah forests. Because of their proximity to the Gulf waters, these habitats are particularly susceptible to human impact.

The effects of the British Petroleum-Deepwater Horizon oil spill are being studied on Mississippi's barrier islands. Long-term effects relative to commercial and recreational fish and invertebrate species diversity have been and will continue to be inventoried and monitored to document if changes have occurred in reproductive cycles, larval migration, and other similar parameters. Island vegetation (trees, shrubs, and dune and lagoon marsh grasses, as well as submerged meadows adjacent to the island) is having similar monitoring plans implemented by various researchers throughout the U.S., particularly in the Gulf of Mexico states. Seafood quality monitoring has been ongoing since the Deepwater Horizon oil spill occurred on April 20, 2010.

### **Introduction:**

This activity is designed to help students understand the importance of barrier islands, the concept of littoral drift, and the effect of pollution on their delicate habitats. This activity is also designed to prove that sand is indeed comprised of many different particle types.

Over time, natural material such as rocks, wood, bones, shells, glass, and metal are "worn-down" and broken into smaller and smaller particles. These particles eventually form sand. This sand is moved by wind and water and may eventually accumulate along a coastline and form a beach. Due to the abundance of these materials varying from place to place, it can be assumed that different beaches are

comprised of different materials; some are made of shell, some of volcanic rock, some of silica, and some are a combination of many different components.

**Procedure:**

Day One: Introduction to barrier islands and key concepts.

Day Two:

1. Collect materials (do not remove sand from sandwich bag).
2. Give each group member one bag of sand.
3. Closely observe the colors of the sand that are present in the sample and record with colored pencils
4. Using a colored pencil, sketch a few of the sand grains (draw them large)
5. Gently rub a magnet on the outside of the sandwich bag. Record the findings (is any of the sand attracted to the magnet? If so, what color is the sand?)
6. What types of material can be found in the sample?
  - a. Small rocks
  - b. Pieces of glass
  - c. Plant material
  - d. Shells
  - e. Wood
  - f. Plastic
  - g. Other material
7. Using a rock kit; determine if the sample contains any of the rocks found in the kit then record the findings.
8. Using the labels on the bags of sand, each group should record the colors of the sand from lightest to darkest.
9. Are the grains in the sample of uniform size?
10. Which sample has the largest grains of sand? Smallest?
11. Place the samples in order from largest to smallest grain size.

Analysis and Conclusion:

1. What do you think is the source your sand sample?
2. What do you think the beach environment is like where your sand was collected?
3. List the ways in which your sand may have reached the beach.
4. Create a story on the manner in which your sample became sand. Be sure to include the information from number 3.

**Ocean Literacy Essential Principles and Fundamental Concepts:**

2. The ocean and life in the ocean shape the features of the Earth.
  - c. "Erosion – the wearing away of rock, soil, and other biotic and abiotic earth material – occurs in coastal areas as wind, waves, and currents in rivers and the ocean move sediment."
  - d. "Sand consists of tiny bits of animals, plants, rocks and mineral."

***National Science Education Standards:***

- Unifying concepts and processes
  - Change, constancy and measurement
- Earth and space
  - Properties of Earth Materials
- Physical science
  - Properties of objects and materials
  - Motions and forces
- Personal and social perspectives
  - Changes in environments
  - Nature and human-induced hazards

**Extension Activities:**

- Add vegetable oil to the sand. Have students create methods to remove the oil from the sand.
- As a community service and to promote enhanced stewardship, students could become involved in an Island Beach Clean-up. Specifically, the students could clean-up an area of beach and categorize the trash into groups, i.e., plastic, Styrofoam<sup>®</sup> glass, metal, and natural products. The students could also count the total number of items of marine litter "picked-up" and then graph the quantity in each of the five categories. Students should infer the manner in which fish, birds, sea turtles, marine mammals, and humans can be impacted by the marine litter.

**Resources:**

- *Barrier Island Handbook*. 1998. The University of Maryland. Coastal Publication Series. Stephen P. Leatherman, PhD.
- *On Sandy Shores: Great Explorations in Math and Science (LHS GEMS)*. 1996. University of California, Berkeley, CA. Craig Strang, Catherine Halverson, and Kimi Hosouome.
- *The Offshore Barrier Islands of Mississippi and Alabama: Marine Educational Leaflet No. 9*. 1989. J.L. Scott Marine Education Center and Aquarium. Sharon H. Walker, PhD.