

**Enrichment****LESSON 2**

## Coastal Landforms

All coastal landforms owe their existence to the combined effort of wind and waves and the material the wind and waves have to work with. A rocky shoreline will respond differently than a sandy beach will, even if the wind and waves are equal in both areas.

### Sand Bars and Barrier Islands

Waves transport sand toward land. When sand deposits are large enough that the top of the sand bar lies just below the surface, waves begin to break over the bar. The waves begin to deposit sand where they first break. Over time, sand piles up until the sand bar rises above high tide. Eventually a barrier island can form.

Sand constructions are dynamic, movable features of a coast. Wind and waves never cease—neither does the movement of the shoreline. Waves constantly deposit sand, and longshore currents carry sand from one spot on the beach to another farther down the island.

### Beaches

All beaches are a construction of waves. They form from eroded material that waves have transported and deposited. Not all coasts, however, have beaches.

Sand bars and barrier islands exist in association with sandy beaches. Beach material that we call sand tends to be made

of very small particles near the shore and larger particles farther inland.

### Sand Dunes

Sand dunes are built by wind, which dries out the sand during low tide and then blows it inland far above high tide. Dunes are hills of sand above the beach where plants grow and waves never reach. Dunes are still dynamic, however, because wind transports and moves sand, shaping and reshaping the dunes.

### Salt Marshes

The body of water between a barrier island and the mainland is usually sheltered from battering wave action and experiences much gentler tides. It is a zone of accumulating sediments.

Salt marshes can develop behind significant sand bars as long as the sand bar is well above high tide and shelters the area from battering wave action. Waves breaking over a sand bar can contribute sand and sediments to the salt marsh. Hurricanes and large tropical storms contribute sediments to a salt marsh as well, and salt marshes mitigate the impact of hurricanes on the mainland.

A healthy salt marsh is a critical habitat for the juveniles of many ocean species. Salt marshes are sometimes referred to as the ocean's nurseries.

## Applying Critical-Thinking Skills

**Directions:** Respond to each statement.

1. **Explain** how a barrier island can form, wash away, and re-form farther down the mainland.
2. **Compare** a dune area to a sandy beach. Explain which natural constructive forces are mainly responsible for their existence.
3. **Summarize** two reasons why salt marshes should be preserved and protected.

**Challenge**

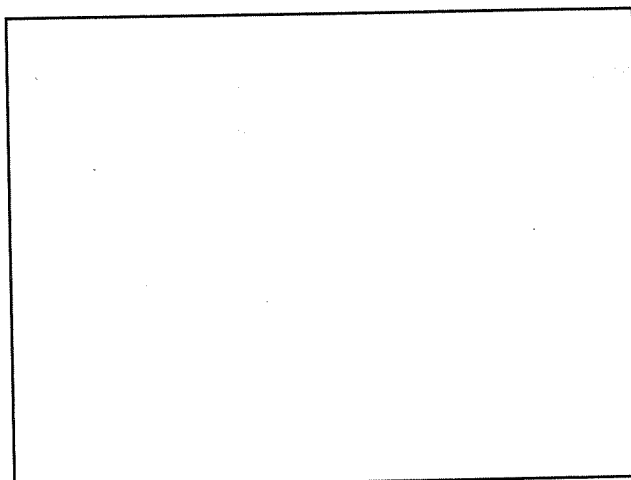
**LESSON 2**

**Tides**

The daily changes in the level of the ocean surface are called tides. In the 1600s, Isaac Newton first identified the force that causes tides—the gravitational pull of the Moon on Earth and its waters. If Earth and the Moon didn't move, tides would always occur in the same locations and there wouldn't be much daily change. But Earth and the Moon move, so most locations have two high tides and two low tides daily. The difference between the levels of the high tide and the low tide at a specific location is called the tidal range.

Below is a table of the highest high tides and the lowest low tides (relative to average sea level) for seven days along the southeast coast of the United States. Use the empty box to graph the data in the table. Graph the high tides and the low tides on the same graph.

High and Low Tides			
Day	Highest High Tide (m)	Lowest Low Tide (m)	% of Moon Visible
1	7.5	1.0	7
2	7.2	1.2	13
3	6.9	1.4	20
4	6.8	1.5	29
5	6.7	1.7	37
6	6.7	1.7	47
7	6.6	1.8	57



**Directions:** Answer each question or respond to each statement on the lines provided.

- Compare** the highest high tide and the lowest low tide with the percentage of the Moon that is visible on that day. Infer what the relationship is.

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- Explain** the significance of the information in the last column of the table.

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- Analyze** the graph. How do the high and low tides change during the week?

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