

Assignment Discovery Online Curriculum

Lesson Title:

Coasts

Grade level:

6-8, with adaptations for older students

Subject area:

Life Science: Ecology

Duration:

Three class periods

Objectives:

Students will

- understand the different types of marine coasts and where they are located in the United States and its territories;
- understand the difference between primary and secondary marine coasts and how they are formed; and
- understand and identify some of the life forms that inhabit different marine coastal regions.

Materials:

- Computers with Internet access (optional but very helpful)
- Reference books on the coastlines of the United States and its territories (Puerto Rico, Virgin Islands, Guam, and American Samoa).
- Two or more maps of the United States and its territories. Maps must include latitude and longitude lines. Separate maps will be needed for Guam, Puerto Rico, and American Samoa.
- Classroom Activity Sheet: The Coasts Around Us
- Take-Home Activity Sheet: Coastal Concerns

Procedures:

1. In preparation for this lesson, gather reference materials about marine biology, oceanography, and ecology. Make several atlases available to the class that contain both political and physical descriptions of the states and territories that have a marine coastal border. Mount a map of the United States and its territories on a bulletin board or wall. Be sure to leave at least 2 feet of space around the map for students to display the presentations they'll be creating in this lesson.
2. As a class, review the characteristics of *marine coasts*. Commonly called the seashore, marine coasts are dynamic regions that experience constant change. They are classified into two major groups, primary and secondary coasts.
3. Explain that *primary coasts* owe their character and appearance to land erosion, deposition of sediments, and other processes that occur on land. Primary coasts can be formed by

earthquakes and volcanoes and by rapid sea level change. A delta is a primary coast. Delta regions are created when sand is deposited at the mouth of a river. Other primary coasts are *drowned river valleys*, *fault coasts*, and *lava coasts*. (See vocabulary.)

4. A *secondary coast* is a shoreline region created by wave erosion, water chemistry, coral-building marine animals, and other processes that occur at sea. A reef is a secondary coast. A reef can be a ridge of rock, sand, or coral that rises toward the surface of marine waters. Other secondary coasts are the *mangrove* swamps in Florida and Puerto Rico, *salt marshes* in Texas and California, and *sea stacks* in Oregon and Northern California. (See vocabulary.)
5. Now gather students around the map and ask them to identify which states and territories have a marine coast. Make a list of these states and territories on the board or a large piece of paper. Have the students brainstorm about the different kinds of coasts that exist around the country, including coasts with lots of sand, cliffs, rocky coasts, and so on. Write students' ideas on the board or a large piece of paper.
6. In this activity the coasts of the United States and its territories have been divided into three broad categories: the Pacific coast, Gulf of Mexico coast, and Atlantic coast. Review the following general characteristics of each category with the class. (Most of the following information is only applicable to the continental United States. Students can discuss departures from the general descriptions during the course of their research later in the activity.)
 - The *Pacific coastline* is the scene of intense geologic activity, where earthquakes and volcanic eruptions are common. The landforms along Pacific coastlines are a testimony to an actively changing region. The Pacific coast is characterized by high-energy conditions, meaning the intensity of the waves is fairly powerful.
 - The *Gulf of Mexico coast* includes the Louisiana-Texas coastline. It is dominated by the Mississippi River Delta, which deposits sediment into the Gulf of Mexico. The region is protected from high-energy waves by the physical barrier of Central America, which shields it from the type of massive erosion that occurs along the Pacific and Atlantic coastlines.
 - The *Atlantic coastline* is subsiding, or sinking. The ocean floor here has subsided about 2 miles (3 kilometers) over the last 15 million years. Erosion of the continent has produced sediment that has accumulated to a maximum thickness of 10 miles (16 kilometers). High-energy conditions develop off this coast during storms and when hurricanes strike the coastal region.
7. Divide students into groups of two or three. Assign each group one of the following 10 areas: California, Washington, Alaska, Hawaii, Texas, Florida, Maine, Louisiana, New Jersey, and Puerto Rico.

8. Hand out copies of the Classroom Activity Sheet: Coastal Analysis. Explain that each student will complete the sheet for an assigned coastal region. Allow students time to conduct research and complete their activity sheets.
9. Students will then work in their groups to create a visual presentation to the class that summarizes information about their coastline. Presentations should be restricted to four or five minutes . Encourage groups to be creative. Have students use images from their research materials to illustrate their presentations. Encourage students to take notes during class presentations and to ask questions.
10. The following Web sites will be helpful:

Monterey Bay Aquarium

<http://www.mbayaq.org>

National Oceanic and Atmospheric Administration (NOAA)

<http://www.noaa.gov/>

Ocean Planet, Smithsonian

http://seawifs.gsfc.nasa.gov/ocean_planet.html

OceanLink

<http://oceanlink.island.net>

Physical Oceanography from Space

<http://podaac.jpl.nasa.gov/kids/>

Coastal mitigation projects clean up and protect coastal areas. Information about these projects are at the following Web site: <http://www.coastalamerica.gov/>

11. Groups should post their visual presentations next to the appropriate coastline on the map when they have finished.
12. For homework or extra credit, distribute copies of the Take-Home Activity Sheet: Coastal Concerns. Each student will determine the biggest threat to the coastline they have studied. For example, a student may focus on beach erosion or pollution. They should then write a letter to the state government of that area explaining what the threat is, what the future holds if it continues, and what might be done to rectify it.

Adaptation for older students:

Students should investigate political and economic complications that can arise when a state or country is attempts to mitigate, or lesson the damage, of an environmental hazard. Ask them to find out about the progress that has been made since the Exxon *Valdez* disaster in Alaska in 1989. Have them gather newspaper stories about how the cleanup was coordinated and the steps taken to prevent another oil spill. Do students think, from an environmental and political

standpoint, that the situation was handled appropriately? Have them research and make comparisons to any similar disasters that have occurred since this incident.

See the following Web about the Exxon Valdez oil spill:

<http://response.restoration.noaa.gov/photos/exxon/exxon.html>

Questions:

1. Discuss the requirements for delta formation. Refer to rivers that empty into the Gulf of Mexico and the Pacific Ocean in your discussion.
2. What do marine organisms have in common along all marine coasts? What are some of their differences?
3. Analyze the effect that building a jetty or pier on a coastline would have on the shape of that coastline.
4. What are the causes of beach erosion? What are some solutions?
5. Hurricanes strike in the Gulf of Mexico and the Atlantic seaboard. What steps can you take to protect sensitive habitats from hurricane damage?
6. Defend the need to transport oil and other petroleum products by ship, despite the risk of spills. Propose other safety measures to prevent future accidents.

Evaluation:

Three points: demonstrates exemplary performance and effort in completing all sections of the Classroom Activity Sheet; actively participates in a well-researched and organized presentation to the class

Two points: demonstrates average performance and effort in completing all sections of the Classroom Activity Sheet; makes an effort to participate in their group presentation; does not organize presentation as clearly as it could be

One point: demonstrates below-average performance and effort; and does not complete all sections of the Classroom Activity Sheet; content of the group presentation is the result of below-average research effort and poor organization

Extension Idea:

Global Climate Change

Sea level is on the rise around the coasts of the world. During the 20th century, sea level increased about 6 inches (15 centimeters), but recently the rate of rise has increased. Scientists

believe that sea level may gain another 1 foot (30 centimeters) in the first half of the 21st century. Discuss with your students the causes of this phenomenon, including human and natural causes. Have each student refer to the classroom worksheet and analyze the potential impact of a 1-foot rise in sea level on a marine coastline. Have them speculate on the effects of a 10-foot (300 centimeter) change in sea level. Each student should propose local solutions. As a class, propose global solutions

Suggested Reading:

Along the Coasts (The Deep Blue Planet series)

Renato Massa. Steck-Vaughn, 1998.

This title presents a brief, clear introduction to the variety of life that exists where the ocean meets the land around the world. Illustrated with photographs and drawings, the interdependence of plant and animal life in coastal regions is examined as well as the impact of pollution on these delicate systems.

Coral Reef (Exploring Earth's Biomes series)

April Pulley Sayre. Twenty First Century Books, 1996.

Learn about the formation of coral reef systems in the ocean's warm and shallow waters. Boxed insets highlight important or unusual information for readers. Threats to the well-being of coral reef systems as a result of pollution, coastal construction, and damage from divers and boaters are discussed. Color photographs and a short glossary add to the text.

Vocabulary:

coast

Definition: The land or area next to the ocean; a seashore.

Context: His family spent vacations in Cape Ann on the Atlantic **coast**.

delta

Definition: A deposit of sand and soil at the mouth of some rivers.

Context: Several **deltas** in the world have risen above water level and can be inhabited by animals, plants, and even humans.

drowned river valley

Definition: An area eroded by water or glaciers.

Context: After the last ice age, rising sea levels filled these **drowned river valleys** with water.

fault coast

Definition: A coastal region created by the action of tectonic movement in the earth's crust.

Context: Baja California is a **fault coast** because it was separated from the mainland by tectonic activity along the San Andreas fault line.

lava coast

Definition: A coastal region created by materials from volcanic eruptions.

Context: We walked along the black sand **lava coast** of a volcanic island.

mangrove swamps

Definition: Any of various related tropical evergreens that grow in masses along tidal shores, with roots that grow above ground in a densely interlaced thicket.

Context: Plants and animals have abundant food and areas to breed in richly productive **mangrove swamps**.

primary coast

Definition: Primary coasts are areas that owe their character and appearance to processes that occur on land, such as land erosion and deposition of sediments. They are formed by the tectonic activity of earthquakes and volcanoes and by rapid sea level change.

Context: The **primary coast** of Hawaii formed after volcanic eruptions sent rivers of molten rock toward the sea, forming black sand beaches made of broken pieces of cooled lava.

reef

Definition: A ridge of rock, sand, or coral rising toward the surface of marine waters.

Context: **Reefs** grow in areas of abundant sunlight and warm water; many are very old and cover vast areas of the tropics.

salt marsh

Definition: A marshy grassland area that is often flooded by seawater.

Context: Despite their environmental value, **salt marshes** are continually destroyed by irresponsible human behavior seeking to satisfy the demand for harbor space.

sea stacks

Definition: Durable material remaining on a coastline after much of the loose sediment has been removed from an area.

Context: During very low tide you can walk over to the **sea stack** at Cannon Beach; it is made of hard rock covered with all kinds of life forms that hang on during high tide and the storms that occur along the Oregon coast.

secondary coast

Definition: A secondary coast is a shoreline region created by processes that occur at sea, such as wave erosion, water chemistry, and coral-building marine animals.

Context: The sea stacks of the Oregon coast are dramatic examples of a **secondary coastline**. Years of wave erosion have worn away much of the coastal area's soft sediments, leaving behind the hard materials of sea stacks.

Academic Standards :**Grade level:**

6-8

Subject area:

Geography

Standard:

Knows the physical processes that shape patterns on the earth's surface.

Benchmark:

Knows the processes that shape patterns in the physical environment (e.g., the erosion agents, such as water and ice; earthquake zones, and volcanic activity).

Grade level:

6-8

Subject area:

Life Science

Standard:

Understands relationships among organisms and their physical environment.

Benchmark:

Knows ways in which organisms interact and depend on each other through food chains and food webs in an ecosystem (e.g., producer/consumer, predator/prey, and parasite/host; relationships that are mutually beneficial or competitive).

Credit:

Robert Michael de Groot, science education consultant and curriculum designer.

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Coastal Analysis Profile

On a separate sheet of paper, answer each of the questions below. Then work together to create a visual display of your research. You will use this display to teach your classmates about a coastal area.

1. Record the name of your state or territory: _____
2. Write a one- or two-sentence description of the location of your state or territory.
3. What marine body of water does your state or territory have along its coast?
4. Classify your coastline as either primary or secondary. Using pictures from your research, describe the characteristics of your coastline. If your state has both primary and secondary coastlines, describe both.
5. List at least 10 animals and plants that live along your coastline. Then write a one-paragraph summary describing the types of organisms that live along your coastline.
6. Describe the natural hazards that could affect your coastline, such as earthquakes, tsunamis, hurricanes, and storms.
7. Discuss one or two ways your marine coastal environment is threatened by humans. Propose possible solutions.

Coastal Concerns

Choose one of the two greatest threats to the marine coastline of your state or territory. Write a letter to the governor or highest-level administrator about the reasons this coastline is at risk. Describe what might happen if the threat continues. Provide suggestions to solve the threats to the coastline.