

Biomes: Coastlines and Seas: Teacher's Guide

Grade Level: 6-8

Curriculum Focus: Life Science

Lesson Duration: Three class periods

Program Description

Ever since Earth was formed, land and sea have battled to claim the coastline. In this visually rich episode, students witness the constant interactions that occur among water, land, and life forms and examine the world-shaping results. This program includes one feature segment and two short segments.

Onscreen Questions

- What are some differences between squids and octopuses?
 - How are coastlines a good source of nourishment for the plants and animals that inhabit them?
 - How do organisms in coral reefs work together for protection and survival?
 - What unique abilities do jellyfish have?
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Lesson Plan

Student Objectives

- Learn about types of marine coasts and their locations in the United States and its territories.
- Discover the difference between primary and secondary marine coasts and their formations.
- Identify life forms that inhabit different marine coastal regions.

Materials

- Reference books on the coastlines of the U.S. and its territories (Puerto Rico, Virgin Islands, Guam, American Samoa)
- Maps: Two or more of the U.S. and its territories, including latitude and longitude lines; separate maps of Guam, Puerto Rico, and American Samoa
- Computers with Internet access (optional but very helpful)

Procedures

1. To prepare, gather reference materials about marine biology, oceanography, and ecology. Make atlases available that contain political and physical descriptions of the U.S. and its territories with marine coasts. Mount one map on a bulletin board or wall. Leave at least two feet of space around the map.
2. As a class, review the characteristics of marine coasts, which are classified as primary and secondary coasts.
 - Primary coasts owe their character and appearance to land erosion, deposition of sediments, and other processes that occur on land; they are formed by earthquakes, volcanoes, and rapid sea level changes. A delta is a primary coast, created by sand deposited at the mouth of a river.
 - Secondary coasts are created by wave erosion, water chemistry, coral-building marine animals, and other processes occurring at sea. A reef is a secondary coast, which may be a ridge of rock, sand, or coral.
3. Have students identify on the map the states and territories that have a marine coast. List these on the board. Brainstorm with students the different kinds of coasts, including those with lots of sand, cliffs, rocky coasts, and so on. Write students' ideas on the board.
4. In this activity, the coasts of the U.S. and its territories fall into three broad geographic categories: the Pacific, Gulf of Mexico, and Atlantic. Review the characteristics of each category.
 - The Pacific coastline commonly experiences earthquakes and volcanic eruptions. Its landforms show evidence of an actively changing region characterized by high-energy, or powerful, waves.
 - The Gulf of Mexico coastline includes the Louisiana-Texas coast. It is dominated by the Mississippi River, which deposits sediment into the Gulf of Mexico. Central America physically shields it from massive erosion and high-energy waves.
 - The Atlantic coastline has subsided, or sunk, about two miles (three kilometers) over the past 15 million years. Continental erosion has produced sediment up to 10 miles (16 kilometers) thick in some places. High-energy waves develop during storms and when hurricanes strike.
5. Divide students into small groups. Assign each group one of the following 10 coastal regions: California, Washington, Alaska, Hawaii, Texas, Florida, Maine, Louisiana, New Jersey, and Puerto Rico.
6. Distribute the Coastal Analysis Profile activity below. Each student will analyze a coastal region. Allow students time to conduct research and complete their profiles.

Coastal Analysis Profile

On a separate sheet of paper, answer each of the following:

- Record the name of your state or territory.
- Write one or two sentences describing its location.



Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students completed all sections of the profile; actively participated in a well-researched and organized presentation to the class.
- **2 points:** Students completed all sections of the profile; made an effort to participate in group presentation; did not organize presentation as clearly as it could be.
- **1 point:** Students did not complete all sections of the profile; made a below-average research effort; poorly organized the content of the group presentation.

Vocabulary

coast

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

Context: Ann's family spent summer vacations at the Atlantic coast.

delta

Definition: A deposit of sand and soil at the mouth of a river

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

mangrove swamp

Definition: A region with various 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 a richly productive mangrove swamp.

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.

Academic Standards

National Academy of Sciences

The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K-12. To view the standards, visit <http://books.nap.edu>.

This lesson plan addresses the following science standard:

- Life Science: Populations and ecosystems



Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit <http://www.mcrel.org/>.

This lesson plan addresses the following national standards:

- Geography – The World in Spatial Terms: Understands the characteristics and uses of maps, globes, and other geographic tools and technologies; Physical Systems: Knows the physical processes that shape patterns on Earth's surface,
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Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the [Discoveryschool.com](http://www.discoveryschool.com) Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>
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DVD Content

This program is available in an interactive DVD format. The following information and activities are specific to the DVD version.

How To Use the DVD

The DVD starting screen has the following options:

Play Video – This plays the video from start to finish. There are no programmed stops, except by using a remote control. With a computer, depending on the particular software player, a pause button is included with the other video controls.

Video Index – Here the video is divided into four parts (see below), indicated by video thumbnail icons. Watching all parts in sequence is similar to watching the video from start to finish. Brief descriptions and total running times are noted for each part. To play a particular segment, press Enter on the remote for TV playback; on a computer, click once to highlight a thumbnail and read the accompanying text description and click again to start the video.

Curriculum Units – These are specially edited video segments pulled from different sections of the video (see below). These nonlinear segments align with key ideas in the unit of instruction. They include onscreen pre- and post-viewing questions, reproduced below in this Teacher's Guide. Total running times for these segments are noted. To play a particular segment, press Enter on the TV remote or click once on the Curriculum Unit title on a computer.

Standards Link – Selecting this option displays a single screen that lists the national academic standards the video addresses.



Teacher Resources—This screen gives the technical support number and Web site address.

Video Index

I. Deep Sea Survival (3 min.)

Their ability to hide from predators leads some scientists to believe octopuses are highly intelligent. Learn about these fascinating creatures and their close relative, the squid.

II. Land and Sea (19 min.)

Coastal habitats provide food and shelter for thousands of different animals and plants. Discover some species that call the coast home.

III. From Oceans to Rivers (20 min.)

Learn about life in a coral reef, and watch salmon struggle upstream to spawn and die—providing food for many creatures that depend on them for survival.

IV. Jellyfish Journey (3 min.)

Seemingly primitive creatures, jellyfish have unique abilities that allow them to skillfully survive in the ocean. Explore the underwater world of these cnidarians.

Curriculum Units

1. Octopus Arms

Pre-viewing question

Q: Are there any similarities between octopuses and humans?

A: Answers will vary.

Post-viewing question

Q: How do the suction cups on its tentacles help an octopus function?

A: Octopuses have eight powerful arms, or tentacles, which they use to move along the ocean floor in search of food. Suction cups on the underside of the tentacles work like fingers, allowing an octopus to tell the difference between a stone and food; they also help octopuses capture prey.

2. A Clever Invertebrate

Pre-viewing question

Q: Are octopuses intelligent?

A: Answers will vary.

Post-viewing question

Q: Why do some scientists believe octopuses are clever?

A: Octopuses set traps for their prey and use rocks and other objects to help them hide from predators; some scientists argue that this is a form of tool use and a sign of intelligence.



3. From the Arctic to the Equator

Pre-viewing question

Q: Why are coastal biomes important to human life?

A: Answers will vary.

Post-viewing question

Q: How do Arctic coastal habitats differ from those near the equator?

A: Answers will vary.

4. Life in the Mangroves

Pre-viewing question

Q: What kinds of animals would you expect to see in a mangrove forest?

A: Answers will vary.

Post-viewing question

Q: Why are predators, such as the saltwater crocodile, attracted to mangrove forests?

A: Many land and sea animals use mangrove forests as a nursery for their young, making these forests rich hunting grounds for predators.

5. The Mangrove Trees

Pre-viewing question

Q: How are mangrove forests different from other kinds of forests?

A: Answers will vary.

Post-viewing question

Q: How does a mangrove's root system help it survive?

A: The mud mangrove trees grow in is rich but devoid of oxygen. The trees are also exposed constantly to seawater. A mangrove's roots filter out salt and, when exposed at low tide, breathe in the oxygen the trees need to live.

6. Hunting in the Mangroves

Pre-viewing question

Q: How does high tide in a mangrove forest differ from low tide?

A: Answers will vary.

Post-viewing question

Q: Are mangrove forests dangerous places for animals to live?

A: Answers will vary.

7. Mobile Rocks

Pre-viewing question

Q: What is the best camouflage for animals on the seafloor?

A: Answers will vary.



Post-viewing question

Q: Which of the bottom-dwelling fish shown has the best disguise?

A: Answers will vary.

8. Coral Colonies

Pre-viewing question

Q: What is a reef?

A: A submerged ridge or chain of rocks or coral

Post-viewing question

Q: How is a living reef formed?

A: Some corals have a spawning time, in which they release millions of eggs and sperm into the water. The eggs float upwards and are carried along by surface currents. Each fertilized egg has the potential to begin a new reef formation. Once established, a coral polyp produces identical copies of itself and attaches itself to a hard surface, where it begins to secrete calcium carbonate. As generations of corals are born and die, their skeletons form the massive foundations of living reefs.

9. Life in a Coral Reef

Pre-viewing question

Q: What are some plants and animals that depend on one another to survive?

A: Answers will vary.

Post-viewing question

Q: Why is the relationship between the gorgonian sea fan and its tenants so extraordinary?

A: The sea fan is all the pygmy seahorses need to sustain themselves and breed a whole new generation. For protection, the seahorses have adapted so that they are the exact color of the sea fan and their bodies are the shape of its bumpy polyps.

10. Solar Energy

Pre-viewing question

Q: Is sunlight an important factor in ocean life?

A: Answers will vary.

Post-viewing question

Q: How does sunlight affect animal life in Asia's far north?

A: During the region's brief summers, sunlight melts the vast areas of ocean locked beneath ice during the winter. Hundreds of thousands of birds return to find an ocean teeming with a great variety of life. Here, summer is a time of concentrated growth for marine life – for example, groups of stellar sea lions come to the region's shores to birth their young.

11. Bear and Salmon

Pre-viewing question

Q: Why do salmon breed so far from the coast?

A: Answers will vary.



Post-viewing question

Q: Should wild salmon be protected by environmental laws?

A: Answers will vary.

12. Sea Jellies

Pre-viewing question

Q: What do you know about jellyfish?

A: Answers will vary.

Post-viewing question

Q: How do jellyfish move about?

A: Jellyfish float with the ocean currents, but they also can propel themselves by expanding and contracting their bodies.