



DEERING ESTATE



SHARK
RESEARCH &
CONSERVATION
PROGRAM



Marine Conservation Science & Policy: Ocean and Coastal Features

Grade Level:

4th – 12th

Subject Area

Science

Biology

Duration

1.5 Hrs

Benchmarks:

Body of Knowledge

Life Science

Nature of Science

Physical Science

Big Idea

Organization and Development of Living Organisms.

The Practice of Science

Standards

SC.K.N.1.1

Collaborate with a partner to collect information.

SC.4.E.6.4

Describe the basics of erosion (movement of rock by gravity, wind, water, and ice).

SC.8.G.5.2

Describe the impact of human modifications on the environment and ecosystems.

SC.912L.17.16

Discuss the large-scale environmental impacts resulting from human activity.

Focus Question

What are some ocean and coastal features? How do these features interact and why are they important?

Objectives

Students will explore some of the main features of the ocean and coastal landforms and examine interactions that are globally significant. Students will learn to

- Identify ocean and coastal features.
- Analyze the importance of these features and how their interactions affect humans.
- Elaborate a news report summarizing their knowledge of ocean and coastal landform features.

This will be a project-based activity in which students will explore the main features of the ocean and coastal landforms.

Background

The ocean covers nearly 70% of our planet and contains 97% of the world's water, affecting everything from climate to recreation and making Earth unique in the Solar System as the only planet with perfect conditions for liquid water. This exceptional body of water makes all of life possible, and this significance draws scientists to study the features, coastal landforms and interactions that support this complex system.

The ocean plays an essential role in regulating the Earth's **climate**, particularly through the **water cycle**, the process of evaporation, condensation, and eventual return of moisture through the precipitation upon which all life depends. The ocean is partly responsible for the temperature of the atmosphere, as the Sun heats the water, the heat is transferred to the atmosphere which then warms the globe. Because water changes temperature less rapidly than air, the ocean helps balance seasonal extremes by absorbing summer heat and slowly releasing it throughout the winter; without these moderations the planet would be a frigid ball of ice.

Ocean **currents**, a stream of water running through a larger body of water, in some ways aid in climate regulation, transferring heat from the Equator to the poles and returning with cooler water. The water of the ocean is also shifted by **tides**, the daily rise and fall of the ocean's surface partly due to the Moon's gravitational pull. Tides move nutrients, shift sediment and shape shorelines, forming a rich intertidal habitat on land and a renewable energy resource that engineers hope to develop further.

Coastal landforms both affect and are affected by the ocean, particularly through erosion. **Erosion** is the breakdown and movement of rock by water and wind, a process particularly evident along shorelines where waves beat at cliffs, pulverizing the rock and grinding the resulting sediment that accumulates at the base. On **erosional coasts**, this sediment is dragged to the deep by currents and tides, introducing new nutrients to ocean depths, while carving sheer cliffs, sea stacks and sea arches.

Vocabulary:

Climate:

The weather conditions prevailing in one area over a long period of time

Water Cycle:

The process by which water moves from land, ocean and atmosphere through evaporation, condensation and precipitation.

Current:

A stream of water moving through a larger body of water.

Tides:

The daily rise and fall of the ocean's surface partly due to the Earth's gravitational pull.

Ocean Floor:

The bottom of the ocean that stems from the continental shelf and rises and falls through mountains, canyons, plains and trenches.

Erosion:

The breakdown and movement of rock by water and wind.

Erosional Coasts:

Shorelines characterized by the reduction of rock and sediment by erosion, often featuring sea stacks, cliffs, and arches.

Depositional Coasts:

Shorelines characterized by the accumulation of sediment often from large distances, and usually divided into deltas, barrier island and estuarine systems, and strand plain coasts.

Marine Pollution:

The entry of harmful materials into the ocean.

Background

Conversely, **depositional coasts** are shaped by currents, tides and wave action and marked by deep accumulations of sediment, usually divided into three categories: deltas, barrier island and estuarine systems, and strand plain coasts. Deltas form at the mouth of the rivers when the continental shelf is only gently sloped, accumulating rich sediment from upstream that can form tidal flats and salt marshes. Barrier island and estuarine systems consists of elongated narrow islands that run parallel to shore and often shelter lagoons and brackish water bodies called estuaries. The term strand plain coasts has been applied to many coastal environments but are usually characterized by beaches and coastal dunes. The mix of nutrients running off land with the vibrant energy of the tides makes the coasts some of the most productive ecosystems in the world, including crucial habitats such as mangrove forests, seagrass meadows, coral reefs, and salt marshes.

Aside from providing critical habitats, ocean features and coastal landforms make incalculable contributions to trade, recreation, tourism, renewable energy developments, mining, oil drilling, food resources, carbon absorption and climate regulation. Humans have relied on the ocean and coasts for thousands of years for exploration, food sources and livelihood, and continue that dependence today.

Despite their global importance, the ocean and coasts are some of the most threatened and damaged regions of the world, suffering from sewage and chemical runoff, global warming and climate change, sea level rise, erosion, and vast amounts of pollution. This may be most evident in the Great Pacific Garbage Patch, a swirling vortex of plastic bags, Styrofoam cups, and other non-biodegradable debris weighing an estimated 3.5 million tons, disturbing wildlife, leeching chemicals and introducing harmful PDBs to the food chain, toxins that are especially devastating by the time they reach tertiary consumers like humans.³

In order to prevent some of this destruction, some governments and companies have taken steps to reduce their wastes, but individuals must take steps to correct harmful habits as well. For example, the Exxon Valdez oil spill of 1989 slopped over 10 million gallons of oil into the sensitive ecosystem of Prince William Sounds, and while the company was vilified and forced to pay reparations, U.S. and Canadian consumers continue to dump about 16 million gallons of oil from runoff into the Atlantic and Pacific oceans. To really make strides in marine conservation, governments, companies and individuals must be held accountable, reducing plastic production, decreasing chemical use, and minimizing waste. While it is important to remember that all drains lead to the ocean, it is equally critical to remind people the ocean is what makes life possible. This isn't an isolated intangibility under discussion, but a complex ecosystem to which humans are indebted, interconnected and indivisible.

Supplemental Resources

1- "Ocean." National Geographic Education.

<http://education.nationalgeographic.org/encyclopedia/ocean/>

2- "Tides." National Geographic Education.

<http://education.nationalgeographic.org/encyclopedia/tide/>

3- Virtual Tour: "The Properties of Water." Odyssey Earth.

<http://www.odysseyearth.com/videos/the-properties-of-water/>

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Extension Activity:

Have students think on how pollution and trash end up in the ocean and how much trash humans create every day. Have them write a paragraph in their journal about a school action plan, explaining some habits they have observed in their school and listing at least five steps that can be taken to improve. Follow up next class by asking about their progress on their individual, home and school action plans.

Assessment:

Have students complete the Ocean and Coastal Conservation worksheet after class and write a list of three items they learned today and three items they would like to research further.

Ocean and Coastal Landforms News Flash

Materials

- Lined Paper for script (may be cut into slips or index cards)
- Butcher paper for visuals
- Pens or pencils for report writing
- Coloring utensils for visuals (crayons, markers, or colored pencils)

Procedure

1. Explain to students that they will be writing a news report to inform the public about today's lesson and briefly introduce some of the formats for the news (i.e. slips of paper with different informative reports, visual representations, weather report).
2. Divide the class into groups of four. Each group will write a news report demonstrating knowledge from today's lesson. Some topics may include:
 - How the ocean affects climate
 - Categorization and formation of local coastal landforms (i.e. Miami has barrier islands, a form of depositional coast)
 - Explanations of currents, tides, and wave motion
 - Why the ocean is important, threats and conservation methods
3. Have students brainstorm ideas for 5 minutes within their groups and decide on 1-5 news report headlines, however many you decide they can handle depending on age and ability.
4. Once each group has decided on their topics, have them write a headline and a brief report on slips of paper or index cards.
5. Have students elaborate on some visuals to pair with their reports.
6. Have groups present their news reports. Encourage discussion about the importance of the ocean and how coastal landforms particularly affect Miami as a coastal city.

Worksheet Answer Key

Answers may vary, can include:

Reduce use of plastics, fertilizers, and household chemicals; walking or biking instead of driving; reusing materials, i.e. using an old tire for a swing; reducing electrical and water use by turning off lights, taking showers instead of baths, and using low-flow showerheads, etc.



Ocean and Coastal Conservation

While the ocean and coasts are critically important for the health of the planet, humans continue to pollute these valuable resources, including dumping over 1.4 billion pounds of trash into the ocean every year. This debris floats into twisting vortexes like the Great Pacific Trash Gyre or washes up on coasts, harming wildlife, commercial fisheries and human health. As individuals, even if we live far from the ocean, we can help prevent this waste by practicing the three R's: Reduce, Reuse, and Recycle. Think about your daily routine and decide what you can do to practice the three R's and help protect the planet's oceans and coasts.



I can reduce by...	I can Reuse by...	I can Recycle by...

Using the table above, convert these lists into an action plan. Determine five steps that you and your family can take at home to reduce, reuse and recycle and help protect the planet's oceans and coasts.

1. _____
2. _____
3. _____
4. _____
5. _____