KEY CONCEPT

5.1 Ocean coasts support plant and animal life.

Sunshine State STANDARDS

SC.G.1.3.2: The student knows that biological adaptations include changes in structures, behaviors, or physiology that enhance reproductive success in a particular environment.

SC.G.1.3.4: The student knows that the interactions of organisms with each other and with the non-living parts of their environments result in the flow of energy and the cycling of matter throughout the system.

SC.G.2.3.4: The student understands that humans are a part of an ecosystem and their activities may deliberately or inadvertently alter the equilibrium in ecosystems.

BEFORE, you learned

- Ocean water contains gases such as oxygen
- Salinity is a measure of the amount of salt in water
- Coastal waters rise and fall each day because of tides

NOW, you will learn

- What the intertidal zone is
- What coastal environments exist where fresh water and salt water meet
- How human activity affects shoreline environments

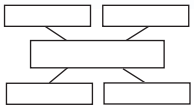
FCAT VOCABULARY

habitat p. 154

VOCABULARY

intertidal zone p. 154
estuary p. 156
wetland p. 156

MAIN IDEA WEB
Remember to start a main idea web in your notebook for this blue heading.



THINK ABOUT

What are the characteristics of shoreline environments?

This map shows the migration route of the osprey, a type of bird. Each fall ospreys fly south to warmer weather. In the spring they fly north. Each dot on the map represents a place where ospreys stop along the way. What do you notice about where the birds stop? What resources might shoreline environments provide for birds?

Ocean waters contain many environments.

Where on Earth can you find a living animal that is larger than the largest dinosaur that ever lived? Where can you find birds that use their wings to fly underwater, or animals that can eject their internal organs—and grow another set? Where can you find warm tropical zones thick with plants, or cold, empty plains where no plant can grow? The ocean contains all these and more.

Like the land, the ocean contains many different environments, each with its own special characteristics. Although scientists have learned a lot about the ocean and its environments, almost 95 percent of the ocean remains unexplored. It is possible that many millions more species of ocean life are yet to be discovered.

The many known ocean organisms are organized in three groups according to the way the organisms live. Bottom dwellers include plantlike organisms called algae (AL-jee) and other organisms that live on the ocean bottom—for example, seaweeds, crabs, corals, starfish, and shellfish. Swimmers are animals such as fish, dolphins, whales, and octopuses that swim in the ocean. Floaters are organisms that do not swim but float at or near the ocean surface. Some floaters, such as jellyfish, are large, but most are so small you need a microscope to see them. These tiny living things include plants, animals, bacteria, and single-celled organisms called protists (PROH-tihsts).

CHECK YOUR READING What are the three groups of ocean life?

The shoreline supports many plants and animals.

An environment that has all the necessary requirements for an organism to live is called a **habitat.** In this chapter you will explore some of the many different ocean habitats. Your journey begins on the coastline, where the ocean meets the land. The habitat at the edge of the ocean is the **intertidal zone** (IHN-tuhr-TYD-uhl)—the narrow ocean margin between the high tide mark and the low tide mark. The conditions constantly change in the intertidal zone. Organisms that live here must be able to survive both wet and dry periods. Plants and animals must also withstand the force of waves that constantly crash onto shore.

READING TiP

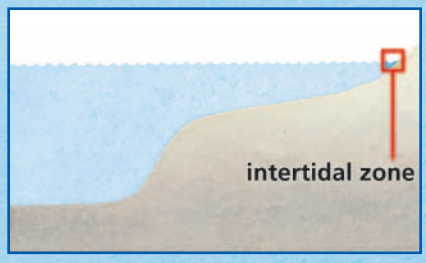
Word parts can help you remember the meaning of *intertidal zone*. The prefix *inter-* means "between." The root *tidal* means "relating to the tides." The *intertidal zone* is the area between high and low tides.

1. At **low tide,** the intertidal zone is dry and exposed to direct sunlight. Organisms must be able to live out of water. They must also be able to tolerate the air temperature, which may differ from the temperature of the water.
2. At **high tide,** the intertidal zone is covered with water, so it is not exposed to direct sunlight. Organisms must be able to live completely underwater and tolerate the temperature of the water.

Tidal pools are areas along the shore where water remains at low tide. Plants and animals that live in tidal pools must survive drastic changes in salinity, or salt content. When sunlight causes water to evaporate, the salinity increases. When rain falls, the salinity decreases.

Organisms have different ways of surviving the conditions of the intertidal zone. For example, crabs can move around and seek cover in the sand or in between rocks. Mussels attach themselves to rocks and close their shells to keep from drying out during low tide. Some seaweeds dry out at low tide but are able to regain moisture at high tide.

Intertidal Zone



The intertidal zone is the area along the coastline between the high tide mark and the low tide mark.

1 Low Tide

At low tide, the intertidal zone is exposed to the air.

Tidal pools are areas where water remains at low tide.

Some seaweeds can dry out during low tide and absorb water at high tide.

At low tide, mussels close their shells tightly to keep from drying out.

2 High Tide

At high tide, the intertidal zone is covered with water.

Plants and animals must survive the constant crashing of waves against the shore.

At high tide, mussels open their shells to eat and take in oxygen.

READING VISUALS What organisms can you see in the photograph of low tide?

INVESTIGATE Coastal Environments

How do mussels survive?

DESIGN YOUR OWN EXPERIMENT

Most intertidal zone organisms require water to survive, and they must endure long dry periods during low tides. Mussels close their shells tightly during low tide and open them during high tide.

SKILL FOCUS
Designing experiments

MATERIALS
- small plastic containers with lids
- sponges
- water

TIME
30 minutes

PROCEDURE

1. Using the materials listed, design an experiment to demonstrate why mussels close their shells during low tide.
2. Write up your procedure.
3. Test your experiment.

WHAT DO YOU THINK?

- How does your experiment demonstrate why mussels close their shells?
- What were the variables in your experiment?

CHALLENGE How could you redesign your experiment to better model what happens during low tide? What other variables would you include?

Fresh water and salt water meet on coasts.

This aerial photograph shows the Pawcatuck River estuary in the northeastern United States. Fresh water from the river mixes with salt water from the ocean.

You have read that rivers flow to the sea. What happens when they get there? The fresh water from rivers mixes with salt water from the ocean in shoreline areas called **estuaries** (EHS-choo-EHR-eez), which include bays, inlets, and harbors. The water in estuaries is not as salty as ocean water, nor as fresh as river water. The salinity changes as the tide flows in and out. Sometimes the water at the surface is fresh, while denser salt water remains below.

Estuaries are bursting with life. Plants and animals thrive on nutrients washed in by rivers. Worms and shellfish live along the bottom. Plants and animals too small to see without a microscope float in the water. Many different kinds of birds and sea animals breed in estuaries. Roots and grasses offer protection for young fish and other animals. These small fish and other animals are an important food source for larger fish and for birds.

Coastal wetlands form along the edges of estuaries. As the name suggests, **wetlands** are wet, swampy areas that are often flooded with water. There are two kinds of coastal wetlands. Away from the equator, in cooler regions, coastal wetlands are salt marshes. Closer to the equator, in tropical regions, coastal wetlands are mangrove forests.

CHECK YOUR READING How are coastal wetlands related to estuaries?

Salt Marshes

Away from the equator, in cooler regions, grassy salt marshes are found along the edges of estuaries. In the United States, salt marshes are found along the coasts of the Atlantic and Pacific oceans and the Gulf of Mexico. Salt marshes help keep the shoreline from washing away. They also provide an important habitat for fish, birds, and other wildlife.

The rivers that flow into estuaries carry nutrient-rich soil. When the rivers reach the sea, they drop the soil. This rich soil supports thick grasses. The grasses form a protective barrier against waves, tides, and storms. Thick root systems hold the muddy bottom together. Tiny organisms decompose, or break down, dead grasses and return the nutrients the grasses contained to the marsh.

Crabs, snails, and minnows thrive among the grasses. Ospreys and other fish-eating birds find food in salt marshes. Birds that migrate use salt marshes as rest stops when they fly back and forth each season.

In the past, people did not understand the importance of wetlands. Over the last 200 years, about half of all wetlands in the United States were destroyed. Many were drained or filled in with soil to provide solid ground to build on or to farm. In the 1970s, people started working to protect and restore coastal wetlands.

CHECK YOUR READING Why are grasses an important part of the salt marsh environment?

This is an underwater view of mangrove roots.

INFER This photograph shows mangrove plants along the coast of Florida. How do the roots brace the mangroves against waves and storms?

Mangrove Forests

In tropical regions, the main coastal wetland is the mangrove forest. In the United States, mangrove forests are found along the coast of southern Florida. A mangrove forest is a thick group of mangrove shrubs and trees. The mangrove plants' roots brace them against storms and waves. Without the protection of these plants, shorelines in tropical areas would be drastically changed by heavy storms.

The sheltered mangrove forest is home to many living things. Fiddler crabs may live in the shallow waters among the mangrove roots. You may find seaweeds, oysters, shrimp, and snails. You may even see tree-climbing fish! These fish, called mudskippers, climb mangrove roots to catch insects and crabs.

MAIN IDEA WEB
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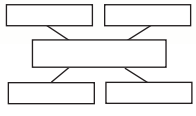

Human activity affects shorelines.

Coastal environments are home not only to many plants and animals, but to many humans as well. About half of the world's population lives within 80 kilometers (50 mi) of a coastline. Big cities and important commercial ports are often located where rivers meet the sea. Many people use coastlines and estuaries for recreation, such as boating, swimming, and fishing.

Human activity can harm the estuary environment. For example, some coastal wetlands are cleared for shrimp farms and for raising crops. Other areas are filled in to make new land for houses and other development. Industry and shipping can disturb wildlife and alter the estuary habitat. In some places, human waste and other sewage drains directly into the water.

About half of the world's population lives near a coastline, such as this one in Mexico.

Even pollution that occurs far away from the shore can affect the coast. The rivers that empty into estuaries pass through farms and cities. Along the way, the rivers may pick up pollutants such as pesticides, fertilizers, oil, and other chemicals. Pollution that washes into the river—even kilometers away from the shore—will eventually end up in the estuary.

Governments, local organizations, and individuals work to protect and preserve shoreline environments in many states. Improved sewage treatment plants reduce the amount of human waste that ends up in shoreline environments. Laws that restrict dumping help reduce pollution along shorelines. Many states have shoreline sanctuaries where plants and animals are protected.

CHECK YOUR READING What are three ways shorelines are protected?

5.1 Review

KEY CONCEPTS

1. Describe the characteristics of the intertidal zone.
2. Name and describe two coastal environments that border estuaries.
3. What human activities are harmful to shoreline environments?

CRITICAL THINKING

4. **Compare and Contrast** What similarities exist between salt marshes and mangrove forests? How are they different?
5. **Infer** Sometimes estuaries are called nursery areas. Why do you think estuaries may have been given that name?

CHALLENGE

6. **Identify Cause** A salinity meter placed in a tidal pool shows a dramatic decrease in salinity between 2 A.M. and 3 A.M. This decrease is followed by a gradual rise in salinity from 11 A.M. until 4 P.M. the next day. What might explain these changes?