chapter 26 Ecosystems

section 1 How Ecosystems Change

What You'll Learn

- how ecosystems change over time
- how new communities begin in areas
- how pioneer species and climax communities differ

Before You Read

List two ways the area you live in has changed over time.

_____

_____

_____

Read to Learn

Ecological Succession

What would happen if the lawn at your home were never cut? The grass would get longer, and it would look like a meadow. Later, larger plants would grow from seeds brought to the area by animals or the wind. Then trees might sprout. In 20 years or less you wouldn't be able to tell that the land was once a mowed lawn.

An ecologist can tell you what type of ecosystem your lawn would become. Ecosystems are all the organisms that live in an area and the nonliving parts of that environment. **Succession** is the normal, gradual changes that occur in the types of species that live in an area. Succession occurs differently in different places around the world.

What is primary succession?

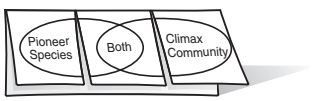
The process of succession that begins in a place where no plants grew before is called primary succession. It begins with the arrival of living things such as lichens (LI kunz). The first living things to inhabit an area are called **pioneer species**. They can survive the harsh conditions of the area, such as drought and extreme heat and cold.

Study Coach

Create a Quiz After you read this section, create a quiz of five to seven questions that you think might be on a test. Be sure to answer your questions.

FOLDABLES™

A Compare Make a Foldable as shown below to compare and contrast pioneer species and climax communities.



How does soil form?

Pioneer species often start the soil-building process in an area that is made up of rock. Soil begins to form as lichens and the forces of weather and erosion help to break down rocks into smaller pieces. When lichens die, they decay, adding organic matter to the rocks. Moss and ferns can grow in this new soil as shown in the photo. When these plants die, they add more organic material to the soil. Soon there is enough soil for grasses, wildflowers, and other plants to grow. When these plants die, they make the soil richer and deep enough for shrubs and trees to grow. During these changes, insects, small birds, and mammals have begun to move into the area.

David Wrobel/Visuals Unlimited

Where does secondary succession occur?

Succession that begins in a place that already has soil and was once home to living organisms is called secondary succession. Since the area already has soil, secondary succession is much faster than primary succession. The soil in an area that had a forest fire or a building torn down will not remain lifeless for long. The soil already contains seeds. Wind and birds will carry more seeds to the area. Wildlife will move in.

Reading Check

1. **Describe** Where does secondary succession occur?

What are climax communities?

A **climax community** is a community of plants that is mostly stable and has reached the end stage of succession. New trees grow when larger, older trees die. The individual trees change, but the species does not. For example, a climax community that is a forest of beeches and maples will stay a forest of beeches and maples even though some older trees will die and new trees grow. It can take hundreds or thousands of years for a climax community to develop.

After You Read

Mini Glossary

climax community: a community of plants that is mostly stable and has reached the end stage of succession

pioneer species: the first living things to inhabit an area

succession: the normal, gradual changes that occur in the types of species that live in an area

1. Review the terms and their definitions in the Mini Glossary. Write two or three sentences that explain the difference between pioneer species and climax communities.

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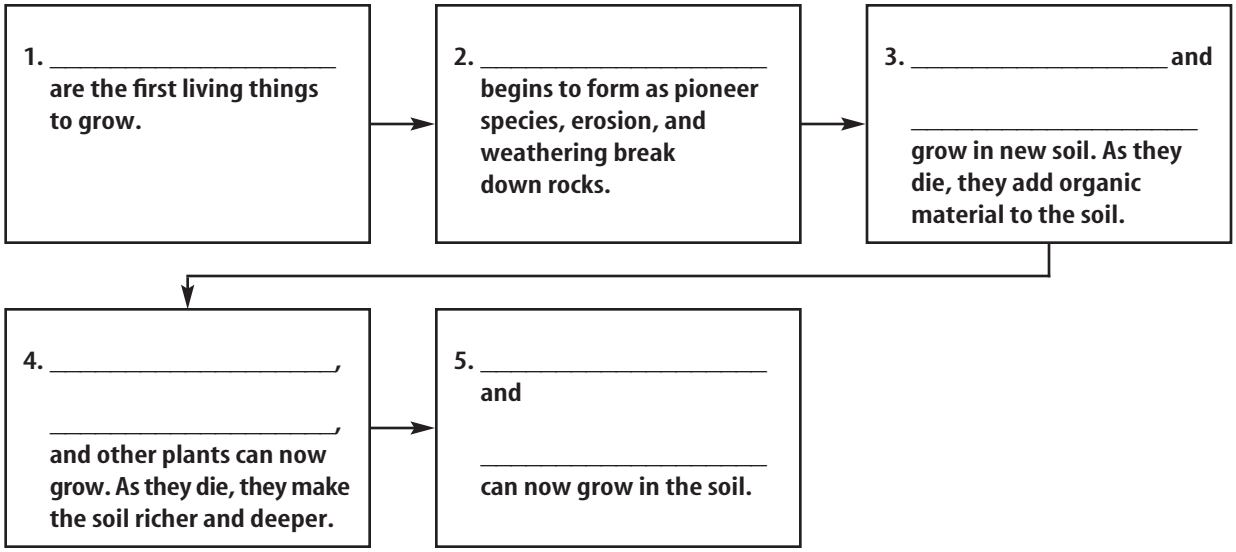
_____

2. Fill in the blanks in the graphic organizer below to show how soil is formed.

How Soil Is Formed



3. How does the quiz you created help you prepare for a test?

_____

_____

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End of Section

chapter 26

Ecosystems

section 2 Biomes

What You'll Learn

- how climate affects land environments
- the seven biomes of Earth
- how organisms adapt to different biomes

Before You Read

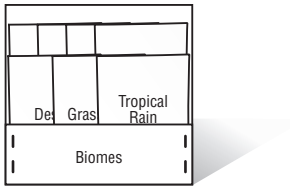
On the lines below, describe the geographic area where you live. Include information about the climate, the landforms, and the kinds of plants and animals that live there.

Mark the Text

Identify the Main Point
Underline the important ideas in this section. This will help you remember what you read.

FOLDABLES™

B Describe Make a pocket Foldable, as shown below. Use quarter sheets of notebook paper to describe the characteristics of each type of biome.



Read to Learn

Factors That Affect Biomes

Does a desert in Arizona have anything in common with a desert in Africa? Both have heat, little rain, poor soil, water-conserving plants with thorns, and lizards. Large geographic areas that have similar climates and ecosystems are called **biomes** (BI ohmz).

What climate factors affect biomes?

Deserts are biomes that have little rainfall. Plants and animals living in a desert are adapted to the small amount of rainfall. Climate is the average weather pattern in an area over many years. The two most important factors of climate that affect life are temperature and precipitation.

Major Biomes

The seven types of land biomes are shown on the map on the next page. The major land biomes are tundra, taiga, temperate deciduous forest, temperate rain forest, tropical rain forest, desert, and grassland. Areas with similar climates have similar plants and animals.

What kind of climate does tundra have?

The **tundra** is a cold, dry, treeless area. The tundra is found in latitudes just south of the North Pole or on high mountains.

Locate the tundra areas on the map below. Notice how far these areas are from the equator. The average amount of precipitation in the tundra is less than 25 cm per year. The average daily temperature is −12°C. The tundra is covered with ice most of the year. Summers are short and cold. The top part of the soil thaws in summer. Below this thawed surface is a layer of soil called permafrost that is always frozen.

What plants and animals live on the tundra?

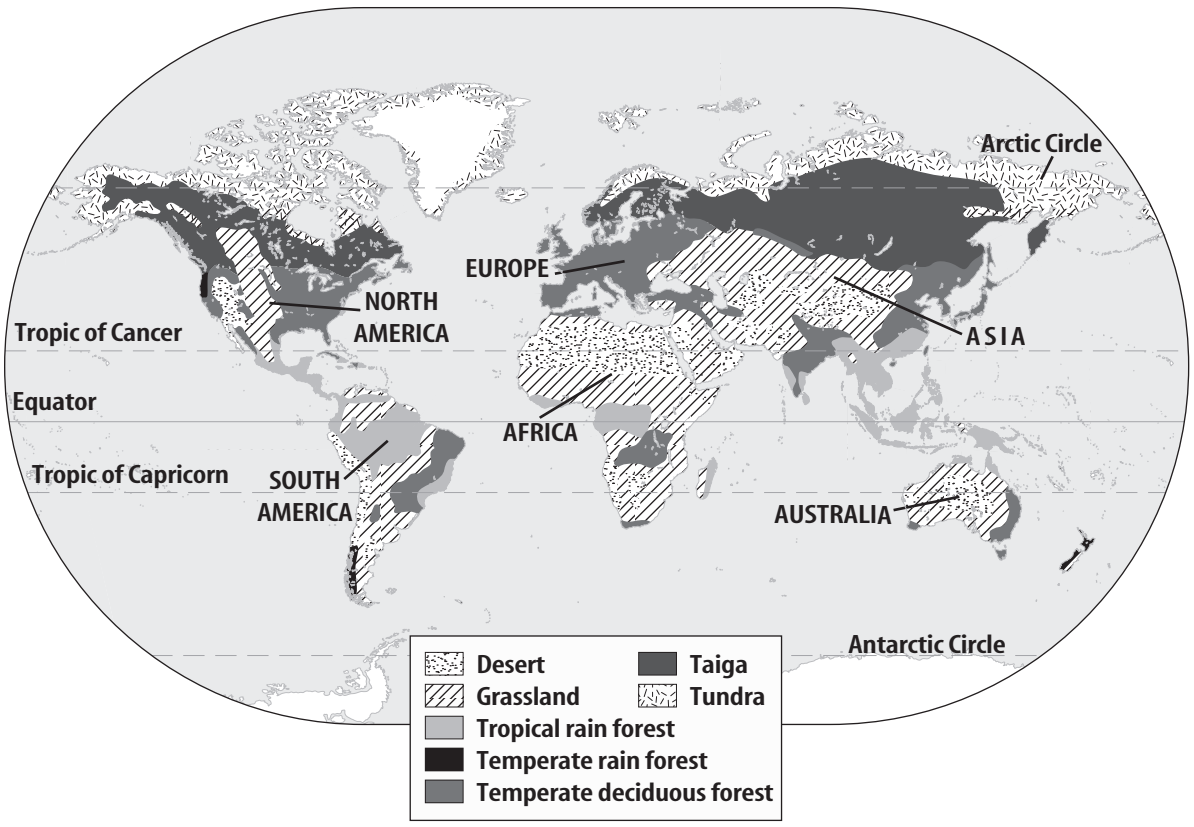
Tundra plants include mosses, grasses, small shrubs, and lichens. Since the growing season is so short, it can take many years for the plant life to recover when damaged. During the summer, insects and migratory birds such as ducks and geese live on the tundra. Other animals that live on the tundra include hawks, owls, mice, reindeer, and musk oxen.

Think it Over

1. **Infer** Would you expect to find few or many species of plants and animals in the tundra? Explain.

Picture This

2. **Locate** Circle the names of continents on which deserts are found.



What is the world's largest biome?

The **taiga** (TI guh) is the world's largest biome. The taiga is located between latitudes 50°N and 60°N and stretches across North America, northern Europe, and Asia. The taiga is a cold, forest region. Its climate is warmer and wetter than the tundra's. Precipitation is mostly snow and averages 35 cm to 100 cm a year. Cone-bearing evergreen trees grow in the taiga.

What are temperate deciduous forests like?

The **temperate deciduous forests** are climax communities of deciduous trees, which lose their leaves every autumn. The yearly precipitation is between 75 cm and 150 cm. Precipitation is received evenly throughout the year. Temperatures range from below freezing during the winter to 30°C or more during the summer. White-tailed deer are one of the many species found in temperate deciduous forests.

Reading Check

3. **Explain** What happens to the leaves of deciduous trees in autumn?

Where are temperate rain forests located?

Temperate rain forests are found in places such as New Zealand, southern Chile, and the Pacific Northwest of the United States. This biome receives precipitation ranging from 200 cm to 400 cm throughout the year. The average temperature ranges from 9°C to 12°C. Temperate rain forests do not have the temperature extremes found in the taiga.

Activities in Temperate Rain Forests Tall trees with needlelike leaves, like fir, cedar, and spruce, grow in temperate rain forests. Lichens and mosses also grow there. Animals that live in temperate rain forests include black bear, bobcats, and many species of amphibians.

The logging industry in the Northwest provides jobs for many people. However, logging removes large parts of the temperate rain forest and destroys the habitat of many organisms. Logging companies in the Pacific Northwest of the United States are required to replant trees to replace the ones they cut down. Some rain forest areas are protected as national parks and forests.

Reading Check

4. **Describe** why logging can be harmful to temperate rain forests.

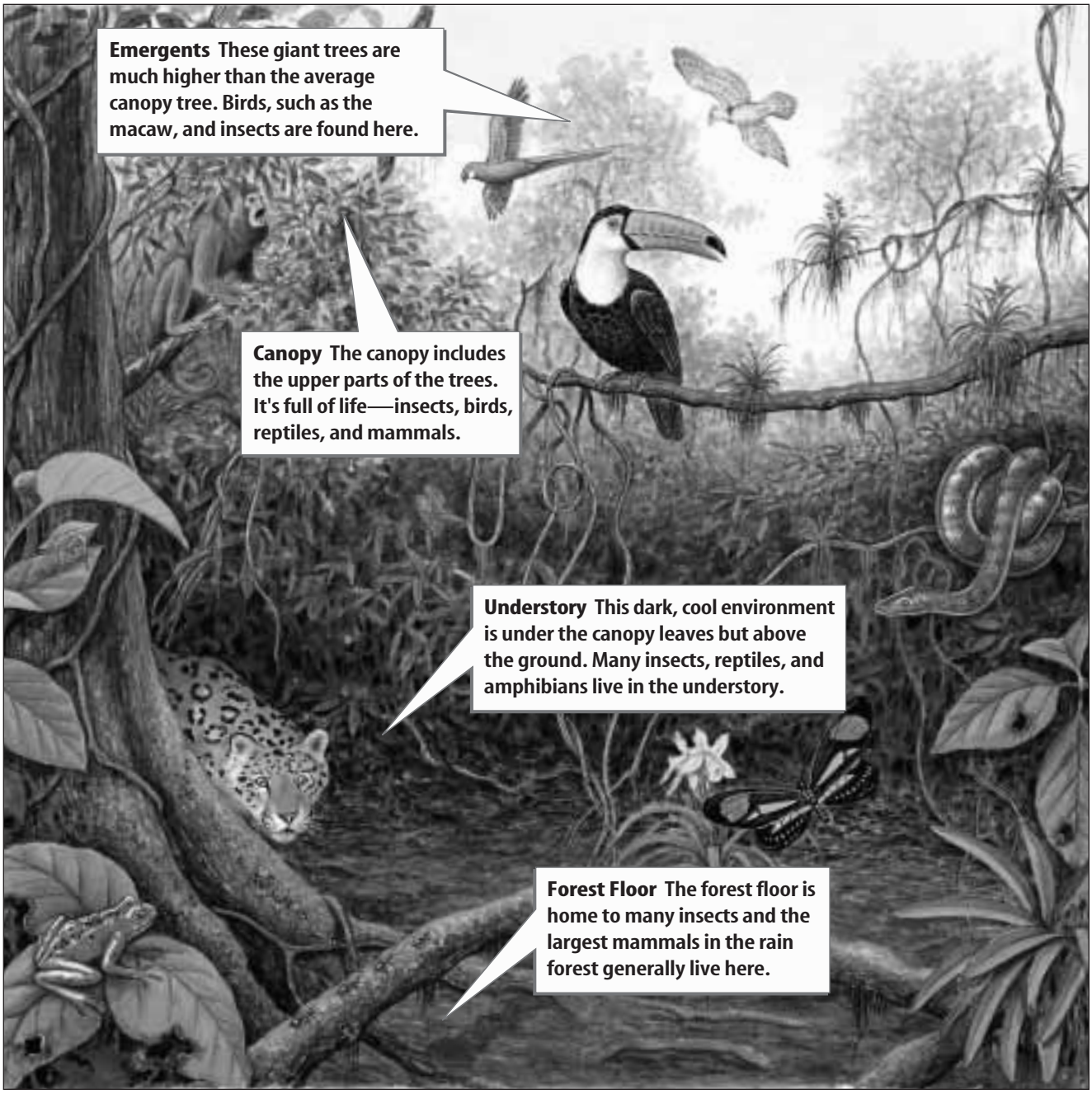
What is the climate in tropical rain forests?

Warm temperatures, wet weather, and dense plant growth are found in **tropical rain forests.** These forests have warm temperatures that average about 25°C because they are located near the equator. Tropical rain forests receive at least 200 cm and as much as 600 cm of rain per year. This is the most precipitation of any biome.

Zones in Tropical Rain Forests More species of animals are found in tropical rain forests than in any other biome. The variety of species is so large that many have not been discovered. Scientists divide the rain forests into zones based on the types of plants and animals that live there. As shown in the figure below, the zones include forest floor, understory, canopy, and emergents (e MERH gentz).

Picture This

5. **Identify** Highlight the zones in which birds live. Circle the zones in which insects live.



Human Impact Farmers clear the land in tropical areas to farm and to sell the wood. After a few years, the crops use up the nutrients in the soil, and more land is cleared. This process destroys the rain forests. Through education, people are learning the value of preserving the species of the rain forest. Logging is not allowed in some areas. In other areas, farmers use new farming methods so they do not need to clear as much rain forest land.

What is the driest biome?

The **desert** is the driest biome. Deserts receive less than 25 cm of rain each year. The temperatures are extreme heat and cold. Few plants live in desert areas and much of the ground is bare. Most deserts are covered with a thin, sandy, or rocky soil that contains little organic matter. The driest deserts have windblown sand dunes.

Desert Plants and Animals Most desert plants, like cactus, survive the extreme dryness because they are able to store water. Desert plants and animals also are adapted to hot and cold temperatures. Some animals, like the kangaroo rat, never need to drink water. They get the moisture they need from the food they eat. Most animals are active only during the night, late afternoon, or early morning when the temperatures are less extreme. Most animals in the desert are small.

What are grasslands like?

Temperate and tropical regions that receive between 25 cm and 75 cm of precipitation each year and are made up of climax communities of grasses are called **grasslands**. Most grasslands have a dry season, with little or no rain. This lack of rain prevents the development of forests.

Grassland Plants and Animals The animals in grasslands are mostly mammals that eat the stems, leaves, and seeds of grass plants. Kangaroos are found in the grasslands of Australia. Zebras live in the grasslands of Africa. Many crops, such as wheat, rye, and corn are grown in grasslands. Sheep and cattle are raised on grasslands.

Think it Over

6. **Explain** why much of the ground in a desert is bare.

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_____

Reading Check

7. **Determine** What keeps forests from developing on grasslands?

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_____

After You Read

Mini Glossary

biomes (BI ohmz): large geographic areas that have similar climates and ecosystems

desert: dry biome with extreme hot and cold temperatures

grasslands: biome of temperate and tropical regions that receive little precipitation and are made up of climax communities of grasses

taiga (TI guh): biome with long, cold winters, moderate precipitation, and forests of evergreen trees

temperate deciduous forests: biome with four seasons and climax forests of deciduous trees, which lose their leaves every autumn

temperate rain forests: biome with warm temperatures, much precipitation, and forests of tall trees that have needlelike leaves

tropical rain forests: biome of warm temperatures, wet weather, and dense plant growth

tundra: a cold, dry, treeless biome that gets little precipitation and is covered with ice most of the year

1. Review the terms and their definitions in the Mini Glossary. Write two sentences that explain the difference between temperate deciduous forests and temperate rain forests.

2. How did underlining the important ideas in this section help you understand biomes?

3. Complete the chart below to help you compare and contrast the seven biomes of the world.

Biomes	Climate	Plants and Animals	Locations
Tundra			
Taiga			
Temperate deciduous forests			
Temperate rain forests			
Tropical rain forests			
Deserts			
Grasslands			

End of Section

ScienceOnline Visit **life.msscience.com** to access your textbook, interactive games, and projects to help you learn more about the biomes.

chapter 26 Ecosystems

section 3 Aquatic Ecosystems

What You'll Learn

- the differences between flowing freshwater and standing freshwater ecosystems
- the importance of saltwater ecosystems
- problems that affect aquatic ecosystems

Before You Read

On each line below, name a different body of water. Next to each body of water, classify it as freshwater or salt water.

_____

_____

_____

_____

Read to Learn

Factors That Affect Aquatic Ecosystems

Aquatic ecosystems are places where organisms grow or live in water. There are four factors that affect aquatic ecosystems—water temperature, the amount of sunlight present, dissolved oxygen, and salt in the water.

Freshwater Ecosystems

Earth's freshwater ecosystems include flowing water such as rivers and streams. Freshwater ecosystems also include standing water such as lakes, ponds, and wetlands. Freshwater ecosystems contain very low amounts of salt.

How are river and stream environments alike?

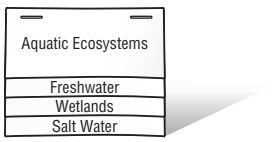
Rivers and streams that flow fast have clearer water and higher levels of oxygen than slow-flowing rivers and streams. This is because the faster the water moves, the more air mixes in. In flowing-water ecosystems, nutrients that support life are washed in from the land. Plants and animals that live in rivers and streams are adapted to the flowing water.

Study Coach

Sticky-Note Discussions
As you read the section, use sticky-note paper to mark at least four paragraphs that you find interesting or that you have a question about. Your teacher can help you better understand what you have read.

FOLDABLES™

Describe Make a layered-look book, as shown below. Under each flap, write descriptions of the aquatic ecosystems.



How are lake and pond environments alike?

The water in lakes and ponds hardly moves. These environments have more plants than flowing-water environments. Lakes and ponds contain organisms that are not well adapted to flowing-water environments.

Lakes are larger and deeper than ponds. They have more open water because plant growth is limited to shallow areas along the shoreline. Colder temperatures and lower light levels limit the types of organisms that can live in deep lake waters. Microscopic algae, plants, and other organisms known as plankton live near the surface and the shoreline of freshwater lakes and in ponds where the water is warm and sunlit. Many ponds are filled almost completely with plant material, which make them high in nutrients.

Reading Check

1. **Compare** What is the difference between a lake and a pond?

What are wetlands?

Regions that are wet for all or most of the year are called **wetlands**. These regions, also known as swamps, bogs, and fens, are located between land areas and water. Wetlands are filled with plants and animals that are adapted to water-logged soil. Fish, shellfish, and cranberries are some products that come from wetlands. Wetland animals include beavers, muskrats, alligators, and some species of turtles. Many birds use wetland areas to have their young.

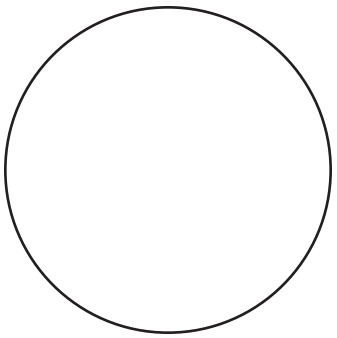
How do humans affect freshwater ecosystems?

Sometimes freshwater ecosystems are used as places to dump waste and other pollutants. Fertilizer from farms and lawns runs off into freshwater. Wetlands were once drained and destroyed because people thought they were useless and full of diseases. The drained land was used for shopping centers and houses.

People are being educated about the damage caused by polluting freshwater ecosystems. Sewage is treated before it is released into the water to prevent problems. People who pollute waterways may be fined. Many developers now are working to restore wetlands.

Applying Math

2. **Graph** In the circle below, make and label a circle graph that shows the percent of Earth's water that is salt water and the percent that is freshwater.



Saltwater Ecosystems

About 95 percent of Earth's water contains high amounts of salts. Saltwater ecosystems include oceans, seas, a few inland lakes such as the Great Salt Lake in Utah, coastal inlets, and estuaries.

What are ocean life zones?

Scientists divide the ocean into life zones. There are two zones based on the depth to which sunlight penetrates the water—the lighted zone and the dark zone. The lighted zone of the ocean is about the upper 200 m. Plankton make up the base of the food chain in this zone. Below about 200 m is the dark zone. Animals living in this zone feed on each other or on material that floats down from the lighted zone. A few organisms produce their own food.

Reading Check

3. **Identify** What are the two ocean life zones?

How do coral reefs form?

Coral reefs are one of the most varied ecosystems in the world. **Coral reefs** form in oceans over long periods of time from the calcium carbonate shells of ocean animals called corals. When corals die, their shells remain. Over time the shell deposits form coral reefs. Coral reefs contain colorful fish and many other organisms.

Waste materials easily damage coral reefs. World organizations are helping protect coral reefs from harm.

What are the characteristics of seashores?

The shallow waters along the world's coastlines have many kinds of saltwater ecosystems. These waters are affected by the tides and by the action of the waves. The height of the tides changes based on the phases of the Moon, the season, and the slope of the shoreline. The part of the shoreline that is covered with water at high tide and exposed to air during low tide is called the **intertidal zone**. Organisms that live in the intertidal zone must withstand the force of the waves. They must also be adapted to changes in temperature, moisture, and the amount of salt in the water.

What is an estuary?

Almost every river eventually flows into an ocean. The area where they meet contains a mixture of freshwater and salt water and is called an **estuary** (ES chuh wer ee). Estuaries are located near coastlines and border the land. Other names for estuaries include bays, lagoons, and sounds. An estuary is a very fertile environment. Freshwater streams bring in great amounts of nutrients washed from inland soils. An estuary is an important aquatic ecosystem because many kinds of organisms live there, including algae, grasses, shrimp, crabs, clams, and fish. Estuaries are places where the young of many species of ocean fish grow and develop.

Think it Over

4. **List** three things that organisms that live in intertidal zones must be adapted to in order to survive.

After You Read

Mini Glossary

coral reefs: ecosystems in oceans that formed over long time periods from the calcium carbonate shells of corals

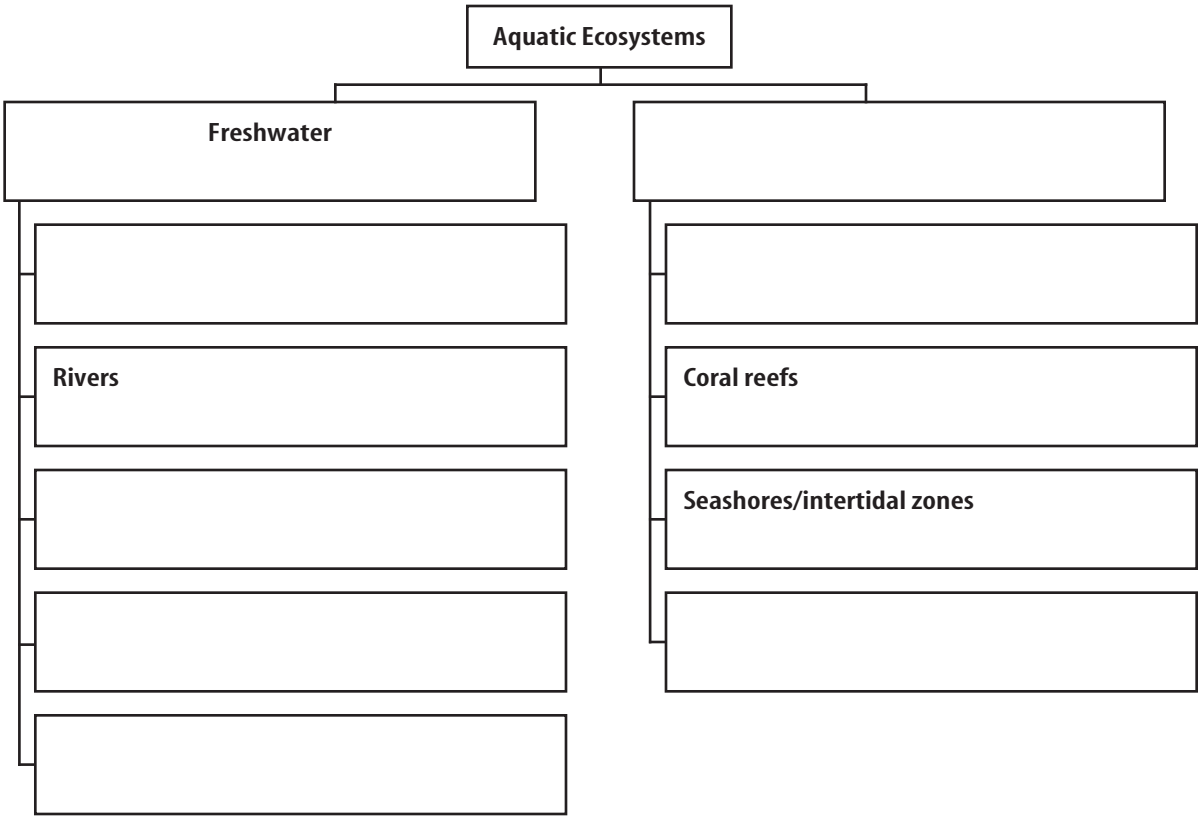
estuary (ES chuh wer ee): the area where a river meets an ocean and contains a mixture of freshwater and salt water

intertidal zone: the part of the shoreline that is covered with water at high tide and exposed to air during low tide

wetlands: regions that are wet for all or most of the year

1. Review the terms and their definitions in the Mini Glossary. Write a sentence that explains the difference between a wetland and an estuary.

2. Complete the graphic organizer below to identify the kinds of aquatic ecosystems.



End of Section

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