

Science

Distance Learning Week 4 5/11 - 5/15

Read pgs 438 - 455

Mon	5/11	Chapter 11-1 Vocabulary pg 438
Tues	5/12	Cornell Notes pg 438-447 Answer Questions on pg 447
Wed	5/13	Chapter 11-2 Vocabulary pg 450
Thurs	5/14	Cornell Notes pgs 450-455 Answer Questions on pg 455
Friday	5/15	Catchup

Science

Distance Learning Week 5 5/18 - 5/22

Read pgs 457 - 467

Mon	5/18	Chapter 11-3 Vocabulary pg 457
Tues	5/19	Cornell Notes pg 457 - 461 Answer Questions on pg 461
Wed	5/20	Chapter 11-4 Vocabulary pg 462
Thurs	5/21	Cornell Notes pg 462 - 467 Answer Questions on pg 467
Friday	5/22	Last day of School

Section 1

Biomes

CALIFORNIA

Standards Focus

S 6.5.d Students know different kinds of organisms may play similar ecological roles in similar biomes.

S 6.5.e Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

- ➊ What factors determine the type of biome found in an area?
- ➋ What are the six major biomes?

Key Terms

- biome
- desert
- canopy
- understory
- grassland
- savanna
- deciduous tree
- coniferous tree
- tundra
- permafrost

Lab zone

Standards Warm-Up

How Much Rain Is That?

The table shows the typical amount of precipitation that falls each year in four locations. With your classmates, you will create a full-sized bar graph on a wall to represent these amounts.

Location	Precipitation (cm)
Mojave Desert	15
Illinois Prairie	70
Great Smoky Mountains	180
Costa Rican Rain Forest	350

1. Using a meter stick, measure a strip of adding-machine paper 15 centimeters long. Label this strip "Mojave Desert."
2. Repeat Step 1 for the other locations. Label each strip.
3. Follow your teacher's instructions on hanging your strips.

Think It Over

Developing Hypotheses What effect might the amount of precipitation have on the types of plants that live in a location?

Congratulations! You've been selected to go on a world expedition to explore Earth's biomes. A **biome** is a region with a certain climate and certain forms of vegetation. You'll be visiting places ranging from steamy tropical forests to frozen Arctic plains. ➊ It is mostly the climate—temperature and precipitation—in an area that determines its biome. Climate limits the species of plants that can grow in an area, which in turn determine what other organisms can live there.

Different organisms living in similar biomes may play similar ecological roles. For example, most continents have a large area of flat, grassy plains. So these continents have organisms that fill the role, or niche, of "large, grazing herbivore." In North America, these herbivores are the bison. In Africa, they are wildebeests and antelopes. And in Australia, they are kangaroos.

Ecologists classify biomes in different ways. ➋ The six major biomes are the desert, rain forest, grassland, deciduous forest, boreal forest, and tundra.



Video Field Trip

Discovery Channel School

Ecosystems and Biomes

Desert Biomes

The first stop on your expedition is a desert. You step off the bus into searing summer heat. At midday, it is too hot to walk outside in the desert.

A **desert** is an area that receives less than 25 centimeters of rain per year. The amount of evaporation in a desert is greater than the amount of precipitation. Some of the driest deserts may not receive any precipitation in a year!

Deserts often undergo large shifts in temperature during the course of a day. A scorching hot desert like the Namib Desert in Africa cools rapidly each night when the sun goes down. Other deserts, such as the Mojave in the southwestern United States, are very hot in the summer but often experience freezing temperatures in the winter.

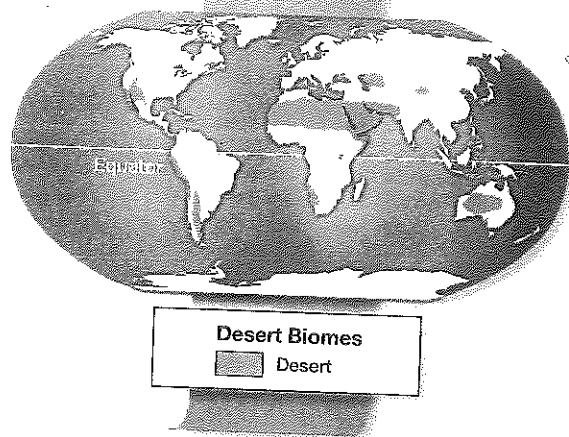
Organisms that live in the desert must be adapted to the lack of rain and extreme temperatures. For example, the stem of a saguaro cactus has folds that work like the pleats in an accordion. The stem expands to store water when it is raining. Gila monsters can spend weeks at a time in their cool underground burrows. Many other desert animals are most active at night when the temperatures are cooler.

FIGURE 1

Desert

The Mojave Desert in California is a typical hot desert.

Making Generalizations Describe the climate conditions of a typical desert.



Lab
zone

Try This Activity

Desert Survival

Use a hand lens to carefully observe a small potted cactus. **CAUTION:** Be careful of the spines. With a pair of scissors, carefully snip a small piece from the tip of the cactus. Observe the inside of the plant. Note any characteristics that seem different from those of other plants.

Observing How is the inside of the cactus different from the outside? Suggest how the features you observe might be adaptations to its desert habitat.

Gambel's quail





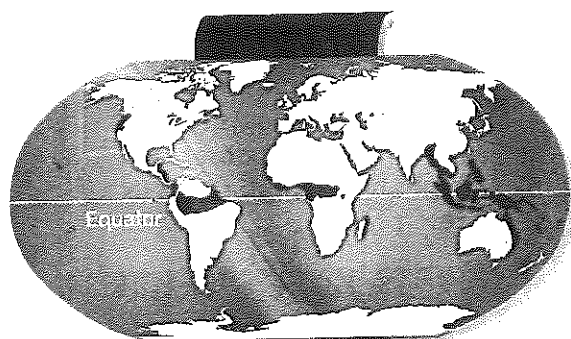
Australian Rain Forest

▲ Lumholtz's tree kangaroo

FIGURE 2

Rain Forest Roles

Tree kangaroos and spider monkeys live in different rain forests on opposite sides of the world. But both are consumers living in the forest canopy.



Rain Forest Biomes

- Tropical rain forest
- Temperate rain forest

Rain Forest Biomes

The next stop on your trip is a rain forest. This biome is living up to its name—it's pouring! After just a short shower, however, the sun reappears. Surprisingly, though, very little sunlight reaches you through the thick leaves above. Plants are everywhere in the rain forest. And animals are flying, creeping, and slithering all around you. Although tropical rain forests cover only a small part of the planet, they probably contain more species of plants and animals than all the other biomes combined.

Tropical Rain Forests As you can see on the map, tropical rain forests are found in regions close to the equator. The climate is warm and humid all year long, and there is a lot of rain—over 200 centimeters per year. Because of these climate conditions, an astounding variety of plants grow in tropical rain forests.

Trees in the rain forest form several distinct layers. The tall trees form a leafy roof called the **canopy**. A few giant trees poke out above the canopy. Below the canopy, a second layer of shorter trees and vines forms an **understory**. Understory plants grow well in the shade formed by the canopy. The forest floor is nearly dark, so only a few plants live there.

The rich plant life in tropical rain forests provides food and habitat for many species of animals. Ecologists estimate that millions of species of insects live in tropical rain forests. In fact, the most abundant animals are ants and termites. These and other insects serve as a source of food for many reptiles, birds, and mammals. These animals are, in turn, food for other animals.



South American Rain Forest

Ecological Roles in Rain Forests Very different animals may play similar ecological roles in rain forests around the world. For example, mammalian consumers in South American rain forests include sloths, deer, monkeys, rodents, and cats. Consumers in Australian rain forests include kangaroos, wallabies, and bandicoots, all of which belong to a different group of mammals altogether.

The animals that live in the rain forest canopy have similar adaptations. For example, spider monkeys have hands with thumbs and tails that can grasp onto branches as they move about in the canopy. Tree kangaroos do not have grasping tails. But they use their long tails to keep their balance as they move about in the trees. Their feet have sharp claws and spongy pads that help them in climbing.

Temperate Rain Forests When you hear the term *rain forest*, you probably think of the warm, humid, tropical rain forests. But there is another type of rain forest. The northwestern coast of the United States receives more than 300 centimeters of rain per year. Huge trees grow there, including cedars, redwoods, and Douglas firs. But it is difficult to classify this region. Many ecologists refer to this ecosystem as temperate rain forest. The term *temperate* means having moderate temperatures. The redwood forests of the northern California coast are temperate rain forests.



▲ Spider monkey

Reading Checkpoint

What is an understory?

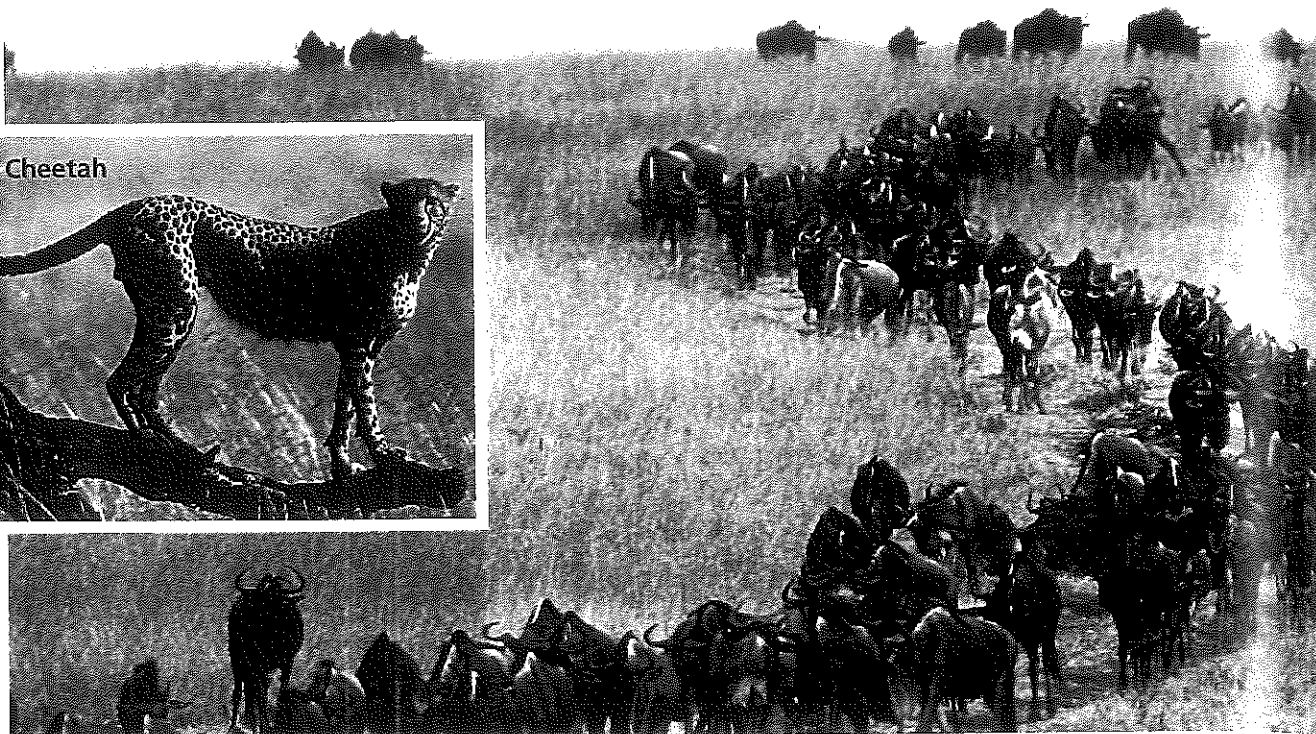
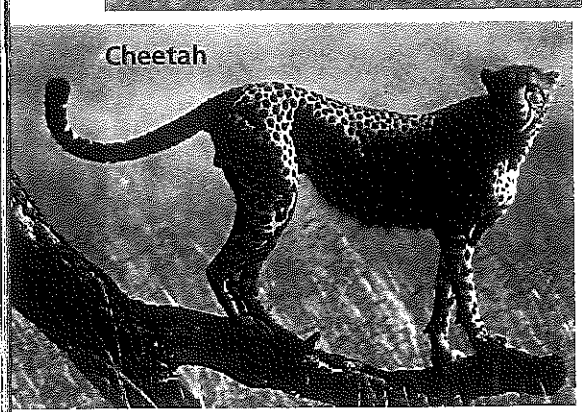


FIGURE 3

Savanna

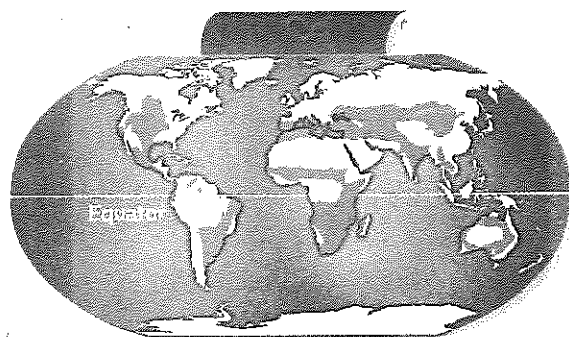
Migrating wildebeests make their way across a vast Kenyan savanna. A savanna is a type of grassland that has scattered shrubs and small trees.

Grassland Biomes

The next stop on the trip is quite a change from the rain forest. You are now in a grassy plain called a prairie. The breeze carries the scent of soil warmed by the sun. The rich soil can support grasses as tall as you. Startled by your approach, sparrows dart into hiding places among the waving grass stems.

Ecologists classify prairies, which are generally found in the middle latitudes, as grasslands. A **grassland** is an area that is populated mostly by grasses and other nonwoody plants. Most grasslands receive 25 to 75 centimeters of rain each year. This amount of rain is not enough for trees to grow. Fires and droughts are common in this biome. Grasslands that are located closer to the equator than prairies are known as savannas. A **savanna** receives as much as 120 centimeters of rain per year. Scattered shrubs and small trees grow on savannas, along with grass.

Grasslands are home to many of the largest animals on Earth. Herbivores include elephants, antelopes, zebras, rhinoceroses, and giraffes in Africa, bison in North America, and kangaroos in Australia. Grazing by these large herbivores helps to maintain the grasslands. The animals keep young trees and bushes from sprouting and competing with the grass for water and sunlight.



Grassland Biomes
 Grassland



Reading
Checkpoint

Which type of grassland usually receives more rainfall, a prairie or a savanna?

Deciduous Forest Biomes

Your trip to the next biome takes you to another forest. It is now late summer. Cool mornings here give way to warm days. Several members of your group are busy recording the many plant species. Others are looking through their binoculars, trying to identify the songbirds. You step carefully to avoid a small frog.

You are now in a deciduous forest biome. Many of the trees here are **deciduous trees** (dee SIJ oo us), trees that shed their leaves and grow new ones each year. Oaks and maples are deciduous trees. Deciduous forests receive enough rain—at least 50 centimeters per year—to support the growth of trees and other plants. Temperatures in the deciduous forest vary greatly during the year. The growing season usually lasts five to six months.

The variety of plants in a deciduous forest creates many different habitats. Different species of birds live in different parts of the forest, eating the insects and fruits in their own areas. Mammals such as chipmunks and skunks live in deciduous forests. In a North American deciduous forest you might also see large herbivores that browse on leaves, such as white-tailed deer. Black bears are omnivores that eat plants and animals.

If you were to return to this biome in the winter, you would not see much wildlife. Many of the bird species migrate to warmer areas. Some of the mammals hibernate, or enter a state of greatly reduced body activity similar to sleep. Animals that hibernate rely on fat stored in their bodies during the winter months. For example, the American black bear and the Asiatic black bear store fat in late summer for use in the winter.

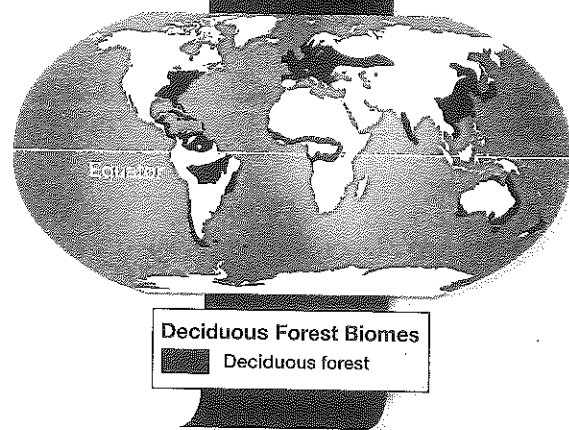
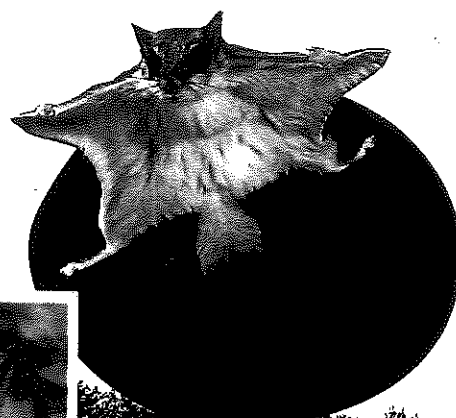


FIGURE 4

Deciduous Forest

This forest is a beautiful example of a deciduous forest in autumn. Most of the trees in a deciduous forest have leaves that change color and drop each autumn. **Comparing and Contrasting** How do deciduous forests differ from rain forests?

▼ Southern flying squirrel

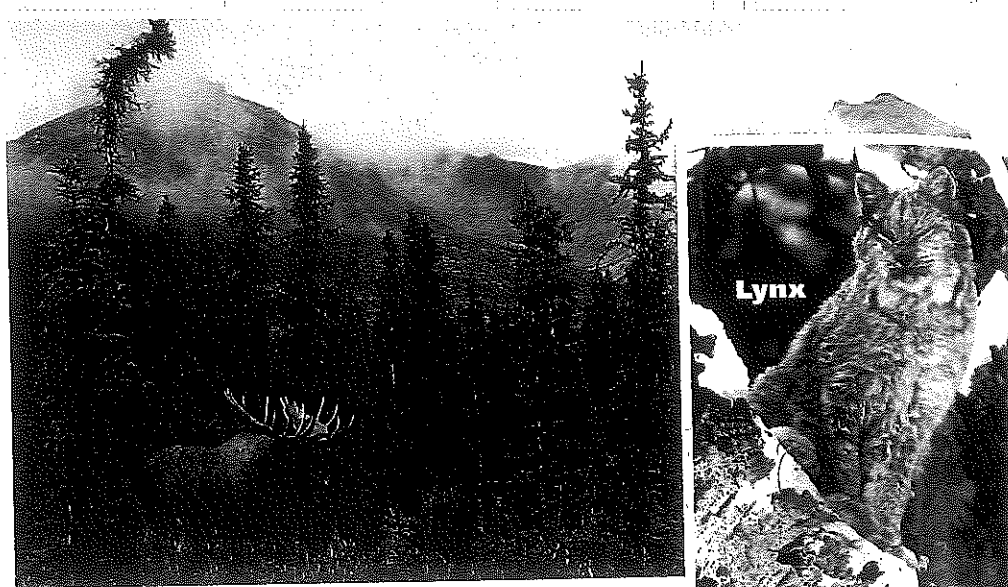


▼ Red fox



FIGURE 5
Boreal Forest

This boreal forest in Alaska's Denali National Park is home to coniferous trees and animals such as moose. The boreal forest is often called the "sprucemoose" forest.



Lab zone Skills Activity

Inferring

Both the great horned owl and the golden eagle live in boreal forest biomes. The great horned owl is found in the boreal forests of North America, while the golden eagle lives in North America, Europe, and Asia. What ecological roles do you think these two birds play in their boreal habitats?

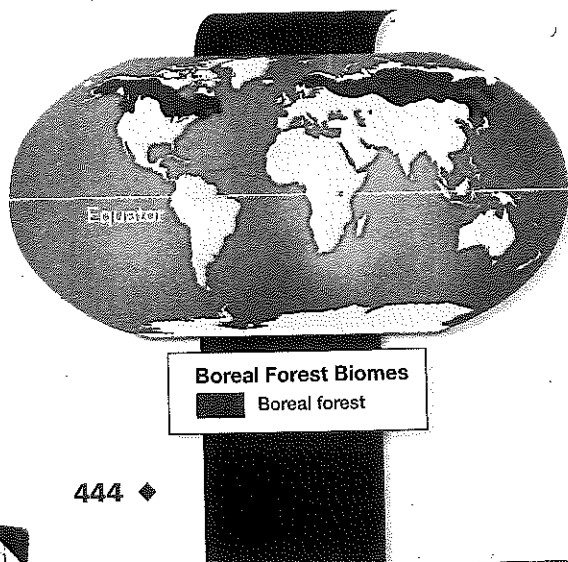
Boreal Forest Biomes

You now head north into a colder climate. The expedition leaders claim they can identify the next biome, a boreal forest, by its smell. When you arrive, you catch a whiff of the spruce and fir trees that blanket the hillsides. Feeling the chilly early fall air, you pull a jacket out of your bag.

Boreal Forest Plants Most of the trees in the boreal forest are **coniferous trees** (koh NIF ur us), trees that produce their seeds in cones and have leaves shaped like needles. The boreal forest is sometimes referred to by its Russian name, the *taiga* (TY guh). Winters in these forests are very cold. The snow can reach heights well over your head! Even so, the summers are rainy and warm enough to melt all the snow.

Trees in the boreal forest are well adapted to the cold climate. Since the water is frozen for much of the year, trees in the boreal forest have adaptations that prevent water loss. Fir, spruce, hemlock, and other coniferous trees all have thick, waxy needles that prevent water from evaporating.

Boreal Forest Animals Many of the animals of the boreal forest eat the seeds produced by the coniferous trees. These animals include red squirrels, insects, and birds such as finches and chickadees. Some herbivores, such as snowshoe hares, moose, and beavers, eat tree bark and new shoots. The variety of herbivores in the boreal forest supports many large predators, including wolves, bears, falcons, owls, and lynxes. The boreal forests of Asia even have Siberian tigers!



Reading Checkpoint

How are needles an advantage to trees in the boreal forest?

Tundra Biomes

As you arrive at your next stop, you feel the driving, chilly wind right away. The **tundra** is an extremely cold and dry biome. But don't expect deep snow. Many people are surprised to learn that the tundra receives about as much precipitation as a desert.

Most of the soil in the tundra is frozen all year. This frozen soil is called **permafrost**. During the short summer, the top layer of soil thaws, but the underlying soil remains frozen. Because rainwater cannot soak into the permafrost, there are many shallow ponds and marshy areas on the tundra in the summer.

Tundra Plants Plants of the tundra include mosses, grasses, shrubs, and dwarf forms of a few trees, such as willows. Most of the plant growth takes place during the long days of the short summer season. North of the Arctic Circle, the sun does not set during midsummer.

Tundra Animals In summer, the animals you might remember most are insects. Insect-eating birds take advantage of the plentiful food. Large numbers of waterfowl nest in the marshes. When winter approaches, these birds migrate south. Mammals of the tundra include caribou, musk oxen, foxes, wolves, and Arctic hares. The mammals that remain on the tundra during the winter grow thick fur coats. What can these animals find to eat on the tundra in winter? The caribou scrape snow away to find lichens. Wolves follow the caribou and look for weak members of the herd to prey upon.



Reading
Checkpoint

What is permafrost?

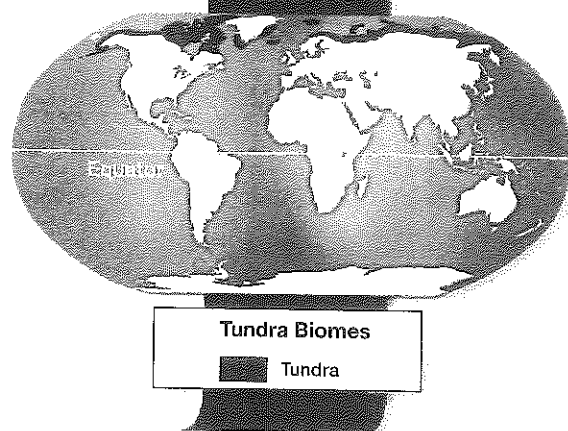


FIGURE 6

Tundra

Although it is frozen and seemingly barren in winter, the tundra in Alaska explodes with color in autumn.

Relating Cause and Effect Why are there no tall trees on the tundra?



Musk ox ▲





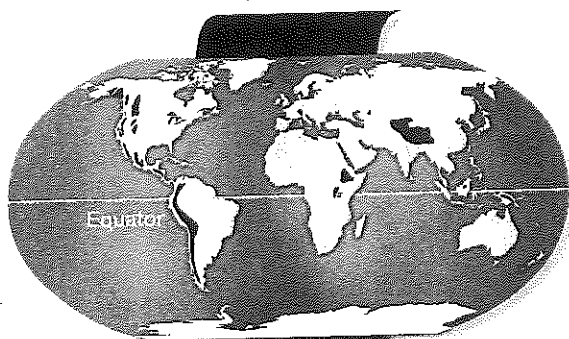
FIGURE 7

Ice


Polar bears live for much of the year on sea ice that covers the Arctic Ocean.

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Mountains and Ice

 Mountains
 Ice

Mountains and Ice

Some areas of land are not part of any major biome. These areas include land that is covered with thick sheets of ice and mountain ranges.

Ice Near Earth's poles, the climate is very cold and the land is covered year-round with thick ice sheets. These places include most of the island of Greenland in the Arctic (the region around the North Pole) and the continent of Antarctica around the South Pole. Organisms that are adapted to life on the Arctic ice include polar bears and harp seals. Leopard seals and emperor penguins are adapted to the Antarctic. Fish living in the icy waters produce chemicals that keep their blood from freezing.

Mountains As you read in Chapter 9, altitude, or elevation, has a great effect on climate. The greater the elevation, the colder the climate is. As a result, high mountains are cool. And because air cools as it rises, the top of a mountain usually receives more rainfall than its base. Thus the climate of a mountain changes from its base to its top. An area's climate determines what plants will grow there. As a result, the types of plants on a mountain can vary greatly from its base to its peak. It is as if different elevations on a mountain have different biomes.



**Reading
Checkpoint**

Why do different plants grow at different elevations on a mountain?

California Mountains If you were to hike from the Central Valley of California to the top of the Sierra Nevada, you would pass through a series of areas, or zones. Each zone has a different climate and a different community of plants, as shown in Figure 8.

The Central Valley is a dry grassland. As you enter the foothills, you see an open woodland of live oak and pine trees. At this elevation, you might also see dense thickets of shrubs. Higher up, you pass through a region of taller trees, including yellow pines, Douglas fir, and black oak. Next you reach a zone that is similar to the boreal forest, with lodgepole pine and fir trees. When you finally reach the peaks of the mountains, it is so cold and windy that only short plants can grow. The tiny flowering plants and dwarf willow trees at the top are similar to those in the tundra.

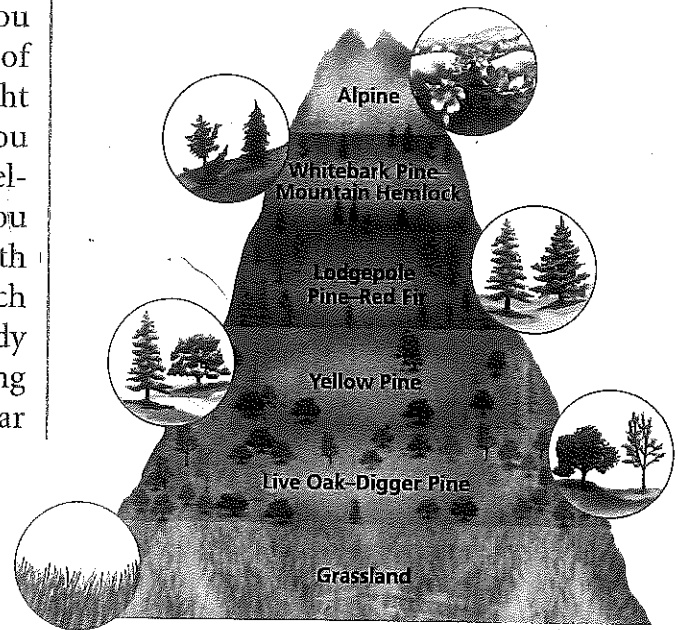


FIGURE 8

Climate Differences on Mountains

The climate changes dramatically as you move up a tall mountain. Climate determines the distribution of species on the mountain. **Inferring** Which zone on the mountain is warmest? Coldest? Explain.

Section 1 Assessment

S 6.5.d, 6.5.e; E-LA: Reading 6.1.0, Writing 6.2.3

Vocabulary Skill High-Use Academic Words In a complete sentence, explain what the *source* of food is for animals in the tundra.

Reviewing Key Concepts

1. a. **Reviewing** What two factors are most important in determining an area's biome?
 b. **Relating Cause and Effect** If deserts and tundras receive similar amounts of rainfall, why are these two biomes so different?
 c. **Applying Concepts** Why would hiking up a tall mountain be a good way to observe how climate determines an area's biome?
2. a. **Listing** What are the six major biomes found on Earth?
 b. **Comparing and Contrasting** How are the three forest biomes (rain forests, deciduous forests, and boreal forests) alike? How are they different?
 c. **Inferring** What biome might you be in if you were standing on a bitterly cold, dry plain with only a few, short plants scattered around?

Writing in Science

Research Report Choose two different biomes, such as a desert and a rain forest. Then, select a niche you would like to learn more about. Compare organisms that fill the niche in the biomes you selected. Use a variety of research materials, such as the Internet, CD-ROM reference materials, videos, or periodicals. Summarize your findings in a report.

Section 2

Aquatic Ecosystems

CALIFORNIA

Standards Focus

S 6.5.b. Students know matter is transferred over time from one organism to others in the food web and between organisms and their physical environment.

- ➊ What abiotic factors influence aquatic ecosystems?
- ➋ What are the major types of aquatic ecosystems?
- ➌ What are the ecological roles of organisms in aquatic food webs?

Key Terms

- estuary
- intertidal zone
- neritic zone
- kelp forests
- coral reefs
- plankton

FIGURE 9

Humpback Whale

Whales like this humpback whale are the largest consumers in marine ecosystems.

Lab zone

Standards Warm-Up

What's in Pond Water?

1. Using a hand lens, observe a sample of pond water.
2. Make a list of everything you see in the water. If you don't know the name of something, write a short description or draw a picture.
3. Your teacher has set up a microscope with a slide of pond water. Observe the slide under the microscope and add any new items to your list. Wash your hands with soap when you are done.

Think It Over


Classifying Use one of these systems to divide the items on your list into two groups: moving/still, biotic/abiotic, or microscopic/visible without a microscope. What does your classification system tell you about pond water?

No trip around the world would be complete without exploring Earth's waters. Since almost three quarters of Earth's surface is covered with water, don't be surprised at how much there is to see. Many organisms make their homes in aquatic, or water-based, ecosystems. Your travels will take you to both freshwater ecosystems and marine (or saltwater) ecosystems.

➊ **All aquatic ecosystems are affected by the same abiotic factors: sunlight, temperature, oxygen, and salt content.** Sunlight is a key factor in aquatic ecosystems. Sunlight is needed for photosynthesis in the water just as it is on land. Because water absorbs sunlight, there is only enough light for photosynthesis near the surface or in shallow water.



Freshwater Ecosystems

On this part of the expedition, you will explore Earth's waters. Most of Earth's surface is covered with water, but only a tiny fraction is fresh water.  **Freshwater ecosystems include streams, rivers, ponds, and lakes.** These ecosystems provide habitats for an amazing variety of organisms, from tiny algae to huge bears.

Streams and Rivers Your first stop is a mountain stream. Where the stream begins, the cold, clear water flows rapidly. Animals that live here are adapted to the strong current. For example, insects and other small animals have hooks or suckers that help them cling to rocks. Trout have streamlined bodies that allow them to swim despite the rushing water. Few plants or algae can grow in this fast-moving water. Instead, first-level consumers rely on leaves and seeds that fall into the stream.

As the stream flows along, other streams join it. The current slows, and the water becomes cloudy with soil. The slower-moving water is warmer and contains less oxygen. This larger stream might now be called a river. Different organisms are adapted to life in a river. Plants take root among the pebbles on the river bottom. These producers provide food for young insects and homes for frogs and their tadpoles. These consumers, in turn, provide food for many larger consumers.

Ponds and Lakes Your next stop is a pond. Ponds and lakes are bodies of standing, or still, fresh water. Most lakes are larger and deeper than ponds. Ponds are often shallow enough that sunlight can reach the bottom even in the center of the pond, allowing plants to grow there. In large ponds and most lakes, however, algae floating at the surface are the major producers.

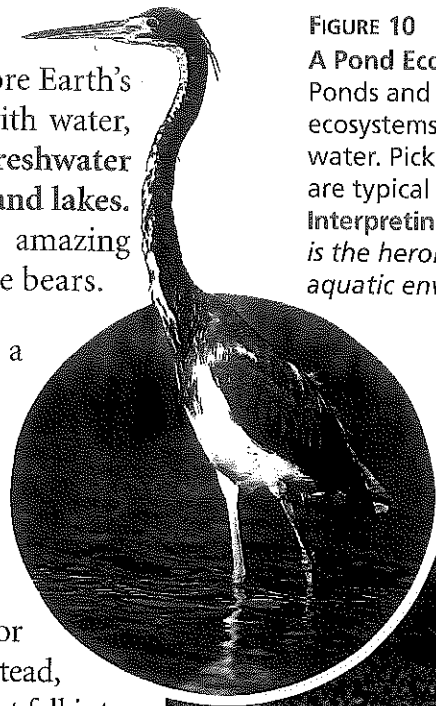
Many animals are adapted for life in the still water. Along the shore of the pond, you observe dragonflies, turtles, snails, and frogs. Sunfish live in the open water, feeding on insects and algae from the surface. Scavengers such as catfish live near the pond bottom. Bacteria and other decomposers also feed on the remains of other organisms.

FIGURE 10

A Pond Ecosystem

Ponds and lakes are freshwater ecosystems characterized by still water. Pickerelweed and herons are typical pond organisms.

Interpreting Photographs How is the heron well suited to its aquatic environment?



◀ Tricolored heron



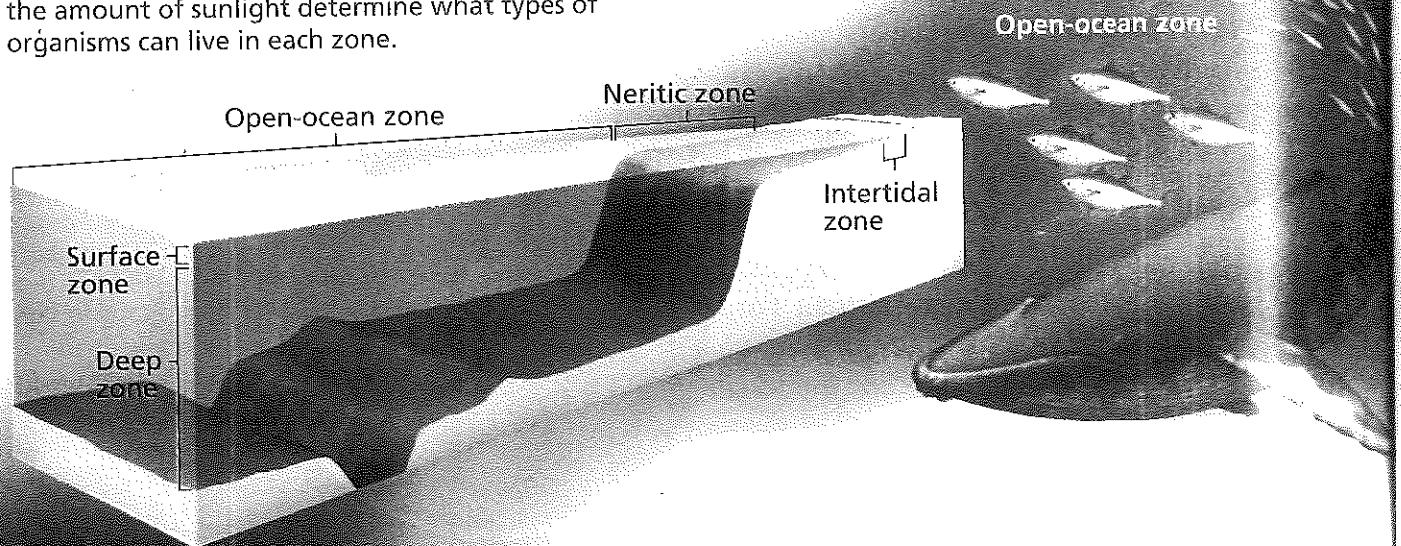
Reading
Checkpoint

What is a lake?

FIGURE 11

Marine Ecosystems

The ocean is home to a number of different ecosystems. Factors such as water temperature and the amount of sunlight determine what types of organisms can live in each zone.



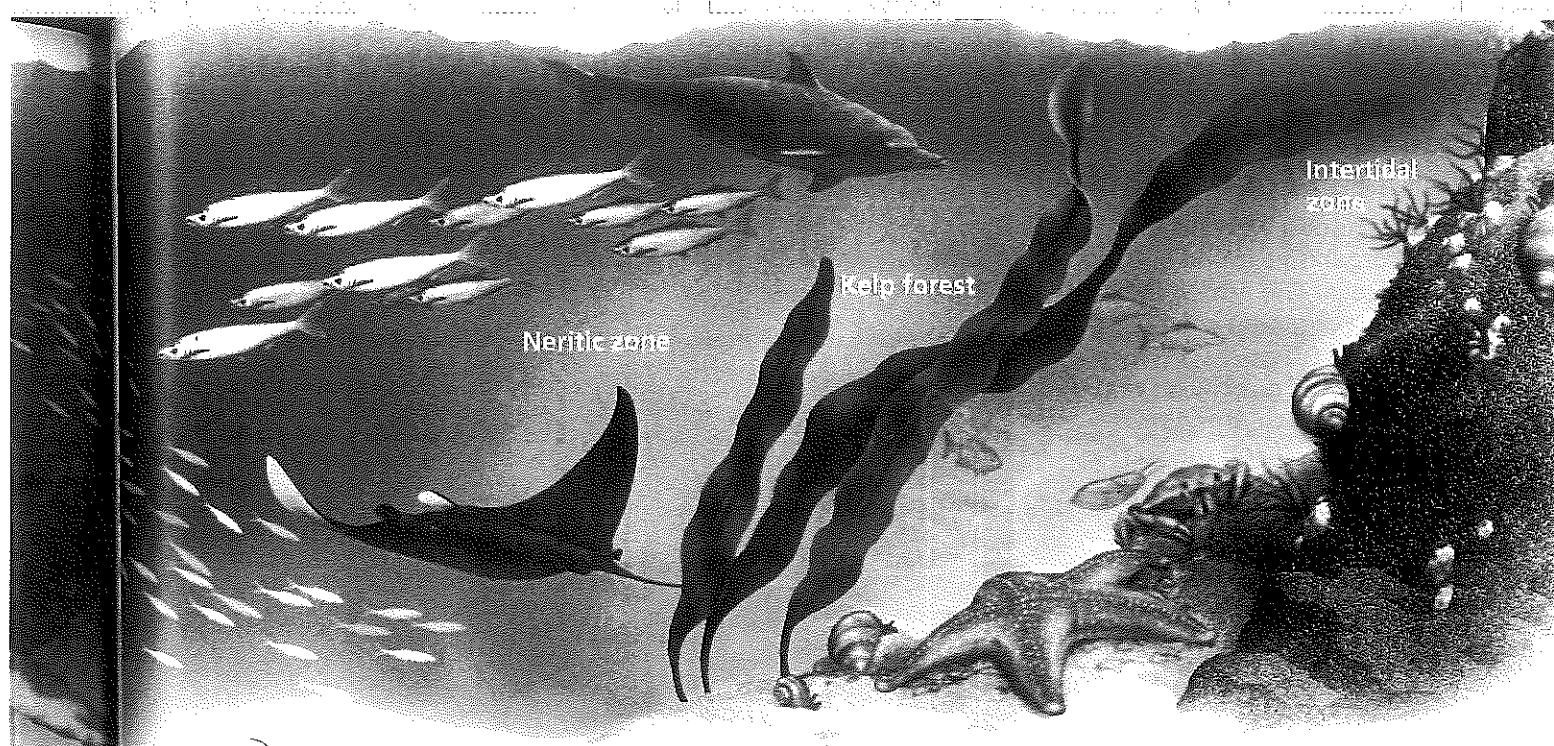
Marine Ecosystems

Now you head to the coast to explore some marine ecosystems. On your way, you'll pass through an estuary. An **estuary** (ES choo ehr ee) is found where the fresh water of a river meets the salt water of the ocean. Algae and plants such as marsh grasses provide food and shelter for many animals, including crabs, worms, clams, and fish. Many of these animals use the calm waters of estuaries for breeding grounds. 🐠 **Marine ecosystems include estuaries, intertidal zones, neritic zones, and the open ocean. These zones are classified largely by the depth of water.** Figure 11 shows the major ocean zones.

Intertidal Zone Next, you walk along a rocky shore. Here, between the highest high-tide line and the lowest low-tide line, is the **intertidal zone**. Organisms here must be able to survive pounding waves and the sudden changes in water level and temperature that occur with high and low tides. Animals such as barnacles and sea stars cling to the rocks. Clams and crabs burrow in the sand.

Neritic Zone Below the low-tide line is the **neritic zone** (nuh RIT ik), the shallow region that extends over the continental shelf. Here sunlight can pass through the shallow water, allowing photosynthesis to occur. Mineral nutrients, such as nitrogen and phosphorus, often well up from the continental shelf. Plenty of sunlight and nutrients make this zone rich in living things.

Deep zone



Kelp forests grow in cold neritic waters where the bottom is rocky. They can be found off California's coast. The major producers are giant kelp—algae that grow up to 30 meters long. Kelp forests are home to many animals, including large schools of fish and gray whales. Sea otters feed on sea urchins.

In tropical regions, coral reefs may form. **Coral reefs** are created by colonies of tiny coral animals. Algae live in the bodies of the coral animals and provide food for the corals. Because the algae need warm temperatures and sunlight, coral reefs form only in warm shallow water. Large numbers of fish and other animals live around a coral reef. Coral reefs are one of the most diverse ecosystems on Earth.

The Open Ocean Out in the open ocean, light reaches only to a depth of a few hundred meters. Near the surface, floating algae carry out photosynthesis. Marine animals, such as tuna, swordfish, and some whales, depend on the algae for food. However, this region does not have the nutrient resources of the neritic zone, so it supports fewer living things.

The deep zone is located below the surface zone. The deep zone is almost totally dark. Most animals in this zone feed on the remains of organisms that sink down from the surface. The deepest parts of the deep zone are home to bizarre-looking animals, such as giant squid with eyes that glow in the dark.



Reading
Checkpoint

What two zones make up the open ocean?

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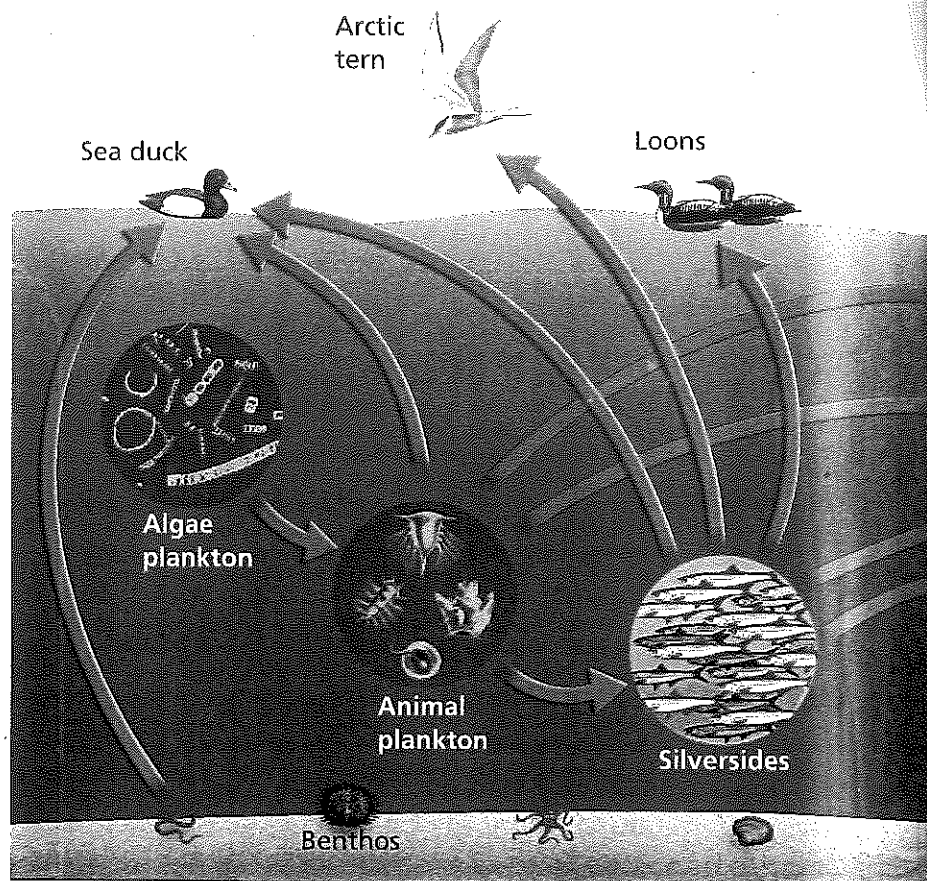
For: Links on aquatic ecosystems
Visit: www.SciLinks.org
Web Code: scn-0525

FIGURE 12

An Ocean Food Web

This ocean food web includes typical organisms found in the Arctic Ocean. The arrows indicate what each organism eats.

Interpreting Diagrams Which organisms feed directly on the Arctic cod? Which organisms depend indirectly on the cod?



Lab
zone

Try This Activity

Model a Food Web

1. Form a circle of five students. Each student will represent a marine organism: algae, animal plankton, fish, seal, or whale. Write the name of your organism on a card.
2. Discuss the feeding relationships among the five organisms.
3. Use pieces of string to connect your card to the cards of organisms that may have feeding relationships with your organism.

Inferring Based on your results in Step 3, are the feeding relationships among ocean organisms simple or complex? Explain.

Ocean Food Webs

As on land, organisms in the ocean are connected by food chains and food webs. But in the ocean, the producers are algae rather than plants. Most algae are plankton—tiny organisms that float in the water.

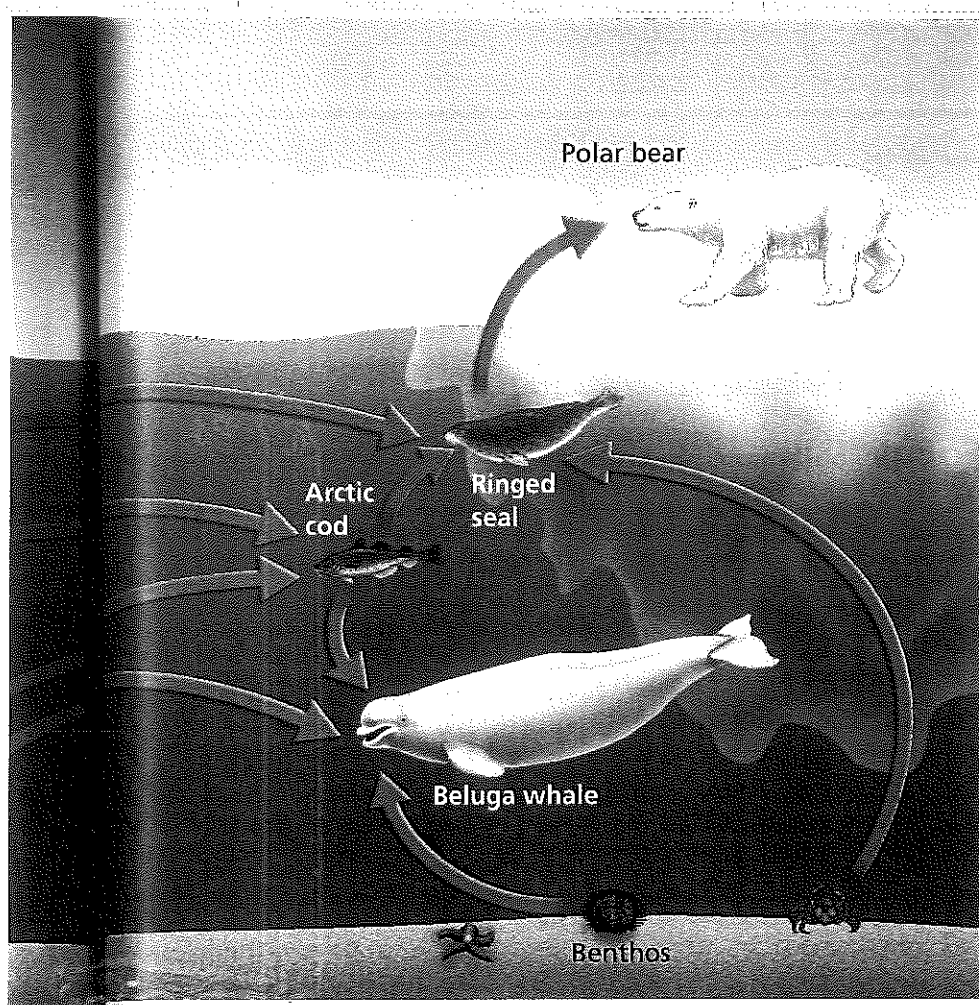
Throughout the ocean, plankton are a source of food for organisms of all sizes. For example, much of the algae is eaten by tiny single-celled consumers called protozoans. These primary consumers are then eaten by secondary consumers—larger protozoans or animal plankton, such as jellyfish, crustaceans, and worms. Animal plankton, in turn, is eaten by fish. Finally, fish are eaten by top-level predators such as birds and seals.

Figure 12 shows a food web of organisms living in the Arctic Ocean. Notice how each organism depends either directly or indirectly on food produced by algae plankton. Wastes from the food chain drift to the ocean floor, where many decomposers live. Some of these decomposers are scavengers, such as crabs. Other decomposers include bacteria and worms.



Reading
Checkpoint

In an ocean food web, which organisms are decomposers?



Go **Online**
active art

For: Ocean Food Web activity
Visit: PHSchool.com
Web Code: cfp-3042

Section 2 Assessment

S 6.5.b; E-LA: Reading 6.2.0,
Writing 6.2.0

Target Reading Skill Identify Main Ideas

Reread the paragraphs under the heading Ocean Food Webs. Identify the main idea and two important details.

Reviewing Key Concepts

- Reviewing** What four abiotic factors are important in all aquatic ecosystems?
 - Explaining** Why is sunlight important in aquatic ecosystems?
 - Predicting** Would you expect to find many organisms living at the bottom of a deep lake? Explain.
- Identifying** Identify the three ocean zones.
 - Sequencing** List the ocean zones in order. Begin with the most shallow zone and end with the zone in the deepest water.
 - Inferring** Which zone probably has the greatest variety of living things? How is variety related to water depth?

3. a. Defining What is plankton?

b. Describing What is the role of algae plankton in an ocean food web?

c. Classifying A great blue whale is a filter feeder that eats mostly plankton. Is a blue whale a primary consumer, a secondary consumer, or a top-level consumer? Explain.

Writing in Science

Cause-and-Effect Paragraph Write a brief paragraph describing how the ocean food web in Figure 12 might be affected by a decrease in the Arctic cod population. Which populations might increase as a result? Which populations might decrease? Explain your answers. To help plan your writing, you might use a cause-and-effect graphic organizer.

Section 3

Forests and Fisheries

CALIFORNIA

Standards Focus

S 6.6.b Students know different natural energy and material resources, including air, soil, rocks, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.

S 6.6.c Students know the natural origin of the materials used to make common objects.

- ➊ How can forests be managed as renewable resources?
- ➋ How can fisheries be managed for a sustainable yield?

Key Terms

- renewable resource
- clear-cutting
- selective cutting
- sustainable yield
- fishery
- aquaculture

Lab zone

Standards Warm-Up

What Happened to the Tuna?

1. Use the data in the table to make a line graph. Label the axes of the graph and add a title.
2. Mark the high and low points on the graph.

Think It Over

Inferring Describe the changes in the tuna population during this period. Can you suggest a reason for these changes?

Year	Bluefin Tuna Population
1970	218,000
1975	370,000
1980	67,000
1985	58,000
1990	46,000
1995	63,000
2000	67,000

At first glance, an oak tree and a bluefin tuna may not seem to have much in common. But oak trees and tuna are both examples of living resources that people can use. People use oak trees to make furniture, lumber, and cork. Tuna are a source of food for people.

Oak trees and tuna reproduce and grow relatively quickly, replacing those that people use. For this reason, they are considered renewable resources. A **renewable resource** is one that is either always available or is naturally replaced in a relatively short time. In this section, you will read about two major types of renewable resources: forests and fisheries.

Forest Resources

Forests contain many valuable resources. Many products are made from the fruits, seeds, and other parts of forest plants. Some of these products, such as maple syrup, rubber, and nuts, come from living trees. Other products, such as lumber and wood pulp for making paper, require cutting down trees. Coniferous trees, including pine and spruce, are used for construction and for making paper. Hardwoods, such as oak, cherry, and maple, are used for furniture because of their strength and beauty.

Trees and other plants produce oxygen that organisms need to survive. They also absorb carbon dioxide and many pollutants from the air. Trees help prevent flooding and control soil erosion. Their roots absorb rainwater and hold soil in place.


FIGURE 13

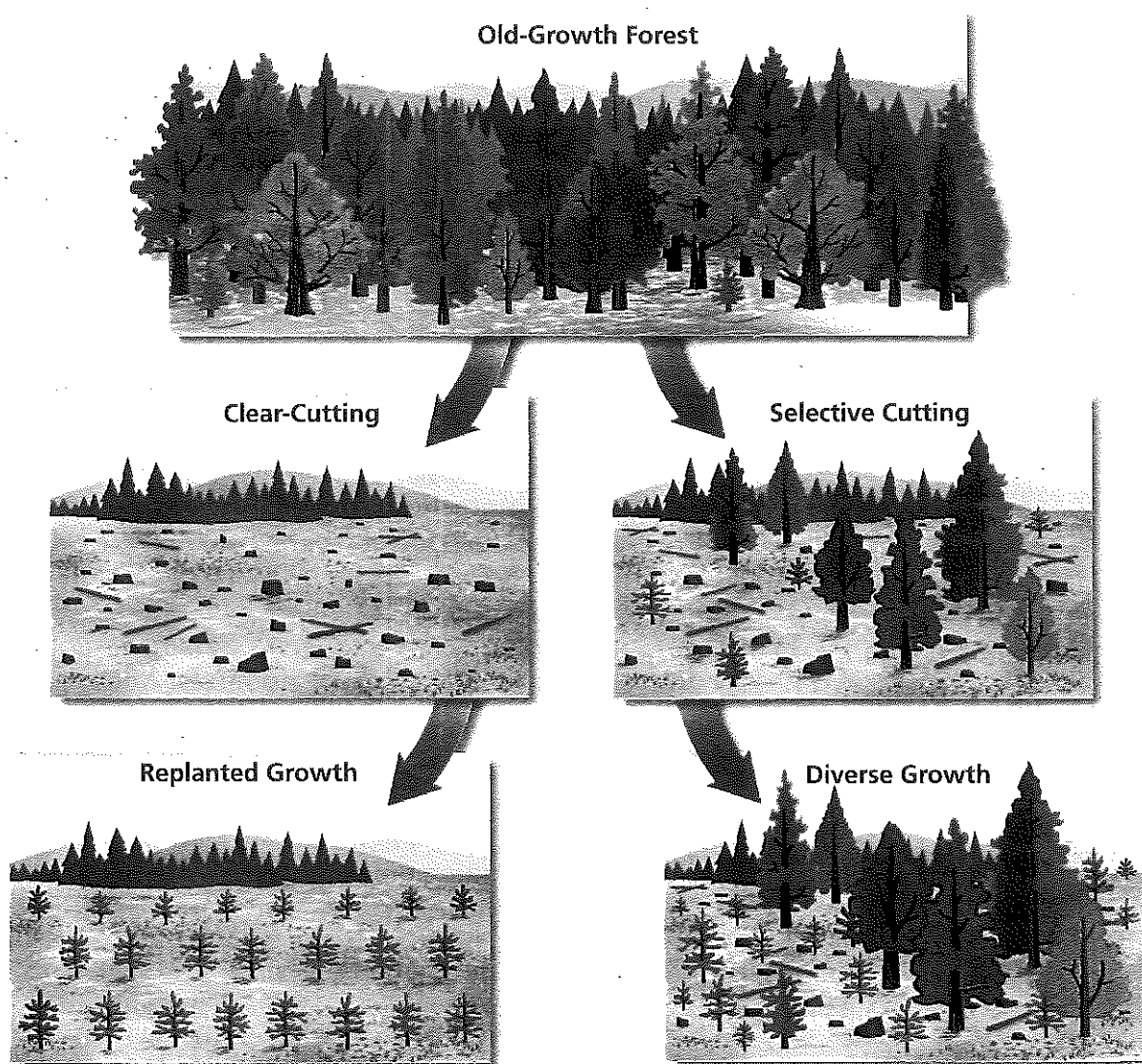
Logging Methods

Clear-cutting involves cutting down all the trees in an area at once. **Interpreting Diagrams**
What is selective cutting?

Managing Forests

There are about 300 million hectares of forests in the United States. That's nearly a third of the nation's area! Many forests are located on public land. Others are owned by individuals or by private timber and paper companies. Forest industries in the United States provide jobs for more than 1 million people.

 Because new trees can be planted to replace trees that are cut down, forests can be renewable resources. The United States Forest Service and environmental organizations work with forestry companies to conserve forest resources. They try to develop logging methods that maintain forests as renewable resources.



Logging Methods There are two major methods of logging: clear-cutting and selective cutting. **Clear-cutting** is the process of cutting down all the trees in an area at once. Cutting down only some trees in a forest and leaving a mix of tree sizes and species behind is called **selective cutting**.

Each logging method has advantages and disadvantages. Clear-cutting is usually quicker and cheaper than selective cutting. It may also be safer for the loggers. In selective cutting, the loggers must move the heavy equipment and logs around the remaining trees in the forest. But selective cutting is usually less damaging to the forest environment than clear-cutting. When an area of forest is clear-cut, the ecosystem changes. After clear-cutting, the soil is exposed to wind and rain. Without the protection of the tree roots, the soil is more easily blown or washed away. Soil washed into streams may harm the fish and other organisms that live there.

Sustainable Forestry Forests can be managed to provide a sustainable yield. A **sustainable yield** is an amount of a renewable resource such as trees that can be harvested regularly without reducing the future supply. Sustainable forestry works sort of like a book swap: as long as you donate a book each time you borrow one, the total supply of books will not be affected. Planting a tree to replace one that was cut down is like donating a book to replace a borrowed one.

In sustainable forestry, after trees are harvested, young trees are planted. Trees must be planted frequently enough to keep a constant supply. Different species grow at different rates. Forests containing faster-growing trees, such as pines, can be harvested and replanted every 20 to 30 years. On the other hand, some forests containing hardwood trees, such as hickory, oak, and cherry, may be harvested only every 40 to 100 years. One sustainable approach is to log small patches of forest. This way, different sections of forest can be harvested every year.



**Reading
Checkpoint**

What is sustainable yield?



FIGURE 14

Sustainable Forestry

Sustainable forestry practices include the planting of young trees after mature trees have been harvested.

Calculating

In a recent year, the total catch of fish in the world was 112.9 million metric tons. Based on the data below, calculate the percent of this total each country caught.

Country	Catch (millions of metric tons)
China	24.4
Japan	6.8
United States	5.6
Peru	8.9

What do you think might happen to the world's fish supply if each country increased its annual catch?

FIGURE 15


Fisheries

Even though fisheries are renewable resources, they must be managed for sustainable yields, or the supply of fish may run out.

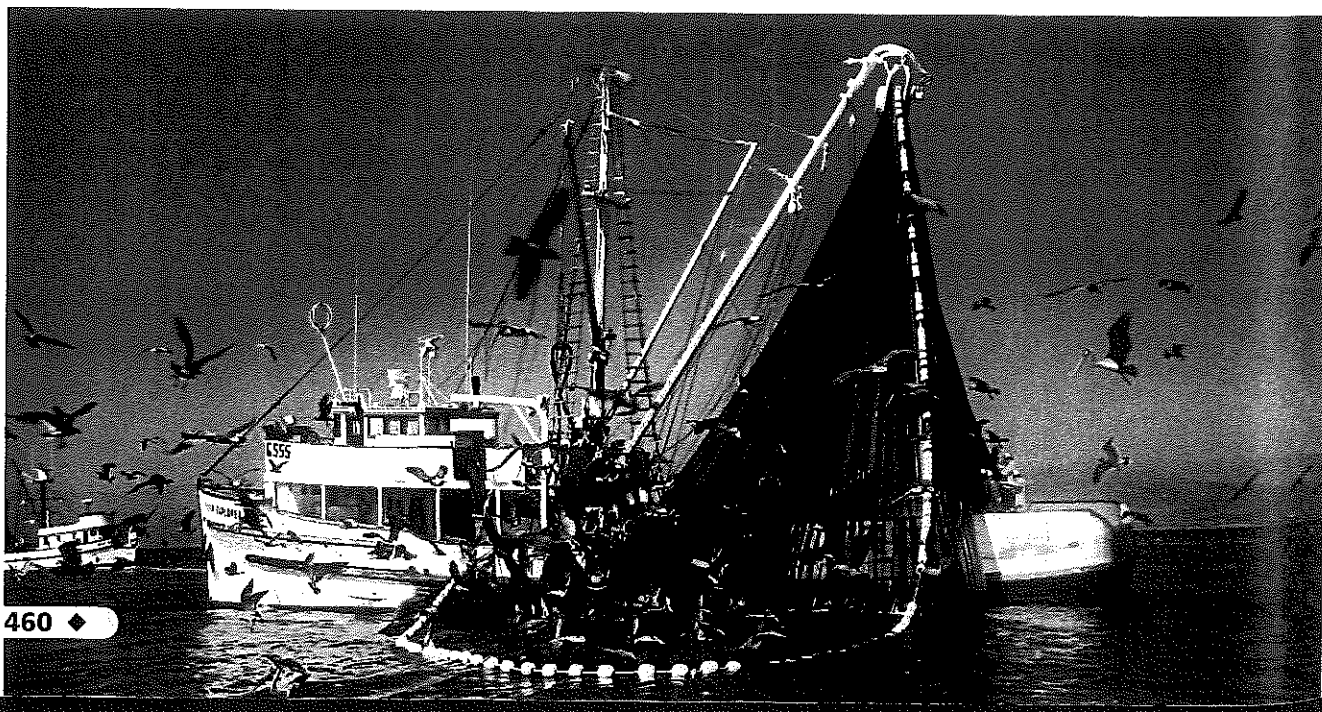
Fisheries

An area of ocean with many valuable ocean organisms is called a **fishery**. Some major fisheries include the Grand Banks off Newfoundland, Georges Bank off New England, and Monterey Canyon off California. Fisheries like these are valuable renewable resources.

Until recently, fisheries seemed like an unlimited resource. The waters held such huge schools of fish. And fish reproduce in great numbers. A single codfish can lay as many as 9 million eggs in a single year! But people have found that this resource has limits. After many years of big catches, huge populations of cod off the New England coast declined greatly. What caused these changes?

The fish were caught faster than they could breed, so the population decreased. This situation is known as **overfishing**. Scientists estimate that 70 percent of the world's major fisheries have been overfished. But if fish populations recover, a sustainable yield can again be harvested.  **Managing fisheries for a sustainable yield includes setting fishing limits, changing fishing methods, developing aquaculture techniques, and finding new resources.**

Fishing Limits Laws can ban the fishing of certain species. Laws may also limit the number or size of fish that can be caught or require that fish be within a certain range of sizes. These laws ensure that young fish survive long enough to reproduce and that all of the largest adult fish aren't caught. If a fishery has been severely overfished, however, the government may ban fishing completely until the populations recover.



Fishing Methods Today many fishing crews use nets with a larger mesh size that allow small, young fish to escape. In addition, many other fishing practices are regulated by laws. Some fishing methods have been outlawed. Outlawed methods include poisoning fish with cyanide and stunning them by exploding dynamite underwater. These techniques harm all the fish in an area rather than targeting certain fish.

Aquaculture The practice of raising fish and other water-dwelling organisms for food is called **aquaculture**. The fish may be raised in artificial ponds or bays. Salmon, catfish, and shrimp are farmed in this way in the United States.

But aquaculture has drawbacks. The artificial ponds and bays often replace natural habitats such as salt marshes. Maintaining the farms can cause pollution and spread diseases into wild fish populations.

New Resources Today about 9,000 different fish species are harvested for food. More than half the animal protein eaten by people throughout the world comes from fish. One way to help feed a growing human population is to fish for new species. Scientists and chefs are working together to introduce people to deep-water species such as monkfish and tile fish, as well as easy-to-farm freshwater fish such as tilapia.



Reading
Checkpoint

What is aquaculture?



FIGURE 16

Aquaculture

Aquaculture is helping to meet the demand for fish. This fish farm in Hawaii raises tilapia.

Applying Concepts What costs and benefits does aquaculture involve?

Section 3 Assessment

S 6.6.b, 6.6.c
E-LA: Reading 6.1.0

Vocabulary Skill High-Use Academic Words
Use the meaning of the word *sustain* to explain the meaning of *sustainable forestry*.

Reviewing Key Concepts

- a. Reviewing** Why are forests considered renewable resources?
- b. Comparing and Contrasting** How does the clear-cutting logging method differ from selective cutting?
- c. Developing Hypotheses** You are walking in a clear-cut section of forest a few days after a heavy rainstorm. A nearby stream is very muddy and has many dead fish. What may have happened?
- a. Listing** What are four ways fisheries can be managed for a sustainable yield?

- Explaining** What are two kinds of laws that regulate fishing? How can they help ensure the health of a fishery?
- Predicting** What might happen to a fish population over time if all the largest fish in the population were caught? Explain.

Lab
zone

At-Home Activity

Renewable Resource Survey With a family member, conduct a "Forest and Fishery" survey of your home. Make a list of all the things that are made from either forest or fishery products. Then ask other family members to predict how many items are on the list. Are they surprised by the answer?

Section 4

Biodiversity

CALIFORNIA

Standards Focus

S 6.6.b Students know different natural energy and material resources, including air, soil, rocks, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.

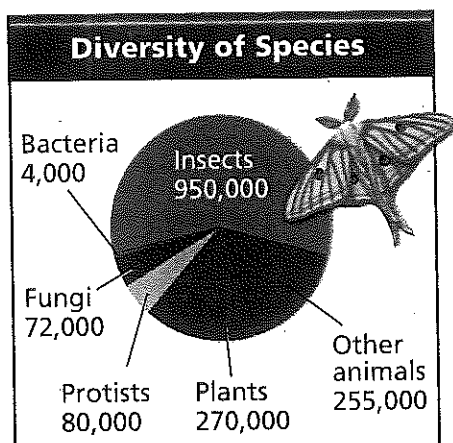
- ☉ In what ways is biodiversity valuable?
- ☉ What factors affect an area's biodiversity?
- ☉ Which human activities threaten biodiversity?
- ☉ How can biodiversity be protected?

Key Terms

- biodiversity
- keystone species
- extinction
- endangered species
- threatened species
- habitat destruction
- poaching
- captive breeding

FIGURE 17

Organisms of many kinds are part of Earth's biodiversity.



Lab
zone

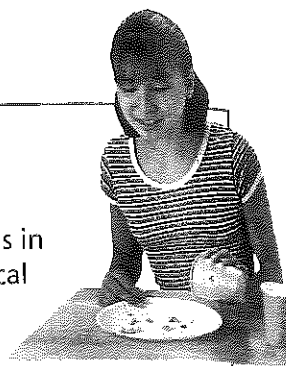
Standards Warm-Up

How Much Variety Is There?

1. You will be given two cups of seeds. The seeds in cup A represent the trees in a section of tropical rain forest. The seeds in cup B represent the trees in a section of deciduous forest.
2. Pour the seeds from cup A onto a plate. Sort the seeds by type. Count the different types of seeds. This number represents the number of different kinds of trees in that forest.
3. Repeat Step 2 with the seeds in cup B.
4. Share your results with your class. Use the class results to calculate the average number of different kinds of trees in each type of forest.

Think It Over

Inferring How does the variety of trees in the two forests differ? Can you suggest any advantages of having a wide variety of species?



No one knows exactly how many species live on Earth. As you can see in Figure 17, more than 1.5 million species have been identified so far. The number of different species in an area is called its **biodiversity**. It is difficult to estimate the total biodiversity on Earth because many areas of the planet have not been thoroughly studied. Some experts think that the deep oceans alone could contain 10 million new species!

Preserving biodiversity is important. ☉ **People value wildlife and ecosystems for their beauty and as a source of recreation. In addition, biodiversity has both economic value and ecological value within an ecosystem.**

Many plants, animals, and other organisms can be valuable resources. They provide food and raw materials for medicines, clothing, and other products. For example, forests provide wood for fuel and building material, and fisheries provide fish for food. But these resources can only be renewable if they are used in a sustainable way. If habitats and species are lost when a resource is harvested, then the resource can become nonrenewable. Ecosystems themselves can also be valuable. People enjoy wildlife tours in rain forests and other locations.

Factors Affecting Biodiversity

Biodiversity varies from place to place. ☞ **Factors that affect biodiversity in an ecosystem include area, climate, diversity of niches, and keystone species.**

Area Within a given biome, a large area will contain more species than a small area. For example, a large island such as New Guinea is home to more bird species than a smaller island such as Bali.

Climate Many scientists hypothesize that the great biodiversity in the tropics may be related to climate. The number of species generally increases from the poles toward the equator. Tropical rain forests are the most diverse ecosystems in the world. Why is this? Tropical rain forests have fairly constant temperatures and large amounts of rainfall throughout the year. Many plants in these regions grow year-round, providing a continuous food supply for other organisms.

Niche Diversity Coral reefs are the second most diverse ecosystems in the world. Found only in shallow, warm waters, coral reefs are often called the rain forests of the sea. A reef supports many different niches for organisms that live under, on, and among the coral. More species are able to live in the reef than in a more uniform habitat, such as a flat sandbar.

Keystone Species All the species in an ecosystem are interconnected. Some species play a particularly crucial role. A **keystone species** is a species that influences the survival of many other species in an ecosystem. For example, the sea otter, which eats sea urchins, is a keystone species in kelp forests. In the 1800s, hunters on the Pacific coast killed most of the sea otters for fur. The sea urchins were able to reproduce without control and ate up all the kelp. When sea otters were reintroduced, the kelp population recovered. The ecosystem's balance was restored.



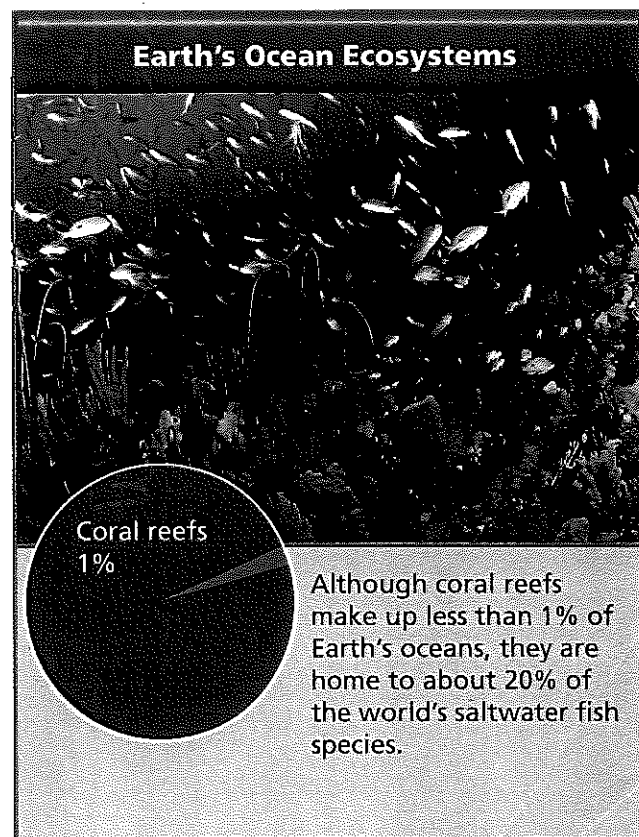
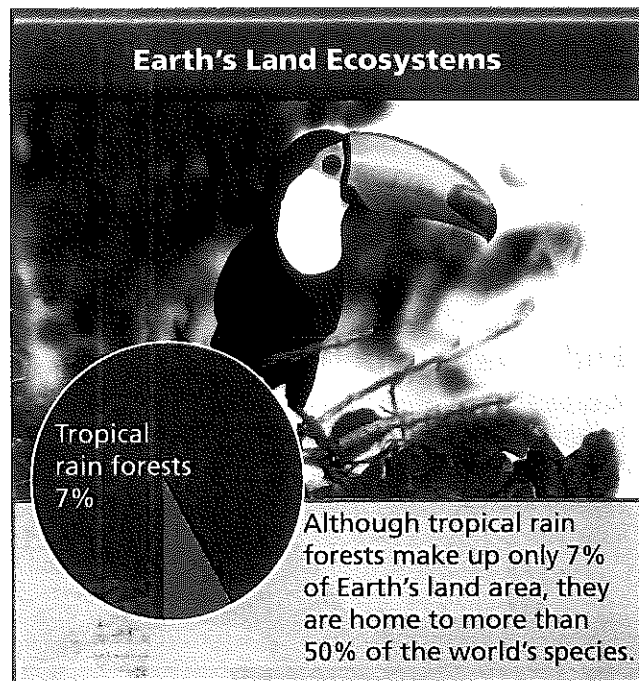
Reading
Checkpoint

What is a keystone species?

FIGURE 18

Land and Ocean Ecosystems

Three factors that affect the biodiversity of an ecosystem are area, climate, and niche diversity. *Inferring Which factor is most likely responsible for the biodiversity of coral reefs? Of tropical rain forests?*



Biodiversity in Danger

In the 1800s, there were millions of passenger pigeons in the United States. Then, in less than a century, people hunted the birds until there were no passenger pigeons left.

Extinction The disappearance of all members of a species from Earth is called **extinction**. Extinction is a natural process. But in the last few centuries, the number of species becoming extinct has increased dramatically. Species in danger of becoming extinct in the near future are called **endangered species**. Species that could become endangered in the near future are called **threatened species**. Threatened and endangered species are found on every continent and in every ocean.

A natural event, such as an earthquake or a volcanic eruption, can damage an ecosystem, wiping out populations or even species. 🌀 **Human activities can also threaten biodiversity. These activities include habitat destruction, poaching, pollution, and the introduction of nonnative species.**

FIGURE 19

Endangered Species

A broad range of species and habitats are represented on the endangered list in the United States.



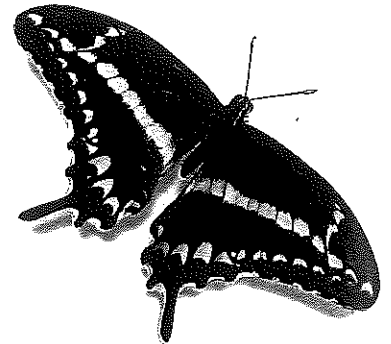
Reading
Checkpoint

What is an endangered species?



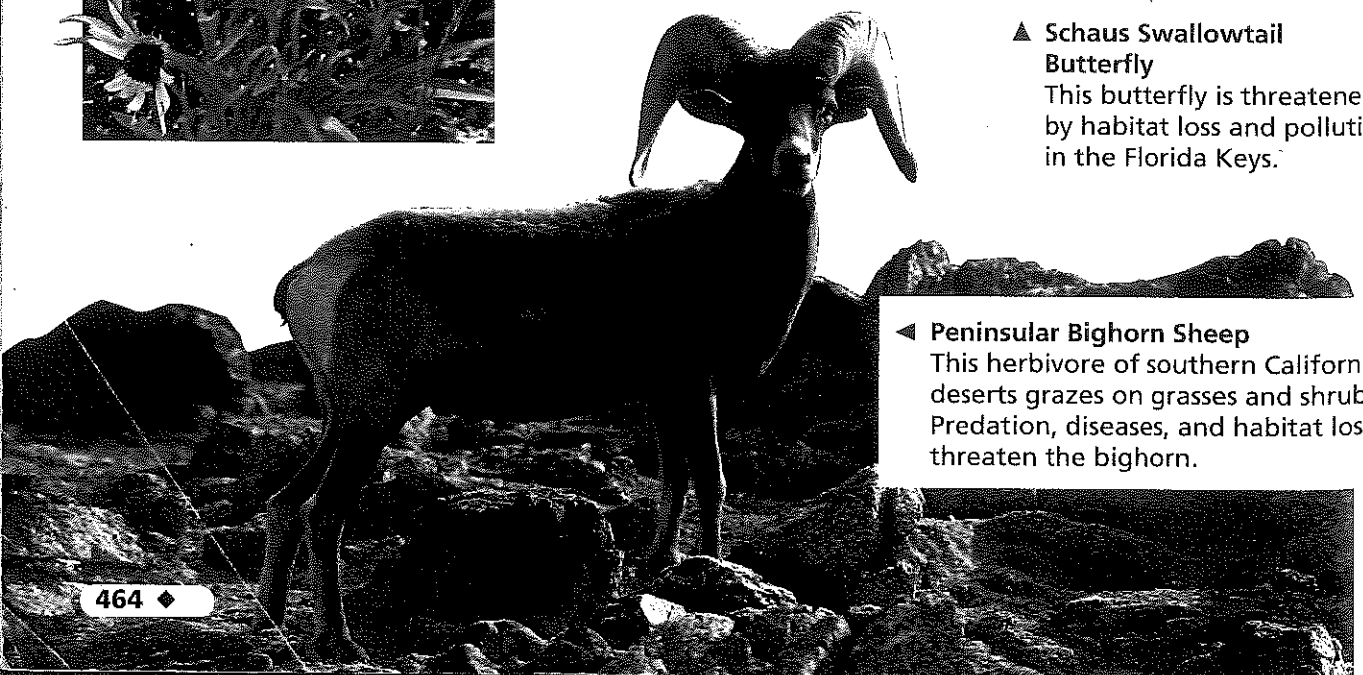
◀ Tennessee Purple Coneflower

These daisy-like plants grow only in cedar forests in central Tennessee. Conservation organizations and landowners are working together to protect these plants.



▲ Schaus Swallowtail Butterfly

This butterfly is threatened by habitat loss and pollution in the Florida Keys.



◀ Peninsular Bighorn Sheep

This herbivore of southern California's deserts grazes on grasses and shrubs. Predation, diseases, and habitat loss threaten the bighorn.

Habitat Destruction The major cause of extinction is habitat destruction, the loss of a natural habitat. This can occur when forests are cleared to create grazing land or when wetlands are filled in to build towns. Some species are not able to survive such changes to their habitat.

Poaching Poaching is the illegal killing or removal of wildlife from their habitats. Many endangered animals are killed and sold for their skin or fur. Others are taken and sold as pets.

Pollution Some species are endangered because of pollution. Substances that cause pollution, called pollutants, may reach animals through the water or air. Pollutants may harm or kill organisms.

Nonnative Species Introducing a nonnative species, or exotic, into an ecosystem threatens biodiversity. Without its natural predators and consumers, the introduced species often outcompetes or harms the native organisms.

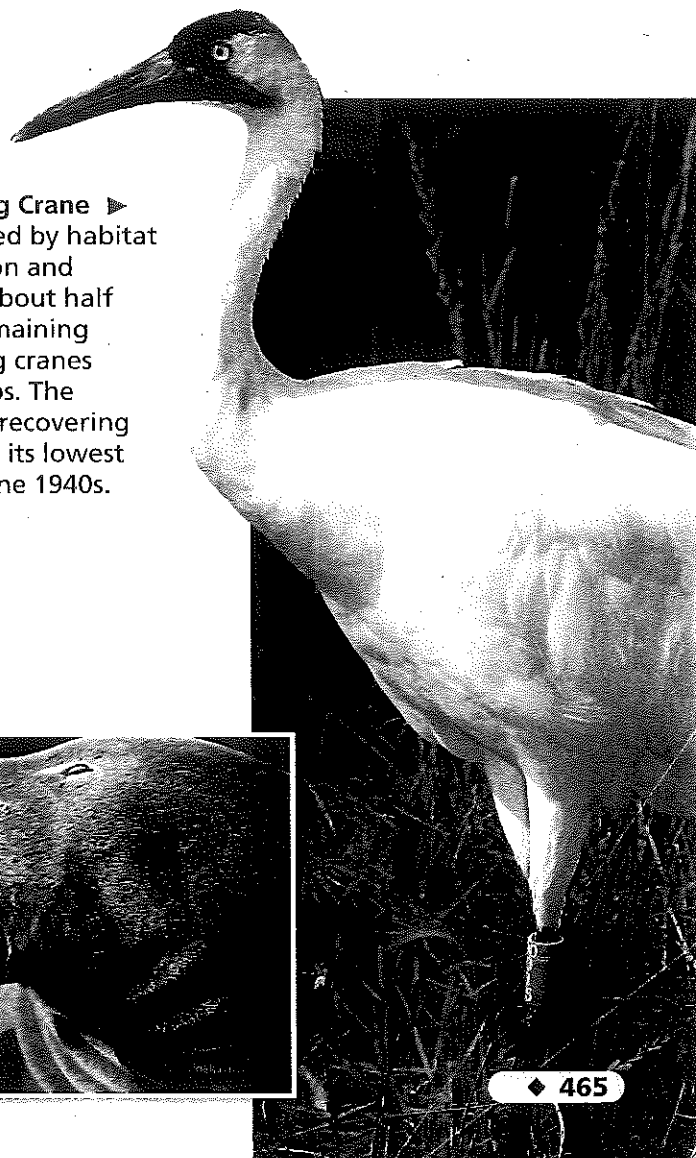
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PLANET DIARY

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California Tiger Salamander ▲
This salamander is threatened by habitat loss.

Whooping Crane ►
Threatened by habitat destruction and disease, about half of the remaining whooping cranes are in zoos. The species is recovering well since its lowest point in the 1940s.



Steller's Sea Lion ►
Overfishing has led to a decline in this mammal's sources of food. Other factors may also be threatening this species.

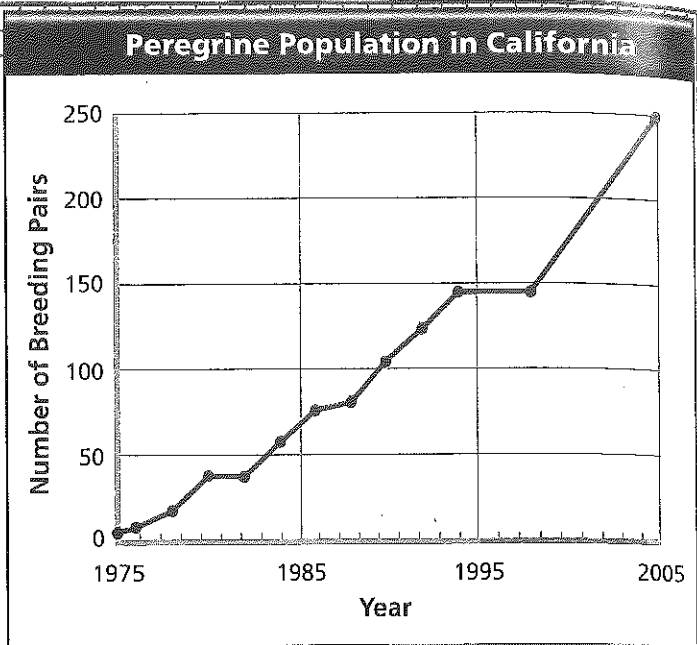


Math Analyzing Data

California Peregrine Falcon Recovery

The peregrine falcon, the world's fastest bird of prey, was nearly extinct in the United States in 1970. The pesticide DDT weakened peregrine eggshells, so the eggs rarely hatched. In 1972, the United States banned DDT. Use the graph to answer the questions.

- Reading Graphs** What variable is plotted on the x-axis? What variable is plotted on the y-axis?
- Interpreting Data** How did California's peregrine population change from 1976 to 1998?
- Inferring** Why do you think the peregrine population grew fairly slowly at first?
- Predicting** What might this graph have looked like if DDT had not been banned?



Protecting Biodiversity

Some people who work to preserve biodiversity focus on protecting just one endangered species. Others try to protect entire ecosystems, such as the Great Barrier Reef in Australia.

☞ **Three successful approaches to protecting biodiversity are captive breeding, laws and treaties, and habitat preservation.**

Captive Breeding Captive breeding is the mating of animals in zoos or wildlife preserves. Scientists care for the young and then release them into the wild when they are grown.

Captive breeding was the only hope for the California condor, the largest bird in North America. Condors became endangered due to habitat destruction, poaching, and pollution. By 1984, there were only 27 California condors. Scientists captured all the wild condors and brought them to zoos to breed. Today, there are more than 200 California condors.

FIGURE 20

Captive Breeding

California condor chicks raised in captivity need to learn what adult condors look like. Here, a scientist uses a puppet to feed and groom a chick.



Laws and Treaties Laws can help protect species. In the United States, the Endangered Species Act prohibits trade in products made from threatened or endangered species. Internationally, wildlife is protected by the Convention on International Trade in Endangered Species. This treaty lists more than 800 species that cannot be traded for profit.

Habitat Preservation The best way to preserve biodiversity is to protect whole ecosystems. Protecting whole ecosystems saves endangered species and the other species in their community. Many countries have set aside wildlife habitats as parks, reserves, and refuges.

To succeed, reserves must have the characteristics of diverse ecosystems. For example, they must be large enough to support the populations that live there. The reserves must contain a variety of niches. And of course, it is still necessary to keep the air, land, and water clean, control poaching, and remove nonnative species.

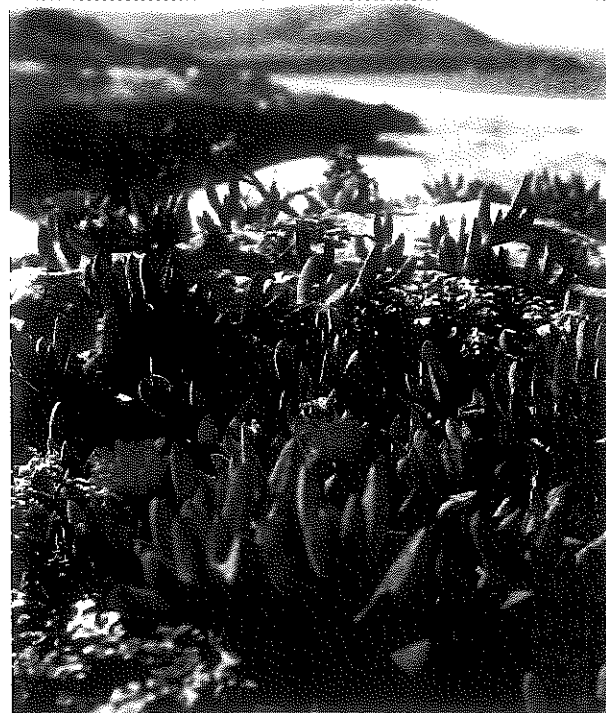


FIGURE 21
Habitat Preservation
Habitat preservation is the aim of national parks such as Channel Islands National Park in California.

Section 4 Assessment

S 6.6.b; E-LA: Reading 6.2.0

- ➊ **Target Reading Skill Identify Main Ideas**
Reread the paragraphs under the heading The Value of Biodiversity. Identify two or three details that support the main idea that preserving biodiversity is important.

➋ **Reviewing Key Concepts**

1. **a. Identifying** What are three factors that affect the biodiversity in an ecosystem?
- b. Explaining** How does each of these factors affect biodiversity?
- c. Developing Hypotheses** Would you expect to find great biodiversity in the tundra biome? Why or why not?
2. **a. Listing** Name four human activities that can threaten biodiversity.
- b. Applying Concepts** Black bears are roaming through a new housing development in search of food, even though the housing development is still surrounded by forest. How can you account for the bears' behavior?

3. **a. Reviewing** What are three approaches to protecting biodiversity?
- b. Relating Cause and Effect** For each approach to protecting biodiversity, list at least one factor that might limit its success.
- c. Making Judgments** List some ways in which those limitations might be dealt with.

Lab
zone

At-Home Activity

Species Refuges Obtain a map of your community or state. With a family member, identify any city, state, or national parks or refuges in your area. Choose one location and find out whether there are endangered or threatened species living there. Research the ecological role of these organisms. Then prepare a five-minute presentation for your class on what you learned.