

SECTION

1

What You Will Learn

- Distinguish between abiotic factors and biotic factors in biomes.
- Identify seven land biomes on Earth.

Vocabulary

biome desert
savanna tundra

READING STRATEGY

Reading Organizer As you read this section, create an outline of the section. Use the headings from the section in your outline.

biome a large region characterized by a specific type of climate and certain types of plant and animal communities

Land Biomes

What do you think of when you think of polar bears? You probably imagine them in a snow-covered setting. Why don't polar bears live in the desert?

Different ecosystems are home to different kinds of organisms. Polar bears don't live in the desert because they are adapted to very cold environments. Polar bears have thick fur. This fur keeps polar bears warm. It also hides them in the snow.

The Earth's Land Biomes

Imagine yourself in a hot, dry, dusty place. You see a cactus on your right. A lizard sits on a rock to your left. Where are you? You may not know exactly, but you probably think you are in a desert.

A desert is different from other places because of its abiotic (AY bie AHT ik) factors and biotic (bie AHT ik) factors. *Abiotic factors* are the nonliving parts of an environment. Soil, water, and climate are abiotic factors. Climate is the average weather conditions for an area over a long period of time. *Biotic factors* are the living parts of an environment. Plants and animals are biotic factors. Areas that have similar abiotic factors usually have similar biotic factors. A **biome** (BIE OHM) is a large area characterized by its climate and the plants and animals that live in the area. A biome contains related ecosystems. For example, a tropical rain forest biome contains treetop ecosystems and forest-floor ecosystems. The major land biomes on Earth are shown in **Figure 1**.

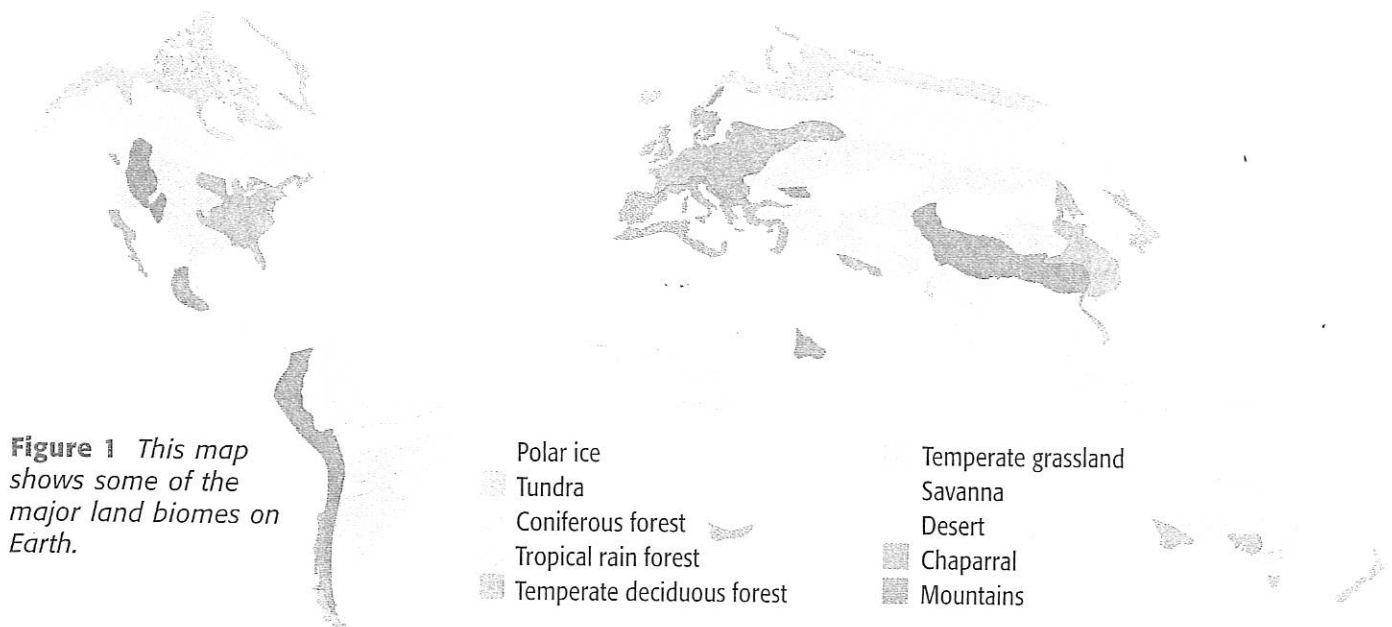
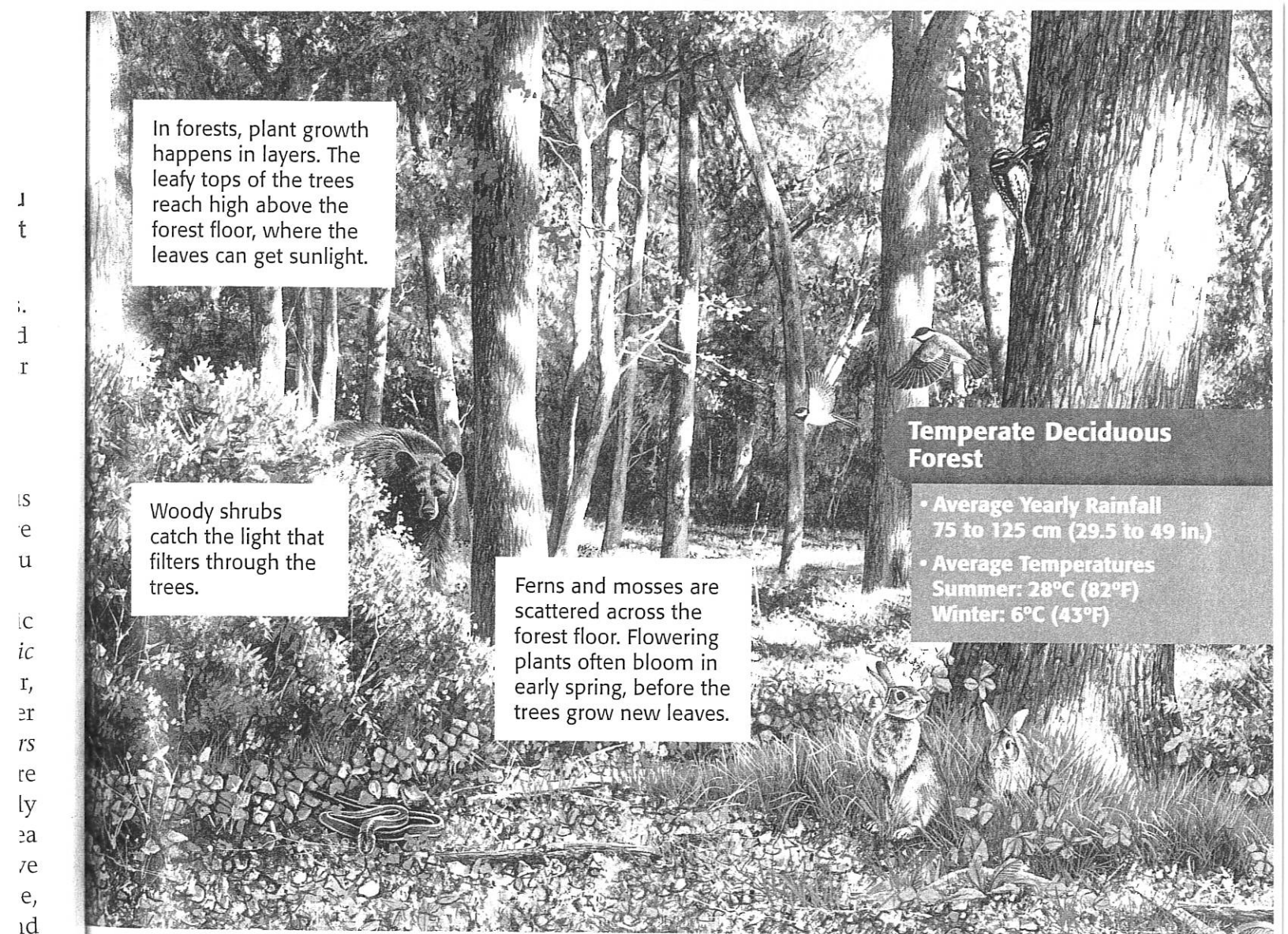


Figure 1 This map shows some of the major land biomes on Earth.



In forests, plant growth happens in layers. The leafy tops of the trees reach high above the forest floor, where the leaves can get sunlight.

Woody shrubs catch the light that filters through the trees.

Ferns and mosses are scattered across the forest floor. Flowering plants often bloom in early spring, before the trees grow new leaves.

Temperate Deciduous Forest

- Average Yearly Rainfall
75 to 125 cm (29.5 to 49 in.)
- Average Temperatures
Summer: 28°C (82°F)
Winter: 6°C (43°F)

Forests

Forest biomes are often found in areas that have mild temperatures and plenty of rain. The kind of forest biome that develops depends on an area's temperatures and rainfall. Three forest biomes are temperate deciduous (dee SIJ oo uhs) forests, coniferous (koh NIF uhr uhs) forests, and tropical rain forests.

Temperate Deciduous Forests

Have you seen leaves change colors in the fall? Have you seen trees lose all of their leaves? If so, you have seen trees that are deciduous. The word *deciduous* comes from a Latin word that means "to fall off." Deciduous trees shed their leaves to save water during the winter or during the dry season. As shown in **Figure 2**, a variety of animals, such as bears, snakes, and woodpeckers, live in temperate deciduous forests.

✓ Reading Check How does the word *deciduous* describe temperate deciduous forests? (See the Appendix for answers to Reading Checks.)

Figure 2 In a temperate deciduous forest, mammals, birds, and reptiles thrive on the many leaves, seeds, nuts, and insects.

Coniferous Forest

- Average Yearly Rainfall
35 to 75 cm (14 to 29.5 in.)
- Average Temperatures
Summer: 14°C (57°F)
Winter: -10°C (14°F)

These conifer leaves are adapted to conserve water.

Herbivores that live in the coniferous forest include deer, moose, porcupines, and squirrels.

A coniferous forest is home to many insects and to birds that eat those insects.

Figure 3 Many animals that live in a coniferous forest survive the harsh winters by hibernating or migrating to a warmer climate for the winter.

Coniferous Forests

Most of the trees in a coniferous forest are called *conifers*. Conifers produce seeds in cones. Conifers also have special leaves that are shaped like needles. The leaves have a thick, waxy coating. This waxy coating has three functions. First, it helps keep conifer leaves from drying out. Second, the waxy coating protects needles from being damaged by cold winter temperatures. Finally, the waxy coating allows most conifers to keep many of their leaves year-round. So, most conifers do not change very much from summer to winter. Trees that stay green all year and do not lose all of their leaves at one time are known as *evergreen trees*.

Figure 3 shows a coniferous forest and some of the animals that live there. Squirrels and insects live in coniferous forests. Birds, such as finches, chickadees, and jays, are common in these forests. Herbivores, such as porcupines, elk, and moose, also live in coniferous forests. The ground beneath large conifers is often covered by a thick layer of needles. Also, very little light reaches the ground. So, few large plants can grow beneath these trees.

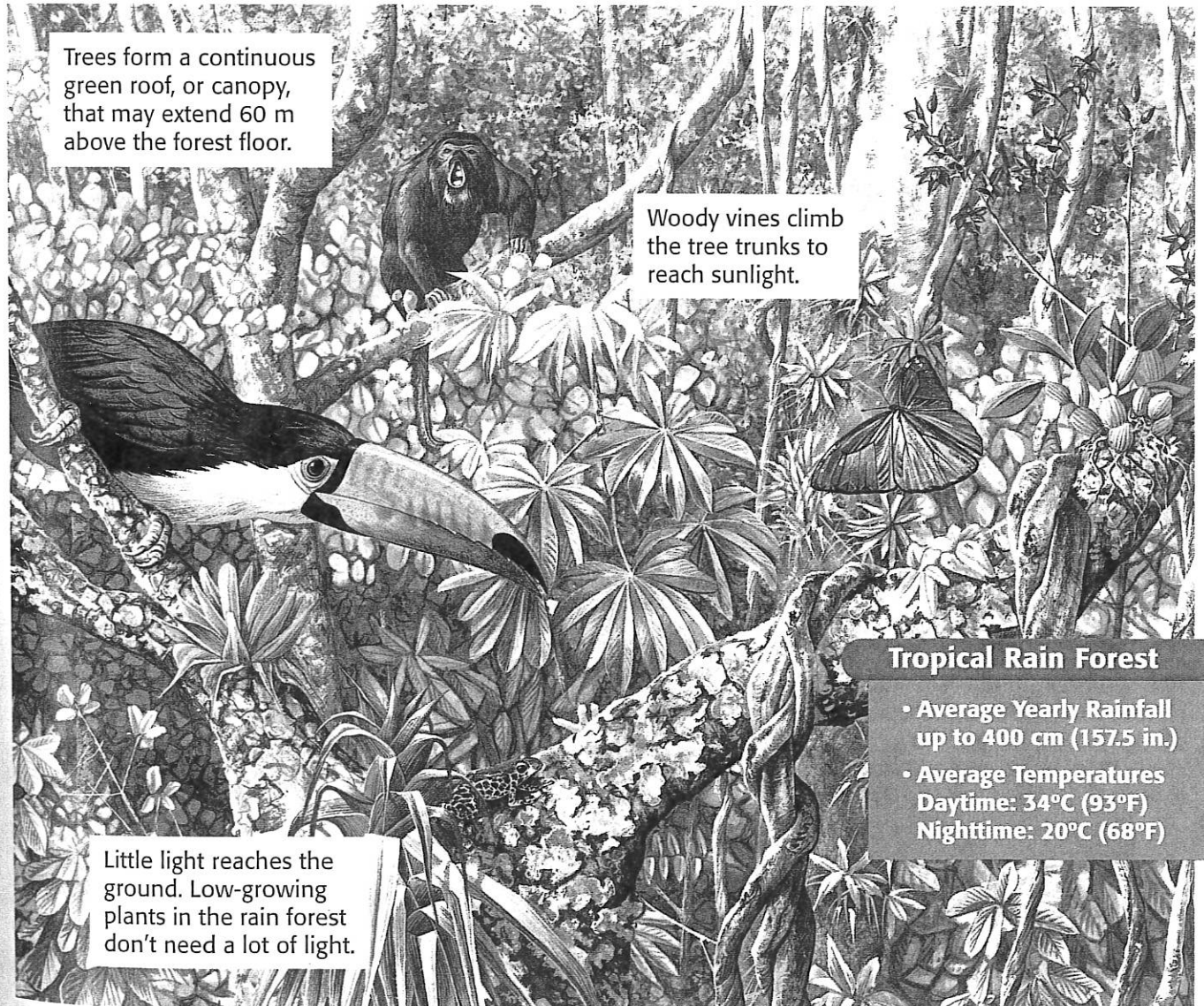
Reading Check What is another name for most conifers? What are some animals that live in coniferous forests?

Tropical Rain Forests

Tropical rain forests have more biological diversity than other places on Earth have. This means that rain forests have more kinds of plants and animals than any other land biome. For example, more than 100 different kinds of trees may grow in an area about one-fourth the size of a football field. Many animals live on the ground. But most animals live in the *canopy*, or the treetops. Many different animals live in the canopy. For example, nearly 1,400 species of birds live in the rain-forest canopy. **Figure 4** shows some of the diversity of the tropical rain forest.

Because of its diversity, the rain forest may seem as if it has nutrient-rich soil. But most of the nutrients in the tropical rain forest are found in the plants. The soil is actually very thin and poor in nutrients. Because the soil is so thin, many trees grow above-ground roots for extra support.

Figure 4 Tropical rain forests have a greater variety of organisms than any other biome.



Temperate Grassland

- Average Yearly Rainfall
25 to 75 cm (10 to 29.5 in.)
- Average Temperatures
Summer: 30°C (86°F)
Winter: 0°C (32°F)

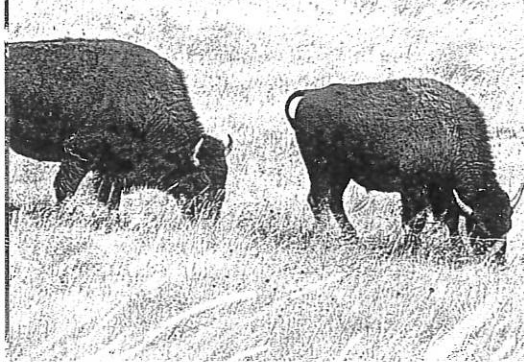


Figure 5 Bison once roamed North American temperate grasslands in great herds.

Grasslands

Grasslands have many names, such as *steppes*, *prairies*, and *pampas*. Grasslands are found on every continent but Antarctica. They are often flat or have gently rolling hills.

Temperate Grasslands

Temperate grassland plants include grasses and other flowering plants. Temperate grasslands have few trees. Fires, drought, and grazing prevent the growth of trees and shrubs. Temperate grasslands support small seed-eating animals, such as prairie dogs and mice. Large grass eaters, such as the North American bison shown in **Figure 5**, also live in temperate grasslands.

Savannas

A grassland that has scattered clumps of trees and seasonal rains is called a **savanna**. Savannas are found in parts of Africa, India, and South America. During the dry season, savanna grasses dry out and turn yellow. But the grasses' deep roots survive for many months without water. The African savanna is home to many large herbivores, such as elephants, giraffes, zebras, and wildebeests. Some of these animals are shown in **Figure 6**.

Reading Check What happens to grasses on a savanna during the dry season?

savanna a grassland that often has scattered trees and that is found in tropical and subtropical areas where seasonal rains, fires, and drought happen

CONNECTION TO Environmental Science

WRITING SKILL Mountains and Climate

Mountains can affect the climate of the land around them. Research the ecosystems around a mountain range. In your **science journal**, write a report describing how the mountains affect the climate of the surrounding land.

Savanna

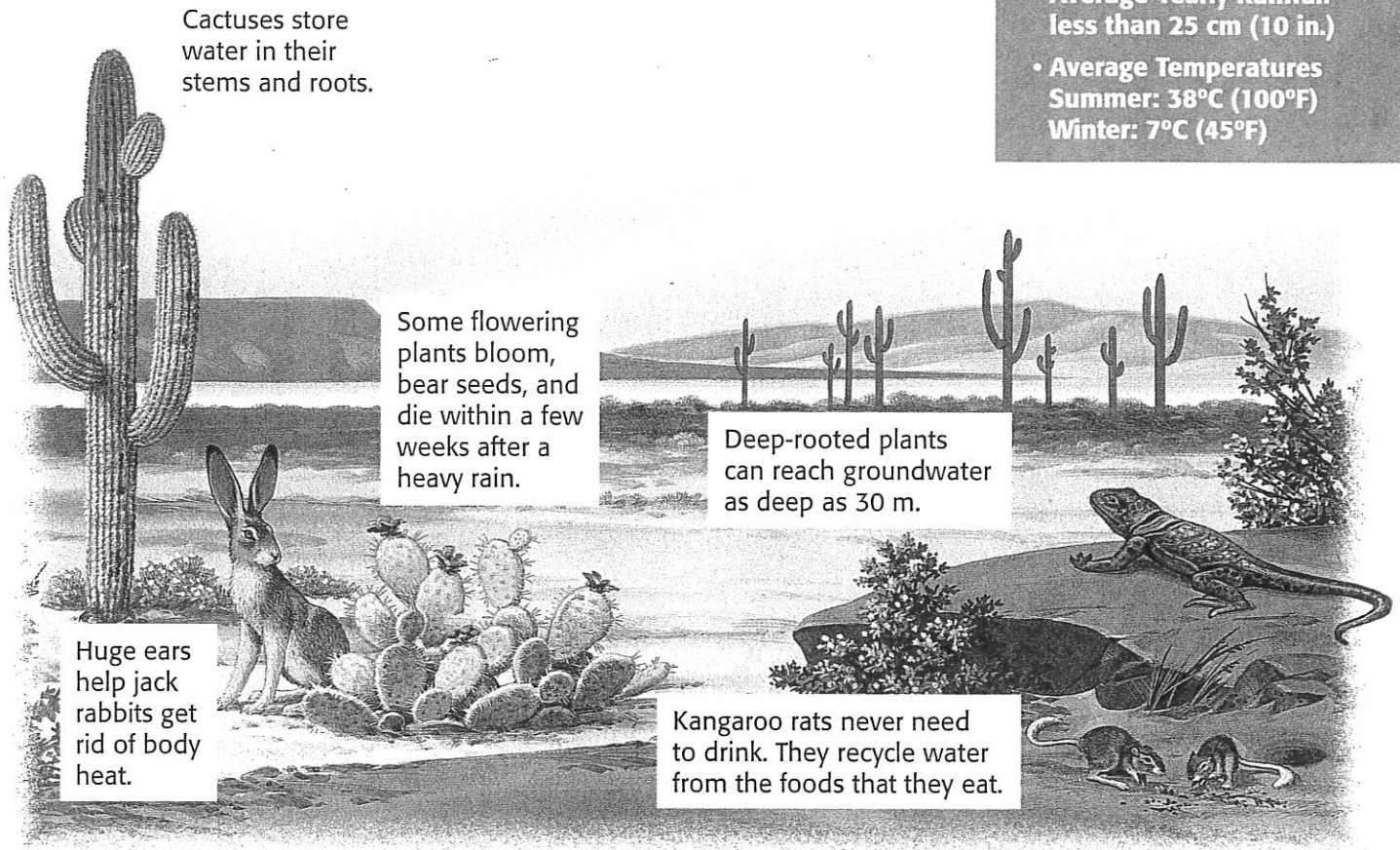
- Average Yearly Rainfall
150 cm (59 in.)
- Average Temperatures
Dry season: 34°C (93°F)
Wet season: 16°C (61°F)



Figure 6 In the African savanna, lions and leopards hunt zebras and wildebeests.

Desert

- Average Yearly Rainfall less than 25 cm (10 in.)
- Average Temperatures
Summer: 38°C (100°F)
Winter: 7°C (45°F)



Deserts

Biomes that are very dry and often very hot are called **deserts**. Many kinds of plants and animals are found only in deserts. These organisms have special adaptations to live in a hot, dry climate. For example, plants grow far apart so that the plants won't have to compete with each other for water. Some plants have shallow, widespread roots that grow just under the surface. These roots let plants take up water during a storm. Other desert plants, such as cactuses, have fleshy stems and leaves. These fleshy structures store water. The leaves of desert plants also have a waxy coating that helps prevent water loss.

Animals also have adaptations for living in the desert. Most desert animals are active only at night, when temperatures are cooler. Some animals, such as the spadefoot toad, bury themselves in the ground and are dormant during the dry season. Doing so helps these animals escape the heat of summer. Animals such as desert tortoises eat flowers or leaves and store the water under their shells. **Figure 7** shows how some desert plants and animals live in the heat with little water.

✓ Reading Check What are some adaptations of desert plants?

Figure 7 The residents of the desert biome have special adaptations to survive in a dry climate.

desert a region that has little or no plant life, long periods without rain, and extreme temperatures; usually found in hot climates

Tundra

- Average Yearly Rainfall
30 to 50 cm (12 to 20 in.)
- Average Temperatures
Summer: 12°C (54°F)
Winter: -26°C (-15°F)



Figure 8 During winters in the tundra, caribou migrate to grazing grounds that have a more-plentiful supply of food.

tundra a treeless plain found in the Arctic, in the Antarctic, or on the tops of mountains that is characterized by very low winter temperatures and short, cool summers

SCHOOL to HOME

Local Ecosystems

Writing Skill With a family member, explore the ecosystems around your home. What kinds of plants and animals live in your area? In your **science journal**, write a short essay describing the plants and animals in the ecosystems near your home.

ACTIVITY

Tundra

Imagine a place on Earth where it is so cold that trees do not grow. A biome that has very cold temperatures and little rainfall is called a **tundra**. Two types of tundra are polar tundra and alpine tundra.

Polar Tundra

Polar tundra is found near the North and South Poles. In polar tundra, the layer of soil beneath the surface soil stays frozen all the time. This layer is called *permafrost*. During the short, cool summers, only the surface soil thaws. The layer of thawed soil is too shallow for deep-rooted plants to live. So, shallow-rooted plants, such as grasses and small shrubs, are common. Mosses and lichens (LIE kuhnz) grow beneath these plants. The thawed soil above the permafrost becomes muddy. Insects, such as mosquitoes, lay eggs in the mud. Birds feed on these insects. Other tundra animals include musk oxen, wolves, and caribou, such as the one shown in **Figure 8**.

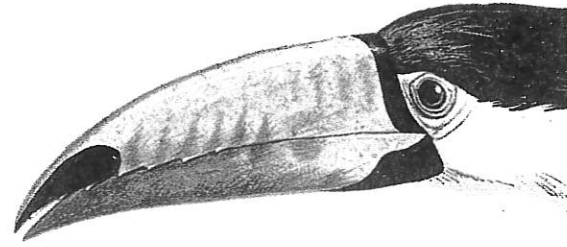
Alpine Tundra

Alpine tundra is similar to arctic tundra. Alpine tundra also has permafrost. But alpine tundra is found at the top of tall mountains. Above an elevation called the *tree line*, trees cannot grow on a mountain. Alpine tundra is found above the tree line. Alpine tundra gets plenty of sunlight and precipitation.

Reading Check What is alpine tundra?

SECTION Review

Summary



- A biome is characterized by abiotic factors, such as climate, and biotic factors, such as plant and animal communities.
- Three forest biomes are temperate deciduous forests, coniferous forests, and tropical rain forests.
- Grasslands are areas where grasses are the main plants. Temperate grasslands have hot summers and cold winters. Savannas have wet and dry seasons.
- Deserts are very dry and often very hot. Desert plants and animals competing for the limited water supply have special adaptations for survival.
- Tundras are cold areas that have very little rainfall. Permafrost, the layer of frozen soil below the surface of arctic tundra, determines the kinds of plants and animals that live on the tundra.

Using Key Terms

1. Use each of the following terms in a separate sentence: *biome* and *tundra*.
2. In your own words, write a definition for each of the following terms: *savanna* and *desert*.

Understanding Key Ideas

3. If you visited a savanna, you would most likely see
 - a. large herds of grazing animals, such as zebras, gazelles, and wildebeests.
 - b. dense forests stretching from horizon to horizon.
 - c. snow and ice throughout most of the year.
 - d. trees that form a continuous green roof, called the *canopy*.
4. Components of a desert ecosystem include
 - a. a hot, dry climate.
 - b. plants that grow far apart.
 - c. animals that are active mostly at night.
 - d. All of the above
5. List seven land biomes that are found on Earth.
6. What are two things that characterize a biome?

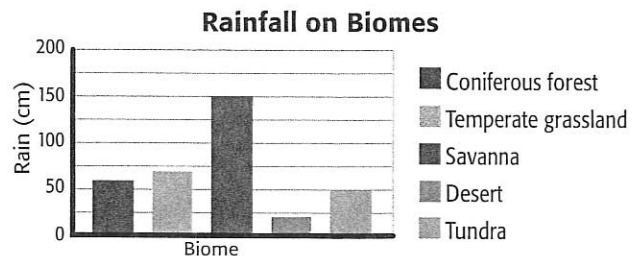
Critical Thinking

7. **Making Inferences** While excavating an area in the desert, a scientist discovers the fossils of very large trees and ferns. What might the scientist conclude about biomes in this area?

8. **Analyzing Ideas** Tundra receives very little rainfall. Could tundra accurately be called a *frozen desert*? Explain your answer.

Interpreting Graphics

Use the bar graph below to answer the questions that follow.



9. Which biomes receive 50 cm or more of rain each year?
10. Which biome receives the smallest amount of rain? the largest amount of rain?

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