2.8 Major Terrestrial Ecosystems

Earth's biosphere is home to millions of species. This could lead you to think that there are an unlimited variety of ecosystems composed of different combinations of species. In fact, there are relatively few prominent and easily recognizable types of ecosystems. These prominent types have characteristic features that are observable even without identifying individual species. Deserts, coral reefs, and tropical rainforests have features that are not quickly forgotten.

What is responsible for the occurrence of these characteristic ecosystems and their locations on our planet? Why do we find similar-looking deserts on several continents? Why do coral reefs seem to form in shallow warm waters? Why do tropical rainforests grow in a band around the equator? In this section, you will look at major terrestrial ecosystems. In Section 2.9, you will consider major aquatic ecosystems.

Terrestrial Biomes

The most important factor in determining the location and makeup of a terrestrial ecosystem is climate. On a global scale, the pattern and range of temperature and precipitation cause the establishment of ecologically similar, terrestrial regions called **biomes**. Figure 1 illustrates the relationships between biomes, temperature, and precipitation.

biome a large geographical region defined by climate (precipitation and temperature) with a specific set of biotic and abiotic features

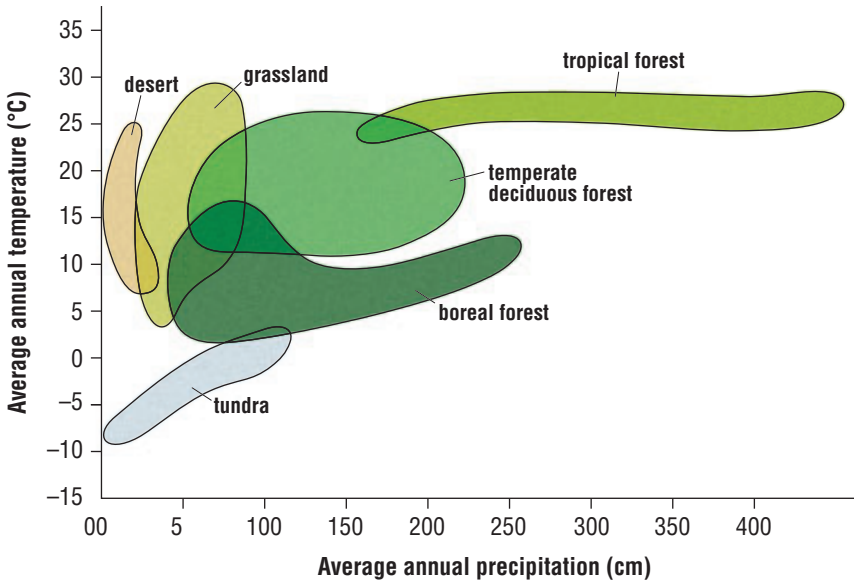

Figure 1 This climatograph shows the influence of precipitation and temperature on biome formation.

The natural landscape in Canada is dominated by four major biomes: tundra, boreal forest, grassland, and temperate deciduous forest. These biomes have characteristic biotic and abiotic features (Figure 2, on the next page). British Columbia contains several smaller biomes, including the mountain forest biome which extends to Alberta, and a narrow strip of temperate rainforest biome along the coast.

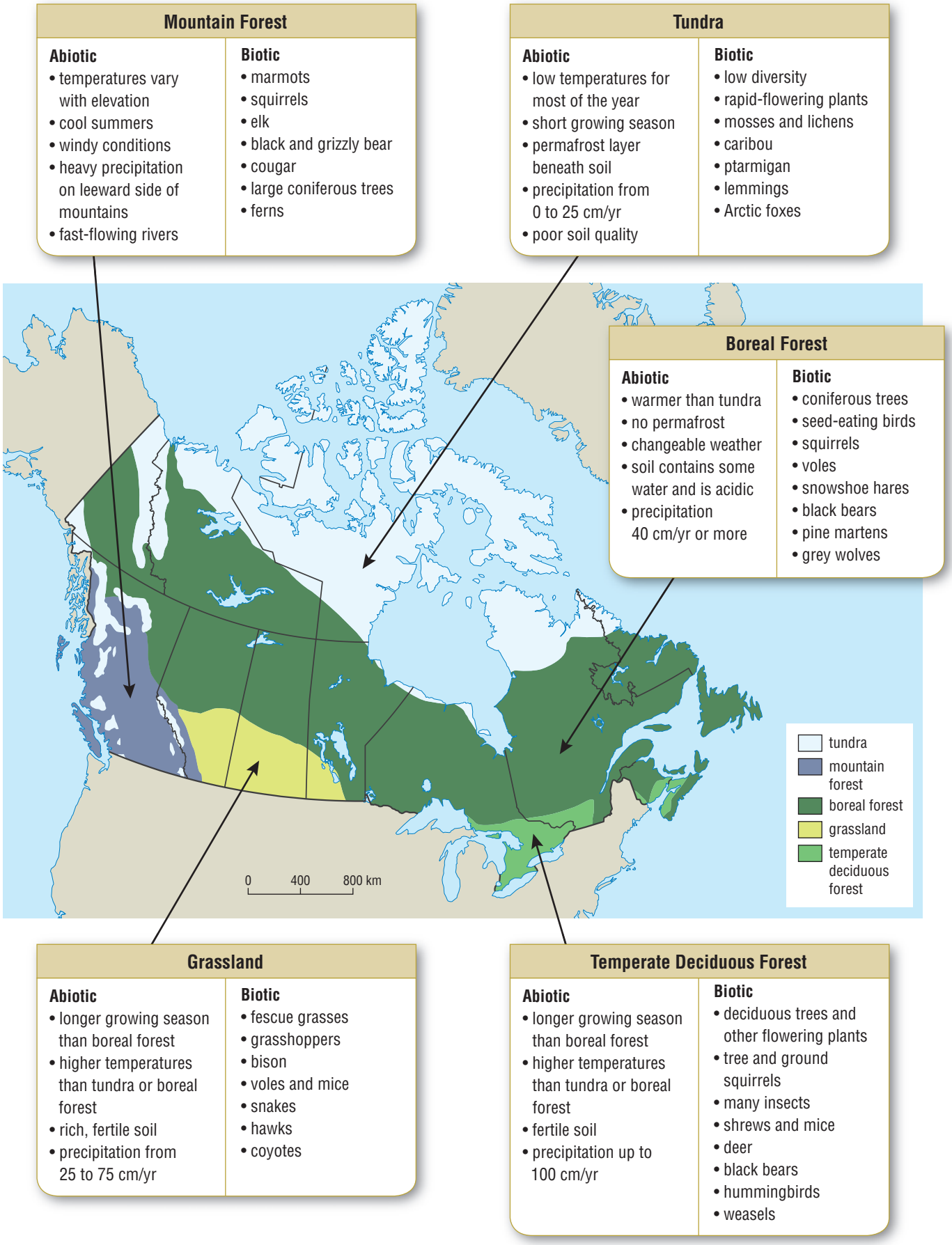

Figure 2 Canada has four major biomes. The mountain forest biome is found in British Columbia and parts of Alberta.

Tundra Biome

Canada's most northern biome, the tundra, is a cold desert. The extremely short growing season and low temperatures place harsh limits on the kinds of plants that are able to survive here. Because the rate of photosynthesis is reduced, plants in the tundra grow slower than in Canada's other biomes.

Vast regions of tundra have permafrost (permanently frozen ground). During the summer, the soil closest to the surface thaws and forms an active layer in which plant roots can grow. Low soil temperature means that decomposition rates are very slow and nutrients are cycled slowly.

Among the most notable species in the tundra are the barren-ground caribou and the polar bear. The barren-ground caribou travel in large herds feeding on low-growing lichens and mosses (Figure 3). These herds migrate long distances to obtain enough food to support their large body size.

Figure 3 Caribou migrate thousands of kilometres every year in the tundra biome.

Boreal Forest Biome

Figure 4 Conifer branches can support and shed heavy loads of snow.

The boreal forest is the largest biome in Canada. Rainfall and warm summers support the growth of trees. Soil in the boreal forest is acidic because acids are released by decomposing conifer needles. This slows decomposition and limits the variety of plants that grow in this biome.

Conifers are the dominant trees. They can withstand the harsh winters while retaining their needle-shaped leaves. Needles have a thick wax coating that reduces water loss during the winter. In addition, leaves can photosynthesize as soon as the temperature warms up in the spring. The short stature, flexible branches, and conical shape of conifers enable them to both support and shed heavy snow loads (Figure 4). The shaded forest floor is covered in shade-tolerant and slow-growing mosses and ferns.

Grassland Biome

Canada's natural grassland, or prairie, occurs where moderate rainfall supports grasses but cannot support most tree species. The hot, dry summers provide ideal conditions for fires. Fires maintain grassland because they suppress tree growth. The black earth of grassland is among the most fertile of soils in the world. High summer temperatures promote decomposition, which releases nutrients back into the soil.

Canada's grassland biome once extended across much of Manitoba, Saskatchewan, and Alberta. Little of the natural grassland remains (Figure 5, next page). Humans have replaced natural grassland with large fields of crops such as wheat and canola.

The animal communities in grassland have survived in modest numbers. The best known inhabitant of the grassland is the bison, which once numbered in the millions and roamed in vast herds.

Figure 5 The grassland biome is composed of shrubs, grasses and herbs.

Temperate Deciduous Forest Biome

The temperate deciduous forest biome is dominated by deciduous trees such as maple, oak, and ash (Figure 6). In this biome, the growing season is longer. Temperatures do not reach the extreme lows found in the boreal region. Decomposition rates are faster.

The deciduous forest plant community is very diverse. It has a layer of canopy trees, understorey trees, shrubs, and non-woody vegetation on the forest floor (Figure 7). The variety of plant life supports a rich variety of animals. Each species is adapted for feeding on or living in a particular portion of the forest.

The climate of this biome has made it attractive to humans. We have replaced large portions of the original temperate forest with farmland, roads, and cities. As you will learn in Section 3.4, these actions have led to the loss of much of the original forest cover and to the division of what remains.

DID YOU KNOW?

Driven to the Brink

Bison were almost driven to extinction in the nineteenth century. Massive commercial overhunting decimated this species until only a few small fragmented populations remained. Today, small numbers of bison occur in the wild, while relatively large numbers are raised for meat.

Figure 6 In autumn, the beautiful range of fall colours highlights the variety of this temperate deciduous forest biome.

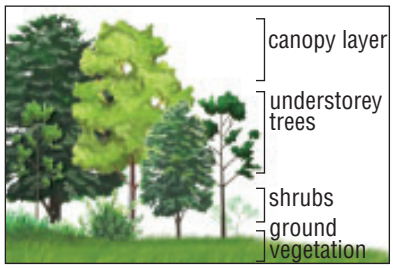

Figure 7 The temperate deciduous forest has distinct layers of tall canopy trees, small understorey trees, shrubs, and ground vegetation.

IN SUMMARY

- Precipitation and temperature are the main abiotic factors influencing biome formation.
- Terrestrial biomes have distinct biotic and abiotic characteristics.
- The five main Canadian biomes are tundra, boreal forest, grassland, temperate deciduous forest, and mountain forest.
- The boreal forest is the largest biome in Canada.

CHECK YOUR LEARNING

1. Order Canada's terrestrial biomes from wettest to driest. Order them from warmest to coldest. K/U
2. Why is fire important to the sustainability of grassland ecosystems? K/U
3. Is the boreal or deciduous forest more diverse? Explain why. K/U
4. Which abiotic factors are most influential in determining what type of biome occurs in a particular region? K/U
5. Describe the terrestrial biome that you live in. Which of the biotic factors listed in Figure 2 have you seen? T/I C
6. Explain why conifers are suited to harsh winters in the boreal forest. K/U