

26.2 Climate Zones

The earth has three major climate zones: tropical, polar, and middle-latitude. Each has distinct temperature characteristics. The warm zone immediately around the equator is the zone of **tropical climates**. Tropical climates have an average monthly temperature of at least 18°C, even during the coldest month of the year. Tropical climates are influenced by the continental and maritime tropical air masses, which develop close to the equator.

At the other extreme are the **polar climates**. In these regions, the average monthly temperature is never higher than 10°C. Continental and maritime polar air masses originate in these areas.

Between the tropical and polar climate zones is the zone of temperate climates, or **middle-latitude climates**. The average monthly temperature of these climates is no warmer than 18°C in the coldest month and no cooler than 10°C in the warmest month. In middle-latitude climate zones, the weather changes often because both tropical and polar air masses move across these regions. The middle-latitude climate zones are also frequently exposed to wave cyclones, with strong winds and heavy rains, that are produced along the polar front. The general boundaries of the three major climate zones are shown in Figure 26-4.

Tropical Climates

Each principal climate zone has a specific range of temperatures. However, there are several different types of climate within each of these zones because of differences in the amount of precipitation that occurs. For example, within the tropical zone there are three types of tropical climates: **tropical rain forest**, **tropical desert**, and **tropical savanna**.

Section Objectives

- Name and describe the three types of tropical climates.
- Compare subarctic and tundra climates.
- List the various types of middle-latitude climates, and name the regions in which they are found.
- Explain why city climates may differ from rural climates.

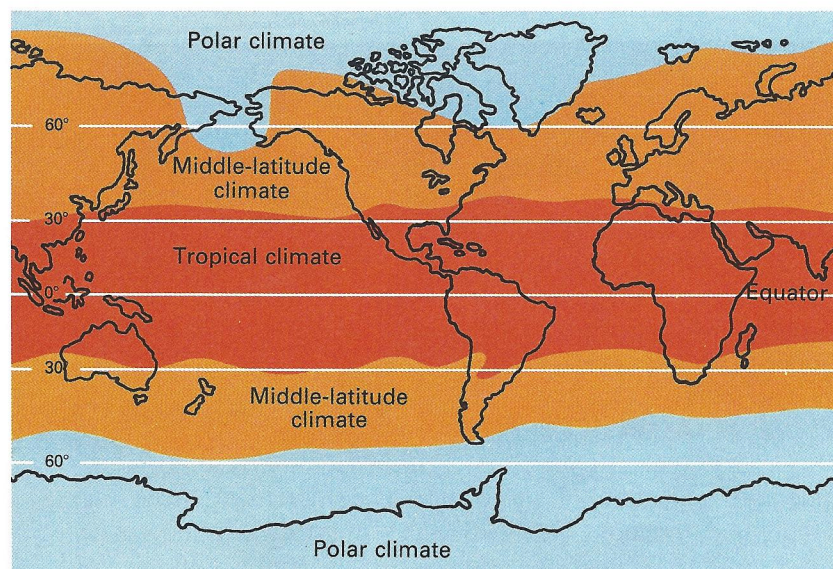


Figure 26-4. The general boundaries of the major climate zones are shown on this map.

An Endangered Habitat

Tropical rain forests are one of the earth's most complex and varied natural habitats. Approximately one third of all the plant and animal species on earth live in rain forests. Scientists have identified 1,100 species of trees, shrubs, and grasses on less than 2.6 km² of land in the Colombian rain forest. In contrast, all of Great Britain and Ireland, which are located in a middle-latitude climate, support only about 1,450 species.

The plants in rain forests are sources for many medicines and for products used in agriculture and industry. For example, the copaiba tree produces a liquid similar to diesel fuel. The wild plants of the rain forests also may become an important source of new crops if cultivated varieties lose their

resistance to diseases and insects.

Destruction of the earth's rain forests, however, is occurring at an alarming rate. Scientists predict that if this destruction continues at its present rate, all tropical rain forests will be destroyed over the next several decades. Huge tracts have been and continue to be burned to provide land for agriculture and urban development. In addition to destroying the forests, the burning of the trees adds carbon dioxide to the atmosphere. This carbon dioxide contributes to the greenhouse effect, which may be causing a rise in global



temperatures. Also common are slash-and-burn farming practices: Forests are cut and burned down, crops are planted, then the land is abandoned when the minerals in the soil have been used up.

Approaches to reclaiming the rain forests include cultivating rain-forest products, using chemical fertilizers, and instituting crop rotation to restore the fertility of the soil.

How does destruction of the rain forests affect the tropical climate?

Tropical Rain Forest Climate

The warm, humid regions within 5° to 10° on either side of the equator are covered with dense, rain-forest vegetation. For that reason, the climate of this region is known as a *tropical rain forest climate*. The warm, moist, rising air produces an annual rainfall that is usually greater than 250 cm. The yearly temperature range is very small—about 3°C. Central Africa, the Amazon River basin of South America, and parts of Central America and Southeast Asia have tropical rain forest climates.

Tropical Desert Climate

Warm, dry weather conditions occur in regions about 20° to 30° latitude north and south of the equator. The Tropic of Cancer and the Tropic of Capricorn (23.5° N/S)—the limit to which the sun advances on the summer and winter solstices—fall within this zone.

These areas have a *tropical desert climate*. Tropical desert climates are influenced by the sinking, warming, and dry air masses of the subtropical highs. They include some of the earth's driest deserts. Annual rainfall in a tropical desert climate is less than 25 cm. The largest belt of tropical deserts extends across North Africa and southwestern Asia and includes the Sahara, Arabian, and Thar deserts. Smaller tropical deserts in the Northern Hemisphere are located in the Sonoran region of northern Mexico and in the southwestern part of the United States. The Kalahari Desert in southwest Africa and most of the interior of Australia also are tropical deserts.

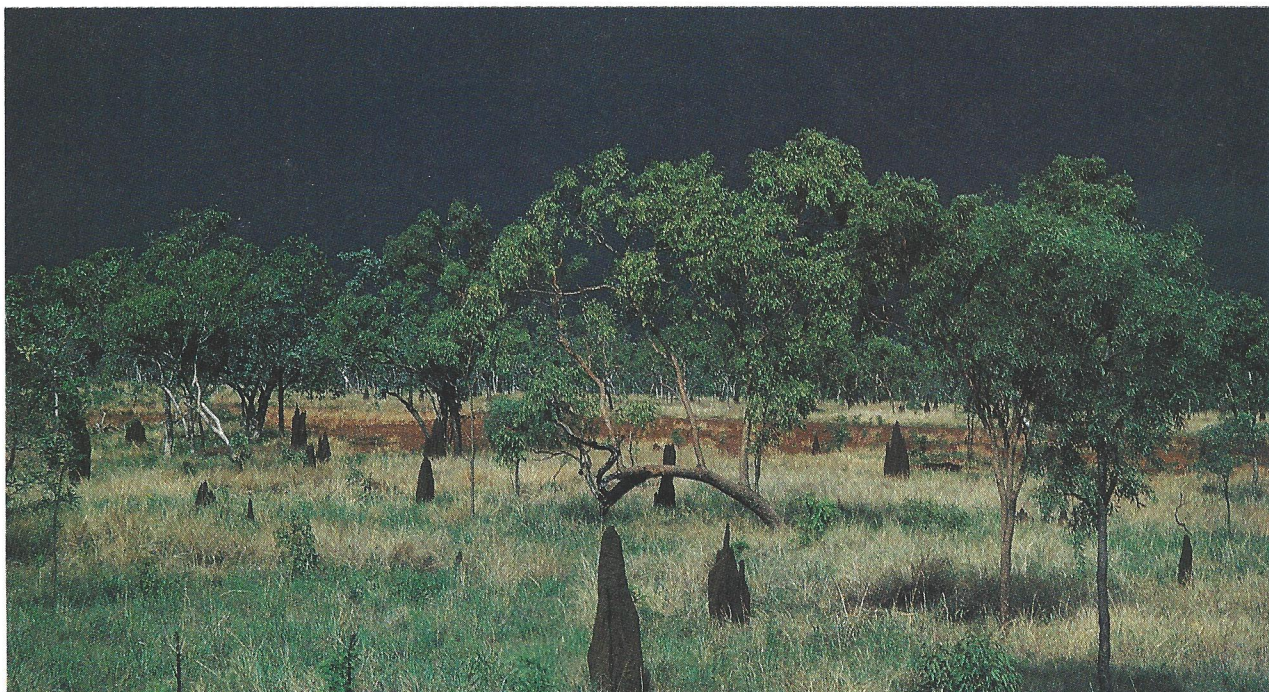
Tropical Savanna Climate

A third type of tropical climate, the savanna climate, occurs in areas located between the tropical rain forest climate and the tropical desert climate. During different seasons, the precipitation belts shift toward the poles, producing very wet summers and very dry winters in these savanna regions.

The weather conditions favor the growth of the type of plants common to a *savanna*. As shown in Figure 26-5, a savanna consists mainly of open areas of coarse grasses that generally grow in clumps. Widely scattered on the grassland are drought-resistant trees and shrubs. Savanna climates are found in the areas that border the rain forests of South America and Africa. Parts of southeast Asia and northern Australia also have savanna climates. In southeast Asia the differences in the seasons are extreme because of the alternating monsoon rains and dry periods.

The Hawaiian Islands have both rain forest and savanna climates. These islands are located in the belt of trade winds that blow almost continuously from the northeast toward the equator. The trade winds bring heavy precipitation to the eastern windward slopes of the islands, causing a tropical rain forest climate. However, the western leeward slopes of the islands have sinking, downslope air and receive less rainfall, causing a savanna climate.

Figure 26-5. The vegetation in a savanna climate consists of drought-resistant grasses, shrubs, and trees, such as those in northern Australia.



Polar Climates

Climates that are mainly influenced by polar air masses—polar climates—occur in the regions located between 55° latitude and the poles. There are two types of polar climates: the **subarctic climate** and the **tundra climate**.

Subarctic Climate

All the land across North America, Europe, and Asia that lies between 55° and 65° north latitude, including most of Alaska, has a subarctic climate. Dry continental polar air masses control this climate. In the subarctic climate, yearly precipitation is only 25 cm to 50 cm. But due to low evaporation, forests of pine, spruce, and other cone-bearing trees can grow. Winters are severe, and summers are short. The subarctic climate has an unusually large annual temperature range. In fact, the largest yearly temperature range on earth—61°C—was recorded in subarctic Yakutsk, Siberia.

There is no subarctic climate in the Southern Hemisphere due to a lack of land between 55° and 65° south latitude.

Tundra Climate

The northern part of Alaska and other land areas north of the Arctic Circle have a tundra climate. This climate is named for the vegetation common to the region, the *tundra*. A tundra has no trees, but the ground is covered with mosses, lichens, and small flowering plants. It also has large expanses of rocky land with no vegetation. The yearly temperature range is not as great as that of subarctic climates. This is because areas with tundra climates are near the ocean, which holds some heat during the winter. The warmest months—July and August—have average temperatures of only 4°C. About 25 cm of precipitation are received in a year, mostly as snow.

In the Southern Hemisphere, only a few ice-free areas of Antarctica and some wind-swept desolate islands have a tundra climate. Poleward of the tundra climate are the ice caps. These areas, which are covered by pack ice or ice sheets, have no vegetation. Polar areas have very dry, cold air and receive little precipitation.

Figure 26–6. Although the Alaskan tundra has a cold average yearly temperature, many small plants bloom during the brief summer.

