

TROPICAL RAIN FOREST



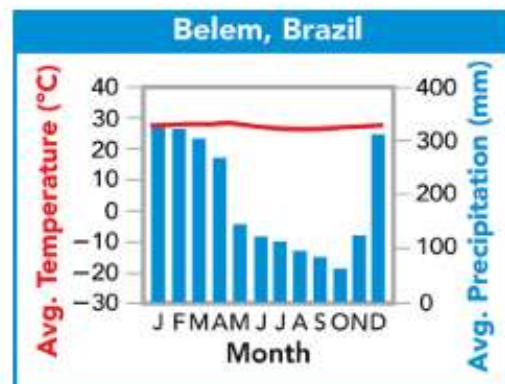
Tropical rain forests have more species than all of the other biomes combined. Tropical rain forests typically get at least 2 meters of rain annually. Tall trees form a dense, leafy covering called a **canopy** from 50 to 80 meters above the forest floor. In the shade below, shorter trees and vines form a layer called the **understory**. Organic matter on the forest floor is recycled and reused so quickly that the soil in most tropical rain forests is not very rich in nutrients.

Abiotic factors: warm and wet year-round; thin, nutrient-poor soils subject to erosion

Biotic factors

Plant life: Understory plants compete for sunlight, so many have large leaves to capture light. Tall trees growing in shallow soil often have buttress roots, which act like props for support. Epiphytic plants grow on the branches of tall plants, taking advantage of available sunlight.

Animal life: Animals are active all year. Many use camouflage to hide from predators; some can change color to match their surroundings. Animals in the canopy have adaptations for climbing, jumping, and flight.



TROPICAL DRY FOREST



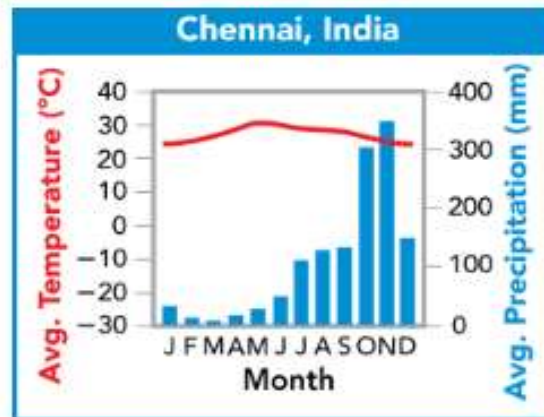
Tropical dry forests grow where rainy seasons alternate with dry seasons. In most places, a period of rain is followed by a prolonged period of drought.

Abiotic factors: warm year-round; alternating wet and dry seasons; rich soils subject to erosion

Biotic factors

Plant life: Many plants here lose their leaves during the dry season. Some leaves have an extra thick waxy layer to reduce water loss. Others store water in their tissues.

Animal life: Many animals reduce their need for water by entering long periods of inactivity similar to hibernation, but typically taking place during a dry season. Other animals, including many birds and primates, move to areas where water is available during the dry season.



TROPICAL GRASSLAND/SAVANNA/SHRUBLAND



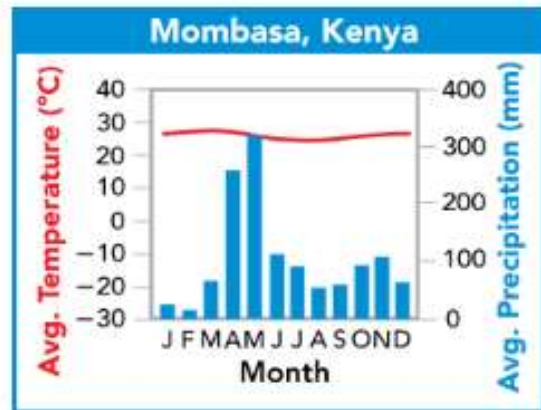
This biome receives more seasonal rainfall than deserts but less than tropical dry forests. Grassy areas are spotted with isolated trees and small groves of trees and shrubs.

Abiotic factors: warm; seasonal rainfall; compact soils; frequent fires set by lightning

Biotic factors

Plant life: Plant adaptations are similar to those in the tropical dry forest, including waxy leaf coverings and seasonal leaf loss. Some grasses have a high silica content that makes them less appetizing to grazing herbivores. Also, grasses have adaptations that enable them to continue to grow after being grazed.

Animal life: Many animals migrate in search of water during the dry season, while some smaller animals burrow and remain dormant.



DESERT



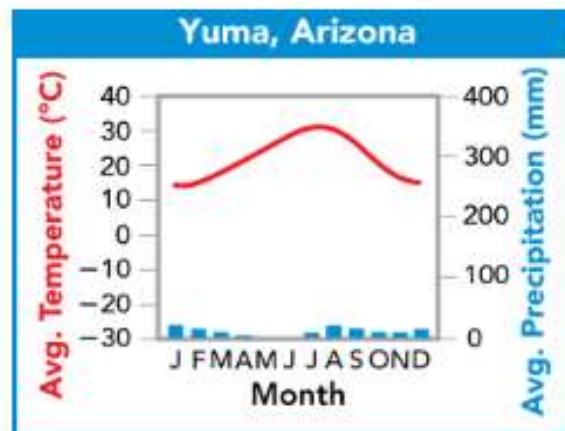
Deserts receive less than 25 centimeters of precipitation annually, but vary greatly depending on elevation and latitude. Many deserts undergo extreme daily temperature changes between hot and cold.

Abiotic factors: low precipitation; variable temperatures; soils rich in minerals but poor in organic material

Biotic factors

Plant life: Many plants, including cacti, store water in their tissues, and minimize leaf surface area to cut down on water loss. Cactus spines are actually modified leaves.

Animal life: Many desert animals get the water they need from their food. To avoid the heat of the day, many are active only at night. Blood vessels near the skin help animals lose body heat.



TEMPERATE GRASSLAND



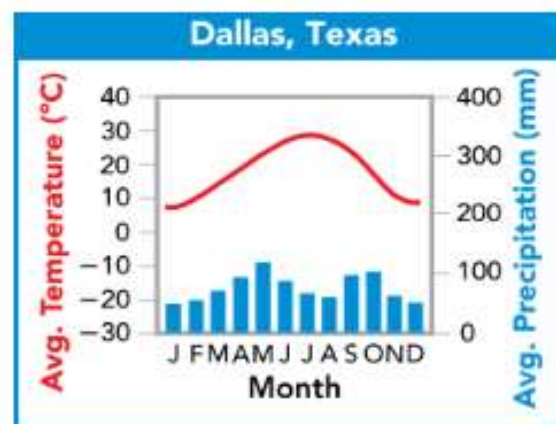
Plains and prairies with fertile soils once covered much of the Midwestern and central United States, land that is now used for farms. Periodic fires and heavy grazing by herbivores maintained the plant communities dominated by grasses.

Abiotic factors: warm to hot summers; cold winters; moderately seasonal precipitation; fertile soils; occasional fires

Biotic factors

Plant life: Grassland plants, especially grasses, are resistant to grazing and fire. Dispersal of seeds by wind is common. The root structure of native grassland plants helps establish and retain deep, rich, fertile topsoil.

Animal life: These open, exposed environments make predation a constant threat for smaller animals. Camouflage and burrowing are common protective adaptations.



TEMPERATE WOODLAND AND SHRUBLAND



Here, large areas of grasses and wildflowers such as poppies are interspersed with oak and other trees. Communities that are more shrubland than forest are known as chaparral. Dense, low plants that contain flammable oils make fire a constant threat.

Abiotic factors: warm, dry summers; cool, moist winters; thin, nutrient-poor soils; periodic fires

Biotic factors

Plant life: Woody chaparral plants have tough waxy leaves that resist water loss. Fire resistance is important, although the seeds of some plants need fire to germinate.

Animal life: Animals tend to eat varied diets of grasses, leaves, shrubs, and other vegetation. In exposed shrubland, camouflage is common.



TEMPERATE FOREST



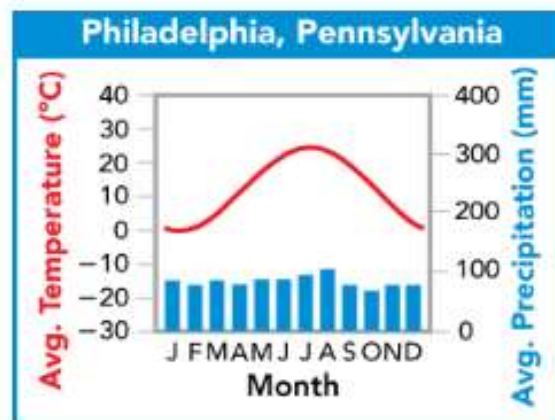
Temperate forests have cold winters and warm summers. Coniferous trees produce seed-bearing cones. In autumn, deciduous trees shed their leaves. Fertile soils are often rich in **humus**, a material formed from decaying leaves and other organic matter.

Abiotic factors: cold to moderate winters; warm summers; year-round precipitation; fertile soils

Biotic factors

Plant life: Deciduous trees drop their leaves and go into a state of dormancy in winter. Conifers have needlelike leaves that minimize water loss in dry winter air.

Animal life: Animals may cope with changing weather by hibernating or migrating to warmer climates. Other animals may be camouflaged to escape predation in the winter when bare trees leave them more exposed.



NORTHWESTERN CONIFEROUS FOREST



Mild, moist air and abundant rainfall nurture many tall conifers, from giant redwoods to spruce, fir, and hemlock, along with flowering trees and shrubs. Moss often covers tree trunks and the forest floor. This biome is sometimes called a “temperate rain forest.”

Abiotic factors: mild temperatures; abundant precipitation in fall, winter, and spring; cool, dry summers; rocky, acidic soils

Biotic factors

Plant life: Seasonal temperature variation means that there is less diversity here than in tropical rain forests. However, ample water and nutrients support lush, dense plant growth.

Animal life: Camouflage helps insects and ground-dwelling mammals avoid predation. Many animals are browsers—they eat a varied diet—an advantage in an environment where vegetation changes seasonally.



BOREAL FOREST/TAIGA



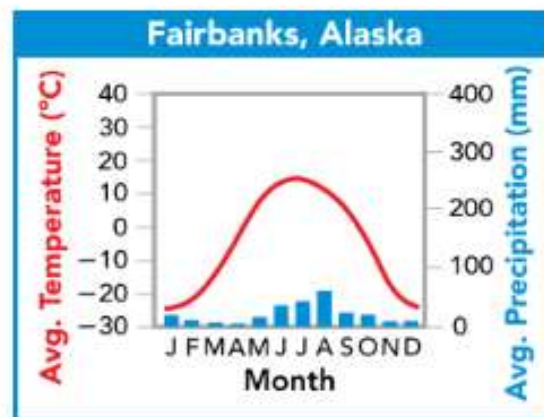
The word *boreal* comes from the Greek word for "north." Dense forests of coniferous evergreens along the northern edge of the temperate zone are called boreal forests, or **taiga** (ty guh). Winters are bitterly cold, but summers are mild and long enough to allow the ground to thaw.

Abiotic factors: long, cold winters; short, mild summers; moderate precipitation; high humidity; acidic, nutrient-poor soils

Biotic factors

Plant life: Conifers' shape and wax-covered needlelike leaves shed snow, and prevent excess water loss.

Animal life: Staying warm is the major challenge. Most have small extremities and extra insulation in the form of fat or downy feathers. Some migrate to warmer areas in winter.



TUNDRA



The tundra is characterized by permafrost, a layer of permanently frozen subsoil. During the short, cool summer, the ground thaws to a depth of a few centimeters and becomes soggy. This cycle of thawing and freezing rips and crushes plant roots, which is one reason that tundra plants are small and stunted. Cold temperatures, high winds, a short growing season, and humus-poor soils also limit plant height.

Abiotic factors: strong winds; low precipitation; short and soggy summers; long, cold, dark winters; thin soils

Biotic factors

Plant life: Ground-hugging mosses and other low-growing plants avoid damage from frequent strong winds. Seed dispersal by wind is common.

Animal life: Many animals migrate to avoid winters. Year-round residents display adaptations, among them natural antifreeze, small extremities that limit heat loss, and a varied diet.

