



# Lesson Overview

## 4.4 Biomes

# TROPICAL RAIN FOREST

Tropical rain forests are home to more species than all the other biomes combined.

Rain forests get at least 2 meters of rain a year, and are always HOT!

Tall trees form a dense, leafy covering called a **canopy** from 50 to 80 meters above the forest floor. In the shade below the canopy, 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 minerals.

# TROPICAL DRY FOREST

Tropical dry forests grow in areas where rainy seasons alternate with dry seasons.

Tropical dry forests are warm year-round, with alternating wet and dry seasons.

Their rich soils are subject to erosion.

Adaptations to survive the dry season include seasonal loss of leaves.

Some plants also have an extra thick waxy layer on their leaves to reduce water loss, or they store water in their tissues.

Many animals reduce their need for water by entering long periods of inactivity called *estivation*.

# **TROPICAL GRASSLAND/SAVANNA/SHRUBLAND**

This biome is warm and 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.

Compacted soils, fairly frequent fires, and the action of large animals prevent some areas from turning into dry forest.

Plant adaptations include waxy leaf coverings and seasonal leaf loss.

Many animals migrate during the dry season in search of water.

Some smaller animals burrow and remain dormant during the dry season.

# DESERT

Deserts have less than 25 centimeters of precipitation annually, but otherwise vary greatly, depending on elevation and latitude.

Many deserts undergo extreme daily temperature changes, alternating between extremely hot and extremely cold (even below freezing).

Their soils are rich in minerals, but poor in organic material.

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.

Modified photosynthesis in some plants requires leaf pores to open only at night, enabling plants to conserve moisture on hot, dry days

Many desert animals get the water they need from the food they eat. To avoid the hottest parts of the day, many animals are nocturnal—active only at night.

Large or elongated ears and other extremities often have many blood vessels close to the surface to help the animal lose body heat and regulate body temperature.

# TEMPERATE GRASSLAND

Today, most have been converted for agriculture because their soil is so rich in nutrients and is ideal for growing crops.

Temperate grasslands experience warm to hot summers and cold winters, with moderate seasonal precipitation.

The soil is fertile and there are occasional fires.

Grassland plants—especially grasses, which grow from their base—are resistant to grazing and fire.

Wind dispersal of seeds is common in this open environment.

Because temperate grasslands are such open, exposed environments, predation is a constant threat for smaller animals.

Camouflage and burrowing are two common protective adaptations.

# TEMPERATE WOODLAND AND SHRUBLAND

In open woodlands, large areas of grasses and wildflowers 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.

The woodlands experience hot dry summers and cool moist winters.

They have thin, nutrient-poor soils and experience periodic fires.

Woodland plants have adapted to drought.

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.

Woodland animals tend to eat varied diets of grasses, leaves, shrubs, and other vegetation.

In exposed shrubland, camouflage is common.

# TEMPERATE FOREST

Temperate forests are mostly made up of deciduous and evergreen coniferous trees.

**Coniferous** trees, or **conifers**, produce seed-bearing cones, and most have needle-shaped leaves coated in a waxy substance that helps reduce water loss.

A plant that sheds its leaves during a particular season is called **deciduous**.

Temperate forests have cold winters. In autumn, deciduous trees shed their leaves. In the spring, small plants burst from the ground and flower.

The fertile soils are rich in **humus**, a material formed from decaying leaves and other organic matter.

Temperate forests experience cold to moderate winters and warm summers and have year round precipitation.

To cope with the changing weather, some animals hibernate, while others migrate to warmer climates.



# NORTHWESTERN CONIFEROUS FOREST

Mild moist air from the Pacific Ocean influenced by the Rocky Mountains provides abundant rainfall to this biome.

The forest includes a variety of conifers, along with flowering trees and shrubs such as dogwood and rhododendron. Moss often covers tree trunks and the forest floor. Because of its lush vegetation, the northwestern coniferous forest is sometimes called a “temperate rain forest.”

Northwestern coniferous forests experience mild temperatures and abundant precipitation in fall, winter, and spring. The summers are cool and dry. Soils are rocky and acidic.

Adaptations that enable plants to obtain sunlight are common. Trees here are among the world’s tallest.

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

Dense forests of coniferous evergreens along the northern edge of the temperate zone are called boreal forests, or **taiga**.

Winters are bitterly cold, but summers are mild and long enough to allow the ground to thaw.

Boreal forests occur mostly in the northern part of the Northern Hemisphere. The word *boreal* comes from the Greek word for “north.”

Boreal forests have long cold winters and short mild summers.

There is moderate precipitation and high humidity.

The soil is acidic and nutrient-poor.

The conical shape of conifers sheds snow, and their wax-covered needlelike leaves prevent excess water loss, making conifers well suited to the boreal forest environment.

Staying warm is the major challenge for boreal forest animals.

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. In winter, the top layer of soil freezes again. The cycle of thawing and freezing, which rips and crushes plant roots, 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.

The tundra experiences strong winds and low precipitation.

The summers are short and soggy, and the winters are long, cold, and dark.

By hugging the ground, mosses and other low-growing plants avoid damage from frequent strong winds. Seed dispersal by wind is common.

Many animals migrate to avoid the long harsh winters.

Animals that live in the tundra year-round display adaptations such as natural antifreeze, small extremities that limit heat loss, and a varied diet.

### Other Land Areas



Because they are not easily defined in terms of a typical community of plants and animals, mountain ranges and polar ice caps are not usually classified into biomes.

# Mountain Ranges

Mountain ranges exist on all continents and in many biomes.

On mountains, temperature, precipitation, exposure to wind, and soil types all change with elevation, and so do organisms.

## Mountain Ranges

If you climb the Rocky Mountains in Colorado, for example, you begin in a grassland.

You then pass through pine woodland and then a forest of spruce and other conifers.

Thickets of aspen and willow trees grow along streambeds in protected valleys.

Higher up, soils are thin. Strong winds buffet open fields of wildflowers and stunted vegetation resembling tundra.

Glaciers are found at the peaks of many ranges.

## Polar Ice Caps

Polar regions border the tundra and are cold year-round.

Plants are few, though some algae grow on snow and ice.

Where rocks and ground are exposed seasonally, mosses and lichens may grow.

Marine mammals, insects, and mites are the typical animals.

## Polar Ice Caps

In the north, where polar bears live, the Arctic Ocean is covered with sea ice, although more and more ice is melting each summer.

In the south, the continent of Antarctica is covered by ice nearly 5 kilometers thick in places.