Biomes

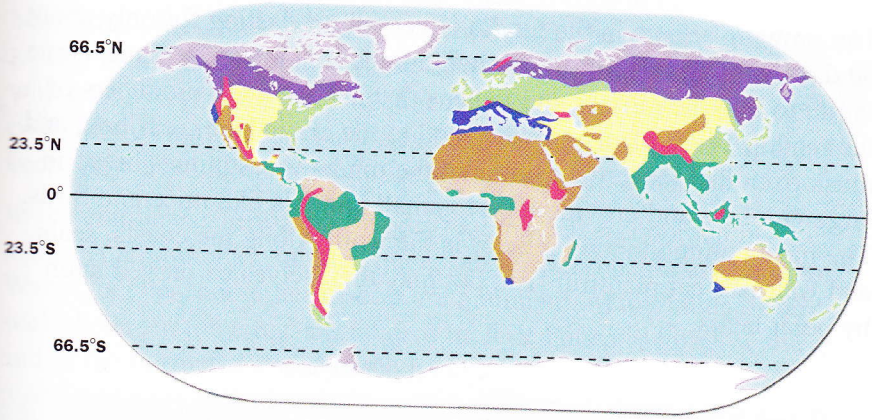
Organisms live almost everywhere on Earth. The part of Earth that supports life is called the **biosphere.** The biosphere extends several kilometers up into the atmosphere (where microscopic organisms float on air currents) and deep down to the ocean floor (where unusual tubeworms live near hot water vents).

SEE ALSO
215 Earth's Atmosphere
207 Ocean Floor

Physical factors such as climate determine what ecosystems exist in different parts of the biosphere. **Climate** is the general weather of an area over a long period of time, including its seasonal changes. The climate of an area is largely determined by its location on Earth. Areas close to the equator receive more direct sunlight than areas near the poles, and so are warmer year-round. Areas nearer the poles experience warm summers but cold winters.

SEE ALSO
227 Climate
230 Pattern of World Climates

The climate of an area determines what plants can grow in that area. The plants, in turn, determine what animals and other organisms the area can support. A **biome** is a large region characterized as having a distinct climate and specific types of plant and animal life. Biomes exist both in the ocean and on land.



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Tundra

The **tundra** is a cold, dry, mostly treeless land biome that encircles the Arctic Ocean. Temperatures in the tundra are well below freezing for much of the year. For this reason, most of the ground is covered by **permafrost,** soil that remains frozen to a depth of about 1 meter (about 3 ft). Only 20 to 50 cm (8 to 20 in.) of precipitation fall in the tundra each year. Most of this precipitation falls as snow or ice because of the cold temperatures.

Did You Know?

There is almost no tundra in the southern hemisphere because there is very little land at that latitude.

The average winter temperature in the tundra is about −26°C (about −15°F), although temperatures often drop much lower. In the summer, the area receives continuous daylight that allows temperatures to rise to an average of 12°C (about 54°F). The warming temperatures of summer melt surface ice, creating many small ponds and streams.

SEE ALSO
133 Feeding Relationships

The growing season in the tundra is very short, lasting for only about 60 days. During this time, a limited number of flowering plants come to life to join the mosses and lichens that are the main producers of the tundra. These plants provide food to the arctic hares, caribou, and musk oxen that make their home in the tundra. Mosquitoes breed in large numbers and provide food to small animals like mice and birds. The most common land predator is the wolf. Along the coasts, seals and walruses eat plentiful fish, but may themselves be preyed upon by polar bears.

Tundra organisms

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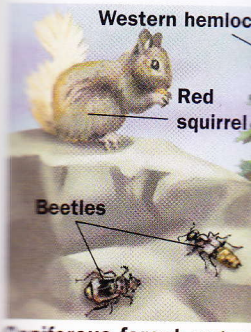


Coniferous forest organ

Coniferous Forests

Trees that remain green throughout the year, have needle-like leaves, and produce seeds in cones, are called **coniferous trees.** Many coniferous forests are found just south of the tundra in an area called the **taiga.** Much of Canada, Alaska, and the northern Rocky Mountains of the United States are taiga.

Science Alert!

Not all coniferous forests are in the taiga. Forests of white pine, red pine, spruce, and hemlock exist in many parts of the northern United States.

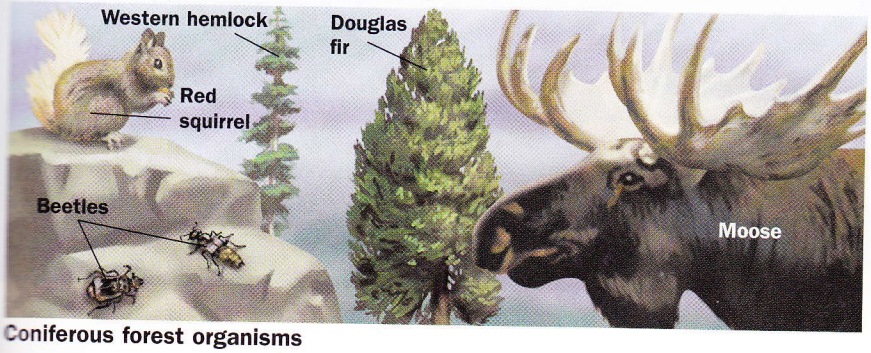
Winter temperatures in coniferous forests average about −10°C (about 14°F), while in summer they average about 14°C (about 57°F). The forests get about 50 cm (about 20 in.) of precipitation each year. This precipitation falls as snow during the winter and as rain during warmer seasons.

Warmer temperatures and regular precipitation make coniferous forests very suitable for tree growth. These forests are made up of firs, hemlocks, pines, and spruces. Coniferous trees have many adaptations to help them survive cold winters. These include needle-shaped leaves with a waxy covering that helps the tree retain water and withstand the cold. Many conifers also have flexible branches and a shape that helps keep snow from building up on and breaking their branches.

SEE ALSO
127 Natural Selection

In the coniferous forest, herbivores like moose, elk, porcupines, red squirrels, chipmunks, rabbits, mice, beavers, and geese are common. Wasps, beetles, and other insects are abundant. Many kinds of birds seek shelter in the trees. Carnivores include bobcats, foxes, wolves, and in the northernmost regions, lynxes.

SEE ALSO
133 Feeding Relationships



Coniferous forest organisms

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Deciduous Forests

SEE ALSO
127 Natural Selection
227 Climate

Many broadleaf trees, such as oaks, maples, and birches, drop their leaves in autumn. This adaptation helps the trees conserve water and energy during winter months. Trees that drop all their leaves each year are called **deciduous trees** and are the main plants of the deciduous forest biome. Deciduous forests are located in temperate climates. Such areas are found in the eastern United States, parts of central Europe, and parts of Asia.

Word Watch!

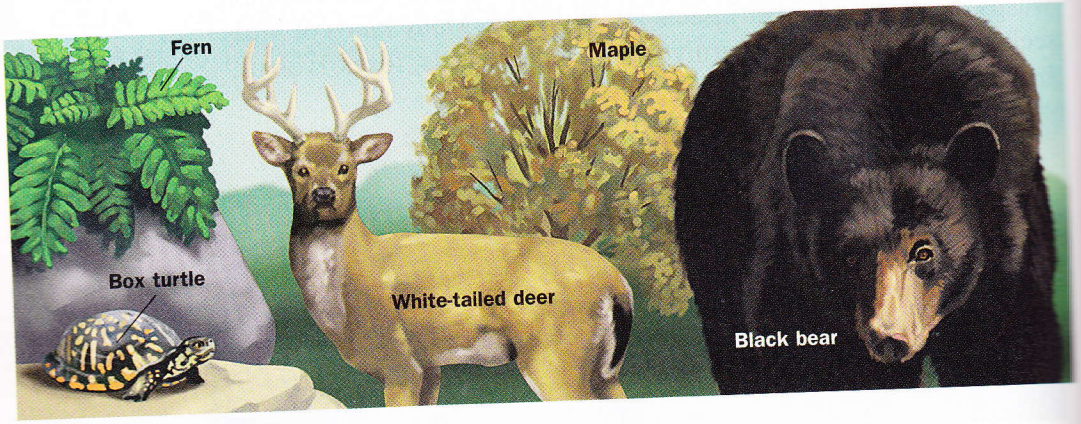
Deciduous comes from the Latin *deciduus*, meaning "to fall off."

With a lot of rain, moderate temperatures, and a long growing season, deciduous forests are home to a wide variety of trees and other plants. Rainfall averages between 75 and 125 cm (about 30 to 49 in.) per year. Temperatures range from 6°C to 28°C (about 43°F to 82°F). Soil and climate determine which deciduous trees will form the climax community. In the eastern and southern United States, hickory trees are common. Beech and maple form the climax community in many northern forests. Other trees of the forest include oak, elm, and poplar. Smaller plants, such as mosses, ferns, and grasses, grow nearer the ground.

SEE ALSO
140 Ecological Succession

Deer are the most common browsing herbivore in many deciduous forests. Other plant-eaters include squirrels, chipmunks, mice, rabbits, turtles, and many birds. Raccoons, opossums, and black bears are omnivores found in many deciduous forests. Carnivores include foxes, coyotes, snakes, insect-eating birds such as woodpeckers, and birds of prey such as hawks, owls, and falcons.

SEE ALSO
133 Feeding Relationships



Deciduous forest organisms

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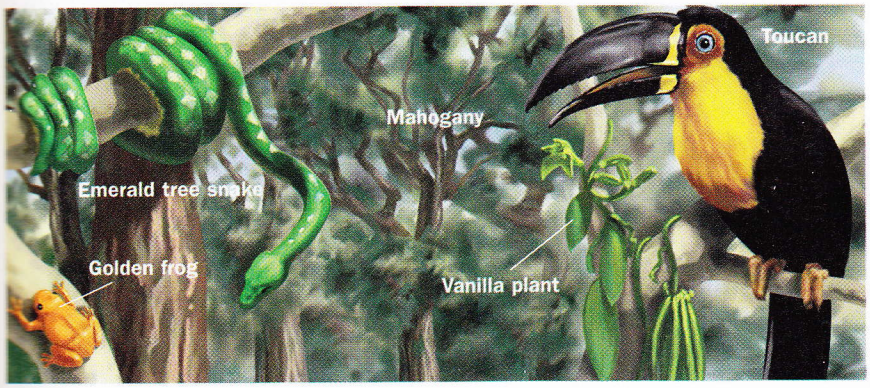
Tropical Rain Forests

Near the equator, warm temperatures (around 25°C, or 77°F) and abundant rainfall (more than 150 cm, or 60 in., each year) allow tropical rainforests to flourish. These ecosystems are home to more species than any other ecosystem on Earth.

The rainforest is divided into many vertical layers. Organisms live on the ground, in the trees, or in the **canopy,** the uppermost layer of the forest. Because of the thick vegetation, little light is able to reach the forest floor, and relatively few small plants grow there.

SEE ALSO
107 Plant Physiology

The tall plants of the rainforest ecosystem include a great variety of hardwood trees. In South America, these trees provide a home to monkeys and jaguars. In Africa, they provide habitat for leopards. In any one rainforest tree there may be hundreds of different species of ants, beetles, termites, and other insects. The rainforest abounds with crickets and tree frogs, toucans and parrots.



Tropical rainforest organisms

Did You Know?

The Amazon rain forest in South America is the world's largest rain forest. But as development has occurred, some of the rain forest has been cleared to make room for roads or farms.

SEE ALSO
341 Habitat Loss

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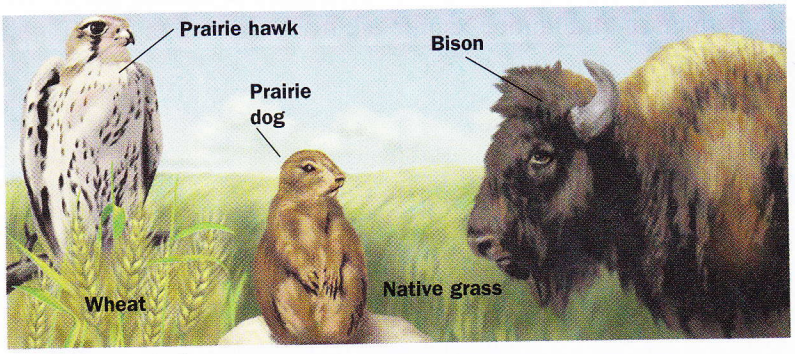
Grasslands

Grasslands are biomes in which the main types of plants are grasses. Temperatures in the grassland are mild in summer (about 30°C, or 86°F) and cool to cold in winter (about 0°C, or 32°F). With only 25–75 cm (about 10–30 in.) of rainfall each year, the grassland is too dry to support the trees of a forest, but it is fertile and can support many species of grasses. This grass provides a source of food to grazing animals. The roots of grasses spread, helping to hold the soil in place. As grasses die and decay, rich soils are formed.

SEE ALSO
139 Nitrogen Cycle
191 Soil

North America is home to the Great Plains and tall-grass prairie where huge, thunderous herds of bison once grazed. Today there is a new population of bison as well as pronghorn antelope. They share the ecosystem with many other grassland dwellers. Prairie dogs, rabbits, and pocket gophers build vast underground homes—sometimes like cities. These animals provide a food source to snakes, prairie hawks, weasels, and coyotes.

SEE ALSO
140 Ecological Succession
134 Food Chains
135 Food Webs



Grassland organisms

A **savanna** is a grassland with a few scattered trees. In Australia, large savannas provide a home to kangaroos and wombats. A savanna near the Serengeti Plain in Africa provides a home to giraffes and elephants that feed on the trees. South America also has large savanna areas called pampas.

SEE ALSO
110 Animal Behavior

The best-known grassland of Africa is the Serengeti Plain. This region is home to antelope, zebra, and lion, among others. Twice a year, hundreds of thousands of wildebeests migrate across this immense grassland.

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Deserts

When you think of the desert, you might imagine the Sahara Desert of northern Africa. But there are many other deserts throughout the world. The huge Gobi Desert cuts a large path across central Asia. More local deserts include the Sonoran and Mohave Deserts of the American west.

Deserts are dry environments that generally receive less than 25 cm (about 10 in.) of rainfall each year. So desert organisms must be able to survive in dry regions. In a typical desert food web, cacti, mesquite bushes, small flowering plants, and thorny bushes are the producers. Animals that eat seeds and other parts of these plants include kangaroo rats, insects, lizards, rabbits, and armadillos. These animals serve as prey for snakes and vultures.

SEE ALSO
133 Feeding Relationships
135 Food Webs

A cactus is a plant with obvious adaptations to desert life. Spiny leaves help prevent water loss. Well-developed roots spread out near the ground's surface to quickly take in any water that falls.

SEE ALSO
127 Natural Selection

Desert temperatures can reach over 38°C (100°F). For many animals, it is a daily challenge to keep cool. To accomplish this, many animals burrow in the ground or take cover under rocks during hot, daylight hours. The animals come out to find food at night, when temperatures are much lower. Animals that are active mainly at night are **nocturnal.**

SEE ALSO
110 Animal Behavior

Desert organisms

Did You Know?

The kangaroo rat does not need to drink water. It gets the water it needs from the seeds and fruits it eats.

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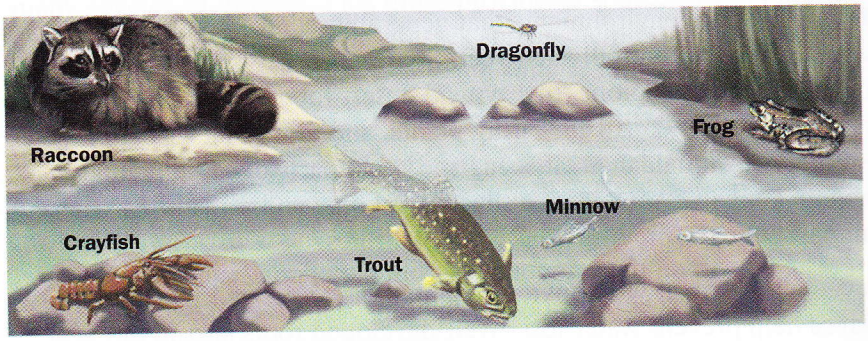
Freshwater Ecosystems

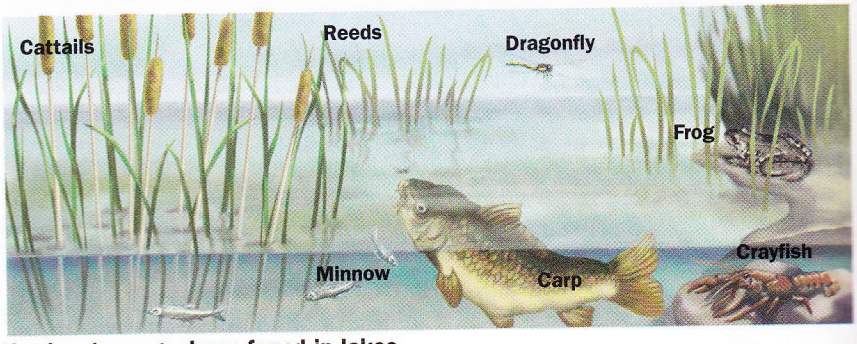
SEE ALSO
105 Animal Physiology
106 Animal Life Cycles

Freshwater ecosystems include lakes, ponds, swamps, streams, and rivers. Swift flowing rivers provide habitat to many fish species that need the high amount of oxygen that a fast-moving stream provides. These streams are also home to the larvae (young) of many kinds of insects.



Freshwater organisms found in streams

Slower moving streams that meander through valleys usually have more plants growing on their banks. This growth provides a sheltered habitat to fish, aquatic birds, and insects. Rivers that empty into oceans may be home to saltwater fish species that come upriver to have their young. Areas where freshwater rivers flow into the ocean are known as **estuaries.** Estuaries are very rich in nutrients and provide a good environment for the young of many types of fish and shellfish.



Freshwater organisms found in lakes

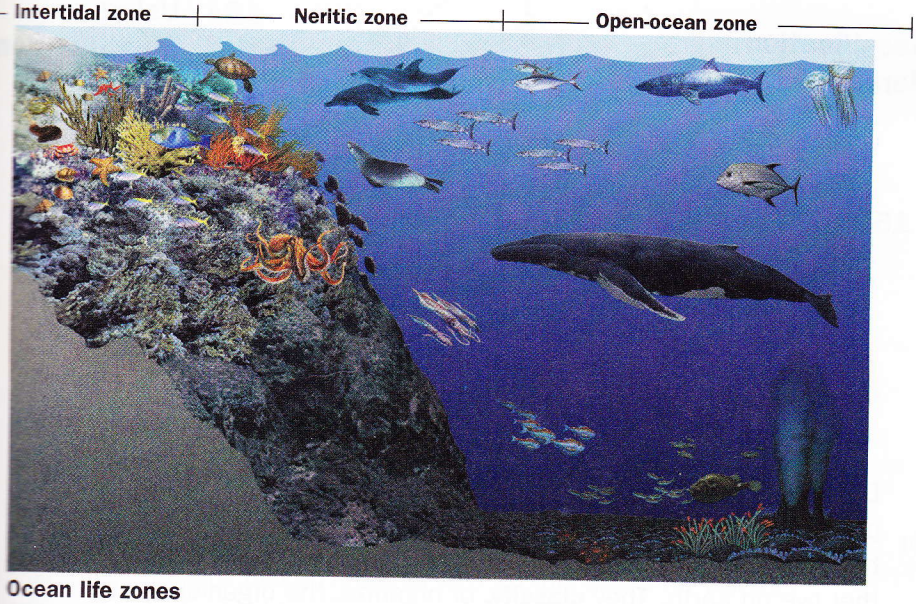
SEE ALSO
133 Feeding Relationships

Lake ecosystems are home to a wide variety of organisms. Plants may grow along the edges of the lake where water is shallow and the plants can take root in soil. Algae are also important lake producers. Many animal species live near the lake's edges, visiting only to get water and food. Different types of fish live in the lake's waters. Amphibians, such as frogs and newts, may also make their home near the water.

Saltwater Ecosystems

The ocean is divided into three zones of life. The largest of these areas is the **open-ocean zone.** Lack of mineral nutrients and sunlight prevent many organisms from living in this region. The main food source in this zone is **plankton,** one-celled algae, protists, and tiny animal larvae that float at or near the water's surface.

SEE ALSO
211 Open-Ocean Zone
156 Protist Kingdom



Ocean life zones

Intertidal zones are shoreline areas that are covered by water at high tide and not covered by water at low tide. In this zone live many shelled animals that have adaptations for clinging to surfaces or burrowing in sand to avoid being carried out to sea. Periwinkles, snails, and other species often live near the tops of rocks, where they are exposed to sunlight, salt spray, and wind for much of the time, only to be covered by salt water during high tide.

SEE ALSO
210 Neritic Zone
209 Intertidal Zone
127 Natural Selection

The **coral reef** is a type of marine ecosystem common in many tropical regions. Life in the coral reef centers on coral, a small animal that grows with others of its kind to form huge colonies. As these corals live and die, they build on the skeletons of others, expanding the reef structure. The crevices of a coral reef provide sheltered habitat to many types of animals, including sea stars, shrimps, lobsters, fish, sea anemones, and sponges.

SEE ALSO
131 Factors That Affect Populations

A coral reef