

Chapter 4 Ecosystems and Communities**Summary****4-1 The Role of Climate**

Weather is the condition of Earth's atmosphere at a particular time and place. Climate is the average yearly condition of temperature and precipitation in a region. Climate is caused by latitude, winds, ocean currents, and the shape and height of landmasses. Climate affects ecosystems, because all organisms have certain needs for temperature and other aspects of climate.

Temperature on Earth stays within a range suitable for life due to the greenhouse effect. The greenhouse effect is the trapping of heat by gases in the atmosphere.

Differences in latitude determine the angle of sunlight striking Earth. This angle determines how much of the surface is heated. Differences in heating result in three main climate zones: polar, temperate, and tropical. Unequal heating of Earth's surface also causes winds and ocean currents. Winds and currents move heat through the biosphere.

4-2 What Shapes an Ecosystem?

Organisms in ecosystems are influenced by both biological, or biotic, and physical, or abiotic, factors. Biotic factors include all the living things with which organisms interact. Abiotic factors include temperature, soil type, and other nonliving factors. The area where an organism lives is called its habitat. A habitat includes both biotic and abiotic factors.

A niche consists of all the physical and biological conditions in which an organism lives and the way in which the organism uses those conditions. For example, a niche includes what an organism eats and how it gets its food.

Organisms in communities may interact in one of three ways: competition, predation, or symbiosis. Competition occurs when organisms try to use the same resources, or necessities of life. Competition often results in one organism dying out.

This is the basis of the competitive exclusion principle. This principle states that no two species can occupy the same niche in the same habitat at the same time. Predation occurs when one organism (the predator) captures and eats another (the prey). Symbiosis occurs when two species live closely together in one of three ways: mutualism, commensalism, or parasitism. In mutualism, both species benefit from the relationship. In commensalism, one species benefits and the other is neither helped nor harmed. In parasitism, one species benefits by living in or on the other and the other is harmed.

As an ecosystem ages, older inhabitants gradually die out and new organisms move in. The series of predictable changes that occurs in a community over time is called ecological succession. Primary succession occurs on bare rock surfaces where no soil exists. The first species to live in an area of primary succession are called pioneer species. Secondary succession occurs when a disturbance changes a community without removing the soil.

4-3 Biomes

A biome is a group of communities on land that covers a large area and is characterized by certain soil and climate. Within a biome, there may be microclimates. A microclimate is the climate of a small area that differs from the climate around it. Species may be found over a large or small area, depending on their tolerance. Tolerance is the ability to survive and reproduce under difficult conditions.

There are ten major biomes: tropical rain forest, tropical dry forest, tropical savanna, desert, temperate grassland, temperate woodland and shrubland, temperate forest, northwestern coniferous forest, boreal forest (or taiga), and tundra. Each biome has a unique set of abiotic factors and a characteristic collection of organisms.

In tropical forests, the tops of tall trees form a covering, called the canopy. Shorter trees and vines form another layer, called the understory. In other forests, trees may be deciduous, meaning they shed their leaves during a particular season each year. Coniferous forests have trees called conifers that produce seed cones. Temperate forests have soils rich in humus, which forms from decaying leaves and makes soil fertile. Tundra is characterized by permafrost, a layer of permanently frozen subsoil. Some areas, such as mountains and polar ice caps, do not fall neatly into the major biomes.

4–4 Aquatic Ecosystems

Aquatic ecosystems are determined mainly by the depth, flow, temperature, and chemistry of the water. Chemistry refers to the amount of salts, nutrients, and oxygen in the water. In many aquatic ecosystems, tiny organisms called plankton are common. Plankton consist of phytoplankton and zooplankton. Phytoplankton are single-celled algae that use nutrients in water to produce food. They form the base of many aquatic food webs. Zooplankton are animals that feed on phytoplankton.

Freshwater ecosystems include flowing-water ecosystems (rivers and streams), standing-water ecosystems (lakes and ponds), and freshwater wetlands (bogs and

swamps). In wetlands, water either covers the soil or is present at or near the surface for at least part of the year.

Estuaries are wetlands formed where rivers meet the sea. They contain a mixture of fresh and salt water. Most of the food produced in estuaries enters food webs as tiny pieces of organic matter, called detritus. Salt marshes are temperate estuaries. Mangrove swamps are tropical estuaries.

Marine ecosystems are found in the ocean. The ocean can be divided into zones based on how much light penetrates the water. The photic zone is the well-lit upper layer of water where photosynthesis can occur. The aphotic zone is the permanently dark lower layer of water where only chemosynthesis can occur. The ocean also can be divided into three zones based on depth and distance from shore: the intertidal zone, coastal ocean, and open ocean. The intertidal zone is exposed to the rise and fall of tides each day. This may lead to zonation, or horizontal distribution of different types of organisms. Coastal ocean is the relatively shallow border of water that surrounds the continents. Kelp forests and coral reefs are found in coastal ocean. Open ocean consists of the rest of the ocean. Nutrients are scarce in open ocean, and fish are the dominant animals. The ocean floor is the benthic zone. Organisms that live on the ocean floor are called benthos.