44.4D: Freshwater Biomes

Lakes, ponds, rivers, streams, and wetlands are all freshwater biomes, which differ in depth, water movement, and other abiotic factors.

Learning Objectives

• Differentiate among the freshwater biomes of lakes and ponds, rivers and streams, and wetlands

Key Points

• Temperature, as well as the availability of nitrogen and phosphorus, are factors that affect living things in lakes and ponds.
• When available in large amounts, nitrogen and phosphorus cause potentially-detrimental algal blooms in lakes; nitrogen is also a limiting factor for plant growth in bogs.
• The continuous movement of rivers and streams are their defining characteristic; these bodies of water carry large amounts of water from the source to a lake or ocean.
• Wetlands are shallow bodies of water with soil that is either permanently or periodically saturated with water; every type of wetland has three shared characteristics: their hydrology, hydrophytic vegetation, and hydric soils.

Key Terms

• **algal bloom**: a dense spread of algae on the surface of water
• **percolation**: the seepage or filtration of a liquid through a porous substance
• **hydrology**: the science of the properties, distribution, and effects of water on a planet’s surface, in the soil and
underlying rocks, and in the atmosphere

Freshwater Biomes

Freshwater biomes occur throughout the world’s terrestrial biomes. They include lakes and ponds, rivers and streams, and wetlands.

Lakes and Ponds

Lakes and ponds can range in area from a few square meters to thousands of square kilometers. Temperature is an important abiotic factor affecting organisms found there. In the summer, thermal stratification of lakes and ponds occurs when the upper layer of water is warmed by the sun, but does not mix with deeper, cooler water. Light can penetrate within the photic zone of the lake or pond. Phytoplankton found here carry out photosynthesis, providing the base of the food web. At the bottom of lakes and ponds, bacteria in the aphotic zone break down dead organisms that sink to the bottom.

Nitrogen and phosphorus are important limiting nutrients. Because of this, they are determining factors in the amount of phytoplankton growth that occurs in lakes and ponds. When there is a large input of nitrogen and phosphorus (from sewage and run-off from fertilized lawns and farms, for example), the growth of algae skyrockets, resulting in a large accumulation called an algal bloom. These blooms can become so extensive that they reduce light penetration in water. As a result, the lake or pond becomes aphotic: photosynthetic plants cannot survive. When the algae die and decompose, severe oxygen depletion of the water occurs. Fish and other organisms that require oxygen are more likely to die. The resulting dead zones are found across the globe.

Figure \(\PageIndex{1}\): Algal blooms: The uncontrolled growth of algae in this lake has resulted in an algal bloom.

Rivers and Streams

Rivers and streams are continuously moving bodies of water that carry large amounts of water from the source, or
headwater, to a lake or ocean. Abiotic features of a river or stream vary along its length. The origin point of streams (source water) is usually cold, low in nutrients, and clear.

Because the source channel is narrow, the current is often faster here than at any other point of the river or stream. This fast-moving water results in minimal silt accumulation at the bottom of the river or stream, resulting in clear water. Photosynthesis occurs primarily in algae growing on rocks since the swift current in channels inhibits the growth of phytoplankton. An additional input of energy can come from leaves or other organic material that falls into the river or stream from trees and other plants that border the water. When the leaves decompose, the organic material and nutrients in the leaves are returned to the water. Plants and animals have adapted to this fast-moving water. For instance, leeches have elongated bodies and suckers on both ends that attach to the substrate, keeping the leech anchored in place.

As the river or stream flows away from the source, the width of the channel gradually widens and the current slows. This slow-moving water, caused by the gradient decrease and the volume increase as tributaries unite, has more sedimentation. The water is as clear as it is near the source since phytoplankton can be suspended in slow-moving water. The water is also warmer. Worms and insects can be found burrowing into the mud. The higher order predator vertebrates, which include waterfowl, frogs, and fishes, often depend on taste or chemical cues to find prey due to the murkiness of the water.

**Wetlands**

Wetlands are environments in which the soil is either permanently or periodically saturated with water. They differ from lakes in that they are shallow bodies of water. Emergent vegetation consists of wetland plants that are rooted in the soil, but have portions of leaves, stems, and flowers extending above the water’s surface. Types of wetlands include marshes, swamps, bogs, mudflats, and salt marshes. The three shared characteristics among these types are their hydrology, hydrophytic vegetation, and hydric soils.

![Wetlands](image)

**Figure \(\PageIndex{1}\):** **Wetlands:** Located in southern Florida, Everglades National Park is vast array of wetland environments, including sawgrass marshes, cypress swamps, and estuarine mangrove forests. Here, a great egret walks among cypress trees.

Freshwater marshes and swamps are characterized by slow and steady water flow. Bogs develop in depressions where water flow is low or non-existent. Bogs usually occur in areas where there is a clay bottom with poor percolation: the
movement of water through the pores in the soil or rocks. The water found in a bog is stagnant and oxygen-depleted because the oxygen that is used during the decomposition of organic matter is not replaced, resulting in a slowing of decomposition. This leads to organic acids and other acids building up, which lower the pH of the water. At a lower pH, nitrogen becomes unavailable to plants, creating a challenge for them. Some types of bog plants capture insects and extract the nitrogen from their bodies.

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