CHAPTER 4

ECOSYSTEMS: WHAT ARE THEY, AND HOW DO THEY WORK?

Summary

1. Ecology is the study of how organisms interact with each other and with their nonliving environment. Ecologists study the interactions among organisms, populations, communities, ecosystems, and the biosphere.

2. The atmosphere is the thin layer of air that surrounds Earth, the hydrosphere consists of Earth's water, the lithosphere is made up of the Earth's crust and upper mantle, and the biosphere is made up of the portion of Earth that contains all living organisms. Life on Earth is sustained by the one-way flow of high-quality energy from the sun, the cycling of matter, and gravity.

3. Ecosystems consist of biotic (living) and abiotic (nonliving) components. Abiotic factors limit the distribution of organisms and their rate of growth. The main biological components of an ecosystem include producers (autotrophs) and consumers (heterotrophs).

4. The amount of available energy in an ecosystem decreases as it moves from one organism to another in a food chain or web.

5. Soil is a complex mixture of eroded rock, mineral nutrients, water, air, decaying organic matter, and billions of living organisms. It covers most of the Earth and provides nutrients for plant growth. Soils are formed by a breakdown of rock, decomposing surface litter, and organic matter. Bacteria, and other decomposer microorganisms, break down some of soil's organic compounds into simpler inorganic compounds.

6. The vast global recycling system is composed of nutrient cycles (biogeochemical cycles). Humans are affecting the water, carbon dioxide, carbon, nitrogen, phosphorus, and sulphur cycles.

7. Scientists study ecosystems through field research, the use of aquarium tanks, greenhouses, and controlled indoor and outdoor chambers. Laboratory research allows specific variables (e.g., temperature, light, carbon dioxide, and humidity) to be carefully controlled,

8. Two principles of sustainability observed in natural ecosystems are the law of conservation of matter and the two laws of thermodynamics.

