44.1A: Introduction to Ecology

Ecology is the study of organisms, populations, and communities as they relate to one another and interact in the ecosystems they comprise.

Learning Objectives

- Describe the study of ecology

Key Points

- In ecology, ecosystems are composed of organisms, the communities they comprise, and the non-living aspects of their environment.
- The four main levels of study in ecology are the organism, population, community, and ecosystem.
- Ecosystem processes are those that sustain and regulate the environment.
- Ecological areas of study include topics ranging from the interactions and adaptations of organisms within an ecosystem to the abiotic processes that drive the development of those ecosystems.

Key Terms

- **ecology**: the branch of biology dealing with the relationships of organisms with their environment and with each other
- **ecosystem**: a system formed by an ecological community and its environment that functions as a unit
- **ecophysiology**: the study of the relationships between, and adaptation of, the physiology of an organism and its environment
An Introduction to Ecology

Ecology is the study of the interactions of living organisms with their environment. Within the discipline of ecology, researchers work at four specific levels, sometimes discretely and sometimes with overlap. These levels are organism, population, community, and ecosystem. In ecology, ecosystems are composed of dynamically-interacting parts, which include organisms, the communities they comprise, and the non-living (abiotic) components of their environment. Ecosystem processes, such as primary production, pedogenesis (the formation of soil), nutrient cycling, and various niche construction activities, regulate the flux of energy and matter through an environment. These processes are sustained by organisms with specific life-history traits. The variety of organisms, called biodiversity, which refer to the differing species, genes, and ecosystems, enhances certain ecosystem services.

![Organisms, Populations, and Communities](image1)

- **Organisms, Populations, and Communities:** In a forest, each pine tree is an organism. Together, all the pine trees make up a population. All the plant and animal species in the forest comprise a community.

![Ecosystems](image2)

- **Ecosystems:** This coastal ecosystem in the southeastern United States includes living organisms and the environment in which they live.

![The Biosphere](image3)

- **The Biosphere:** Encompasses all the ecosystems on Earth.

Figure \(\PageIndex{1}\): Levels of ecological study: Ecologists study within several biological levels of organization, which include organism, population, community, and ecosystem.

In essence, ecologists seek to explain:

- life processes
- interactions, interrelationships, behaviors, and adaptations of organisms
- the movement of materials and energy through living communities
- the successional development of ecosystems
- the abundance and distribution of organisms and biodiversity in the context of the environment
There are many practical applications of ecology in conservation biology, wetland management, natural resource management (agroecology, agriculture, forestry, agroforestry, fisheries), city planning (urban ecology), community health, economics, basic and applied science, and human social interaction (human ecology). Organisms and resources comprise ecosystems which, in turn, maintain biophysical feedback mechanisms that moderate processes acting on living (biotic) and nonliving (abiotic) components of the planet. Ecosystems sustain life-supporting functions and produce natural capital, such as biomass production (food, fuel, fiber and medicine), the regulation of climate, global biogeochemical cycles, water filtration, soil formation, erosion control, flood protection, and many other natural features of scientific, historical, economic, or intrinsic value.

There are also many subcategories of ecology, such as ecosystem ecology, animal ecology, and plant ecology, which look at the differences and similarities of various plants in various climates and habitats. In addition, physiological ecology, or ecophysiology, studies the responses of the individual organism to the environment, while population ecology looks at the similarities and dissimilarities of populations and how they replace each other over time.

Finally, it is important to note that ecology is not synonymous with environment, environmentalism, natural history, or environmental science. It is also different from, though closely related to, the studies of evolutionary biology, genetics, and ethology.