

## Chapter 50 Introduction to Ecology

- I. Ecologists study how organisms interact with their environment at different hierarchical levels.
  - A. Organismal Ecology
    1. Focuses on how individual organisms interact with their environment.
    2. Organismal ecologists study morphological, physiological, and behavioral adaptations that allow individuals to be successful in a particular habitat.
      - a. Behavioral studies can reveal how an individual responds to stimuli in its environment.
      - b. Physiological studies can reveal how individuals thrive in the changing conditions of their environment.
    3. An example of organismal ecology: the sockeye salmon
  - B. Population Ecology
    1. A population is a group of individuals of the same species that live in the same area at the same time.
    2. Population ecology seeks to understand how the numbers of individuals in a population change over time.
  - C. Community Ecology
    1. A biological community consists of the species that interact with one another in a particular area.
    2. Community ecologists study the nature and consequence of the interactions between species in a community.
    3. Community ecologists are often make predictions about how human actions will affect ecological communities in the future.
  - D. Ecosystem Ecology
    1. An ecosystem consists of all organisms living in a certain area plus all nonliving, abiotic components such as air, water, and soil.
    2. Ecosystem ecologists study ecosystem nutrient cycles and energy flows.
    3. Humans impacts are changing nutrients cycles and altering ecosystem ecology.
      - a. Global warming -hot issue
      - b. Pollution Impacts
  - E. Ecology and conservation efforts
    1. Conservation biology is the practical application of the basic science of ecology.
    2. Conservation biologists work to preserve populations, communities, and ecosystems that are threatened.
- II. The Nature of the Environment
  - A. The environment is a mixture of biotic and abiotic components.
    1. Abiotic components include temperature, precipitation, wind, sunlight, and chemical content of soil and water.
    2. Biotic components consist of all living organisms in a community or ecosystem.
  - B. The abiotic environment in a given region is characterized by its climate.
    1. Climate vs. weather
      - a. Climate is the prevailing long-term weather conditions
      - b. Weather is the short-term atmospheric conditions
- III. Types of Terrestrial and Aquatic Ecosystems

A. Climate (temperature and precipitation) affects the productivity of terrestrial biomes. A **biome** is a type of terrestrial ecosystem that is unique to a given region and is characterized by a distinct type of vegetation. Each biome is associated with a distinctive combination of temperature and moisture conditions.

1. Tropical wet forests
  
2. Subtropical deserts
  
3. Temperate grasslands
  
4. Temperate forests
  
5. Boreal forests (also called taiga)
  
6. Arctic tundra

B. Depth of water and rate of water movement characterize aquatic environments.

1. Water depth affects the amount and wavelengths of light that can reach organisms.
2. The rate of water flow influences aquatic environments.
3. Freshwater environments
  - a. Lakes, ponds, and wetlands
  - b. Streams
3. Marine environments
  - a. Like lakes and ponds, oceans have different zones based on depth.
  - b. Additional ocean zones are distinguished by depth and distance from the shore.

IV. Biogeography is the study of how organisms are distributed in space.

A. No one species can survive the whole range of environmental conditions present on Earth.

1. Most organisms have a specific set of conditions that must be available for them to live.
2. At present, humans have the broadest range of any organism on Earth, but no one organism can live everywhere.
3. Ecologists study historical, biotic, and abiotic factors to understand the environmental range of an organism.

- B. The Role of History
  - 1. How a species came to occur in a certain area can be explained by its history of dispersal.
    - a. Dispersal refers to the movement of an individual from its place of origin to the location where it lives and breeds as an adult.
    - b. If a species is missing from an area it could potentially inhabit, it is likely that a physical barrier such as an ocean or mountain has blocked dispersal.
  - 2. Human activity is affecting dispersal of species in a number of ways.
    - a. Flu outbreaks disperse all over the planet quickly via the respiratory passages of airplane passengers.
    - b. Humans transport seeds, birds, insects, etc. across physical barriers to new locations.
- C. The distribution of species is often limited by biotic factors.
  - 1. Interactions with other species can limit dispersal.
  - 2. Example: Warblers
- D. Often, exotic species fail to thrive in the new environment due to abiotic factors.
  - 1. An area may simply be too cold or too warm for the exotic species.
- E. Sometimes the right combination of abiotic and biotic factors allows an exotic species to invade its new habitat.
  - 1. Cheatgrass has invaded dry, temperate grasslands and sage-steppe areas because it is not affected by fire. (**Fig. 50.25**)
  - 2. The introduction of cows to these regions set the stage for the invasion of cheatgrass.