

## Unit 2: Ecology

### Learning Goals

**Key Concepts:** After completing the ecology unit, students should be able to explain and apply Key Concepts A, B and C through the specific Learning Objectives defined for each Concept.

- A. The distribution and abundance of organisms is determined by the interactions between organisms, and between organisms and the non-living environment.**
- A1. Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.
  - A2. Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.
  - A3. Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.
  - A4. Describe changes in ecosystems resulting from seasonal variations, climate change and succession.
  - A5. Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.
  - A6. Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.
- B. Energy and nutrients move within and between biotic and abiotic components of ecosystems via physical, chemical and biological processes.**
- B1. Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.
  - B2. Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.
  - B3. Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.
  - B4. Describe how different natural resources are produced and how their rates of use and renewal limit availability.
- C. Human activities and natural events can have profound effects on populations, biodiversity and ecosystem processes.**
- C1. Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
  - C2. Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.
  - C3. Discuss the political, social, and environmental consequences of sustainable use of land.
  - C4. Discuss the need for adequate monitoring of environmental parameters when making policy decisions.
  - C5. Assess the need for adequate waste management strategies.
  - C6. Discuss the effects of technology on environmental quality.
  - C7. Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.
  - C8. Assess the effectiveness of innovative methods of protecting the environment.
  - C9. Describe how human population size and resource use relate to environmental quality.
  - C10. Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.