Ecology Unit

Major Themes

**Scientific Inquiry** Scientists use methods of inquiry to understand the natural world

**Diversity** Adaptations to conditions in various biomes results in diversity.

**Energy** Energy created by photosynthesis sustains life at all levels.

**Homeostasis** Organisms use the resources in their environments to maintain homeostasis.

**Change** A climax community develops through the process of succession

Areas of Study

# Principles of Ecology

**Focus:** Energy from the Sun flows though all levels of biological organization and cycles

**Big Idea:** Energy is required to cycle materials through living and nonliving systems

## Organisms & Their Relationships

* + 1. Main Idea: Biotic and abiotic factors interact in complex ways in communities and ecosystems.
    2. Essential Questions
       1. *What is the difference between abiotic factors and biotic factors?*
       2. *What are the interactions between the levels of biological communities?*
       3. *What is the difference between an organism’s habitat and its niche?*

## Flow of Energy in an Ecosystem

* + 1. Main Idea: Autotrophs capture energy, making it available for all members of a food web.
    2. Essential Questions
       1. *What are the producers and consumers in an ecosystem?*
       2. *How does energy flow through an ecosystem?*
       3. *What are food chains, food webs, and ecological pyramid models?*

## Cycling of Matter

* + 1. Main Idea: Essential nutrients are cycled through biogeochemical processes.
    2. Essential Questions
       1. *How do nutrients move through biotic and abiotic parts of an ecosystem?*
       2. *Why are nutrients important to living organisms?*
       3. *What are biogeochemical cycles of nutrients and how are they alike?*
  + Water cycle
  + Carbon Cycle
  + Oxygen cycle
  + Nitrogen cycle
  + Phosphorus cycle

# 2. Communities, Biomes, and Ecosystems

**Theme Focus:** Change

**Big Idea:** Limiting factors and ranges of tolerance are factors that determine where terrestrial biomes and aquatic ecosystems exist.

## Community Ecology

1. Main Idea: All living organisms are limited by factors in the environment
2. Essential Questions
3. *How do unfavorable abiotic and biotic factors affect species?*
4. *How do ranges of tolerance affect the distribution of organisms?*
5. *What are the stages of primary and secondary succession?*

## B) Terrestrial Biomes

1. Main Idea: Ecosystems on land are grouped into biomes primarily based on the plant communities within them.
2. Essential Questions
3. *How is the latitude related to the three major climate zones?*
4. *What are the major abiotic factors that determine the location of a terrestrial biome?*
5. *How are the terrestrial biomes based on climate and biotic factors?*

## C) Aquatic Ecosystems

1. Main Idea: Aquatic ecosystems are grouped based on abiotic factors such as water flow, depth, distance from shore, salinity, and latitude.
2. Essential Questions
3. *What are the major abiotic factors that determine the aquatic ecosystems?*
4. *What are transitional aquatic ecosystems and why are they important?*
5. *What are the zones of marine ecosystems?*

# 3. Population Ecology

Theme Focus: Homeostasis

Big Idea: Population growth is a critical factor in a species ability to maintain homeostasis within its environment.

## A). Population Dynamics

* + 1. Main Idea: Population of species are described by density, spatial distribution, and growth rate.
    2. Essential Questions
       1. *What are the characteristics of populations and how are they distributed?*
       2. *What are the differences between density-independent and density-dependent limiting factors?*
       3. *What are the similarities between the different models used to quantify the growth of a population?*
       4. *How does carrying capacity affect reproductive rates?*

# 4. Biodiversity and Conservation

Themes: Focus on Diversity

Big Idea: Community and ecosystem homeostasis depend on a complex set of interactions among biologically diverse individuals.

## Biodiversity

1. Main Idea: Biodiversity maintains a healthy biosphere and provides direct and indirect value to humans.
2. Essential Questions
   1. *What are three types of biodiversity?*
   2. *Why is biodiversity important?*
   3. *What are the direct and indirect values of biodiversity?*

## Threats to Biodiversity

* + 1. Main Idea: Some human activities reduce biodiversity in ecosystems, and current evidence suggests that reduced biodiversity might have serious long-term effects on the biosphere.
    2. Essential Questions
       - 1. *What are the threats to biodiversity?*
         2. *How is the current extinction rate different from the background extinction rate?*
         3. *How can the decline of a single species affect an entire ecosystem?*

## Conserving Biodiversity

1. Main Idea:
2. Essential Questions