

Ecosystems and Nutrient Cycles

Chapter 6

Ecology

- The study of living organisms in the natural environment
 - How they interact with one another
 - How they interact with their non-living environment

Organization of Life

- Species depend on suitable habitat in which to live and they fill a specific niche in their community

The place of an organism in its environment

Niche

- An organism's habitat + role + tolerance limits to all limiting factors
- The position or function of an organism in a community of plants and animals.

The niche as a two-dimensional shape

Separate niches

Overlapping niches

Specialization avoids competition

This niche is not big enough for the both of us!

- Ecosystem process:
Energy Flow + nutrient cycle
- Earth's Major Biomes
 - Tundra, Boreal Forests, Temperate Rainforest, Temperate Deciduous Forests, Grasslands, Chaparral, Deserts, Savanna, & Tropical Rainforests

Earth's Major Biomes

- Biome
 - A large, relatively distinct terrestrial region with a similar climate soil, plants, and animals, regardless of where it occurs in the world
 - Nine major biomes
- Location of each biome is primarily determined by:
 - Temperature (varies with both latitude and elevation)
 - Precipitation

- Biomes can also be defined by
 - Winds, rapid temperature changes, fires, floods, etc.

Tundra

- Treeless biome in the far north with harsh, cold winters and extremely short summers
- Precipitation
 - 10-25 cm/yr
- Temperature
 - Short growing season
 - 50-160 days

Tundra

- Nutrient poor soils with little organic material
 - Permafrost present
- Low species richness
 - Veg is mostly grasses and sedges
 - Very simple food web
- Low primary productivity

Boreal Forests

- A region of coniferous forests in the northern hemisphere
 - Just south of tundra
- Covers 11% of earth's land
- Growing Season
 - A little longer than tundra
- Precipitation
 - ~ 50 cm/yr

Boreal Forests

- Soils are acidic and mineral poor
- Vegetation comprised of drought resistant conifers

Temperate Rainforest

- Coniferous biome with cool weather, dense fog and high precipitation
 - Ex: Northwest US
- Precipitation
 - > 127 cm/yr
 - Heaviest in winter
- Temperature
 - Winters are mild
 - Summers are cool

Temperate Rainforest

- Soils are nutrient-poor, but high in organic material (dropped needles)
 - Cool temperatures slow decomposition

- Dominant Vegetation
 - Large evergreen trees
 - Old-growth forest
- Variety of cool climate animal life
- Very high species richness
- Heavily logged

Temperature Deciduous Forests

- Forest biome that occurs in temperate areas with a moderate amount of precipitation
- Precipitation
 - 75-150 cm/yr
- Temperature
 - Seasonality
 - Hot summers and cold winters

Temperate Deciduous Forest

- Topsoil is rich in organic material and underlain by clay

Grassland

- Grasslands with hot summers, cold winters and too little precipitation to support trees
- Precipitation
 - 25-75 cm/yr
- Tall grass prairies
- Short grass prairies
- 90% of this biome has been lost to farmland

Grassland

- Soil has thick, organic material rich organic horizon
- Periodic fires keep the dominant

Chaparral

- Also called a Mediterranean Climate
 - Ex: Southern California
 - Ex: Greece
- Temperature
 - Mild, moist winters
 - Hot, dry summers
- Frequent fires

Chaparral

- Soil is thin and often not fertile
- Vegetation
 - Dense growth of evergreen shrubs
 - Lush during the growing season
- Animals
 - Mule deer, chipmunks, many species of birds

Deserts

- Biome where lack of precipitation limits plant growth
- Temperature
 - Can vary greatly in 24-hr period, as well as yearly (based on location)
- Precipitation
 - < 25 cm/yr

Deserts

- Soils low in nutrients and high in salts
- Vegetation sparse
 - cactus and sagebrush
- Animals are very small to regulate temperature

Savanna

- Tropical grassland with widely scattered trees
- Temperature
 - Varies little throughout the year
- Precipitation
 - Seasons regulated by precipitation, not temperature
 - 76-150 cm/yr

Savanna

- Soil low in nutrients due to leaching
- Vegetation
 - Wide expanses of grass
 - Occasional Acacia trees

Tropical Rainforest

- Lush, species-rich biome that occurs where climate is warm and moist throughout the year
- Precipitation
 - 200-450 cm/yr
- Very productive biome
- Most species-rich biome

Tropical Rainforest

- Ancient, weathered, nutrient-poor soil
 - Nutrients tied up in vegetation, not soil
- Vegetation
 - 3 distinct canopy layers
- Animals
 - Most abundant insect, reptiles and amphibians on earth

Sustainable Ecosystems

- Rely on renewable energy: Solar

Sustainable Ecosystems

- Recycle matter resources

The Carbon Cycle

The Nitrogen Cycle

The Phosphorous Cycle

Sustainable Ecosystems

- Rely on biodiversity
 - Many different species participate in matter cycles

Sustainable Ecosystems

- Have population control