

The Structure of Ecosystems

1: The Structure of Ecosystems

Habitat

- Habitat: the physical area in which an organism lives
 - An organism's habitat may include many different kinds of areas
 - A drastic change in the abiotic (climate, topography, soil, water, etc.) or biotic (plant and animal life) factors of a habitat that affects one organism can have an effect on the whole ecosystem.

Niche

- Niche: the sum of an organism's interactions with its physical environment and with other organisms
 - An organism's niche includes its habitat, feeding habits, reproductive behavior, and all other aspects of its biology.
- Fundamental Niche: the total niche that an organism could potentially use within an ecosystem
- Realized Niche: that part of a fundamental niche that an organism actually occupies as a direct result of competition

Trophic Levels

- Trophic Level: a group of organisms whose energy source is the same number of steps away from the sun
 - Primary Producer: an autotrophic organism
 - Primary Productivity: the rate at which solar or chemical energy is converted into organic compounds in an ecosystem
 - Primary Productivity is expressed as the rate at which energy is stored as organic matter. The units are kcal/m²/yr.
 - Gross Primary Productivity (GPP): the total amount of energy produced in an ecosystem including the energy used by the plants for their own respiration
 - Net Primary Productivity (NPP): the rate at which plants store energy that is not used in plant respiration
 - ◆ Over time, NPP should show up as plant material that can be used as food by animals.
- Consumer: a heterotroph that obtains energy from chemical bonds in nutrients it eats
 - Primary Consumer: any organism that eats a producer
 - Secondary Consumer: an organism that eats a primary consumer
 - Herbivore: a consumer that eats primary producers
 - Carnivores: a consumer that eats other consumers
 - Omnivores: an animal that eats both plants and animals
 - Scavengers: a consumer that eats organisms that have recently died
 - Decomposers: an organism that uses nutrients from dead plants and animals

Section 2: Energy Flow

Food Chains

- Food Chain: the specific feeding sequence in which organisms obtain energy in an ecosystem
- On the average, an organism stores only about 15% of the energy available to it from the trophic level beneath it. The rest of the energy is lost in the form of heat.

- Thus the amount of energy available to the higher trophic levels is much smaller than the amount available to the lower levels.
- Food chains usually have only four or five levels for several reasons:
 1. Animals at a higher level do not eat all the available food at the lower level
 2. There is a great amount of waste at every level
 3. Energy is expended during metabolism

Food Webs

- Food Web: the interrelated food chains in an ecosystem

Ecological Pyramids

Numbers Pyramids

- Numbers Pyramids compare the number of individuals at each trophic level.

Biomass Pyramids

- Biomass pyramids compare the amount of biomass at each trophic level
 - Biomass: total dry weight of the organisms in the ecosystem

Energy Pyramids

- Energy Pyramids compare the total amount of energy (measured in kcal) in each trophic level.
- Energy Pyramids are never inverted because energy is always lost from one trophic level to the next higher.

3: Biochemical Cycles

- Biochemical Cycle: the process by which materials necessary for organisms are circulated through the environment

Water Cycle

- Evapotranspiration, Condensation, Precipitation, Seepage & Runoff

Nitrogen Cycle

- Nitrogen gas makes up about 78% of the atmosphere, however most living things cannot use atmospheric nitrogen (N^2). They must rely on nitrogen compounds found in soils such as nitrites (NO^2^-) and nitrates (NO^3^-).
- Nitrogen Fixation: bacteria (that live on the roots of legumes) convert nitrogen gas into ammonium compounds
- Ammonification: bacteria break down nitrogen-containing amino acids from animal wastes and dead organisms, forming ammonia compounds
- Nitrification: chemosynthetic bacteria oxidize ammonia compounds to produce nitrites and nitrates which plants use to form amino acids
- Denitrification: anaerobic bacteria break down nitrates, releasing nitrogen gas back into the atmosphere

Oxygen-Carbon Cycle

- Photosynthesis, Respiration, Decomposition, Combustion
- Greenhouse Effect: a condition of increased heat due to reflection of sunlight back to earth from the atmosphere