

## Ecology and The Biosphere

Ecology: The study of the interactions of organisms with each other and their environment.

→ includes knowledge from:

Biology	Politics
Chemistry	Law
Geology	Physics

Ecologist = a person who studies such interactions

### Levels of Study for an Ecologist

Organism

Population

Community

Ecosystem

Biosphere

Organism = one living thing

Population = all the individuals of one species living in a given area

Community = all the populations (living things) living in a given area (all species)

Ecosystem = includes all living things and non-living factors in a given area

Includes the study of:

I) Biotic factors = living organisms

II) Abiotic factors = nonliving components, ex.

Temperature	Wind
Water	Minerals
Gases	Nutrients
Energy (solar)	Fire
Other chemicals	Other heat sources

Biosphere = global ecosystem, i.e. the whole planet

- Living portion of earth
- Includes area from a couple of miles down in the earth to several miles up into the atmosphere
- Self-contained system

Organisms adapt to the environment by process of natural selection

Aspects of Ecosystems:

Habitat = environmental place where an organism lives

Niche = the sum total of all of an organism's interactions, what an organism does for a living

Regional climate influences the structure of communities

Generated by sunlight → drives wind and ocean currents

Tropics = trade winds

Temperate zones = prevailing winds

Ocean currents caused by heating from sun

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Oceans

## Types of Living Zones in the Ocean

- 1) Estuary = where freshwater meets salt water
- 2) Intertidal Zone = marshes, swamps, shallow land edge
- 3) Continental Zone = continental shelf, shallow water
- 4) Pelagic Zone = deep water, most of seas, open ocean
- 5) Benthic Zone = ocean floor

Pelagic zone broken into two parts:

- 1) Photic layer = receives light
- 2) Aphotic layer = does not receive light

Oceans: 3/4 of Earth's surface, most O<sub>2</sub> comes from algae

Plankton: in pelagic zone

Phytoplankton = plants, main producers

Zooplankton = tiny animals

Freshwater Communities:

Lakes and ponds: layered like oceans, smaller scale

Rivers and streams: moving water, source, flow

## Terrestrial Ecosystems

Major terrestrial ecosystems are called biomes.

Biomes: major types of ecosystems, determined by climate, named by predominant vegetation. Specific biomes may be located in several places around the world.

### 9 Major Biomes:

#### 1) Tropical Forests:

- Warm all year long, non-seasonal, 11-12 hour long day, near equator, abundant rainfall

#### 2) Savannas:

- Grasses predominate, some trees, dry tropical climate, non-seasonal

#### 3) Desert:

- Characterized by lack of moisture, sparse vegetation, great variation in temperature

#### 4) Chaparral (Mediterranean):

- Mild, rainy winters and long, hot, dry summers

#### 5) Temperate Grasslands:

- Like savannas, more rainfall, cold winters, seasonal

#### 6) Temperate Deciduous Forests

- Much moisture, seasonal with hot wet summers and cold dry winters, rich soil

#### 7) Coniferous Forests

- Trees cone bearing, evergreens, and few species of tree, colder climates
- Taiga = northern (boreal) forest with harsh winters and short summers

## 8) Tundra

- Extreme north and alpine (mountain) regions, dwarf trees, grasses, mosses and lichens; long, cold winters, brief summers with little light or moisture
  - Arctic tundra = from conifers to North Pole, around world; characterized by: Permafrost = ground frozen all year long
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## Communities and Ecosystems

Community Structure: defining properties

1) Diversity

2) Prevalent form of vegetation

3) Stability

4) Trophic structure

Troph = nourishment, to feed

- The feeding relationships among the species of a community
- Determines passage of energy and nutrients
- Has levels, hierarchical

## Trophic Structure:

Trophic Level = the particular place an organism occupies in the feeding sequence

Food Chain = the sequence of energy and food transfers from level to level, who eats who

### Levels:

1. Producers = plants, algae. Also called autotrophs because they make their own food.
2. Consumers = all levels above producers, also called heterotrophs because they get food from other sources.
  - a. Primary consumers = eat produce from autotrophs (herbivores)
  - b. Secondary consumers = eat the primary consumers (carnivores)
  - c. Tertiary consumers
  - d. Quaternary
3. Decomposers = break down dead organic material, animal wastes and plants. Called detritivores. Mainly bacteria and fungi. Responsible for recycling of nutrients in an ecosystem.

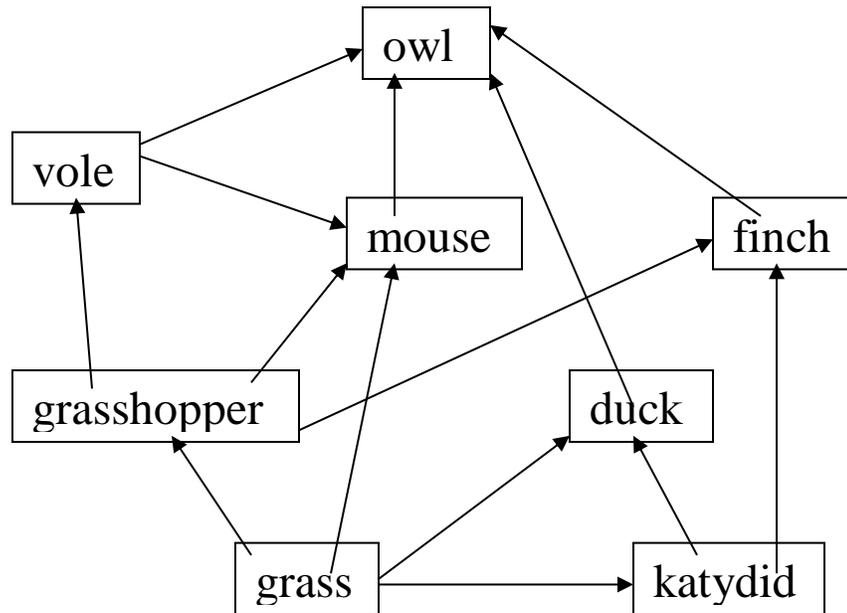
### Other terms:

Detritus = dead material for decomposers

Decomposition = breakdown of organic material to inorganic

Omnivores = feed on both plants and animals

Food Webs: interconnecting food chains within a community



Energy flow = one way; sun → heat

Chemicals = nutrients recycled over and over

### Species Interactions

Species relationships of two types:

- 1) Symbiotic
- 2) Competitive

Competition: occurs when a shared resource is limited

Either of two kinds:

Interspecific = between members of different species

Intraspecific = between members of the same species

Competitive Exclusion Principle:

Two species that compete for the same resources cannot coexist in the same place.

A special type of competition: Predation

Prey = the food species  
Predator = the consumer

## Predator - Prey relationships and the Arms Race

### Symbiotic Relationships:

Symbiosis: A close relationship between two or more species in which one lives in or on another.

There are three main types!

- 1) Parasitism = one species derives nourishment at the expense of the other. 1 gains - 1 loses
- 2) Commensalism = one species benefits without significantly affecting the other. 1 gains - 1 even
- 3) Mutualism = both partners benefit in the relationship. 1 gains - 1 gains

### Food Chains:

Only limited by energy supply

Energy comes from the sun and is lost

Only 10% of energy incorporated into next level

Food pyramids, energy pyramids, biomass pyramids, number pyramids, trophic pyramids

### Conservation Biology

Concepts: Biomagnification, Greenhouse Effect, Population fragmentation, Sustainable Development, and Biodiversity Hotspots

## Conservation and the Biodiversity Crisis

## Population Explosion and the Overpopulation Crisis

### Major Threats to Biodiversity

1. Habitat destruction
2. Exotic species
3. Overexploitation

### Exotics vs. Endemics

### Landscape Ecology

1. Maintaining ecosystems through landscaping
2. Population viability
3. Gap analysis
4. Edges and corridors

### Restoring Degraded Habitats

1. Restoration ecology
2. Bioremediation
3. Augmentation of ecosystem processes