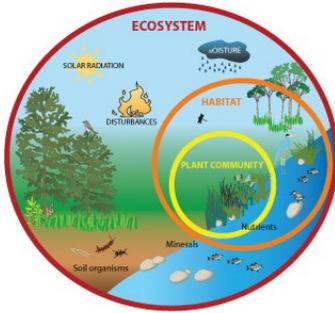


Introduction to Ecosystems



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Ecology is....



- the study of interactions among organisms with each other & with their environment

3

Ecosystem

- An ecosystem is made up of one or more communities living together in a specific area or habitat.
- Within a community, living things (called biotic factors) interact with other living things - but they also interact with abiotic (non-living) factors too, such as the sun, the wind, water, and soil that make up the natural environment = the organism's role or niche

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Ecosystem

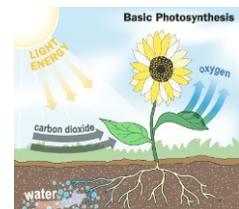
- An ecosystem is a self-supporting unit. There are 4 processes that continually take place.

1. Energy Production
2. Energy Transfers
3. Decomposition
4. Recycling

5

1. Energy Production

- The "fuel" for ecosystems is energy from the sun.
- Sunlight is captured by green plants during photosynthesis.



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Photosynthesis

- In order to photosynthesize, plants need water and carbon dioxide.
 - Water enters a plant via its roots while carbon dioxide enters via tiny holes in the underside of leaves.
- Photosynthesis produces: glucose and oxygen.
 - Glucose is needed by the plant for energy.
 - Plants change glucose into starch, fats, and proteins. These nutrients are then stored in the plant and available for consumers.

$$6\text{CO}_2 + 6\text{H}_2\text{O} \xrightarrow{\text{Light}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$$

Carbon dioxide
Water
Sugar
Oxygen

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2. Energy Transfers

- Energy from plants is then transferred to the herbivores (plant-eating animals) and omnivores (plant and animal-eating animals) that eat them.
- The energy is transferred again to the carnivores (animals that eat other animals).

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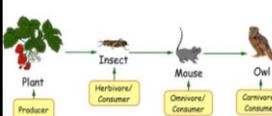
2. Energy Transfers

- Energy transfers can be shown through the use of:
 - Food chains: show the flow of energy in an ecosystem.
 - Food webs: represent interconnected food chains.
 - Energy pyramids: show the changes in available energy from one trophic level to another.

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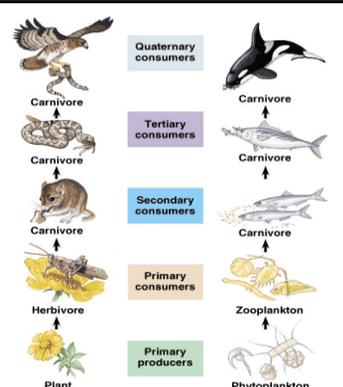
Food Chains

The Food Chain Of An Owl



- Because green plants convert the sun's energy into chemical energy, they are called producers.
- Animals that eat producers are primary consumers.
- Animals that eat primary consumers are secondary consumers, and so on.

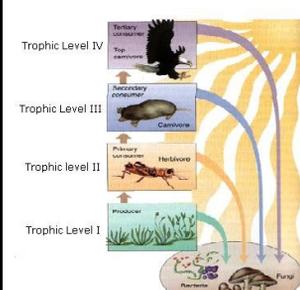
10



A terrestrial food chain A marine food chain

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Food Chains



- We need to think of ecosystems as being made up of several feeding levels, called trophic levels.
- Producers make up the first trophic level, primary consumers the second, secondary consumers the third, and so on.

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Food Webs

13

- Most organisms are part of many food chains.
- Arrows in a food web represent the flow of energy and nutrients.
- Following the arrows leads to the top consumers.

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Energy Pyramids

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- Most of the energy that enters each trophic level is used by the organism just to stay alive and a small amount is passed as waste.
- This leaves only a very small percentage (~10%) to be stored as body tissues and it is this energy that gets passed on to the next trophic level.
- An energy pyramid is a way to show how energy moves through a food chain.

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Energy Pyramids

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- The trophic level of an organism identifies its position in the pyramid.
- The producers are on the bottom with the most energy.
- As you move up you will find less energy. Having less energy available means there will be a smaller number of organisms and a smaller overall biomass (total mass of all living things in a given area).

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3. Decomposition

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- When biotic things die, their bodies get consumed by scavengers (ravens, ants) and detritivores (earthworms, beetles, crabs) and are decomposed (broken down) by microorganisms, fungi, and animals.

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3. Decomposition

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- Because decomposers can consume any living thing, they are said to occur at any and all trophic levels.
- The chemicals from biotic things are returned to the soil and used again by plants.

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4. Recycling

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- Certain elements and compounds are recycled within ecosystems, meaning they are never added or lost, simply used over and over again.

18



1

Interactions Within the Biotic Community

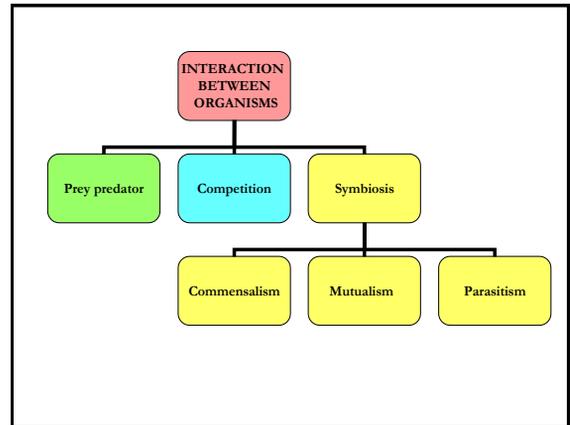
- Biodiversity**
 - : the number of different species in an ecosystem
 - : the more **diverse** the ecosystem, the **healthier** it is
 - : eg. a community of 300 members with 10 species is healthier than a community of 600 members with only 5 species

2

Interactions Within the Biotic Community

- Many interactions actions occur between living organisms
- Most of these relate to eating or are nutritional in nature = involve energy flow
- Ecologists use specific terms to describe these relationships between species
- In terms of these relationships:
 - The plus sign “+” indicates 1 species **benefits**
 - The negative sign “-” indicates 1 species **does not benefit**
 - The “O” sign indicates **no effect**

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1. Predation (+,-)

- **Predators** are animals which hunt & feed on small animals or prey
- **Prey** are organism that a predator uses for food
- Most predators kill their food and by doing so help control populations
 - Eg. Foxes kill rabbits & in doing so limit the rabbit population & other predators of rabbits
- Some predators only feed on a part of their prey
 - Eg. Mosquitos hunt prey for their blood

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2. Competition (-,-)

- Involves 2 similar species which occupy the same niche competing for the same food, space, sunlight, water, etc.
- Can result when food supplies become limited
- **Interspecies** competition = between members of different species
- **Intraspecies** competition = between members of the same species
- Usually the stronger animals get to food first or win fights for it
 - Eg. Red-winged & yellow-headed black birds compete for nest sites.
 - Two Coyotes fighting over a dead weasel.

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3. Co-operation (+,+)

- Results when animals form herds or packs & interact co-operatively
- May take such forms as: hunting together (**wolves**)
: defensive purposes (**elephants**)



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4. Mutualism (+,+)

- A relationship between 2 organisms where both benefit
- Eg.

A hummingbird gathers nectar from flowers & at the same time aids in pollinating the plants by carrying pollen from 1 flower to another.



A Lichen is an algae & fungus living together. The algae makes food that is used by the fungus while the fungus supplies water & a habitat for the algae.

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5. Parasitism (+,-)

- Occurs when an organism lives on the surface, or inside the body, or off of another living organism called a host without killing it.
 - The host provides food, protection, etc
 - Parasites often weaken the host
 - Death of a host is not an advantage to a parasite as it will lose its "home" and food
- Eg. Beef tapeworms have stages in both cattle & humans. They take away food and cause bleeding in the intestine.



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6. Commensalism (+,0)

- Exists when 1 kind of organism benefits while another is unaffected



Eg. Crow feeding on the abandoned remains of kills made by wolves

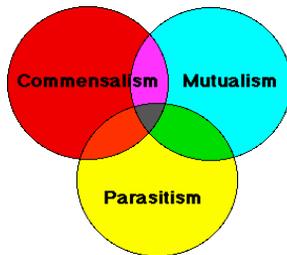
A bird nesting in a tree



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***Symbiosis

= a relationship where 2 different kinds of organisms live close together or actually with each other
Mutualism, parasitism & commensalism are **symbiotic** relationships



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Interactions Within Ecosystems Activity

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