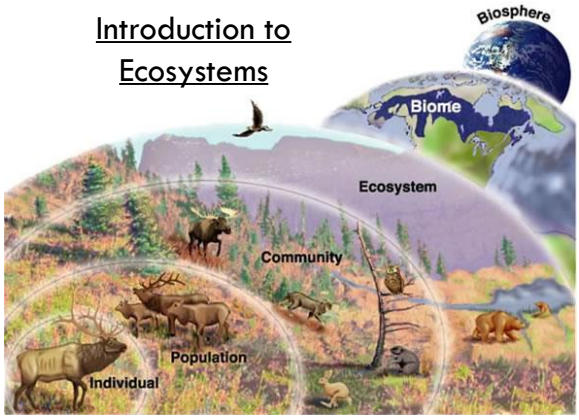
Introduction to Ecosystems



Ecosystems

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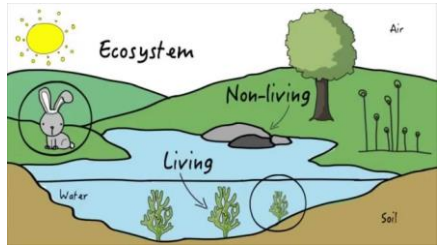
- An ecosystem refers to the sum of abiotic (non-living) and biotic (living) factors in a given area.



Ecosystems

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- Abiotic factors include: air, water, soil, nutrients and light.
- Biotic factors include: plants, animals and micro-organisms.

Ecosystems

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- 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

1. Energy Production

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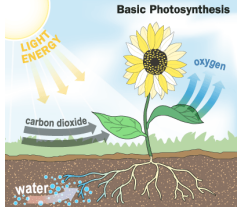
- The "fuel" for ecosystems is energy from the sun.
- Sunlight is captured by green plants during photosynthesis.



Photosynthesis

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- 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.

$$\underset{\text{Carbon dioxide}}{6CO_2} + \underset{\text{Water}}{6H_2O} \xrightarrow{\text{Light}} \underset{\text{Sugar}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6O_2}$$

- 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.

2. Energy Transfers

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- 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).

2. Energy Transfers

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- 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.

Food Chains

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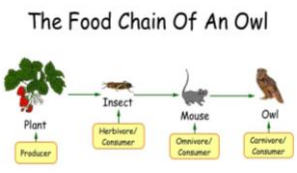
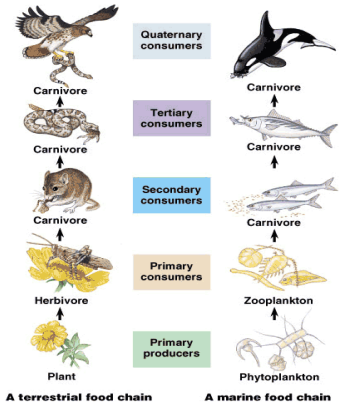


- Because green plants convert the sun's energy into chemical energy, they are called producers.
- Animals that eat producers are primary consumers.
- Animals that eat primary consumers are secondary consumers, and so on.



Food Chains

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- 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.

Food Webs

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- 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.

Energy Pyramids

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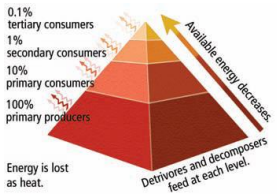

- Most of the energy that enters each trophic level is used by the organism just to stay alive and a small amount is passed as waste.
- This leaves only a very small percentage (~10%) to be stored as body tissues and it is this energy that gets passed on to the next trophic level.
- An energy pyramid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

Energy Pyramids

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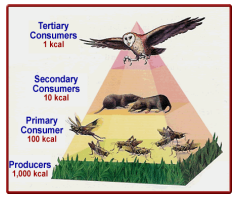
- The trophic level of an organism identifies its position in the pyramid.
- The producers are on the bottom with the most energy.
- As you move up you will find less energy. Having less energy available means there will be a smaller number of organisms and a smaller overall biomass (total mass of all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



3. Decomposition

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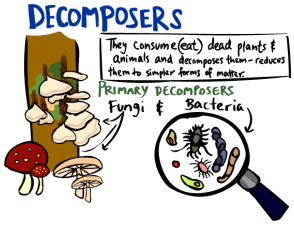

- When biotic things die, their bodies get consumed by scavengers (ravens, ants) and detritivores (earthworms, beetles, crabs) and are decomposed (broken down) by microorganisms, fungi, and animals.

3. Decomposition

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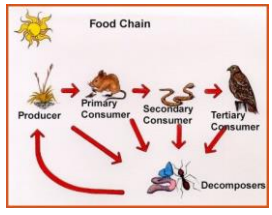
- Because decomposers can consume any living thing, they are said to occur at any and all trophic levels.
- The chemicals from biotic things are returned to the soil and used again by plants.



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.