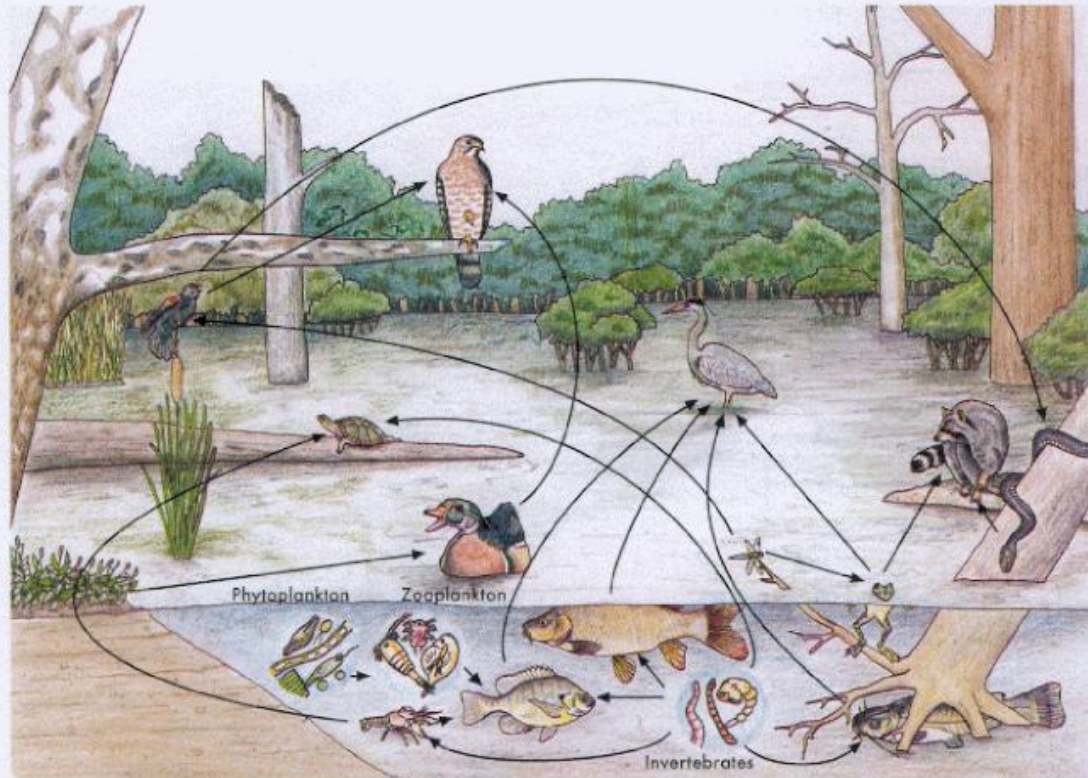


Ecology: Part 2



A Fresh Water Food Web

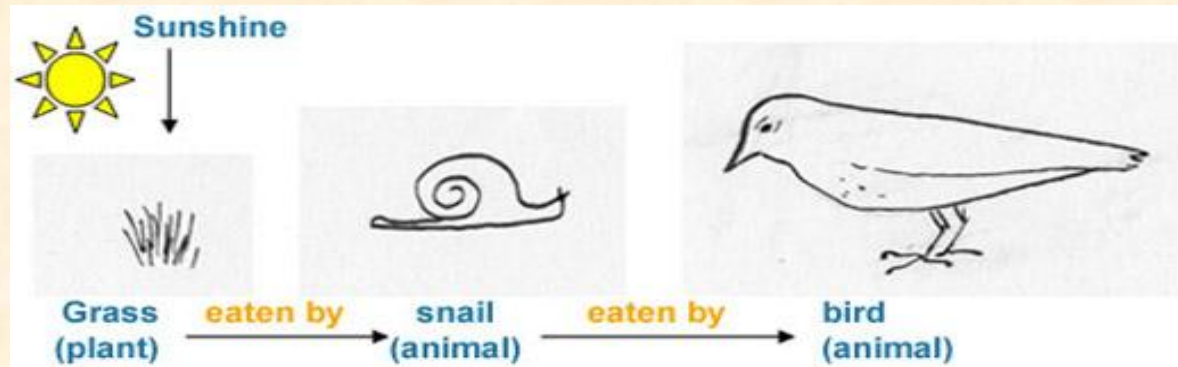
Biology - Mrs. Bradbury

Model 1: Food Chains

- **Food Chain** - simple model showing the movement of matter and energy through ecosystems.

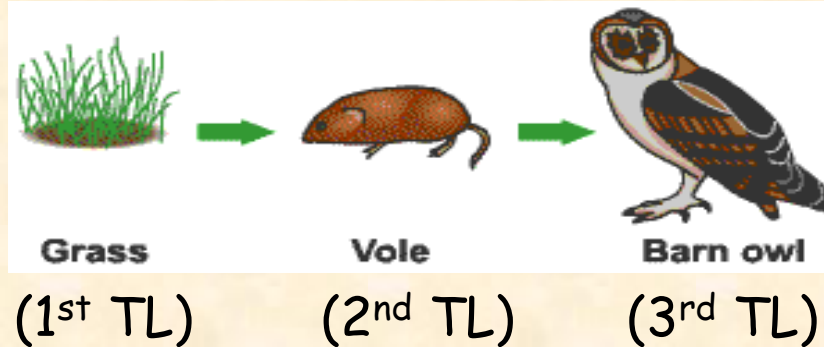
Autotrophs → Heterotrophs → Decomposers

- **Arrows** show energy transfer
- Usually only 3-5 links
 - Energy is lost at every link of the chain
 - By the 5th link the amount of energy left is very small.



Food Chains Continued...

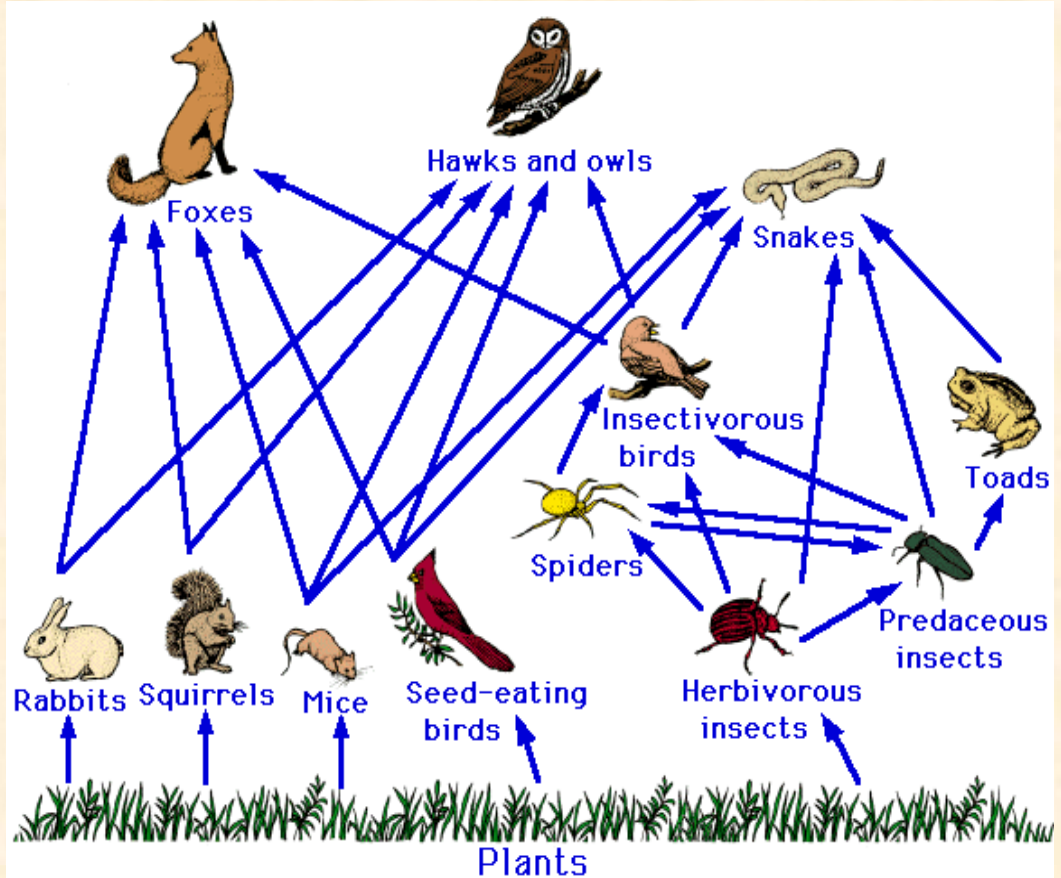
- Each organism in a food chain is 1 *trophic level*
- **Trophic Level** - feeding step in the passage of energy and materials



- **The Sun does NOT count as a trophic level**
- Food chains are limited since they only show one route through an ecosystem - many routes exist
- They do **NOT** indicate complex relationships among organisms that feed on more than one species.

Model 2: Food Webs

- **Food Web** - model that expresses ALL possible feeding relationships at each trophic level in a community
- More natural model
- Shows complex relationships
- **Decomposers** can be found at all trophic levels of a food web.

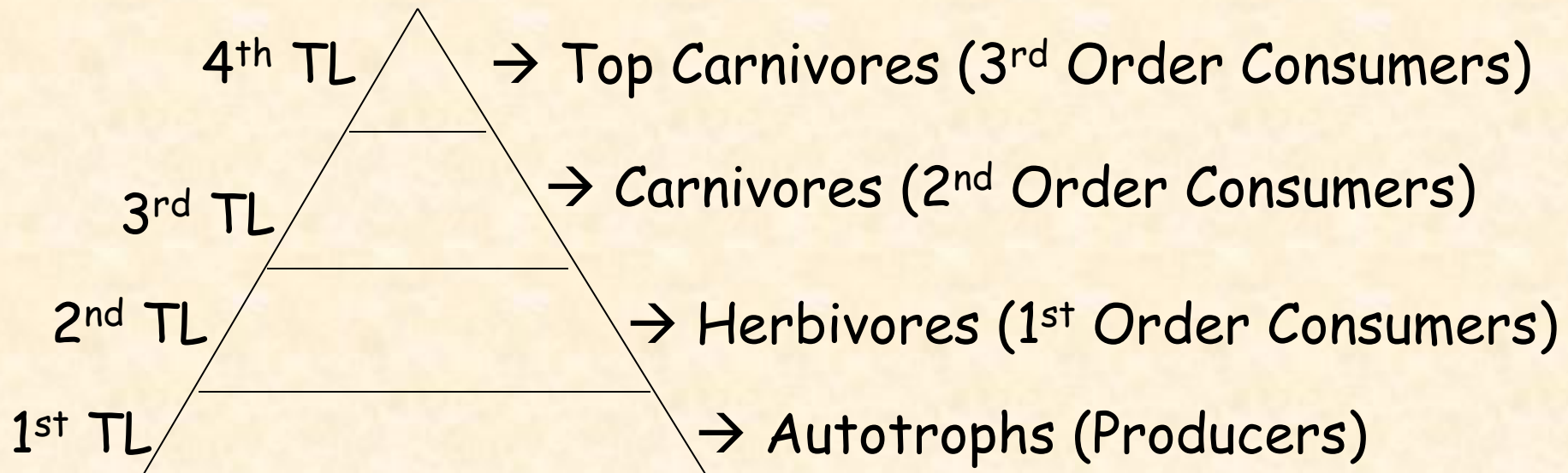


Model 3: Ecological Pyramids

- Ecological Pyramids -show energy conversions in an ecosystem



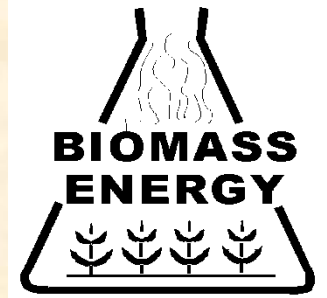
- Energy source for all pyramids is the sun.

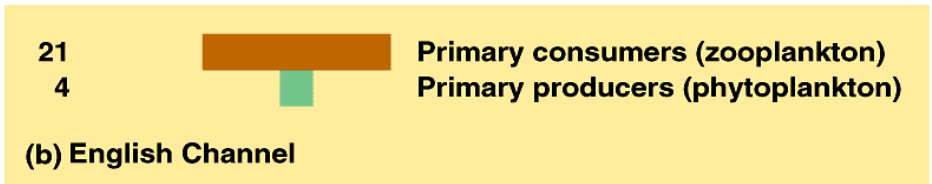
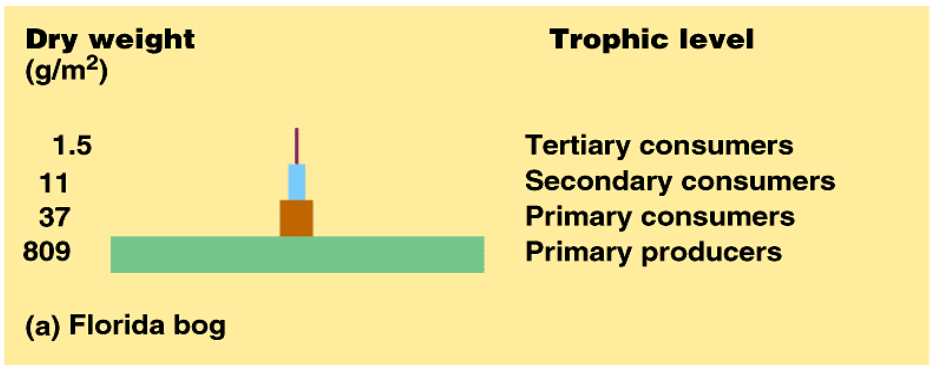


Ecological Pyramids Continued...

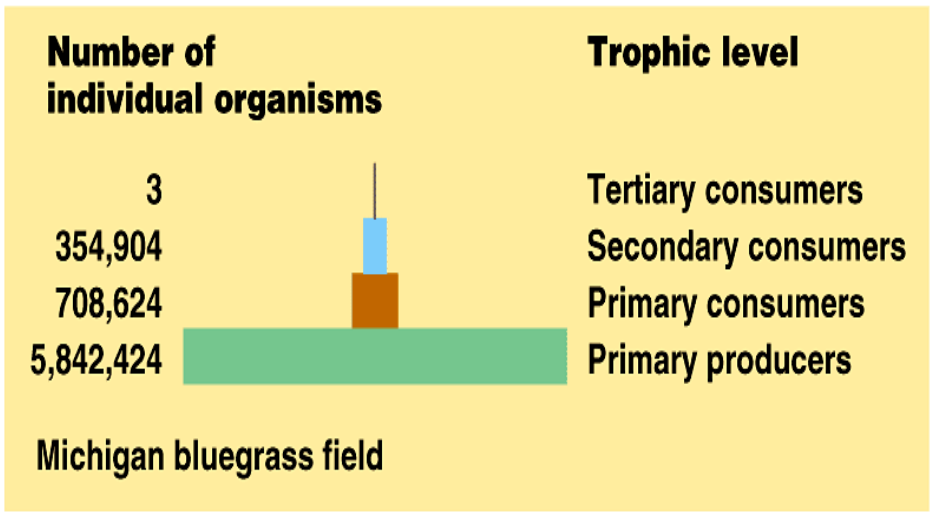
Three types of Ecological Pyramids

1. **Pyramid of Energy** - Each level represents energy that is available at that trophic level.
2. **Pyramid of Numbers** - Each level represents the number of organisms consumed by the level above it.
3. **Pyramid of Biomass** - Each level represents the amount that the level above needs to consume to meet its needs.

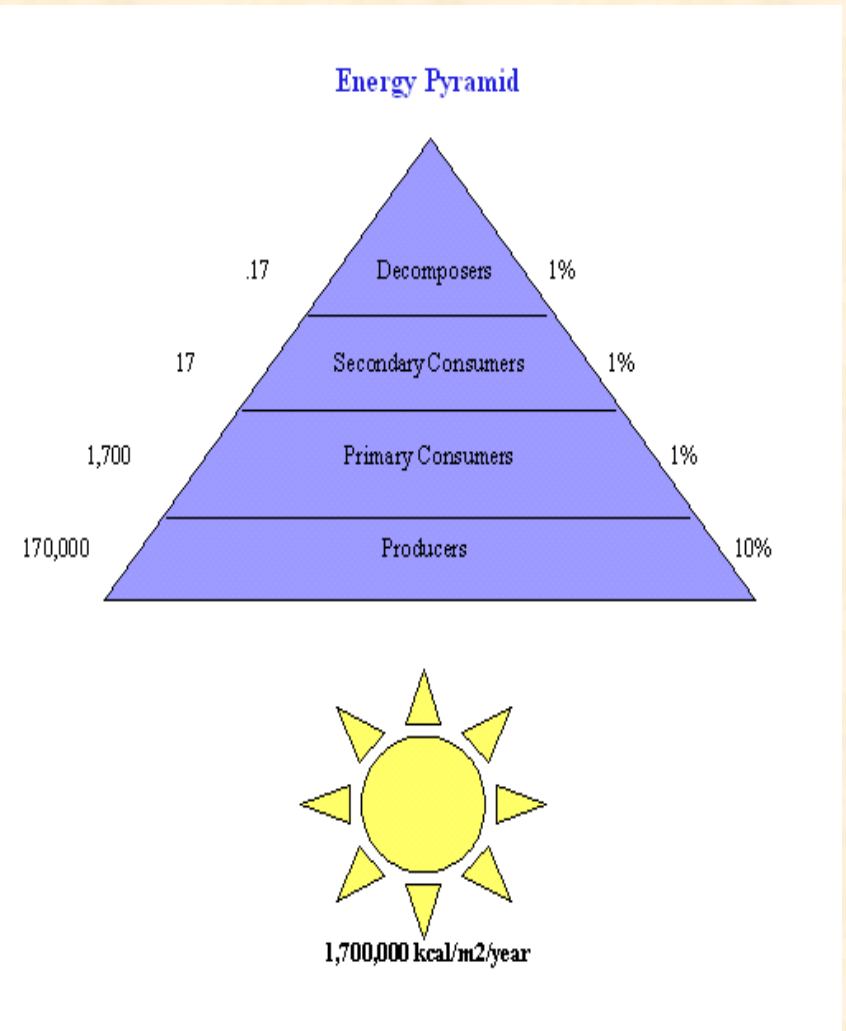




Pyramid of Biomass



Pyramid of Numbers



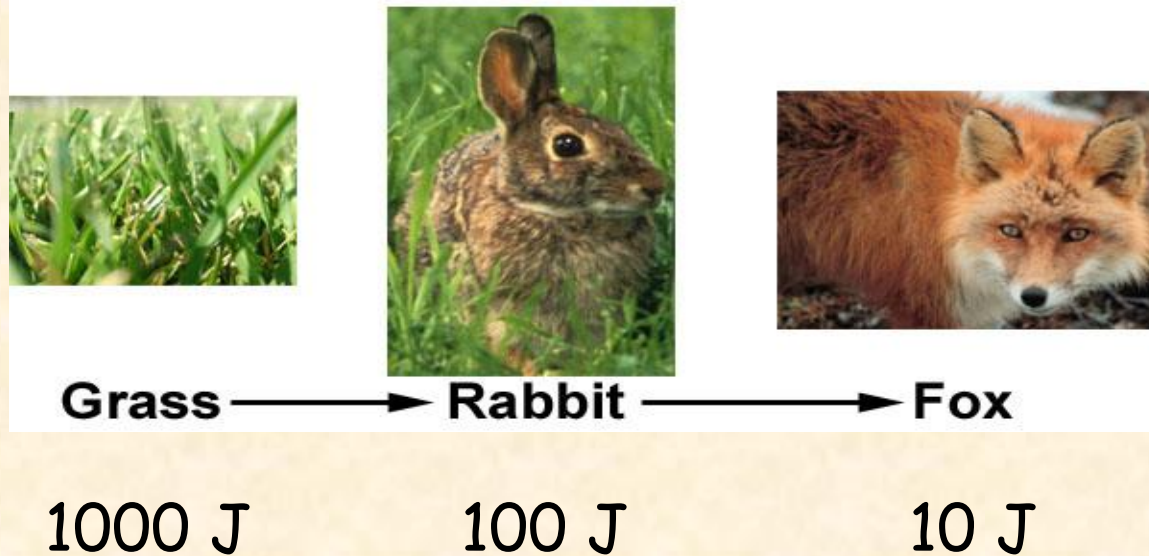
Pyramid of Energy

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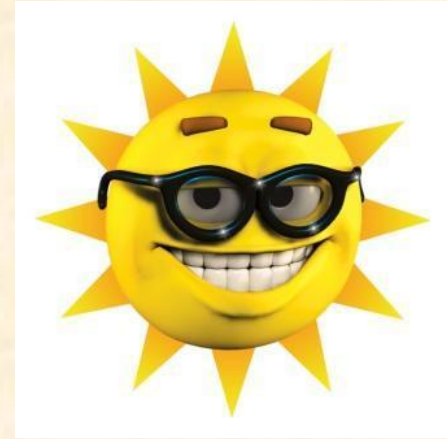
Energy Transfer in Ecological Models

- Energy decreases at each succeeding trophic level
- Energy transfer is about **10%** from one trophic level to the next



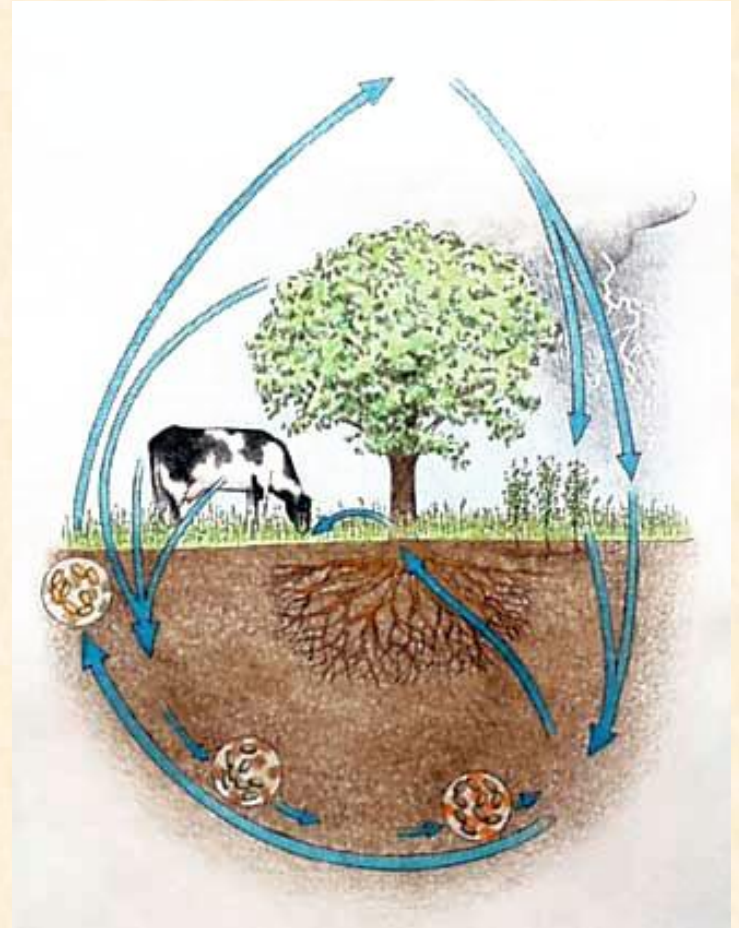
Energy Transfer Continued...

- The other 90% of Energy...
 1. Not all organisms in each trophic level are eaten.
 2. Not all food that is captured is eaten and digested.
 3. Some of the digested food is used by the organism for energy
- This energy cannot be passed on.
- Lost energy is replenished by the Sun.

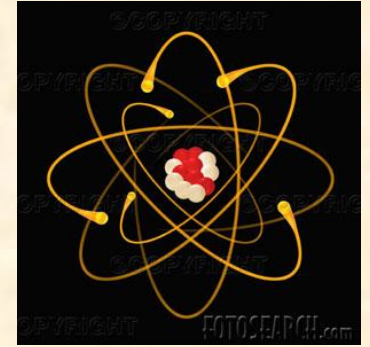


Nutrient Cycles

- Organisms rely on the recycling of nutrients for survival.
 - Ex: plants need nitrogen to grow
- Nutrients and matter are constantly recycled.
- Organisms alive today are made of the same atoms as the 1st living organisms.

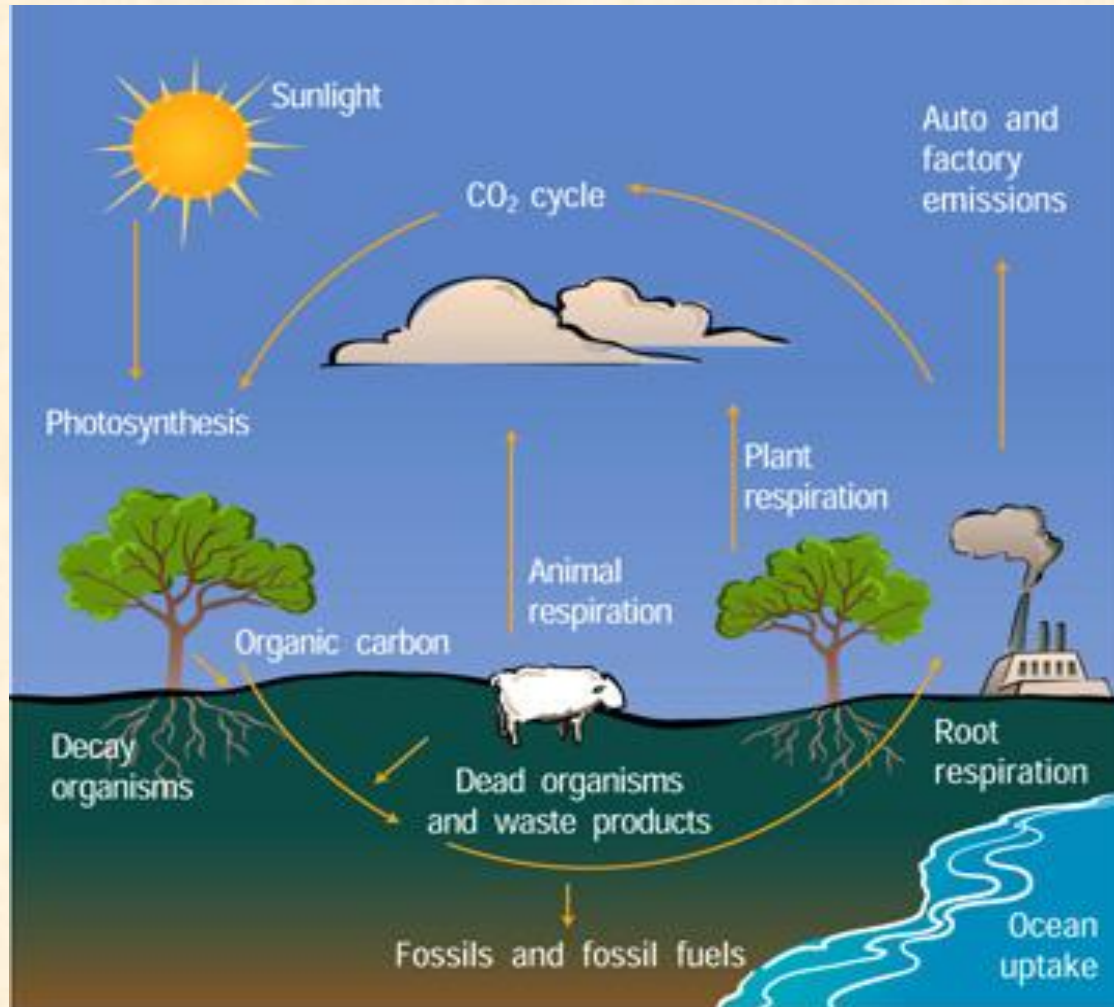


The Carbon Cycle



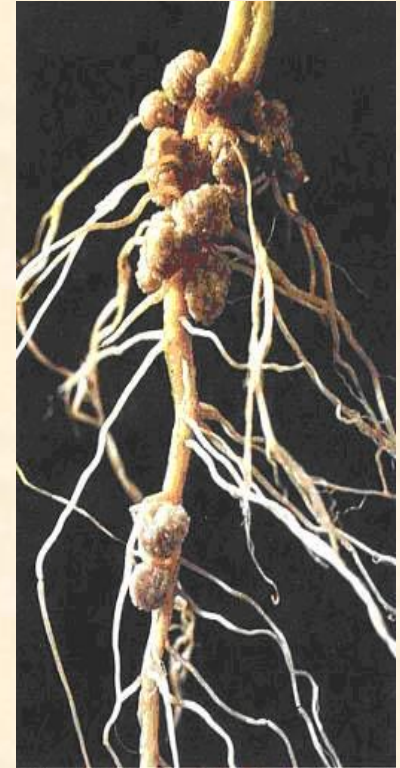
1. Carbon is found in the environment as CO_2 gas in the oceans and atmosphere.
2. Aquatic and terrestrial producers use CO_2 for **photosynthesis**, making high energy sugars.
3. Organisms eat producers or other organisms and obtain carbon.
4. **Respiration** and **decay** return CO_2 to the atmosphere and oceans.
 - If decay occurs **without oxygen**, carbon can form **fossil fuels** over millions of years. (Ex: oil, coal, and natural gas)
 - When fossil fuels are burned, CO_2 is released to the atmosphere.

The Carbon Cycle



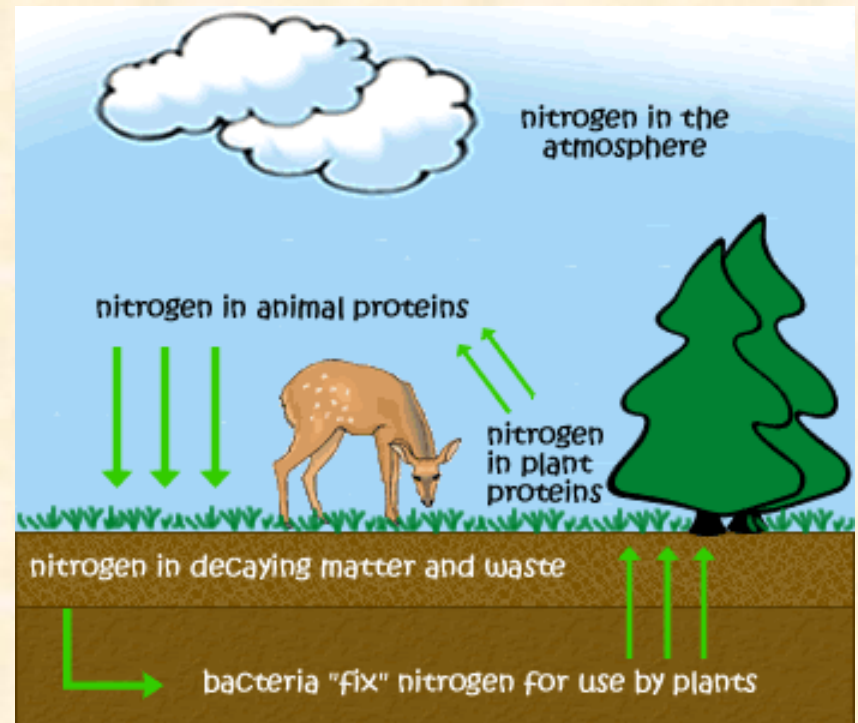
Nitrogen Cycle

- Plants and animals need nitrogen to make proteins.
- Atmospheric Nitrogen makes up 78% of air.
- However... living things **CANNOT** use nitrogen in atmospheric form
- Nitrogen **MUST** be converted to a usable form: (two methods)
 1. Lightening
 2. Bacteria on roots (Root Nodules)
- This is called **Nitrogen Fixation**



The Nitrogen Cycle Cont...

1. Lightening or bacteria convert nitrogen in the air to nitrates in the soil through **nitrogen fixation**.
2. Plants take up nitrates and change it into **plant proteins**.
3. Animals eat the plants and convert the nitrogen into **animal proteins** during digestion.
4. Nitrogen is returned to the atmosphere through **decay** and **wastes**.



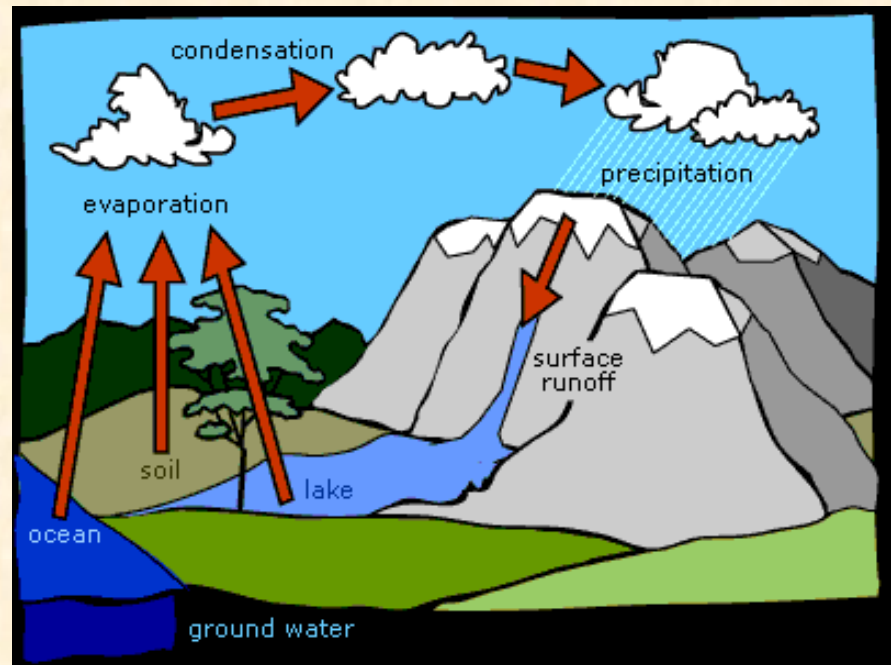
The Water Cycle

- Water occurs as liquid, solid, and in the atmosphere as a gas.

1. Water falls to the Earth as rain or snow
(precipitation)

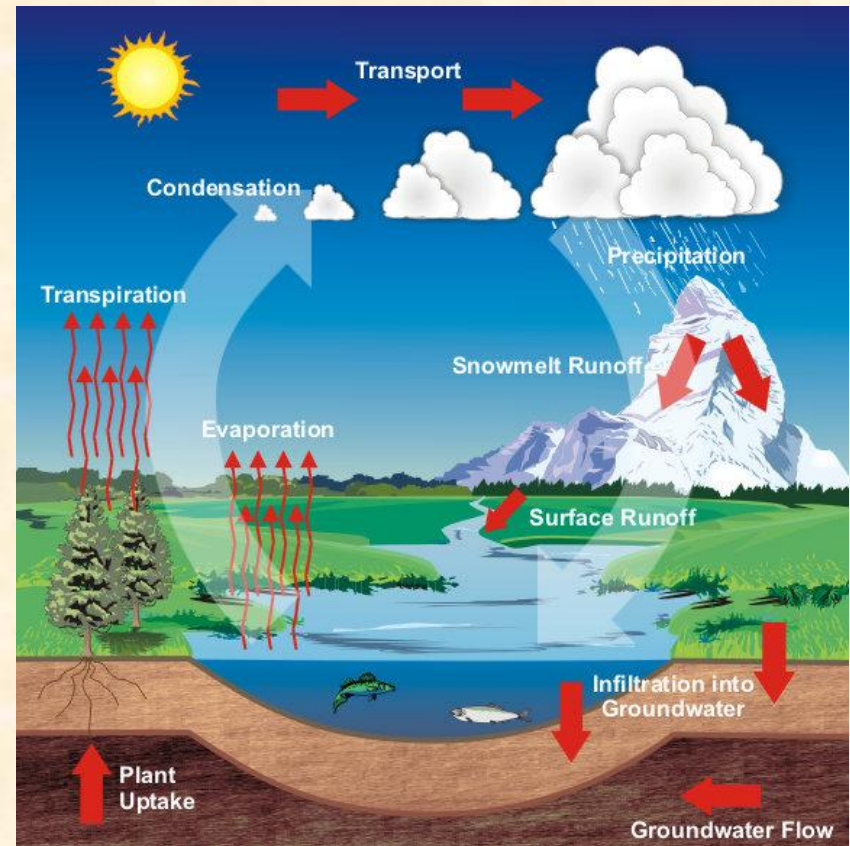
2. Some water runs-off into ponds, lakes, rivers, and oceans **(Run-off)**

3. Water in the soil is taken up by plants and animals eat the plants or drink water directly.



The Water Cycle Continued...

4. Excess water passes out of plants through their leaves (**transpiration**) or animals lose water through wastes (**excretion**), sweat (**perspiration**), or breathing (**respiration**).
5. Water may also be released through **decay** or **evaporate** from ponds and lakes and **condense** into clouds in the atmosphere.



The Water Cycle Cont...

- All living things need water... cells would die and plants could not photosynthesize.

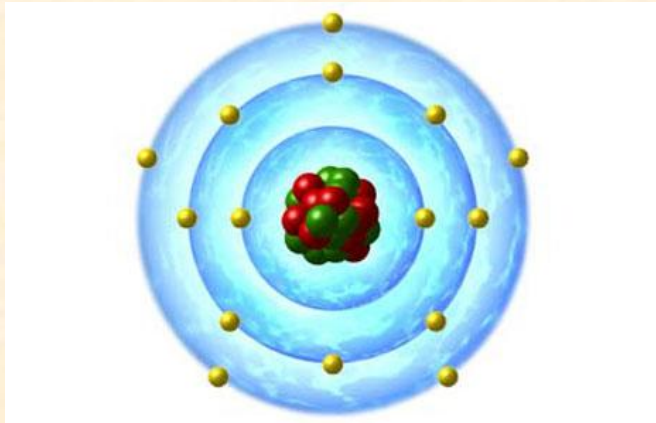


The Phosphorous (P) Cycle

(Important for plant growth)

- **Cycle 1:**

1. Plants store (P) from the soil in tissues.
2. Animals eat the plants
3. Decay releases (P) into the soil.



- **Cycle 2:**

1. (P) is washed into the sea and becomes incorporated into the rocks.
 2. When the rocks weather and erode the (P) is released again.
- * Can take millions of years.

The Phosphorous Cycle

