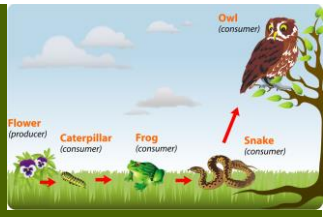
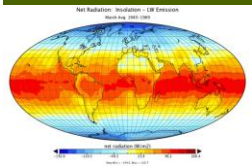
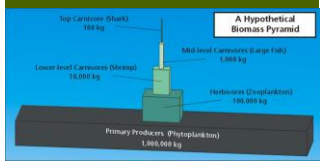


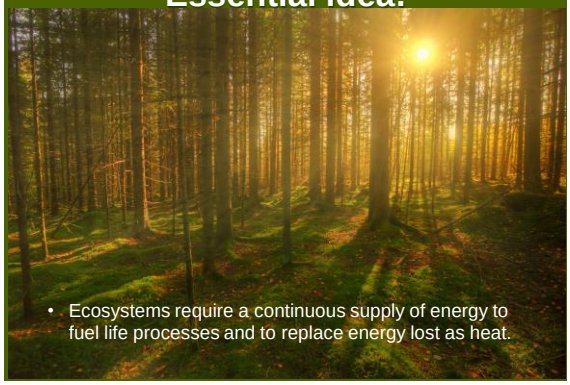
Ecology

4.2- Energy Flow





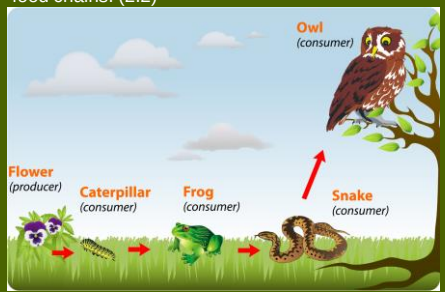
Essential idea:



- Ecosystems require a continuous supply of energy to fuel life processes and to replace energy lost as heat.

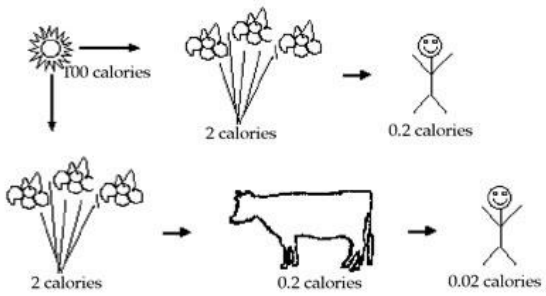
Nature of science:

- Use theories to explain natural phenomena
  - the concept of energy flow explains the limited length of food chains. (2.2)



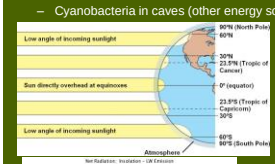
International-mindedness:

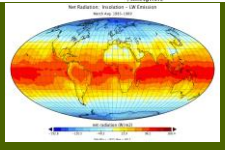
- The energetics of food chains is a factor in the efficiency of food production for the alleviation of world hunger.

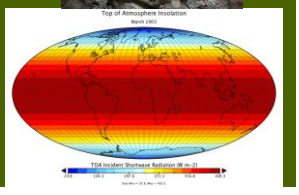


Understandings

- Most ecosystems rely on a supply of energy from sunlight.
  - Energy levels vary in ecosystems (latitute affects intensity)
  - Insolation: measure of solar radiation (watts/m^2) (DBQ 214)
  - Cyanobacteria in caves (other energy sources?)

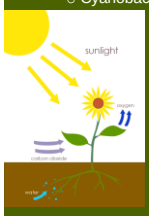


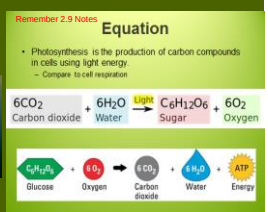




Understandings

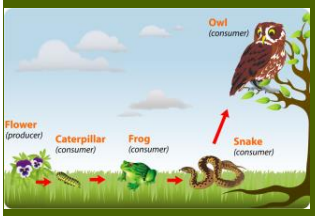
- Light energy is converted to chemical energy in carbon compounds by photosynthesis.
  - Light energy is converted to chemical energy (carbon compounds) by producers
    - Plants
    - Eukaryotic Algae (seaweeds)
    - Cyanobacteria (blue-green)

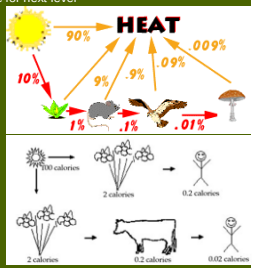




Understandings

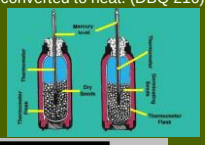
- Chemical energy in carbon compounds flows through food chains by means of feeding.
  - Food chains show energy flow through organisms
  - Arrows show direction of flow
  - Only about 10% of chemical energy is available for next level

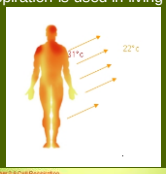


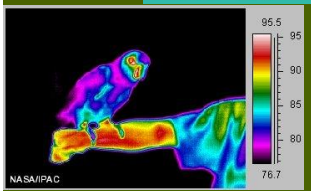


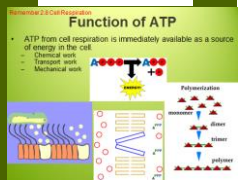
Understandings

- Energy released from carbon compounds by respiration is used in living organisms and converted to heat. (DBQ 216)
  - Synthesis
  - Pumping
  - Movement



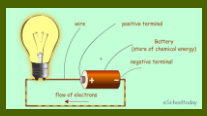


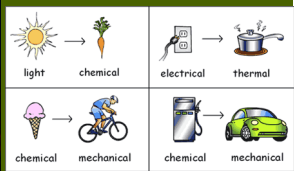




Understandings

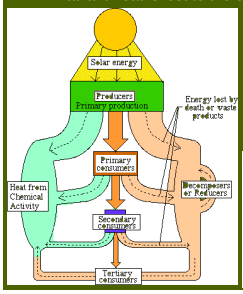
- Living organisms cannot convert heat to other forms of energy.
  - Can convert
    - Light to chemical
    - Chemical to kinetic
    - Chemical to electrical
    - Chemical to heat

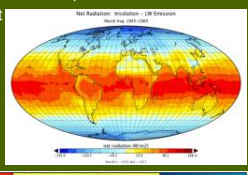


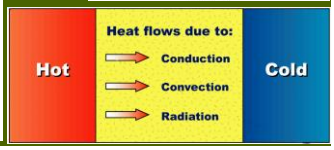


Understandings

- Heat is lost from ecosystems.
  - Heat passes from hot to cold (cold is lack of heat)
  - Radiant heat is lost to the environment



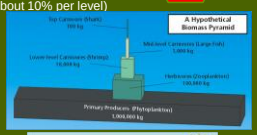


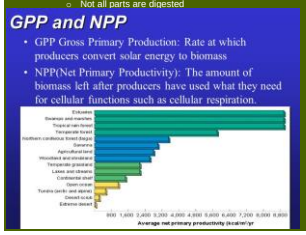


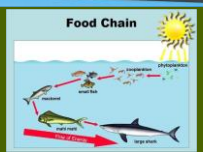
Understandings

- Energy losses between trophic levels restrict the length of food chains and the biomass of higher trophic levels.
  - Biomass has chemical energy.
  - Energy can be measured as gain in biomass.(GPP and NPP)
  - Each trophic level has less energy/biomass (about 10% per level)
    - Respiration loss (heat)
    - Entire organism not consumed
    - Not all parts are digested

End

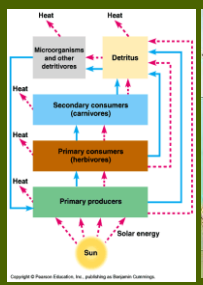


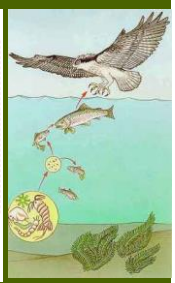




Trophic Structure

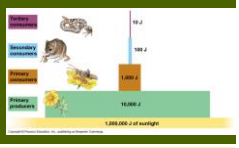
- Trophic Levels- organisms that are the same number of steps from the energy input into the system
  - Primary Producers (autotrophs)
  - Primary consumers (herbivores)
  - Secondary and tertiary consumers (carnivores)

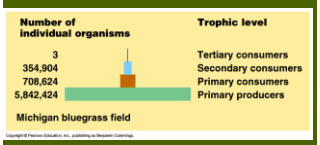


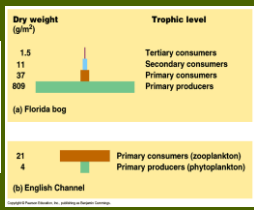


Ecological Pyramids

- Pyramid of Productivity: shows loss of E in trophic levels
- Pyramid of Biomass: representation of biomass in ecosystems
- Pyramid of Numbers: representation of the number of organisms in an ecosystem

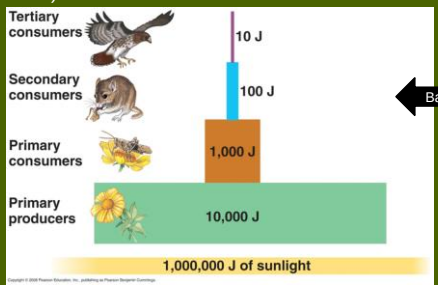






Applications and Skills

- Skill: Quantitative representations of energy flow using pyramids of energy. (Read 218, DBQ 219- what's wrong with #4)



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