TARGETS: [1]understand how organisms and environments fit together
[2]make responsible decisions relevant to our future on Earth

"PRINCIPLES OF ECOLOGY"

GENERAL

ECOLOGY = scientific study of interxns b/w organisms and their environ.

- developed from nature study or natural history
- combines info. from many sci. fields… chem.. phys, geo, etc
- uses both qualitative and quantitative research

BIOSPHERE = portion of the earth that supports life

- BIOTIC FACTORS – all living organisms that inhabit an environ.
  Ex. trees, animals, bacteria
- ABIOTIC FACTORS – nonliving parts of environ
  ex. air currents, temperature, moisture, light, soil

LEVELS OF ORGANIZATION: THE HIERARCHY OF LIFE

(smallest) individual
population
community
ecosystem
biosphere

HABIT vs. NICHE

NICHE = role a species plays in a community

HABITAT = place where an organism lives

HOW ORGANISMS INTERACT

SPECIES RELATIONSHIPS

1. Feeding relationships:
   - AUTOTROPH (producer) = make their own food ex. plants
   - HETEROTROPH (consumer) = must eat other sources of food ex. human

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TYPES OF HETEROTROPHS

A. HERBIVORE = feeds only on plants
Ex.

B. CARNIVORE = kills and eats other heterotrophs
Ex.

C. SCAVENGER = eats animals that have already died
Ex.

D. OMNIVORE = eats both plant and animal foods
Ex.

E. DECOMPOSER = breaks down and absorbs nutrients from dead organisms (plant and/or animal)
Ex.

2. Relationships for survival (symbiosis)

A. COMMENSALISM = one species benefits and the other is neither helped nor harmed
Ex.

B. MUTUALISM = both species benefit
Ex.

C. PARASITISM = one organism benefits; the other is harmed
Ex.

MATTER AND ENERGY IN ECOSYSTEMS

- matter and energy cycle through ecosystems
(neither created nor destroyed)
- FOOD CHAIN = pathway of nutrients and energy
↳ autotroph to heterotroph to decomposer
ex. grass to cow to human to worm

HETEROTROPH LEVELS

A. 1ST order consumer = eat plants
Ex.

B. 2ND order consumer = eat meat; smaller
Ex.

C. 3RD order consumer = eat meat; larger
Ex.

D. Decomposer = last step of cycle before repeating

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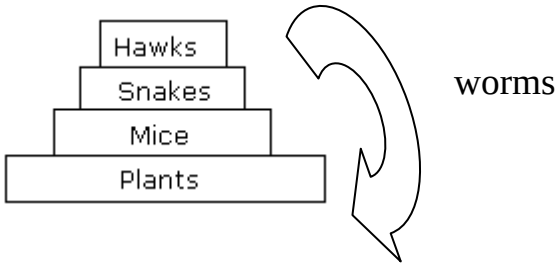
- food chain is limited to 3-5 steps; NRG is lost at each step as heat
- TROPHIC LEVELS = each feeding step of the food chain; represents passage of NRG and materials
- FOOD WEB = shows all the possible food chains in an ecosystem
- ECOLOGICAL PYRAMID = shows avail. NRG at each trophic level
  - base is producers, on top of that is 1ST order consumer, etc.
  - ultimate source of NRG = sun
  - only 10% of NRG is transferred at ea. level; rest is lost as heat

Food Web Example



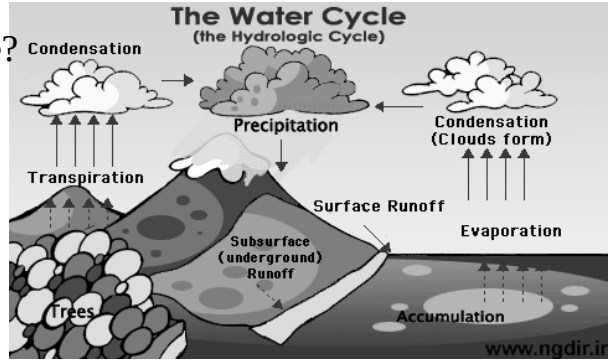
RECYCLING OF MATTER THROUGH ECOSYSTEMS

- unlike NRG, these materials are not lost, but recycle through the biotic and abiotic parts of the ecosystem

1. WATER CYCLE
   A. Crucial to life
      - cells contain 70-90% water
      - cell processes must take place in presence of water
      - only small portion of earth's water is in living things

   B. Where is water?
      - surface water (lakes, rivers, oceans, ice)
      - groundwater (underground reservoirs)
      - atmosphere (vapor)

   C. What forms does water take?
      - liquid (>1 C <100 C)
      - solid (<1 C)
      - gas (>99 C))



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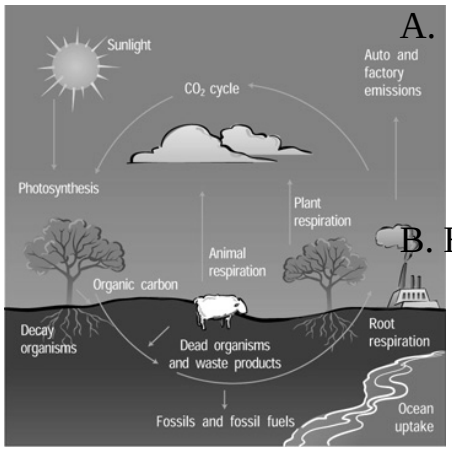
D. Important Processes
1. evaporation – from liquid to gas
2. precipitation – gas to liquid (rain)
3. transpiration – movement of water through plants
4. excretion – movement of water through animals
d. decomposition – break bonds (making Kool-Aid)

2. CARBON CYCLE



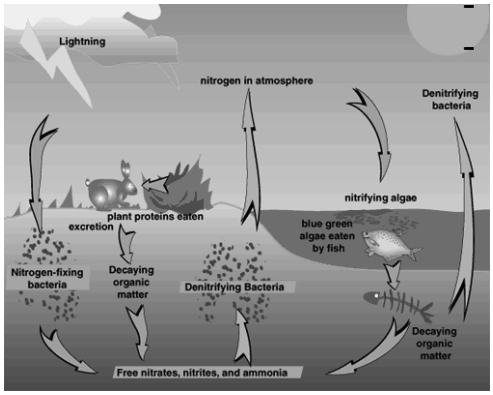
A. Why is Carbon important?
- found in sugars = formed during photosynthesis; food NRG for all living things
- source is atmospheric CO_2

B. How does it cycle?
- consumed as one organism eats another
- returned to atmosphere by
  - respiration ("breathing")
  - decay
  - burning of fossil fuels

3. NITROGEN CYCLE

A. Why is Nitrogen (N) important?
- basic molecule in proteins

B. How does it cycle?
- 78% of air is N
- living things cannot use N directly from air
- converted to useable form by
  - lightning
  - bacteria in soil and roots of some plants
    - absorbed from soil by plants
    - eaten by herbivores and converted into proteins
    - returned to soil and atm. during decay



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4. PHOSPHORUS CYCLE

A. Why is Phosphorus (P) important?

- used in body processes_____

B. How does it cycle?

- Short-term
  - taken up by plants
  - eaten by animals
  - returned to soil by decay

- Long-term
  - deposited as ocean sediments
  - becomes part of rocks
  - must erode to release P