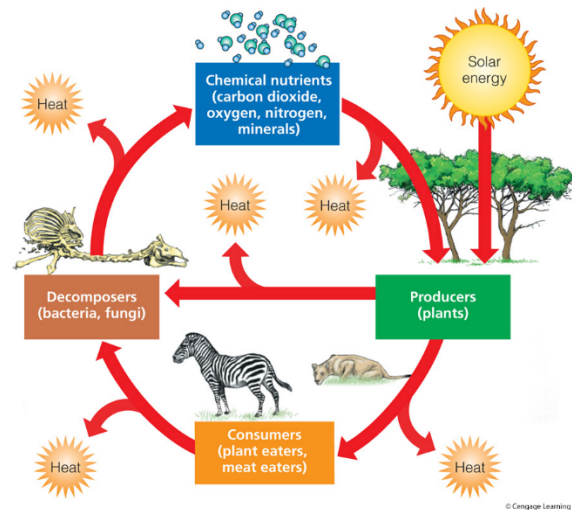


Lecture 09 – Ecosystem Functioning

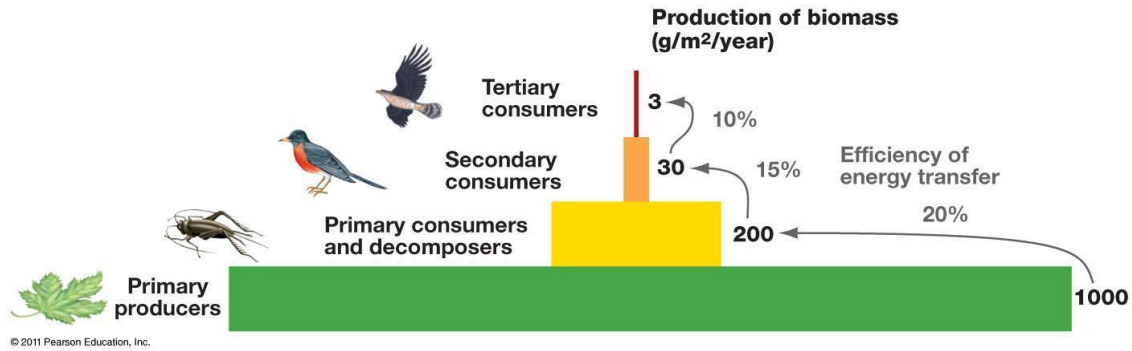
1. Ecosystem

- a. Community of different species interacting with one another and with non-living components of their environment
- b. Main Components
 - i. Energy
 - ii. Chemicals
 - iii. Organisms
- c. Energy Flows
 - i. Ultimately lost from planet as waste heat
- d. Nutrients Cycle
 - i. Not usually lost from ecosystems



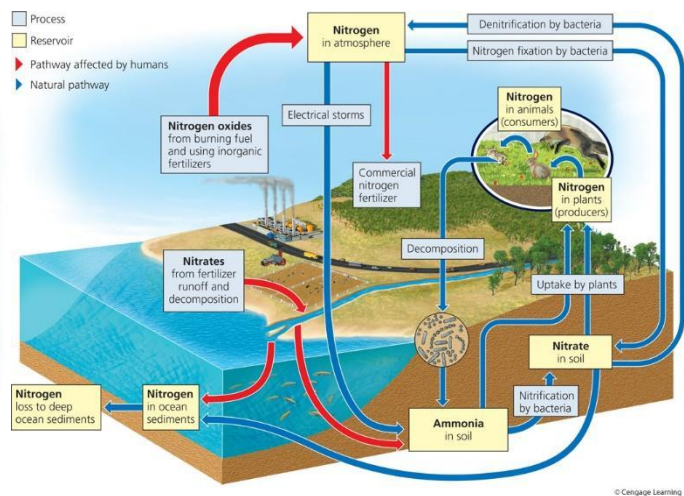
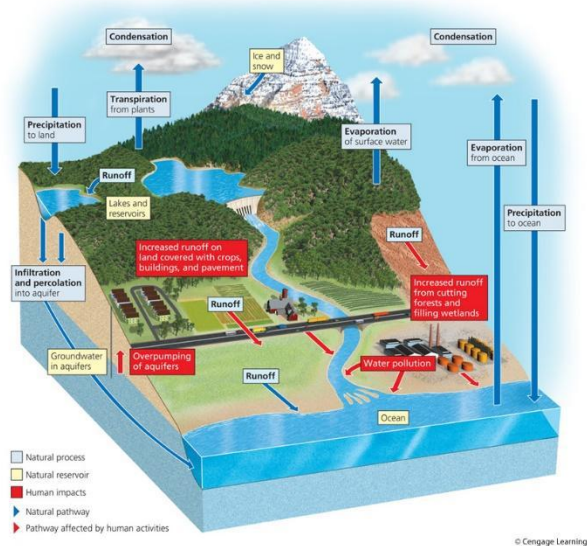
2. Ecosystem Energy

- a. Solar energy stored as chemical energy in molecular bonds – glucose
- b. Gross Primary Productivity (GPP): rate at which producers convert solar energy into chemical energy
- c. Net Primary Productivity (NPP): Proportion of GPP invested in new tissue; energy available to consumers
- d. Comparing productivity between ecosystems, some clearly higher than others
 - i. What might that mean?
- e. Energy Flow:
 - i. Energy moves across trophic levels: Feeding levels, classify where an organism gets its nutrients from
 - 1. 1st trophic level: producers
 - 2. 2nd trophic level: primary consumers
 - 3. Etc.
 - ii. Most energy lost to maintenance or excretion, with only small amount moving up trophic levels
 - iii. Farther up trophic chain, less biomass
 - iv. Food webs summarize trophic interactions
 - v. Energy ultimately lost, but new energy coming in from sun all the time



3. Ecosystem Nutrients

- a. Cycle within ecosystems
- b. Soil organic matter: mixture of partially and completely decomposed detritus
 - i. Until decomposition occurs, nutrients are trapped in dead tissue
 - ii. What affects decomposition rates?
 1. Abiotic conditions (temperature/precip./etc.)
 2. Detritus quality
- c. If biomass leaves ecosystem, nutrients are lost
- d. Water



i. Major Processes:

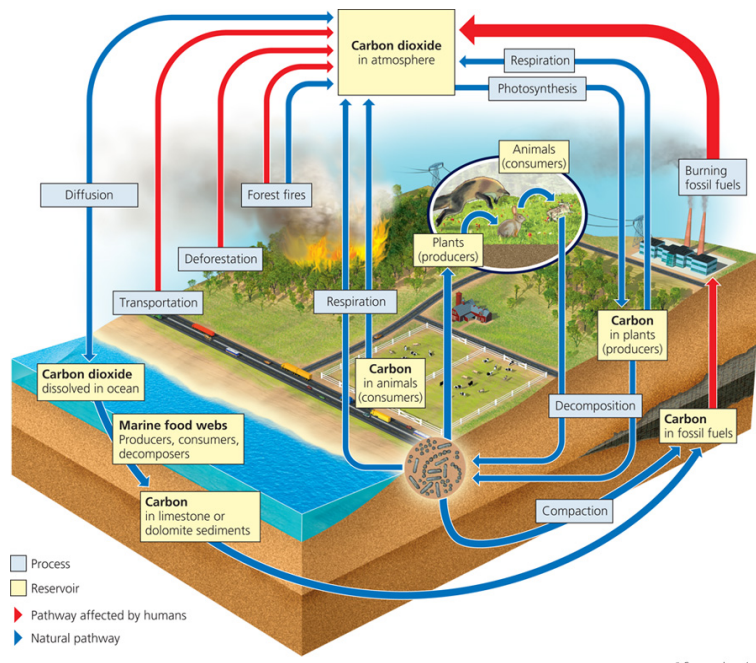
1. Evaporation
 - a. Evapotranspiration
 2. Condensation
 3. Precipitation
- e. Nitrogen
- i. Most nitrogen in atmosphere as N₂, not interactive
 - ii. Converted to usable forms by soil bacteria
 1. Nitrogen fixing bacteria associate with root nodules of some plants
 2. Mycorrhizae do this as well, again in association with plants

iii. Humans have large influence on nitrogen cycle, mostly through anthropogenic fixation of nitrogen

f. Carbon

i. Processes:

1. Removed from atmosphere via photosynthesis
2. Replace via respiration
3. Understand role of carbon in global climate change



Focal Questions:

1. What is an ecosystem?
2. How does energy move through ecosystems?
3. Where does energy ultimately go?
4. How do nutrients move through ecosystems?
5. For water, carbon and nitrogen, what are the major transport processes of these nutrients?
What are the storage pools?
6. How are humans modifying the ecosystem cycling of water, carbon, and nitrogen? What are the effects of those modification?