Topic 6: Ecology (review)

- ***Population:*** one species in a given area
- ***Community:*** all the species in a given area
- ***Habitat:*** specific environment where organisms live
- ***Ecosystem:*** the community plus their habitat. An ecosystem is the basic unit of structure and function in ecology.
  a. must have a constant source of energy (sun)
  b. must recycle materials between the living and nonliving parts of the ecosystem
- ***Biosphere:*** the part of the Earth that is inhabited by living organisms
- ***Abiotic factors:*** nonliving factors that influence what lives in an ecosystem (amount of water, temperature, amount of light, pH of soil, climate etc…)
- ***Biotic factors:*** living factors – interactions of living organisms within and between species
- ***Competition:*** organisms struggle for limited resources in their environments – competition occurs within and between species for food, water, space, chances to reproduce, etc…
- ***Limiting factors:*** limit the size of populations living in a given environment, may be abiotic or biotic (intensity of light, temperature range, available minerals in water or soil, predators prey, etc…)
- ***Carrying Capacity:*** The maximum number of organisms of any single species that an ecosystem can support.
- ***Niche:*** role that each organism has in its ecosystem
- ***Autotroph:*** can make its own food
- ***Heterotroph:*** has to go out into the environment to get its own food
- ***Producer:*** autotroph
- ***Consumer:*** heterotroph
- ***Herbivore:*** consumes plants
- ***Carnivore:*** meat eater
- ***Omnivore:*** eats both plants and animals
- ***Predator:*** organisms that hunt and kill their food
- ***Prey:*** food for the predator
- ***Scavengers:*** eat freshly killed leftovers from a predator's prey
- ***Organisms of Decay: bacteria and fungi*** break down dead organisms, recycling materials back to the environment
- ***Symbiotic relationships:*** organisms that live in close association with one another
  a. ***mutualism:*** (+,+) both organisms benefit (termites and protozoans, nitrogen fixers and legumes, rhino bird and rhino)
  b. ***commensalism:*** (+,0) one organism benefits, the other is not affected (sharks and remoras, orchids and trees, barnacles and whales)
  c. ***parasitism:*** (+,-) one organism benefits, the other **(host)** is harmed (athlete's foot and humans, tapeworm and humans, heartworm and dogs)
- ***Food chain:*** shows the nutritional relationships and flow of energy from producer through consumers. Arrows indicate the flow of energy from one organism to the next
- ***Food webs:*** complex interconnecting food relationships in an ecosystem through the connection of many food chains. **A food web is more stable**; the elimination of one food source will have less effect on consumers since they have more than one food source to choose from.
- ***Energy Pyramid:*** illustrates the transfer of energy through a food chain. Each block or trophic level indicates the amount of energy available to the level above. Since the organisms **at each level use most of the energy for their life functions and some is lost to the environment as heat, only 10% is available** for organisms in the next level to use.
- ***SUN:*** ultimate source of energy for all living things.
- ***Energy:*** **CANNOT BE CREATED OR DESTROYED – can only be converted into other forms!**
- ***Photosynthesis:*** light energy is converted to chemical bond energy of food by plants and algae. (producers).
- ***Biomass Pyramid:*** illustrates the mass of living organisms found at each level of the pyramid. Each level must have more biomass than the level above it.
- ***Recycling of Materials by decomposers:***
  a. water cycle:
  --*physical cycling*: evaporation, transpiration (evaporation of water from stomates [pores] of leaves), condensation, precipitation
  --*chemical cycling*: photosynthesis and respiration
  b. carbon/oxygen cycle:
  --*photosynthesis* takes carbon dioxide in and releases oxygen
  --*cellular aerobic respiration* takes in oxygen and releases carbon dioxide

--*combustion* fueled by oxygen, releasing carbon dioxide
--*decomposers* break down dead organisms releasing carbon dioxide back into the environment.

c. <u>nitrogen cycle:</u>

--plants absorb ***nitrates*** (NO_2) from soil in order to make proteins
--animals eat plants, break down plant proteins and make their own proteins
--plants and animals die, decomposers release ***ammonia*** (NH_3) to the soil
--***nitrifying bacteria*** convert ammonia to nitrates for plants to use
--***denitrifying bacteria*** break down nitrates, releasing ***free nitrogen*** (N_2) into the atmosphere.
--nitrogen fixers (live in the nodules on the roots of legumes such as clover, beans, peanuts) capture free nitrogen from atmosphere and convert it into nitrates for plants.

- ***Ecological Succession:*** the series of changes when one habitat changes into another
- ***Biodiversity:*** the variety of species that live in a given ecosystem
  a. greater the biodiversity, the more stable the ecosystem
  b. Biodiversity can be considered on three different levels which include:
     --Genetic Diversity: the variations among inherited biological traits (found in the DNA) of each species.
     - The more genetic variations among organisms in a given species, the better chance that the species will adapt and survive when changes occur in their environment.

     --**Species Diversity:** The greater the biodiversity of a given ecosystem, the more stable that ecosystem is.
     - **Species diversity serves as a barrier to the spread of disease.** By having a large number of diverse species, it is harder for the agents of infection (disease causing organisms) to spread quickly through the ecosystem.

     --**Ecosystem Diversity:** occurs in natural communities in a given area or region that is made up of interacting groups of living organisms that live are interdependent on one another.
- ***Importance of Biodiversity***
  a. **Maintenance of Soil Quality:** Bacteria, fungi, mites, millipedes and worms (to name a few) help to break down organic matter, recycle materials back to the soil and the environment. Trees prevent valuable soil from being washed away.
  b. **Maintenance of Air Quality:** plants and algae remove CO_2 (greenhouse gas) from the environment and release O_2 into the atmosphere.
  c. **Pest Control:** some biologists estimate that around 99% of potential crop pests are controlled by a variety of other organisms such as birds, insects and fungi. Natural control of pests eliminates the need for harmful chemical insecticides.
  d. **Pollination:** Flowering plants rely on the activities of various animal species including bees, butterflies, bats, and birds to help them reproduce through the transport of their pollen. More than 1/3 of our food crops depend on this process of natural pollination.
  e. **Diversity in Food Sources:** with decreased biodiversity we would have less variety in the foods we eat
  f. **Sources of Medicine:** by limiting biodiversity, we lose potential plants and animals that may provide us with new medicines, drugs, insecticides, or other valuable resources.
- **Threats to Biodiversity**
  a. Physical alteration of habitat areas (ex: cutting down rainforests)
  b. Introduction of alien species (have no natural predators)
  c. Exploitation for human consumption (ex: killing seal pup for fur coats)
  d. Air, water, and land pollution
  e. Continual increase in human population
  f. Wasteful consumption and management of limited resources