

2.1 Notes

- I. Ecosystems: A Description
 - A. General vocabulary
 - 1) biota = **biotic community**—*plants, animals, and microbes of an area*
 - 2) **biosphere**—*all species on Earth and their ecosystems*
 - 3) **ecology**—*the study of ecosystems and the interactions within them*
 - 4) ecologists—*scientists who specialize in ecology*
 - B. The ecological progression: POP → COMM → ECO
 - 1) **population**—*a group of organisms in the same species, living in the same area*
 - 2) **community**—*groups of different, interacting species in the same area*
 - a) **association**—*a plant community with the same habitat and growth*
 - 3) **ecosystem**—*biotic factors (plants, animals, microbes) interacting in a specific area with each other and with the environment*
 - a) **landscapes**—*a group of ecosystems which affect one another (interdependence and interactions)*
 - b) **ecotone**—*a transition area between ecosystems, with blended characteristics*
 - c) **biomes**—*major ecosystems of the world (grasslands, deserts, forests...)*
 - C. Parts of the environment
 - 1) living
 - a) **biotic factors**—*living aspects of the environment (example: animals)*
 - b) **species**—*members of the same genus who can reproduce and produce viable offspring*
 - 2) nonliving
 - abiotic factors** (A-BIO: without life)—*nonliving, chemical, and/or physical aspects of the environment (example: humidity)*
 - * conditions
 - *resources

Table 2-1: MAJOR AQUATIC SYSTEMS - important to review
Lakes, ponds, streams, rivers, wetlands, estuaries, oceans

2.2 Notes

- II. The Structure of Ecosystems
 - A. general information
 - 1) biotic structure—*how different categories of organisms fit together*
 - 2) trophic structure—*major feeding relationships among organisms*
 - B. trophic categories
 - 1) **producers (autotrophs)**—*organisms which make their own food (through photosynthesis or chemosynthesis)*
 - a) green plants, phytoplankton, some bacteria
 - b) *chlorophyll*—*green pigment*
 - c) *organic*—*carbon-based; from living organisms or organisms that were once alive (example: wood)*
 - d) *inorganic*—*non-organic components; not carbon-based (example: quartz)*

- 2) **consumers (heterotrophs)**—*organisms which feed on organic material/living prey*
 - a) types of consumers
 - **primary (1°) consumers**—*herbivores—organisms which feed on plants/autotrophs/producers*
 - **secondary (2°) consumers**—*organisms which feed on the primary consumers*
 - there can be higher levels: **tertiary (3°)**, etc.; usually 3 or 4 levels
 - b) “diet” terms
 - **carnivores**—*animal-eaters*
 - **herbivores**—*plant-eaters*
 - **omnivores**—*plant-and-animal eaters*
 - c) predator-prey relationships
 - **predator**—*organism doing the hunting and feeding*
 - **prey**—*organism which is fed upon*
 - d) parasite-host relationships
 - **parasite**—*organism feeding off another organism, weakening it but not usually killing it*
 - **host**—*organism which is fed upon*
 - viruses and bacteria are pathogens but are considered to be types of parasites
- 3) **decomposers & detritus feeders**—*organisms which feed on dead organic material: dead organisms and/or their products*
 - a) **detritus**—*dead plant and animal material*
 - b) **primary detritus feeders**—*organisms feeding directly on detritus*
 - c) **secondary detritus feeders**—*organisms feeding on 1° detritus feeders*

C. trophic relationships

- 1) **food chain**—*a simple, linear arrangement of feeding relationships*
GRASS eaten by ANT eaten by LIZARD eaten by SNAKE
- 2) **food web**—*complex arrangement of food chains; all possible feeding relationships in an area*
- 3) **trophic levels**—*feeding levels; usually 3 or 4*
 - a) *trophic levels must begin with producers*
 - b) **biomass**—*total mass of organisms; can be estimated at each trophic level*
 - c) **biomass pyramid**—*graphic representation of biomass at different levels*
 - d) **10% rule**—*approximately 10% of the biomass of a trophic levels goes to the next level*
 - * *most of the food eaten by consumers is metabolized for energy, not incorporated into the body mass*
 - * *much of the producers' biomass goes directly to the decomposers*

D. nonfeeding relationships

- symbiosis**—*a relationship between members of different species*
- 1) **mutualism**—*mutually beneficial to both organisms*

(lichens—algae and fungi)

- 2) **commensalism**—*one organism benefits, but the other is unchanged* (fish hiding in coral reefs)
- 3) **parasitism**—*one organism benefits, the other is harmed* (tapeworm infestation of a puppy)

E. competitive relationships

- 1) **habitat**—*the area in which an organism is adapted to live*
- 2) **ecological niche**—*the role or job an organism plays in its environment; where it lives, what it eats, when it eats, where it eats, etc.*
- 3) *two species cannot occupy the same niche—competition will drive one out—but niche overlap is possible*
- 4) **competitive exclusion**—*species becoming extinct as a result of competition*

F. abiotic factors

- 1) two types: conditions and resources
 - a) **conditions**—*aspects of the environment* (temperature, humidity, salinity...)
 - b) **resources**—*factors consumed by organisms* (water, chemicals...)
- 2) optimum, zone of stress, range of tolerance
 - a) optimum—the best (circumstances, environment...)
 - **optimal range**—*various conditions in which the organism will thrive*
 - b) **range of tolerance**—*the span of conditions in which the organism is able to live*
 - **limits of tolerance**—high and low limits
 - **zones of stress**—between optimal range and each limit
- 3) Law of Limiting Factors
 - a) **limiting factor**—*anything limiting growth*
 - b) **Law of Limiting Factors**—*any one factor outside the optimal range will cause stress, possibly limiting growth, or even survival*
 - c) **synergistic effects (synergisms)**—*two or more factors which interact in a way that produces a greater total impact than each would separately*

2.3 Notes

- III. Global Biomes Table 2-3: MAJOR TERRESTRIAL BIOMES - review
 - A. **climate**—*average temperature and precipitation each day throughout the year*
 - B. **biomes**—*large ecosystems of the world*
examples of *terrestrial (land) biomes*:
 - 1) *desert*
 - a) warm desert/semidesert
 - b) cold desert/semidesert
 - 2) *tundra*
 - a) arctic tundra (near Arctic Circle; North Pole)
 - b) alpine tundra (high mountaintops)
 - permafrost—permanently frozen subsoil

- 3) *grassland*
 - a) *prairie (temperate grassland)*
 - tall grass prairie (Eastern Midwest U.S.)
 - short grass prairies (steppe; Rocky Mtn. areas)
 - b) *savanna (tropical grassland)*
 - 4) forest
 - a) *coniferous forest* (needle and cone-bearing trees)
 - b) *deciduous forest* (temperate forest; trees shedding leaves seasonally)
 - c) *tropical rainforest*
- C. microclimate and other abiotic factors
- 1) **microclimate**—conditions in a *localized area* of a biome
 - 2) some abiotic factors
 - a) soil contents / types of soil separates (sand, clay, silt)
 - b) topography—the layout of the land; elevations and depressions
 - c) temperature
 - d) precipitation / water quality
 - e) available living space
 - f) pH
 - g) light intensity / shade...
- D. biotic factors
- 1) predator / prey ratio
 - 2) amount of plant growth (for food or for shelter)...
- E. physical barriers
- 1) mountain ranges
 - 2) bodies of water

2.4 Notes

IV. The Human Factor

A. Paleolithic hunter-gatherer society

- 1) gather natural food
- 2) hunt wild animals for food
- 3) *nomadic—roaming around*
- 4) *low impact on the environment; low population density*

B. Neolithic revolution ~12,000 yrs ago in the Fertile Crescent—the advent of agriculture changed how people lived

- 1) agricultural society—planting crops (*invention of the plow*)
- 2) *domestication of animals*
- 3) specialized jobs among people
- 4) *larger populations living in settlements*

C. Industrial revolution— 1800s (**natural system** → **human system**)

- 1) industrial society
- 2) machines play a large role
- 3) *high demands for resources and energy*
- 4) advances in technology
- 5) larger population size
- 6) severe environmental damage

D. Environmental revolution—the quest to establish sustainable practices in all that we do, through *sustainability, stewardship, and sound science*