**Notes: Ecology #5**

**Biomes**

* Definition:
  + Major ecosystem spread over a wide geographic area, and characterized by certain types of flora and fauna.
  + Types of Biomes:
    1. Terrestrial biomes (9)
    2. Freshwater biomes (2)
    3. Freshwater OR Brackish biomes (2)
    4. Marine biomes (4)

**Terrestrial Biomes:**

1. Arctic
2. Tundra
3. Taiga (boreal forest)
4. Temperate deciduous forest
5. Prairie (temperate grassland)
6. Savanna (tropic grassland)
7. Chaparral (Mediterranean scrub forest)
8. Tropical Rainforest
9. Desert

**#1 Arctic**

* Located above 60o North and South latitudes (N and S poles)
* Arid
* Bitterly cold temperatures
* Day length varies tremendously, with 24 hour daylight or night at the respective solstices.
* Low animal diversity
* Most photosynthetic organisms are marine
* Some typical vertebrates you might find here:
  + Penguins (Antarctic only; no penguins in the North), seals, walruses, whales of various species, polar bear

**#2 Tundra**

* Located just south of the polar regions in north
* Arid
* Characterized by PERMAFROST:
  + A permanently frozen layer of soil
* High winds and cold temperatures
* Very short days in winter, very long days in summer
* Most plants are scrubby and small
* Lichens (fungus/algae symbiosis) are a major photosynthetic food source
* Typical vertebrates:
  + Reindeer/caribou, Snowy Owls, Grizzly Bear, Brown Bear, Wolf, Arctic Fox, Ptarmigan (a partridge-like bird), migratory birds, lemmings (small rodents), voles

**#3 Taiga**

* Boreal coniferous forest (pines)
* Border arctic and tundra regions (primarily north)
* High precipitation: Snowfall in winter, rain in summer
* Highly endangered, these ecosystems are being rapidly logged out, especially in North America.
* Also found along the Andes of South America
* Major plants:
  + Evergreen, coniferous trees such as pines, firs, spruce, etc. (Cone-bearing trees). Under the trees grow shrubs, mosses, ferns, etc.
* Typical vertebrates:
  + Deer, wolf, bear, foxes, many migratory birds, squirrels, rabbits, etc.
  + Higher species diversity than tundra

**#4 Temperate Deciduous Forest**

* South of the coniferous forests in northern hemisphere
* Relatively high rainfall and elevation
* Four distinct seasons; trees loose leaves during winter
* Typical temperate deciduous forest areas are the northeastern U.S. and most of Europe
* Major plants:
  + Deciduous (i.e., trees that seasonally drop their leaves) flowering trees and shrubs
* Typical vertebrates:
  + Deer, wolf, bear, foxes, many migratory birds, squirrels, rabbits, etc.
  + Higher species diversity than coniferous forest.
  + Some species hibernate through the winter, when food is scarce in the snowy landscape

**#5 Prairie**

* Temperate grassland
* Characterized by distinct seasonal changes, moderate rainfall, extremely rich, organic soil
* Very fertile land, but with harsh seasonal variations: hot summers, cold winters
* Often converted to farmland
* Example: Plains of the central U.S.
* Major plants:
  + Annual grasses and flowering plants; some areas with more standing water become marshes characterized by small trees such as willows, cottonwoods, etc.
* Typical vertebrates:
  + American Bison, prairie dog, jackrabbit, fox, coyote, deer, many migratory birds (especially predatory birds such as hawks and falcons), etc.
  + Many animals undergo winter hibernation

**#6 Savanna**

* Tropical or Subtropical Grassland
* Characterized by distinct seasonal changes, highly seasonal rainfall, and extremely rich, fertile soil.
* Harsh seasonal variations: Very wet season followed by extremely harsh dry season
* Fire is a major abiotic component of this biome, and most plant species are evolved to withstand periodic fires
* Lush grass and shrubbery growth in the rainy season provides ample food for large animals, but they must migrate to greener pastures during drought
* Major plants:
  + Annual grasses and flowering plants; Trees are generally very drought tolerant and have high canopies due to herbivory by large animals such as elephants and giraffes.
* Typical vertebrates:
  + Grazing hoofed mammals (gazelles, antelopes, etc.), lions, leopards, cheetahs, elephants, giraffes, true buffalo (Water Buffalo, Cape Buffalo), rhino, hippopotamus, etc.

**#7 Chaparral**

* Mediterranean Scrub Forest
* Found in arid regions with Mediterranean climate
  + Examples: Southern California, Spain, European and African areas bordering the Mediterranean Sea; southern tip of Africa, southwestern tip of Australia)
* Winters are rainy and mild; summer days are long, hot, and very dry
* Characterized by periodic, seasonal fires
* Major plants:
  + Dense, spiny, evergreen shrubs (some of these produce seeds that will germinate and grow only after they've been through a fire.)
* Typical vertebrates:
  + Coyote, mule deer, various rodents, many lizards, snakes, migratory birds, etc.

**#8 Tropical Rainforest**

* Found worldwide around the equator
* Extremely high levels of rainfall
* Nutrient-poor soils due to frequent heavy rain
* Very dense plant growth and very high productivity
* In mature rainforest, the forest floor is relatively clear of plants, since the upper canopy of trees blocks most sunlight
* Tremendous plant diversity:
  + Large trees have shallow root systems evolved to be able to quickly absorb nutrients as soon as they become available, before the rains wash them away
* Typical vertebrates:
  + You name it! More than 50% of all the earth's terrestrial animal species are found in the tropical rainforest
  + Monkeys, toucans, parrots, reptiles of all types, amphibians, and representatives of most major animal groups

**#9 Desert**

* Extremely arid
  + Very hot in the daytime
  + In some regions, extremely cold at night
* High nutrient levels in the soil due to very little rainfall
* Sparse plant life due to very low humidity and available water
* Plant life has evolved to have special adaptations to store and avoid losing water (Xeriphytic)
* Typical plants:
  + Cactus, Yucca, xeriphytic shrubs of various species, spectacular explosion of flowering annuals comes with the spring rains
* Typical vertebrates:
  + Drought-tolerant mammals such as desert foxes, burros, jackrabbits, high diversity of snakes and lizards, tortoises, roadrunner and some other desert-adapted birds (hawks and eagles)

**Freshwater Biomes:**

1. Lakes and Ponds
2. Rivers and streams

**#1 Lakes and Ponds**

* Can be very small or very large
* May be seasonal or permanent
* Fresh water only
* Divided into three different zones:
  + Littoral Zone- Top most zone near the shore, light reaches to bottom
  + Limnetic Zone – Near-surface open water,well lit
  + Profundal Zone- Deep, colder water; little light penetrates to bottom
* Littoral Zone
  + Producers: Aquatic plants and algae
  + Animals: Small crustaceans, snails, flatworms, insect larvae, frogs, fish, turtles
* Limnetic Zone
  + Producers: Phytoplankton, algae
  + Consumers: Zooplankton , swimming insects, fish
* Profundal zone
  + Most organisms are decomposers: bacteria and fungi

**#2 Rivers and Streams**

* Bodies of flowing water that move in one direction
* Start at headwaters: springs, snowmelts, lakes
* End at the mouth, which enters a channel or an ocean
  + Towards mouth, water is warmer, murkier, and less oxygenated
* Most organisms found toward the middle of a river/stream
* Large diversity of plants and animals
  + Catfish, carp, river otters, turtles, frogs, salamanders, alligators, birds, mollusks, river dolphin

**Freshwater or Brackish Biomes:**

* Brackish water: Mix of fresh and salt water

1. Estuaries
2. Wetlands

**#1 Estuaries**

* Occur where freshwater rivers/streams merge with the ocean
* Water is **brackish** (mix of fresh and salt water)
* Very unique organisms due to varying salt concentrations
* Plant life:
  + Algae, seaweeds, marsh grasses, mangroves
* Animal life:
  + Wide variety
  + Worms, oysters, crabs, waterfowl

**#2 Wetlands**

* Fresh water OR brackish water
* Area of standing water that supports many plants
  + Plants are adapted to very moist and humid conditions
* Very productive
* Examples: Marshes, swamps, bogs
* Plant life:
  + Lilies, cattails, sedges, tamarack, black spruce
* Animal life
  + Very diverse
  + Many amphibians, reptiles, birds, mammals
  + Salt adapted species in salt marshes (shrimp, shellfish)

**Marine Biomes:**

* Ocean biomes (**salt water)**

1. Intertidal Zone
2. Coral Reefs
3. Ocean Pelagic Zones
4. Abyssal Zones

**#1 Intertidal Zone**

* Coastal region
* Seabed is exposed at low tide and submerged at high tide
* Harsh environment
  + Exposed to bright sun and powerful waves
* Organisms are typically small, and sometimes anchored to surface
* Plant life:
  + Sea lettuce, sea palms, sea weeds, algae
* Animal life:
  + Sea stars, sea urchins, sponges, tube worms, whelks, snails, crabs, sea cucumber

**#2 Coral Reefs**

* Very high diversity and productivity
* Salt water
* Found in warm waters around the globe
  + Water temperature must remain constant
* Coral are relatives of jellyfish and sea anemones
  + Mutualistic relationship with an algae, zooxanthellae
* Plant and animal life is **extremely** diverse
  + Fish, coral, lobsters, clams, sea turtles, sponges, sea horses, eels

**#3 Ocean Pelagic Zones**

* Open ocean
* Covers a huge area
* Consists of many different subzones
* Not densely populated, but a huge variety of organisms overall:
  + Algae, phytoplankton, zooplankton, fish, sharks, aquatic mammals (whales, dolphins), reptiles (sea turtles)

**#4 Abyssal Zones**

* Deepest part of the ocean, ocean floor
* Perpetual darkness
* Very few animals can survive with so little food and such immense pressure
* Abyssal organisms are very unique, bizarre, and found nowhere else
* Chemosynthesis:
  + Bacteria exist that can **produce** their own energy from chemicals that are expelled from thermal vents
* Plant life:
  + NONE—Since no light reaches the abyss, photosynthesis cannot occur
* Animal life:
  + Giant squid, vampire squid, angler fish, dumbo octopus, giant tubeworms

**Biosphere**

* Definition:
  + Layer of the planet where all life lives
* Three components of the biosphere
  + Lithosphere: Outermost crust of the earth’s surface
    - Makes up all continents and land masses
  + Atmosphere: Large body of air that surrounds the planet
    - Filters sunlight and creates water patterns
  + Hydrosphere: The earth’s water system
    - Fresh and salt water