BIOMES OF THE WORLD

Earth's Major Biomes

Biome

A large, relatively distinct terrestrial region with a similar climate, soil, plants, and animals, regardless of where it occurs in the world

Nine major terrestrial biomes:

- **Tropical rain forest,**
- **Savanna,**
- **Temperate decidious forest,**
- **Boreal forest,**
- **Tundra,**
- **Desert,**
- **Chapparal,**
- **Grassland,**
- **Temperate rain forest.**

- **Location of each biome is primarily determined by:**
  - **Temperature (varies with both latitude and elevation)**
  - **Precipitation**
- **Biomes can also be defined by**
  - **Winds, rapid temperature changes, fires, floods, etc.**

Whittaker's scheme: biomes delineated by average temperature and precipitation.

Climate is the major determinant of plant distributions.

Other factors are soil, fire, grazing, topography.

Vertical Zonation

- Increasing in elevation has similar effect on ecosystem as traveling to higher latitudes

Tundra

- **Treeless biome in the far north with harsh, cold winters and extremely short summers**
- **Precipitation**
  - **10-25 cm/yr**
- **Temperature**
  - **Short growing season**
  - **50-160 days**

- **Soils are nutrient poor and permafrost present**
- **Low biodiversity**
- **Low primary productivity**
- **Simple food web**

Threats to the Tundra

- **One of the most fragile biomes on the planet**
- **Oil drilling is proposed in Alaska and other areas**
- **The tundra is slow to recover from damage.**
- **Climate change**

Boreal Forests-Northern Coniferous Forests- Taiga

- A region of coniferous forests in the northern hemisphere
  - Just south of tundra
- Covers 11% of earth's land
- Growing Season
  - A little longer than tundra
- Precipitation
  - ~ 50 cm/yr
- Soils are acidic and mineral poor

Temperate Deciduous Forests

Location:

- **found in temperate zone**

  (about 48^0 North latitude)
- **Much of the human population lives in this biome**

- **Forest biome that occurs in temperate areas with a moderate amount of precipitation**
- **Precipitation**
  - **75-150 cm/yr**
- **Temperature**
  - **Seasonality**
  - **Hot summers and cold winters**
- **Topsoil is rich in organic material and underlain by clay**

Most of this biome land area has been regenerated after farming & timber harvest

Threats to Temperate Deciduous Forests

- **Many forests are cleared to provide housing for humans.**
- **Careful use of the resource can provide a renewable system if we don't take too much habitat away.**

Temperate Rainforest

- **Coniferous biome with cool weather, dense fog and high precipitation**
- **Precipitation**
  - **> 127 cm/yr**
  - **Heaviest in winter**
- **Temperature**
  - **Winters are mild**
  - **Summers are cool**
- **Soils are nutrient-poor, but high in organic material (dropped needles)**
- **Cool temperatures slow decomposition**

- Lots of precipitation
- Cool summers, mild winters
- Large trees—ideal growing conditions
- High biodiversity
- High biomass (higher than tropical rainforest)
- One of the most unique (and therefore rarest) biomes on our planet

Grassland

- Grasslands with hot summers, cold winters and too little precipitation to support trees
- Precipitation
  - 25-75 cm/yr
- Tall grass prairies
- Short grass prairies
- 90% of this biome has been lost to farmland

- **Soil has thick, organic material rich organic horizon.**
- **Periodic fires keep the dominant vegetation grasses**

Chaparral

- **Location: Primarily in coastal areas with Mediterranean climates. About 30^0 N and S of the equator.**
- **Temperature**
  - **Mild, moist winters**
  - **Hot, dry summers**
- **Frequent fires**
- **Soil is thin and often not fertile**

Threats to the Chaparral

Human development—very desirable climate for humans to live.

Deserts

- **Biome where lack of precipitation limits plant growth**
- **Temperature**
  - **Can vary greatly in 24-hr period, as well as yearly (based on location)**
- **Precipitation**
  - **< 25 cm/yr**
- **Soils low in nutrients, high in salts**

Location: Depending on type of desert, you will find them in various locations.

What are the types of deserts?

Threats to the Desert

- **Off road recreational activities destroy habitat for plants and animals.**
- **Some plants are removed by collectors, endangering the population.**
- **Human impacts last a long time due to slow growth and productivity. Impacts include cities expanding into desert environments, deposition of salts due to irrigation, and depletion of groundwater resources. Desert areas are preferred sites for storage of toxic and radioactive wastes and may be used for collection of solar energy.**

Savanna (Tropical Grasslands)

- **Tropical grassland with widely scattered trees**
- **Temperature**
  - **Varies little throughout the year**
- **Precipitation**
  - **Seasons regulated by precipitation, not temperature**
  - **76-150 cm/yr**
- **Soil low in nutrients due to leaching**

Location: Found in the tropics…near equator

Threats to the Tropical Savanna

- Invasive species
- Changes in fire management
- Because of their low elevation, some savannas are threatened by minor rises in sea level associated with global climate change

Tropical Rainforest

- **Lush, species-rich biome that occurs where climate is warm and moist throughout the year**
- **Precipitation**
  - **200-450 cm/yr**
- **Very productive biome**
- **Most species-rich biome**
- **Ancient, weathered, nutrient-poor soil**
  - **Nutrients tied up in vegetation, not soil**

Location: Found near equator…little variation in temperatures. No distinct seasonal changes.

Threats to the Tropical Rainforest

- **Humans strip the rainforests for uses including logging and cattle ranching.**
- **In addition to the plants and animals that are displaced by this destruction, entire civilizations of people are also without a home.**
- **You can help by promoting sustainable use of the rainforests' products**

Aquatic Ecosystem

- **Fundamental Division**
  - **Freshwater**
  - **Saltwater**

- **Aquatic Ecosystems also affected by**
  - **Dissolved oxygen level, light penetration, pH, presence/absence of currents**
- **Three main ecological categories of organisms**
  - **Plankton- free floating**
  - **Nekton- strong swimming**
  - **Benthos- bottom dwelling**

Freshwater Ecosystems

- **Includes:**
  - **Rivers and streams**
  - **Lakes and ponds**
  - **Marshes and swamps**
- **Represent 2% of earth's surface**
- **Assist in recycling water back to the oceans (Biogeochemical Cycling)**

- **Salinity <0.5 ppt.**
- **Lake are the deepest of fresh water systems**
- **Lakes are fed by underground aquifer or stream**
- **Ponds are fed by rainfall and may be seasonal**

Rivers and Streams

- **Changes greatly from headwater to mouth**
- **Headwaters**
  - **Shallow, cool, swiftly flowing, high oxygenated**
- **Mouth**
  - **Not as cool, slower flowing, less oxygen in water**

Threats to Rivers and Streams

- **Industry uses water to dispose of waste products**
- **Runoff from homes and other places causes changes in acidity, pollution, etc.**
- **Dams alter the flow of the water**

Lakes and Ponds

- **Body of freshwater that does not flow**
- **Three zones**
  - **Littoral**
  - **Limnetic**
  - **Profundal**
- **Experience thermal stratification (depending on depth)**

Lakes can be poor or rich in nutrients.

Eutropic lakes and oligotrophic lakes

Limnology **= study of freshwater habitats**

- **Littoral Zone** - shallow water area along the shore
- **Limnetic Zone** - open water beyond the littoral zone
- **Profundal Zone** - beneath the limnetic zone of deep lakes

Threats to lakes and ponds

All water systems are being polluted and degraded by human impact

Marshes and Swamps

- **Lands that shallow, fresh water covers for at least part of the year**
  - **Characteristic soil- water logged and anaerobic for periods of time**
  - **Water tolerant vegetation**
  - **More recently their ecosystem services have been better recognized**
    - **Flood protection, water filtering, etc.**

Uses:

- **Animal/plant homes**
- **Carbon “sink”**
- **Water recharge areas, removing pollutants**

Types: Brackish and freshwater

Estuaries

- **Where freshwater and saltwater mix**
- **Highly variable environment**
- **Temperature, salinity, depth of light penetration**
- **Highly productive**
  - **Nutrients transported from land**
  - **Tidal action promotes rapid circulation of nutrients**
  - **High level of light penetrates shallow water**
  - **Many plants provide photosynthetic carpet**

Threats to Estuaries

- **Many ports are found on estuaries—pollution**
- **Human population**

Marine Ecosystems

- **Subdivided into life zones**
  - **Intertidal zone**
  - **Benthic zone**
  - **Pelagic environment**
    - **Neritic Province**
    - **Oceanic Province**

Intertidal Zone

- Area of shoreline between low and high tides
- Habitat
  - Sandy or rocky
- Muscles
- Crabs
- Algae
- Oysters
- Barnacles
- Animals must adapts to changing conditions

Benthic Zone

- **Ocean floor, extending from tidal zone to deep sea trenches**
- **Sediment is mostly mud**
  - **Burrowing worms and clams**
- **Three zone**
  - **Bathyal: 200m - 4000m deep**
  - **Abyssal: 4000m -6000m deep**
  - **Hadal: 6000m – bottom of deep sea trenches**

Productive Benthic Communities

- Seagrass Beds
  - Present to depth of 10 m
  - Provide food and habitat to ecosystem
- Kelp Forest
  - 60-m long brown algae found off rocky shores
  - Diversity of life supported by kelp rivals
- Coral Reefs
  - Built from accumulated layers of $CaCO_3$
    - **Colonies of millions of tiny coral animals**
  - Found in shallow warm water
  - Most diverse of all marine environments

Coral Reef Environments

- **Three types of coral reefs**
  - **Fringing reef- directly attach to continent- no lagoon**
  - **Atoll- circular reef in a lagoon**
  - **Barrier reef- separates lagoon from ocean**

Human Impact on Coral Reefs

- **Sedimentation**
  - **From clear-cutting upstream**
- **Overfishing**
- **Coral bleaching**
- **Mining of corals as building materials**
- **Runoff pollution**

Pelagic Environment

- **All the open ocean water**
- **Two main divisions**
  - **Neritic Province**
    - **Water that overlies the continental shelf (to depth of 200 m)**
    - **Organisms are all floaters or swimmers**
  - **Oceanic Province**
    - **Water that overlies depths greater than 200 m**
    - **75% of world's ocean**
    - **Organisms are filter feeders, scavengers and predators**