Week 8 Notes

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May 2021

Contents

1 Mutualism, Conditional Interactions, Succession

	-	0	+
-	Competition	Amensalism	Predation
0	Amensalism	No Interaction	Commensalism Facilitation
+	Predation Parasitism	Commensalism Facilitation	Mutualism

Symbolism: An interaction between two species living in close association with each other (does not necessarily have to be a positive interaction

1.1 Facilitation

- An interaction in which the presence of one species alters the environment in a way that enhances growth, survival or reproduction of a second, neighboring species.

- Example: Limber Pine trees provide shade for young Douglas Fir trees. Shade has a positive impact on Douglas Fir survival because UV rays can be damaging.

1.2   Obligate Mutualism

- Individuals are obligated to participate in the relationship. Species can not function or survive without relationship.

- Example: Yucca glauca and Yucca moth. The Yucca plant is only pollinated by the Yucca moth, and the moth reproduces within the flowers of the plant. Yucca moth lays eggs in the plant such that larvae will be within the fruit of the plant.

- Costs and benefits

  - Yucca Plant: gets flowers pollinated, able to produce fruit. But, the larvae may harm the fruit.
  - Yucca moth: Fruit provide sustenance for larvae.
  - If the moth leaves too many larvae, the plant will abort development of that flower.

1.3   Facilitative Mutualism

- A type of mutualism in which the interacting species derive benefit from each other but not being fully dependent that each cannot survive without the symbiotic partner.

- Plants and Mycorrhizae: Plants and Fungi can survive without the relationship, but do better together.

1.4   Conditional Interactions

- Occur when the status of the interaction depends on the environment.

- Example: Plants and Mycorrhizae. If Nutrient/water availability is high, plant does not require mycorrhizae, but is still providing sugar.

- Example: Mutualistic relationships are more common at higher elevation. Surviving in a high elevation environment is difficult, and individuals require more help.

1.5   Species Interactions and Succession

- Primary vs Secondary Succession

- Primary: Total habitat destruction. Starting from bare rock.

  - Stages
    * Bare rock
    * Lichens
    * Small Plants
    * Grasses

* Grasses, shrubs, shade intolerant trees
  * Large trees

- Secondary: Sever disturbance, but there is still soil.

  - Stages
    * Bare rock
    * Lichens
    * Small Plants
    * Grasses
    * Grasses, shrubs, shade intolerant trees
    * Large trees

- Succession may affect a species' realized niche

  - A plant that requires a very developed forest system might be around early in a succession environment, but won't operate in that environment until the ecosystem recovers enough to contain the species that they need to interact with.
  - i.e. Consider a bear. They would likely not return to a succession environment until the environment contains the specie sit relies on: salmon for food, bees to make honey, and large trees to scratch their backs.

2 Biomes

- Biomes are defined by 4 main components

  - Average annual temperature
  - Annual Precipitation
  - Seasonality: Difference between dry and wet season, and warm and cool season.
  - Disturbance: How disturbances (fire) affect

2.1 Types of terrestrial biomes

- Tropical Rainforest

  - High Biodiversity
  - High precipitation and temperature all year

- Temperate Deciduous Forest

  - Seasonality in temperature and precipitation

- Deserts

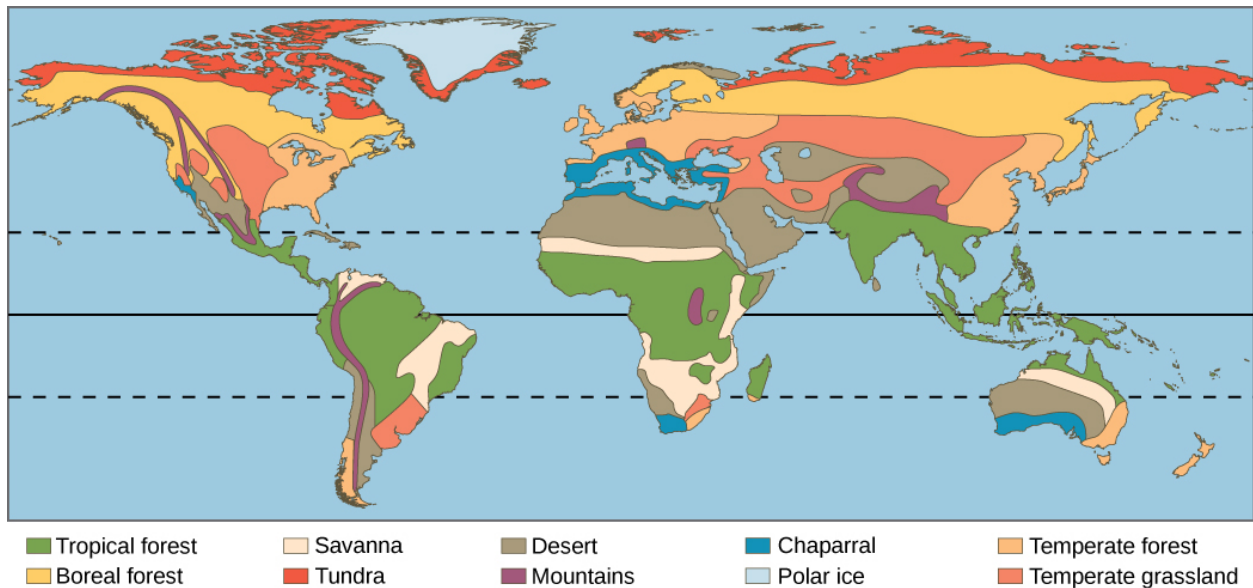 - Low Precipitation and High temperature

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Figure 1: Locations of Biomes

- Temperature has high seasonality

- By definition, very dry, but can be cold

- Cold desserts can have similar climate graph to Tundra

- Tundra

  - Seasonality in temperature and extremely low precipitation

  - Must be high latitude

- Boreal Forest - Taiga

  - Seasonality in temperature and precipitation

  - Only in northern hemisphere because the latitude negative is ocean

  - Low temperatures

- Temperate Grassland

  - Seasonality in temperature

  - Slight Seasonality in Precipitation

- Mediterranean - Chaparral

  - Seasonality in Temperature and Precipitation but they are opposites.

  - All other biomes have hot wet summers and cold dry summers, Chaparrals have hot dry summers and cold wet winters.

2.2 Aquatic Biomes

Abiotic conditions that define aquatic biomes.

- Salt Content

  - Fresh water (Lakes, rivers, streams)
  - Salt water
  - Brackish - meh

- Pelagic Zones (Ocean Zones)

2.2.1 Wetlands

- Wetland ecosystem services

  - Filter pollutants out of the water
  - Reduce sediment load
  - Habitat for species (water fowl during breeding)
  - Absorb storm surges and prevent floods

3 Fire

- Types of Fires

  - Ground Fire: Matter below the soil surface.
  - Surface Fire: Dead or dry vegetation on the ground.
  - Crown Fire: Burn through the tree canopy. They are very destructive and spread quickly.

- Fire adaptations

  - Fire tolerators (trees)
    * Tall with thick bark, no branches near the ground, long needles
  - Fire embracers (trees)
    * Short, thin bark, flammable needles, keep low branches, closed clones
    * Cones don't open until experiencing fire
  - Fire recruiters (shrubs)
    * Seeds are dormant until fire, germinate immediately after fire event.
  - Fire Persisters (shrubs)
    * Can resprout from below-ground tissue, no seed dormancy and no adaptations for surviving fire events.

* Essentially just die and hope theres enough time to come back before the next fire.

- Fire Examples

  - Prairie fire

    * Fire stimulates regrowth of grass
    * Prevents tree encroachment
    * Konza Prairie Fire Study
      · A plot burned every year is entirely grass
      · A plot burned every 4 years will have some shrubs
      · Shrubs protect trees
      · Trees in areas with more grazing are more resistant to fire because they have less low hanging brush.