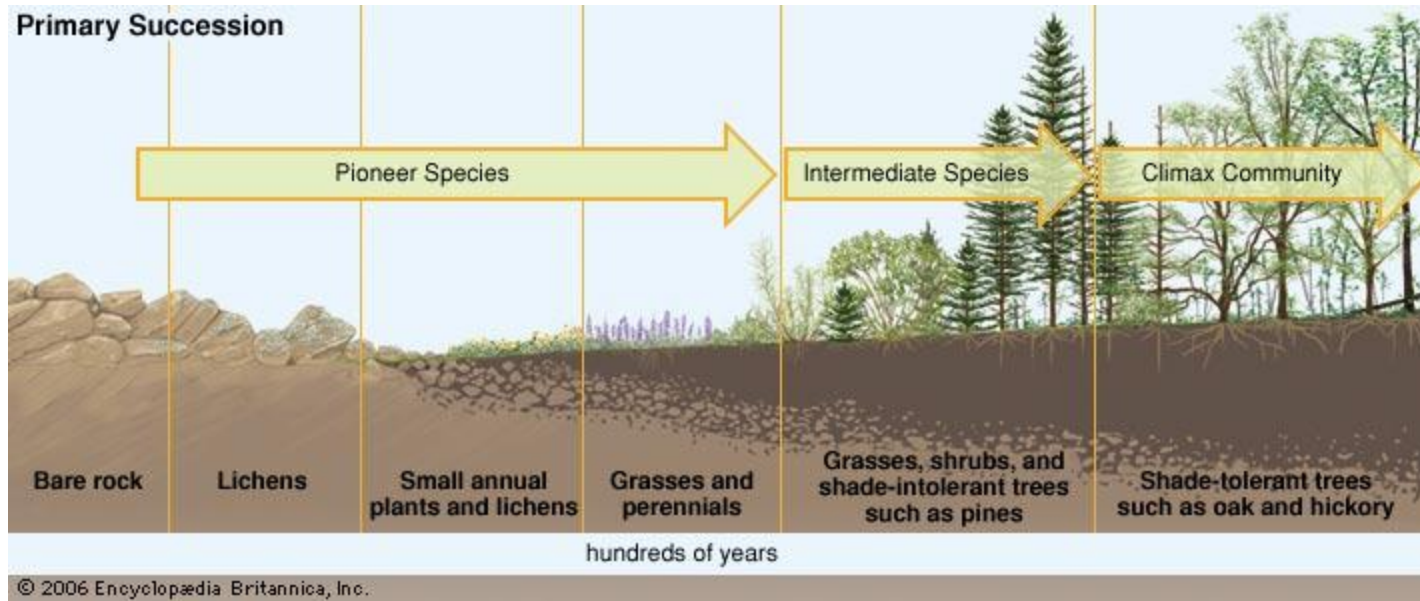


Chapters 3,4 & 5

Notes

Succession and Biodiversity



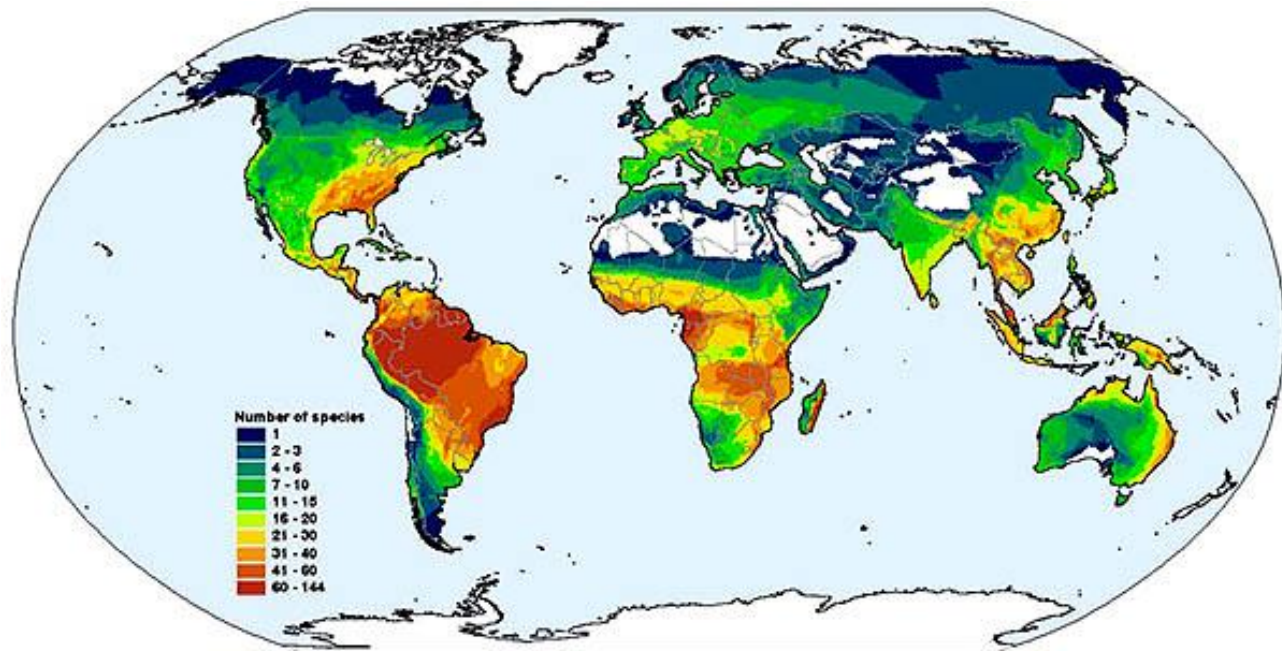
What is biodiversity?

- Variety of life in an area
 - # of different species



Species Diversity

- Number of different species and relative abundance
 - increase as you go towards the equator
 - Biodiversity hot spots



Why is diversity important to ecology?

- More diverse = more likely to flourish
 - Multiple organisms in each niche



Importance of Biodiversity

Direct Economic value

- Food, clothing, energy, medicine
- Preserve desirable genes
 - Food crops – most crops come from a few species
 - Close relatives exist in the wild
 - Disease resistant plants in wild – create disease resistant crops

Importance of Biodiversity

Indirect Economic Value

- Plants provide oxygen, natural processes clean water
 - Water cycle, carbon cycle, wetlands
 - New York City – create \$6 Billion water filtration system or clean wetlands to filter water

Importance of Biodiversity

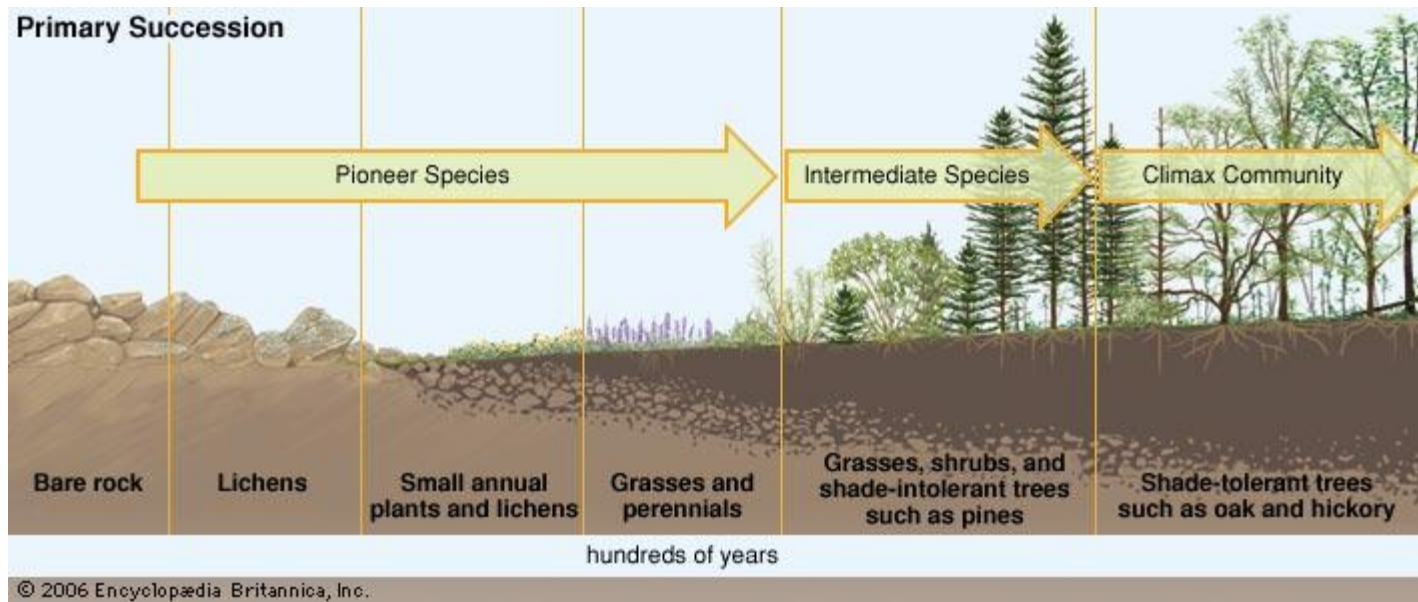
Aesthetic and scientific value

- Camping
- Hunting
- Research

Threat to Biodiversity

Threat	Description	What organisms it affects	How does it disrupt an ecosystem?

Ecological Succession



Succession and Disturbance

- **Primary succession:** occurs on bare, lifeless substrate
 - Open water
 - Rocks
- Organisms gradually move into an area and change its nature

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b.

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c.

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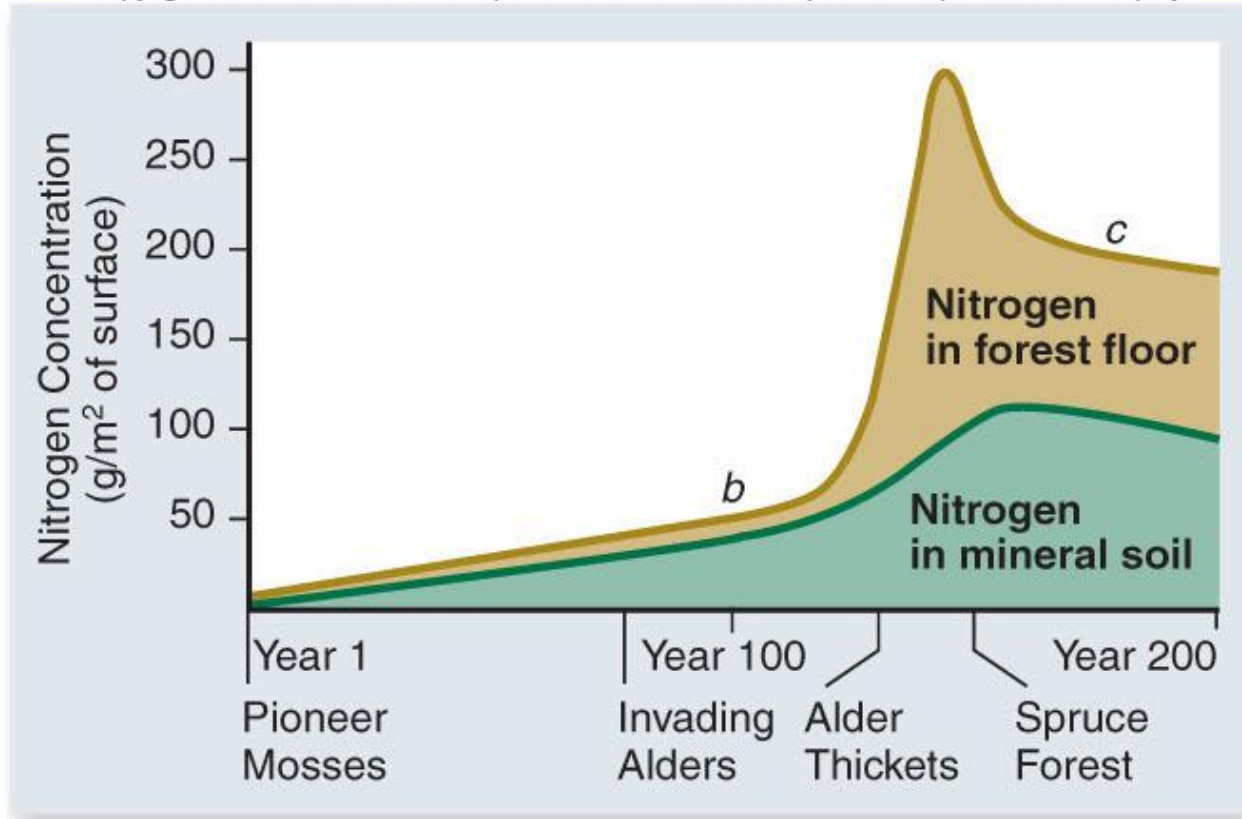


d.

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Succession and Disturbance

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a.

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Primary succession on glacial moraines

Succession and Disturbance

- **Secondary succession:** occurs in areas where an existing community has been disturbed but organisms still remain
 - Example: field left uncultivated
 - Forest after a fire
- Succession happens because species alter the habitat and the resources available in ways that favor other species entering the habitat

Succession and Disturbance

- Animal species in a community can also change over time
- Krakatau island
 - Volcanic eruption
 - Fauna changed in synchrony with the vegetation
 - Changes in animals affect plant occurrences; pollination, animal dispersion

Succession and Disturbance

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a.

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b.

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Succession after a volcanic eruption

Succession and Disturbance

- Communities are constantly changing as a result of

- Climatic changes
- Species invasions
- Disturbance events

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- Nonequilibrium models that emphasize change rather than stability are used to study communities and ecosystems

Succession and Disturbance

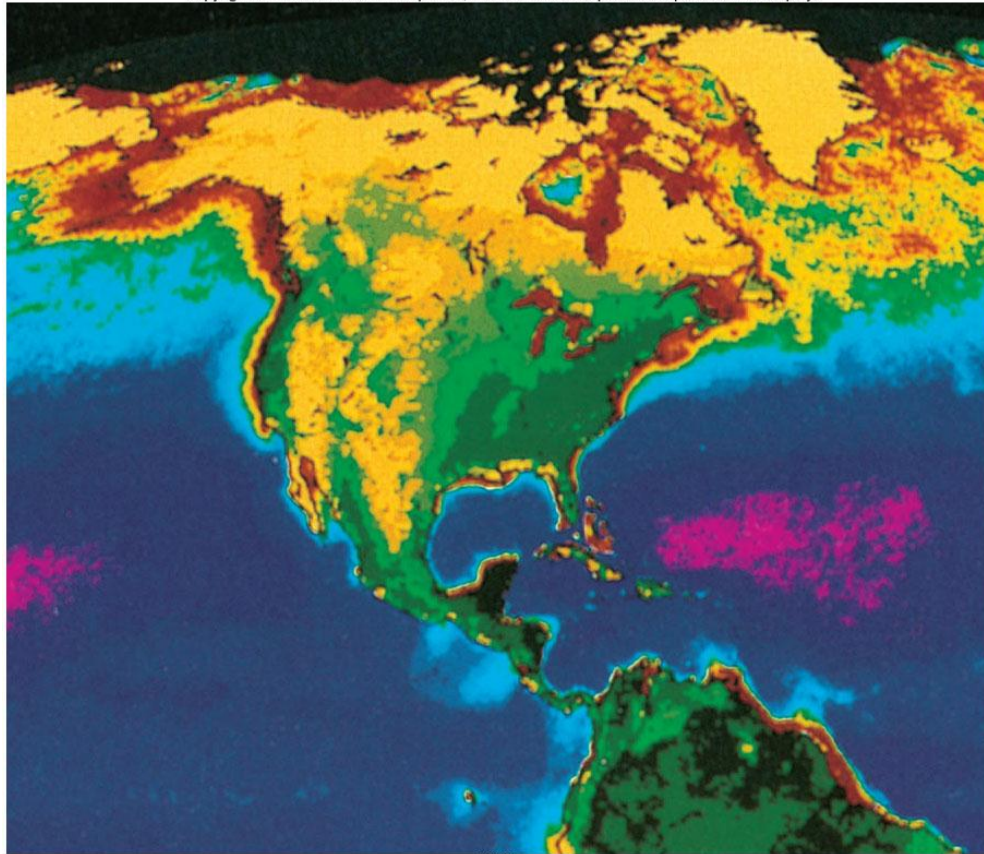
- Disturbance is common, rather than exceptional in many communities
- Understanding the role that disturbances play in structuring communities is an important area of ecology



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Biomes 3.2

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NASA

Effects of Sun, Wind, Water

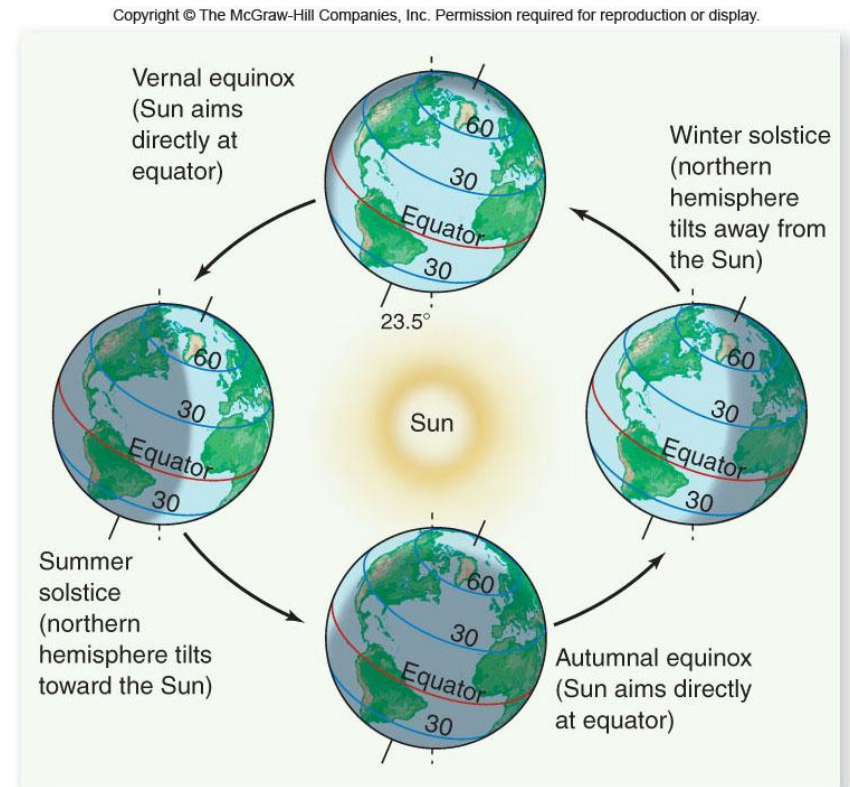
- **Biosphere:** includes all living communities on Earth
- Global patterns of life on Earth are influenced by
 1. The amount of solar radiation that reaches different areas
 2. Patterns of global atmospheric circulation which influence oceanic circulation

Effects of Sun, Wind, Water

- Earth receives energy from the Sun
- Solar energy passes through the atmosphere and its intensity & wavelengths are modified
- About 1/2 of the energy is absorbed within the atmosphere
 - UV-B is strongly absorbed by the ozone

Effects of Sun, Wind, Water

- **Inclination of the Earth:** or the tilt of the Earth this along with the orbit is the reason for the seasons.
- The further North or South in Latitude from the equator the lower the angle of the sun and the solar energy that will strike the Earth



b.

Weather vs Climate

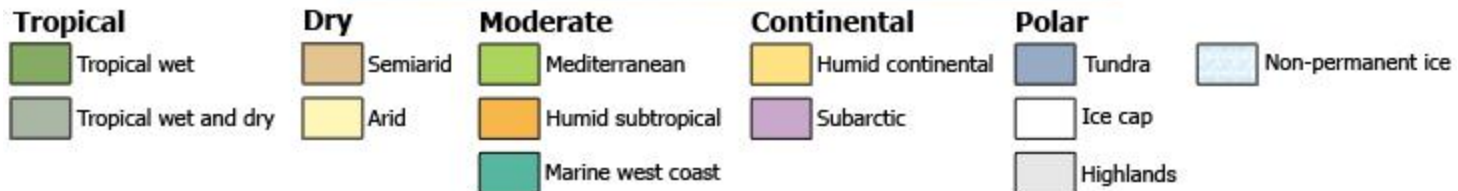
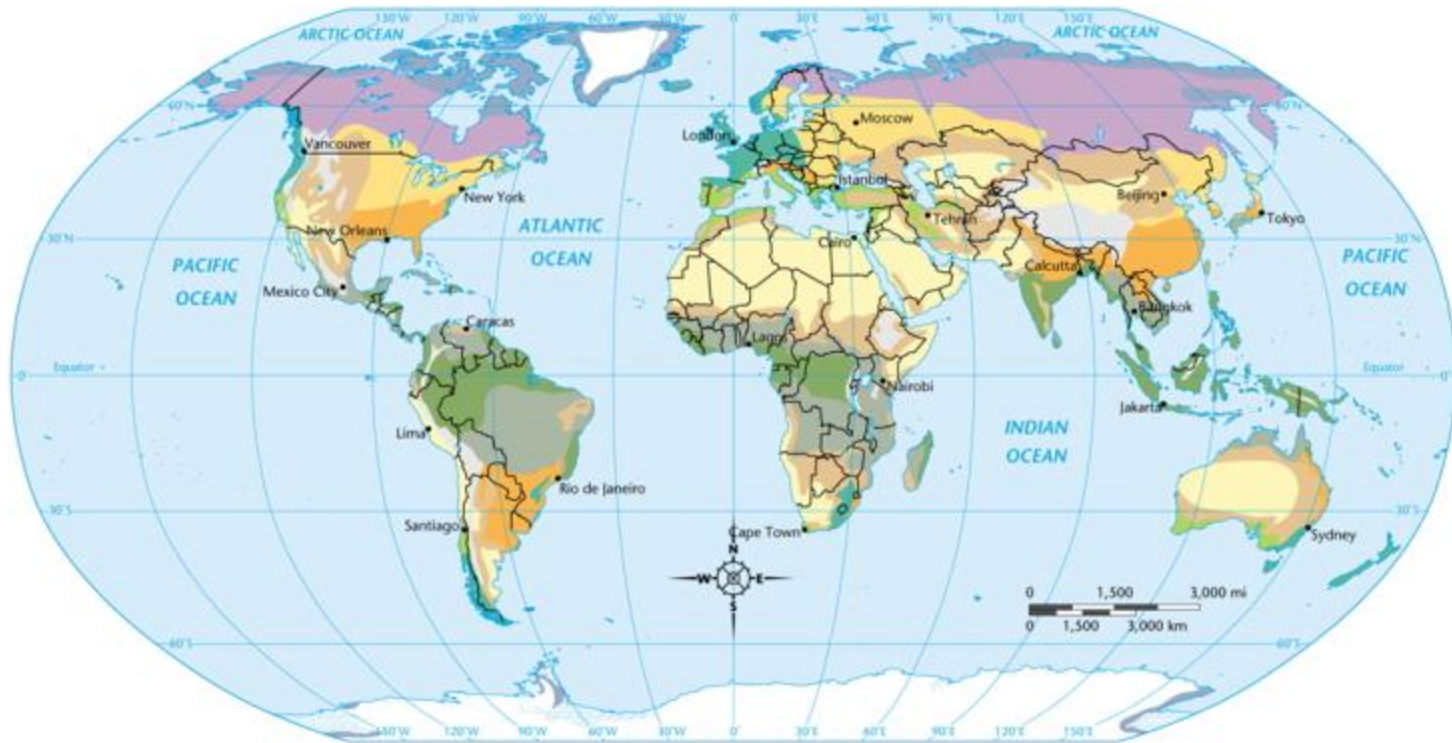
- **Weather** is what the current atmospheric conditions are like at any one moment. What is happening NOW!



Weather vs Climate

- Climate is the average weather conditions over a period of years. Usually decades.
- The areas latitude has a great effect on the Climate!! Is it the only One??
- No!! Elevation, Size of the continent and ocean currents effect the climate.

Climate Map



Biomes

- **Biomes:** a major type of ecosystem on land
- Each biome has a characteristic appearance
 - Defined largely by sets of regional climatic conditions
- Biomes are named according to their vegetational structures
- Eight principle biomes




polar ice	mountain zone	warm, moist evergreen forest	chaparral	semidesert
tundra	temperate deciduous forest	tropical monsoon forest	temperate grassland	desert
taiga	temperate evergreen forest	tropical rain forest	savanna	

Biomes

- **Tropical rain forests**

- 140-450 cm or 55- 177 inches rain/yr
- Richest ecosystems in Biodiversity on land.
- High temperature and high rainfall
- Very high diversity: 1200 species of butterflies in a single square mile

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Biome	Climate	Example Location	Characteristic Flora	Characteristic Fauna
■ Tropical Rain Forest	High temperatures year round	 <p>Brazilian rain forest</p>	 <p>Plant Species</p>	 <p>Animal Species</p>

(left to right): © age fotostock/SuperStock; © Luiz C. Marigo/Peter Arnold; © age fotostock/SuperStock

Biomes

- **Savanna**

- 50-120 cm or 20- 47 inches rainfall/yr
- Tropical or subtropical grasslands or tall and Short Grass Prairie.
- Occur as a transition ecosystem between tropical rainforests and deserts.
- In Minnesota transition of Deciduous and Prairie.






Red Oak Savannah



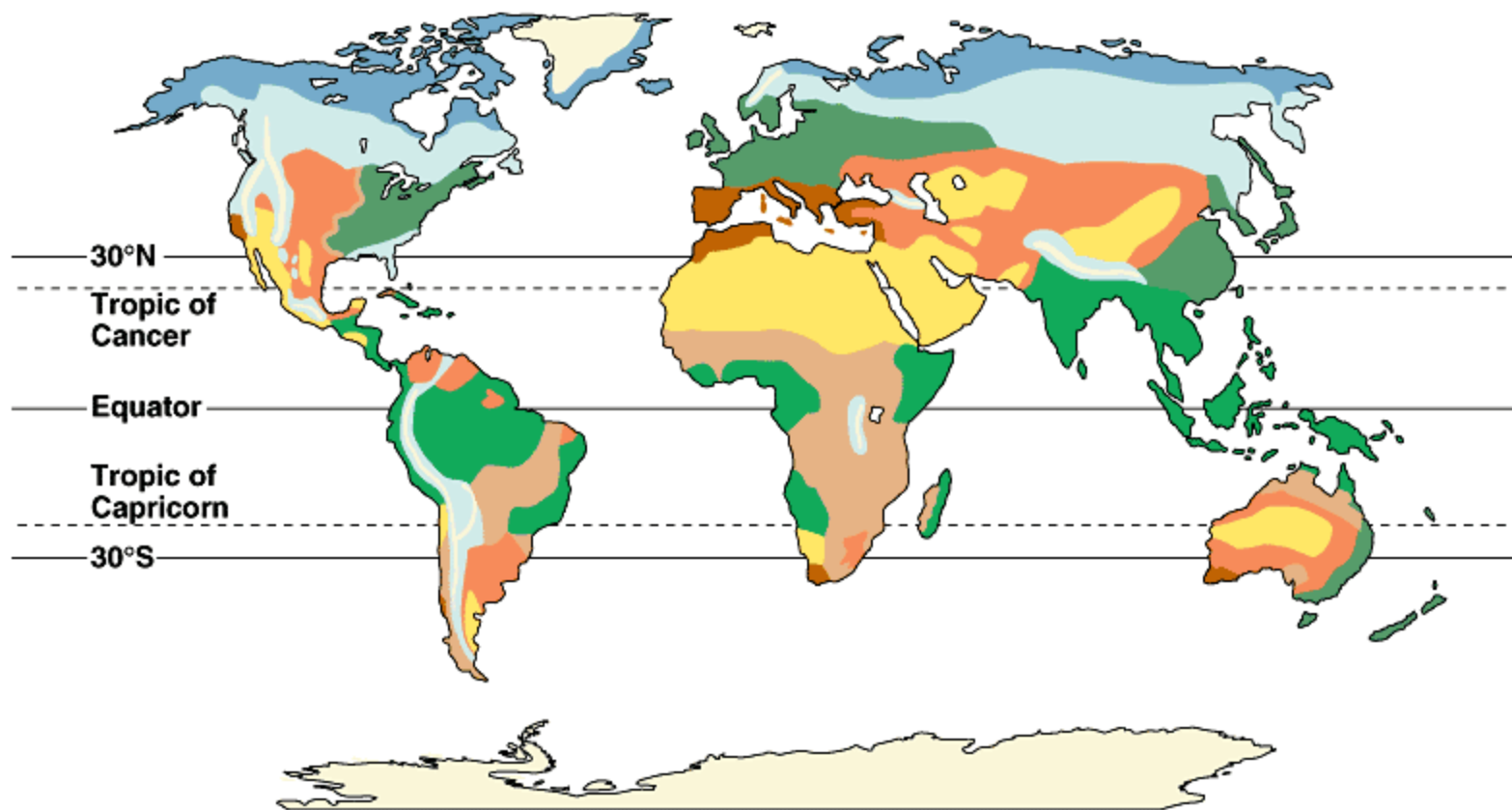
Biomes










- Deserts
 - 25-40cm or 10-16 inches rainfall/yr; unpredictable
 - Plants and animals cannot depend on any rainfall
 - 30°N and S latitudes, rainshadows
 - Vegetation sparse, animals adapted to little water availability

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Biome	Climate	Example Location	Characteristic Flora	Characteristic Fauna	
☐ Desert	Warm and cool temperatures	 Mojave	 Plant Species	 Animal Species	

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- | | | |
|---|---|--|
|  Tropical forest |  Polar and high-mountain ice |  Temperate deciduous forest |
|  Savanna |  Chaparral |  Coniferous forest |
|  Desert |  Temperate grassland |  Tundra (arctic and alpine) |

Biomes

- **Temperate grasslands or Prairies**
 - Rich soils
 - Grasses with roots that penetrate deep into the soil
 - In North America converted to agricultural use
 - Adapted to periodic fire

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Biome	Climate	Example Location	Characteristic Flora	Characteristic Fauna
■ Temperate Grasslands	Warm summers cool winters	 <p>South Dakota prairie</p>	 <p>Plant Species</p>	 <p>Animal Species</p>

(left to right): © Jon Arnold Images/Alamy; © Jim Brandenburg/Minden Pictures; © Eastcott Momatiuki/Getty Images

Temperate Grassland: Marked by seasonal drought and fires, and grazing by large animals. Rich habitat for agriculture, very little prairie exists in US today.
Precipitation: 19.6 inches to 25.1 inches.
Ave Temp: 64 to 70 degrees F







Temperate Forest or Deciduous Forest

- **Deciduous** : Comes from the Latin term that means to fall off.
- The reason for the leaf fall is due to the lack of sunlight .
- The chlorophyll breaks down into a colorless compound. The other secondary pigments then come out.



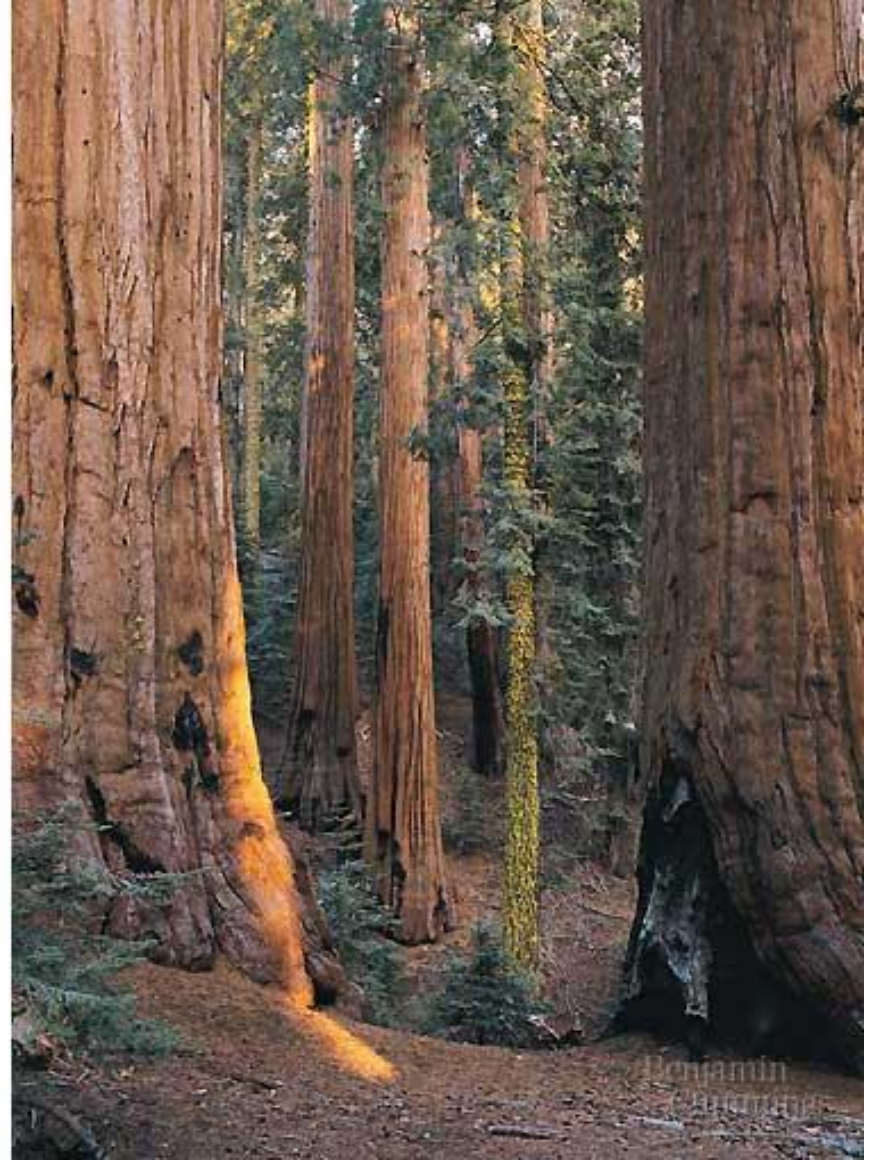
Benjamin
Cummings

Deciduous

- **Climate:** In Minnesota
- The temperature range: is from 37°F in NW to 45°F in SE
- Precipitation: 20” in NW to 32+” in the SE.
- Frost free days: 100 in the northwest; 160 in the southeast.

Deciduous Forest

- **Ecosystem Functions**
- The deciduous forest is the highest in productivity found in Minnesota.
- This area has a high rate of decomposition as well as a good rate of precipitation to supply the area for good plant growth.



Coniferous forest: Largest terrestrial biome on earth, old growth forests rapidly disappearing, usually receives lots of moisture as rain or snow.

Coniferous Forest OF Minnesota

- Found in the Northeastern 1/3 of the state.
- The surface of this area is mainly exposed rock with very little **humus**. This is an area that was glaciated heavily and had to go through **Primary Succession**. **Lichens** are the pioneer species that breaks up rock material to make soil.
- The soil in this region are very acidic due to pine needles, and there is not a lot of ground cover.

Coniferous Forest OF Minnesota

- Consists of Jack ,White, Norway Pines and Balsam Fir.
-
- Ave Temperature is 36°F – 41°F
-
- Precipitation is 21-28 inches
-
- Snowfall is over 68 inches with a 1 inch cover for about 125 Days.
-
- Frost free season may be less than 100 days. May to Sept.

Coniferous Forest OF Minnesota

- Conifers grow in soils that are dry and coarse with little nutrients. It is beneficial for them to have needles all year because they can begin photosynthesis as soon as water is available. (From early spring to early winter.)

Coniferous Forest OF Minnesota

- Conifers also benefit from not wasting energy to grow new leaves every year.
- The needles are coated with a cutin and the stomata are deeply set into the needle, this keeps the tree healthy in low water times of the year.

How are humans a threat to biodiversity?

Agenda for Friday Oct 26th

1. Finish Biodiversity Stuff
2. Review

TEST MONDAY

Human Impact

- How do humans decrease biodiversity?
- land use, the cutting of vast areas of forest, pollution of the soil, air, and water, add/remove organisms
- energy demand

Human Impact - pollution

- Air pollution
- acid rain
- damage to the ozone layer
- Smog
- global warming
- Biological magnification

Human Impact - pollution

- Water pollution
- Eutrophication
 - accumulation of nutrients in water (Nitrogen)
 - causes excessive algal growth
 - reduction in O₂ levels and death of aquatic life

How do we conserve and protect biodiversity?

Pages 129-135

Groups will pick 3 key words from the section they are given.

Write 1 sentences summarizing what you read.

Conserving Biodiversity

How do we conserve and protect biodiversity?

- Endangered Species Act
- Protected areas
 - National Parks
 - State Parks
 - International Protected areas
 - Large reserves protected by buffer zone

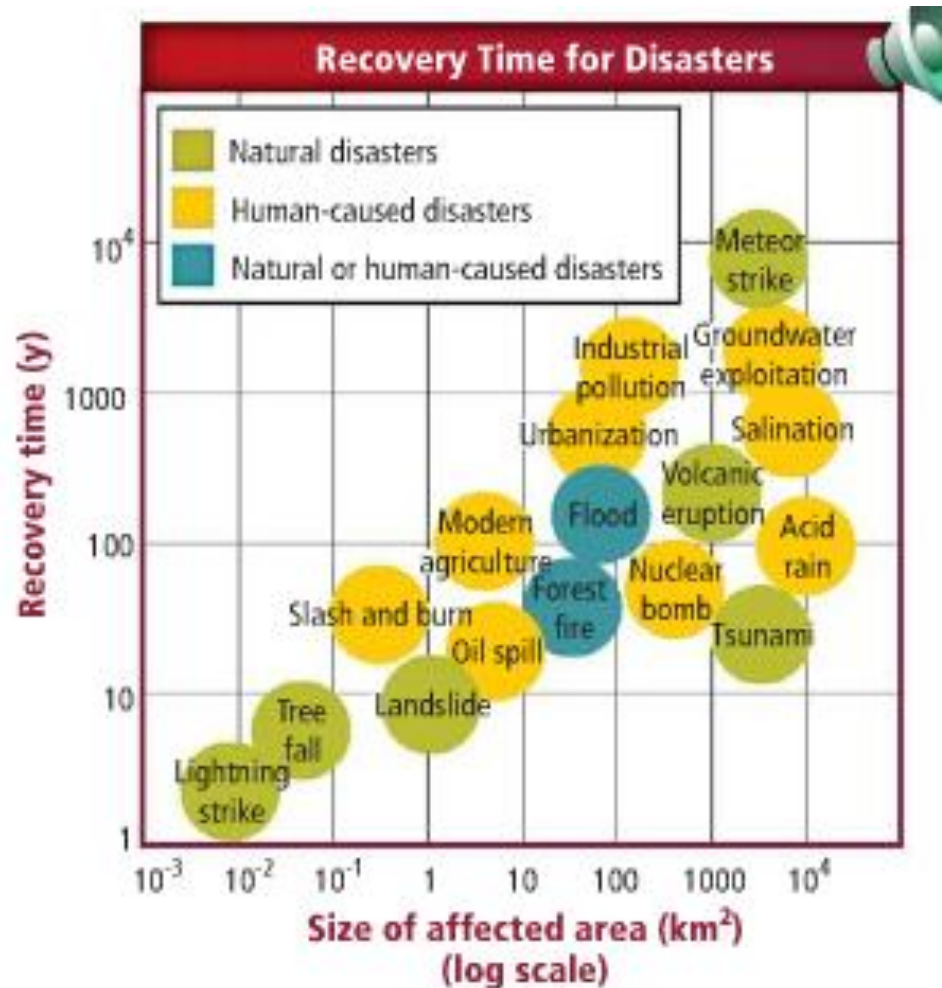
Conserving Biodiversity

- Identify hot spots
 - Endemic species – species found only in one area
- Corridors
 - Between habitat fragments
 - Allows animals to move safely
 - Creates a larger piece of land = sustain wider variety of species and genetic variation
 - Can spread disease



Restoring Ecosystems

- Abandoned land can recover to create a new ecosystem



Restoring Ecosystems

- Bioremediation – using living organisms to detoxify an area
 - Gulf coast oil spill and bacteria
- Biological Augmentation – adding natural predators to a degraded ecosystem

Non-native/Introduced and Invasive species

- Invasive - species that are not native to Minn.
 - cause economic, env't, harm or harm human health
- No predators, parasites, and competition to keep in check
 - No natural enemies
- Not all are harmful
 - Pheasants

Common Invasives

- Buckthorn



- Zebra Mussels

- Emerald Ash Borer



- Silver Carp



Threats to biodiversity



Habitat loss



Smaller, narrower fragments suffer more from edge effects



"It's the edge effect."

- Fragmentation
- Edge effect



Overexploitation

Human Population

- **Population Growth caused many changes in the environment:**
- **Birthrate/ Death rate:** The two main factors that determine population growth.
- **Birthrate:** Highest increase in U.S. Population was during the “Baby Boom”
- 1947-1964

Human Population

- U.S. and Europe had a decrease in numbers during the 1970s
- 1980s & 1990's U.S. rate rose.
- Tropical Regions of Asia, Africa, and South America; Rose nearly **3%** each year
- This will cause the world population to double in **23** years.

Human Population

- **Death rate:** This has decreased world wide.
- 1. More food
- 2. Better medical care.
- 3. Better childhood survival rate.

Human Population

- **What effects in these two factors have:**
- 1. Need more room for food and housing.
- Clear cut tropical areas.
- 2. Burning more fuels: Pollution with CO2 etc.
- Even though the U.S. pop is stable we use more Energy than ever.

Fate of the Earth

- **Biodegradable:** Waste products that can be broken down by microbes
- EX. sewage and food scraps.
- **Non-biodegradable:** Material that cannot be broken down by microbes or takes a very long time.
- Ex. Plastics, asbestos, glass, radioactive wastes, Chemicals DDT & PCB's

Fate of the Earth

- **Biological Magnification:** This is the step by step increase in contaminants as food moves through the food chain. 1. a plant is sprayed with DDT.
- 2. A insect eats the plant and increases their level of DDT.
- 3. A frog eats high amount of infested insects, and the frogs level of DDT increases.

- 4. A fish feeds on many of the infested frogs causing them to have even higher
- concentrations of DDT in their body.
- 5. An eagle or osprey eats the fish. This high concentration of DDT causes them to lay eggs that are too thin to be incubated.
- **Remember this is only one food chain. This affects the entire food web.**
- And concentrations of each contaminant become greater at each step.
- **DDT, Mercury, Radiation, & All toxins** are passed down

Acid Rain:

- This is caused when pollutants combine with water, rain, snow, etc.
- **coal contains sulfur**. When the coal is burned it releases Sulfur dioxide. This combines with water to form sulfuric acid.
- **Gasoline contains Nitric oxide**. When the gasoline burns it releases Nitric oxide and in the presence of sunlight combines with another oxygen forming Nitrogen dioxide

Fate of the Earth

- **Fate of the Earth:**
- The survival of humans and our society depends on the survival of other organisms in the biosphere.
- **Forests:** Provide us with wood and wood pulp
- Vital parts of the ecosystem, the roots hold down soil and hold water.
- Without it we would have large runoffs into lakes and streams.

Fate of the Earth

- **Endangered Species.** animals that are threatend to extinction.
- 461 foreign species of animals as being endangered.