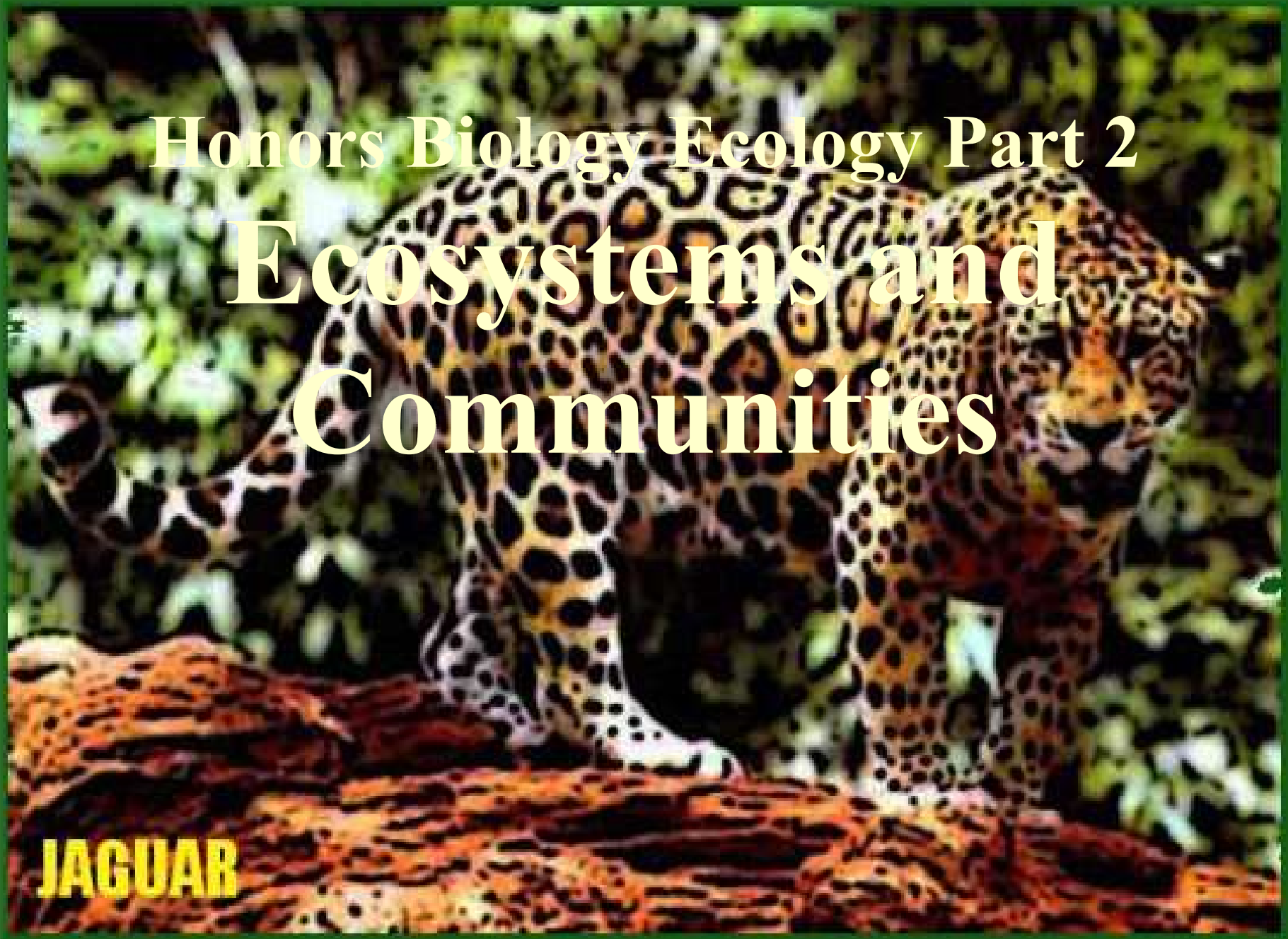


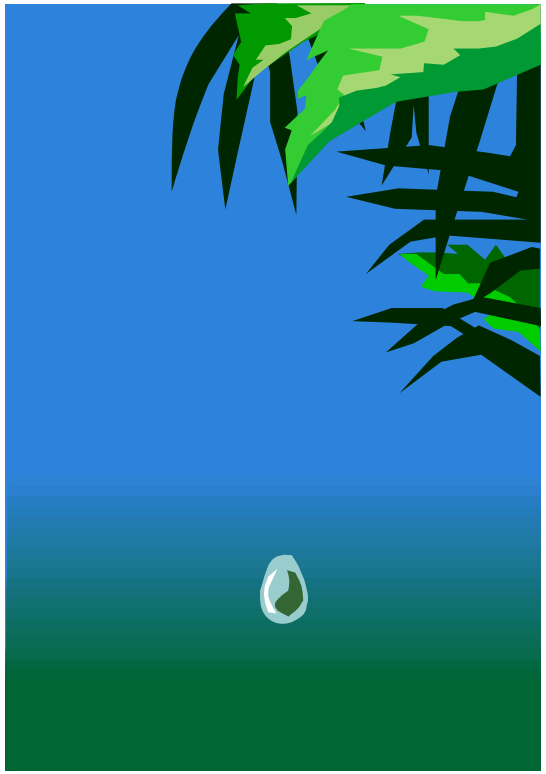
Honors Biology Ecology Part 2

Ecosystems and Communities

IV. Ecosystems and Communities

A. The Role of Climate

1. **Weather-** day-to-day condition of Earth's atmosphere

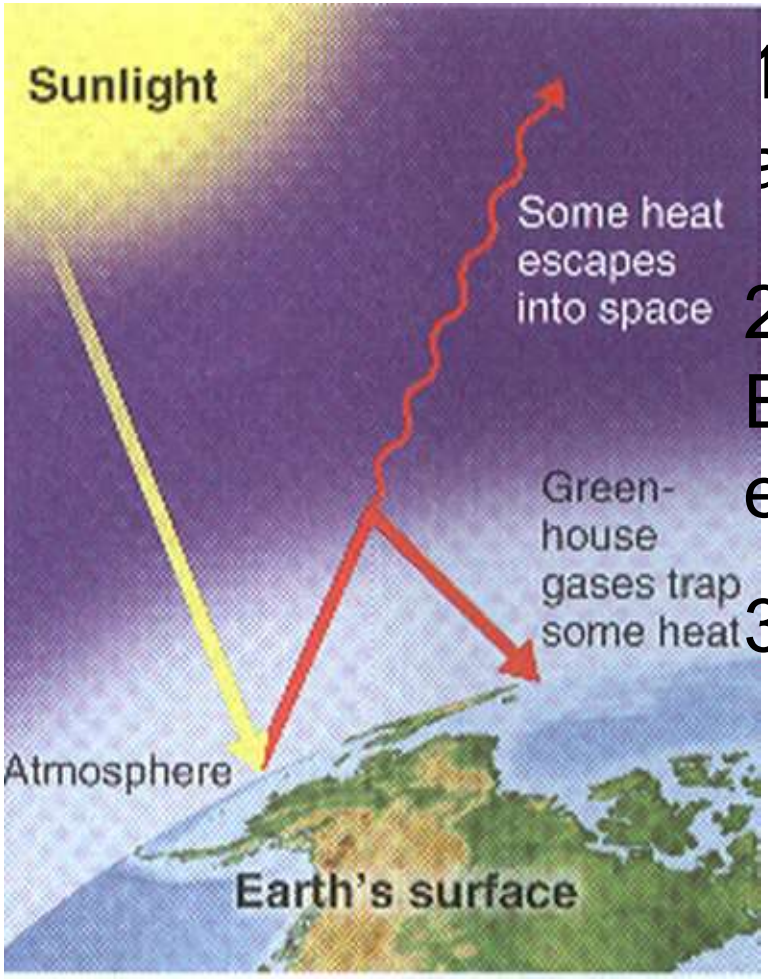


2. **Climate**- average, year-after-year conditions of temperature and precipitation in a particular region. Caused by interplay of many factors

Six Factors that Affect Climate

- Heat trapping of the atmosphere (Greenhouse effect)
- Latitude
- Transport of heat by winds, ocean currents
- Amount of Precipitation from the wind, etc.
- Shape/Elevation of Land
- Energy of incoming sunlight

a. Greenhouse Effect- atmospheric gases (CO_2, CH_4, H_2O), etc.) trap heat like a blanket and maintain Earth's temperature range



1). Solar energy can penetrate atmosphere

2). Sunlight hits surface of Earth and turned into heat energy

3). Gasses trap heat energy

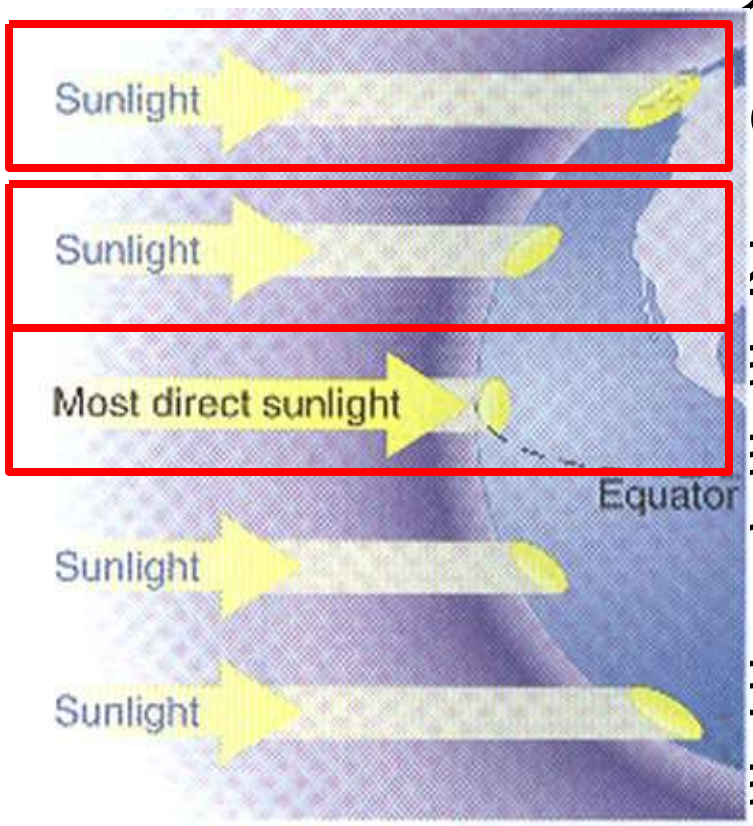
WHAT IF NO "GREENHOUSE EFFECT"?

- The Earth would be 30 **Celsius**

  Degrees colder!!!

- That is equal to 86 Degrees Farenheit colder!!

b. Effect of Latitude- The earth is tilted on its axis so the surface of the Earth receives varying amounts of solar radiation because of different angles of sunlight. Three main climate zones

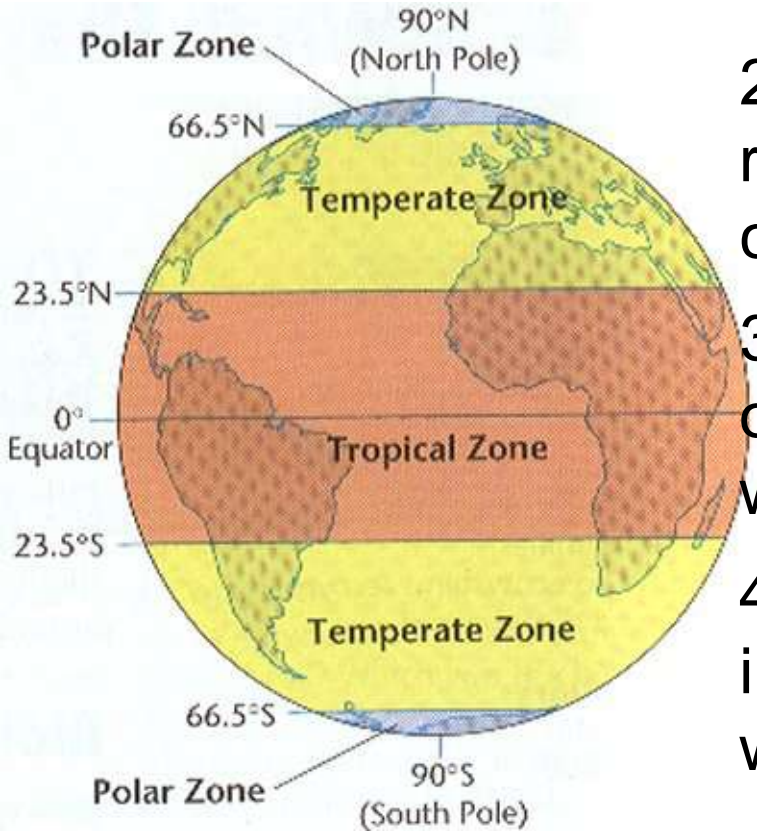


1). **Polar Zone**- sun strikes at ow angle

2). **Temperate Zone**- zone affected more by changing angle of sun- climate changes not to cold

3). **Tropical Zone**- direct sun all year. Always warm

c. Heat transport in Biosphere- unequal heating of Earth's surface drives winds and ocean currents



1). Warm air at equator rises and cool air at poles sinks – creates winds, which alter expected climate of latitude

2). Cold water at poles sinks and rises in warmer regions (**upwelling**)- creates currents.

3). Landmasses affect winds and ocean currents (physically interfere with circulation.

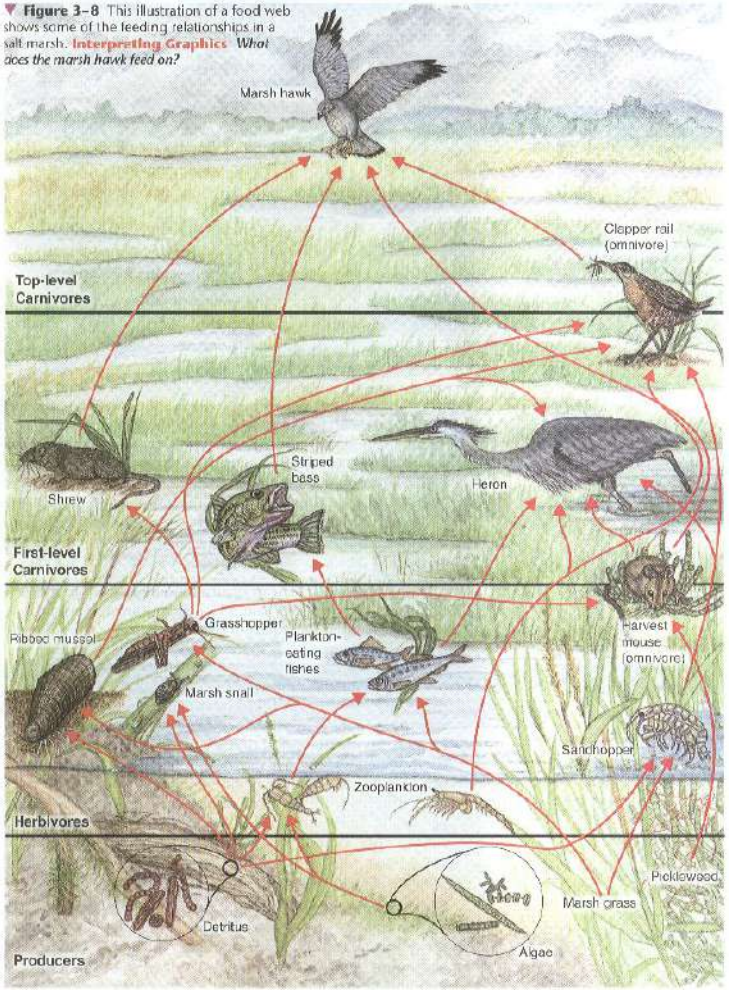
4). Winds, currents, landmasses influence temperature and precipitation which in turn create Earth's climate

Rain Shadow Effect

- When wind approaches mountain ranges, it causes air to rise.
- As the air rises, it cools, causing precipitation on the windward side of the mountain range. (Lots of rain, snow, etc.)
- On the far side of the mountain range, there is no water vapor left, so the lee side of the mountain range is DRY!!! (Deserts exist in the “Rain Shadow” of mountain ranges.)

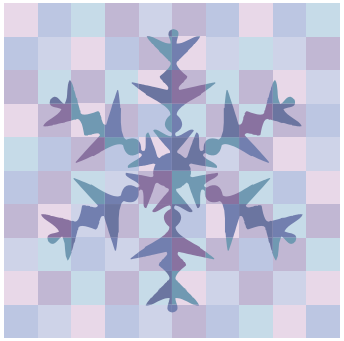
V. What Shapes an Ecosystem

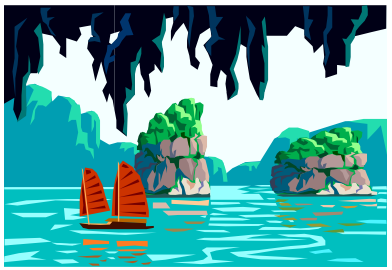
A. Ecosystems influenced by combination of factors



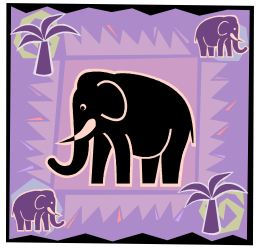
Abiotic factors- physical, or nliving, factors that shape an osystem *(e.g. temperature, ecipitation, humidity)*

Biotic factors- biological luences on organisms (all living ngs in ecosystem)

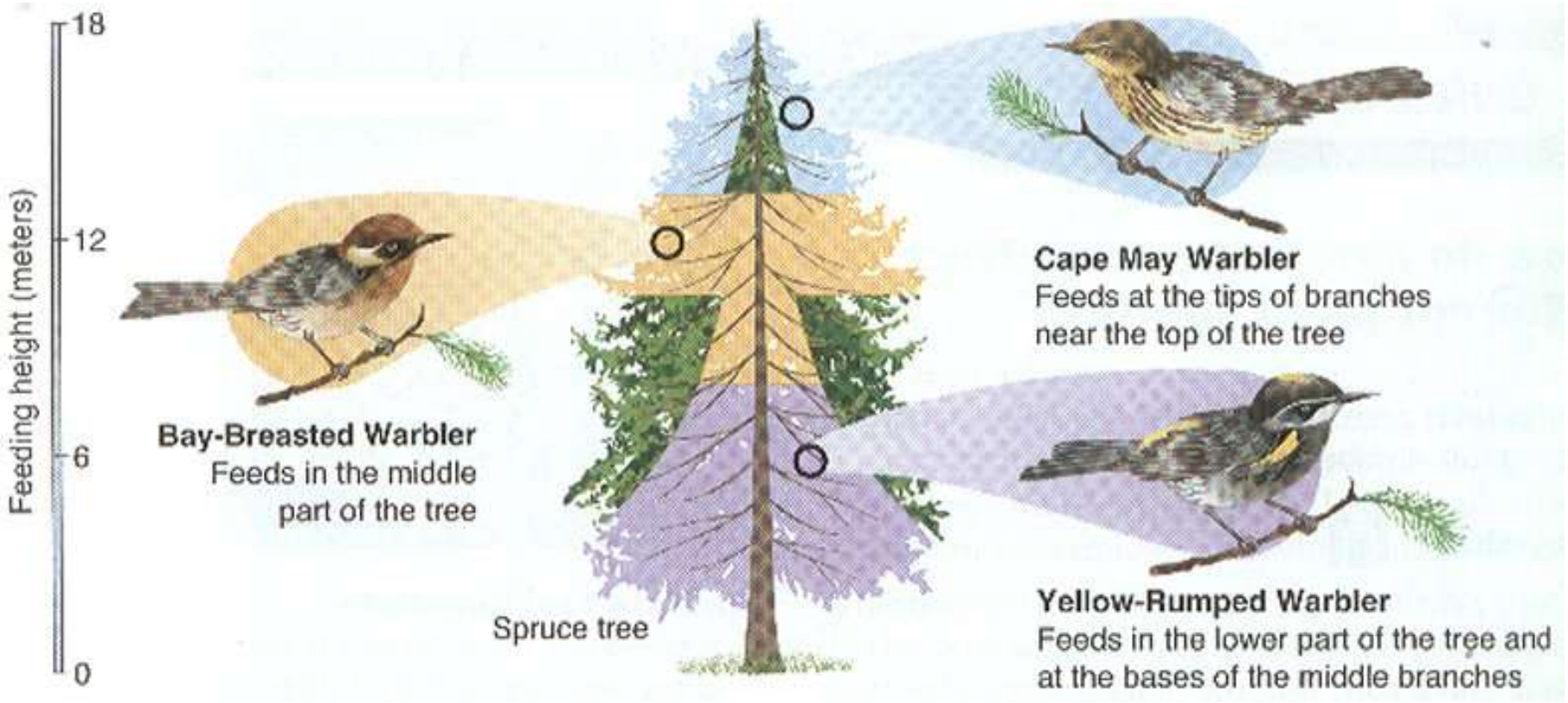




- ***Both Biotic and Abiotic factors determine the survival and growth of an organism, and the productivity of the ecosystem in which it lives!!!!!!!!!!*



B. The Niche- all conditions (biological and physical) in which organisms lives and the way organism uses these conditions



C. Community interactions- organisms interact constantly within an ecosystem

1. **Competition**- occurs when organisms attempt to use ecological resource in same place at same time

a. Resources include necessities of life (water, nutrients, light, food, space)

b. **Competitive exclusion principle**- no two species can occupy the same niche in the same habitat at the same time

2. Predation- interaction when one organism captures and feeds on another

3. Symbiosis – relationship in which two species live closely together. Three main classes

a. Commensalism- one benefits and the other is neither helped nor harmed.

b. Mutualism- both species benefit

c. Parasitism- one organism lives on or in another obtaining part or all of its nutritional needs

D. Disturbance and Succesion- ecosystems are constantly changing in response to natural and human disturbances.

1. Ecological succession- the gradual change in living communities that follows disturbance

Succession after Yellowstone fire

3 CAUSES OF SUCCESSION

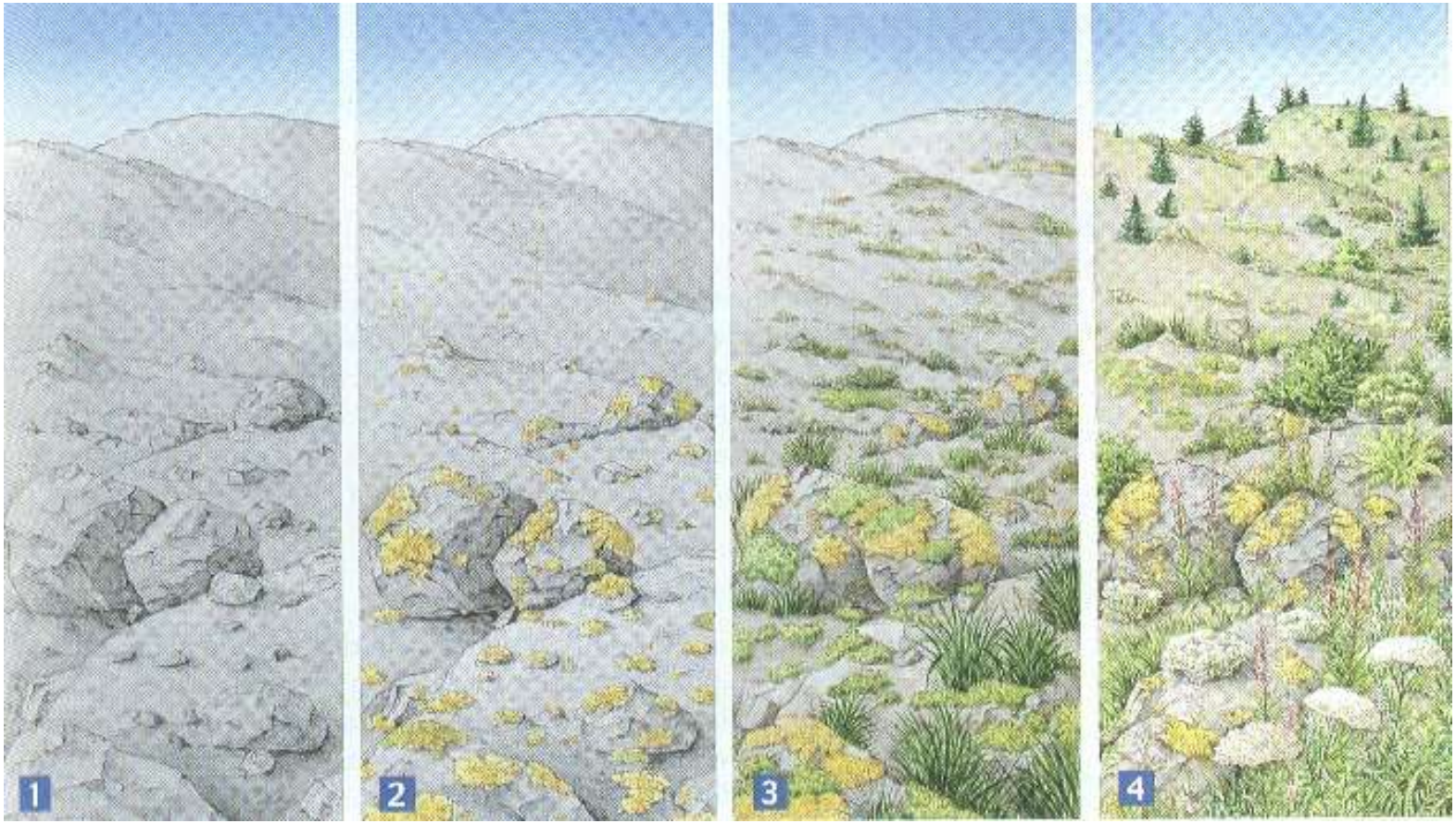
- Natural disasters: Fires, volcanoes, floods, hurricanes, tornadoes, etc.

- Man's activities: farming, mining, etc.

- Gradual, environmental physical change

a. Can result from slow changes or sudden natural disturbances (e.g. volcanic eruption- Mt. St. Helens)

b. Occurs in stages

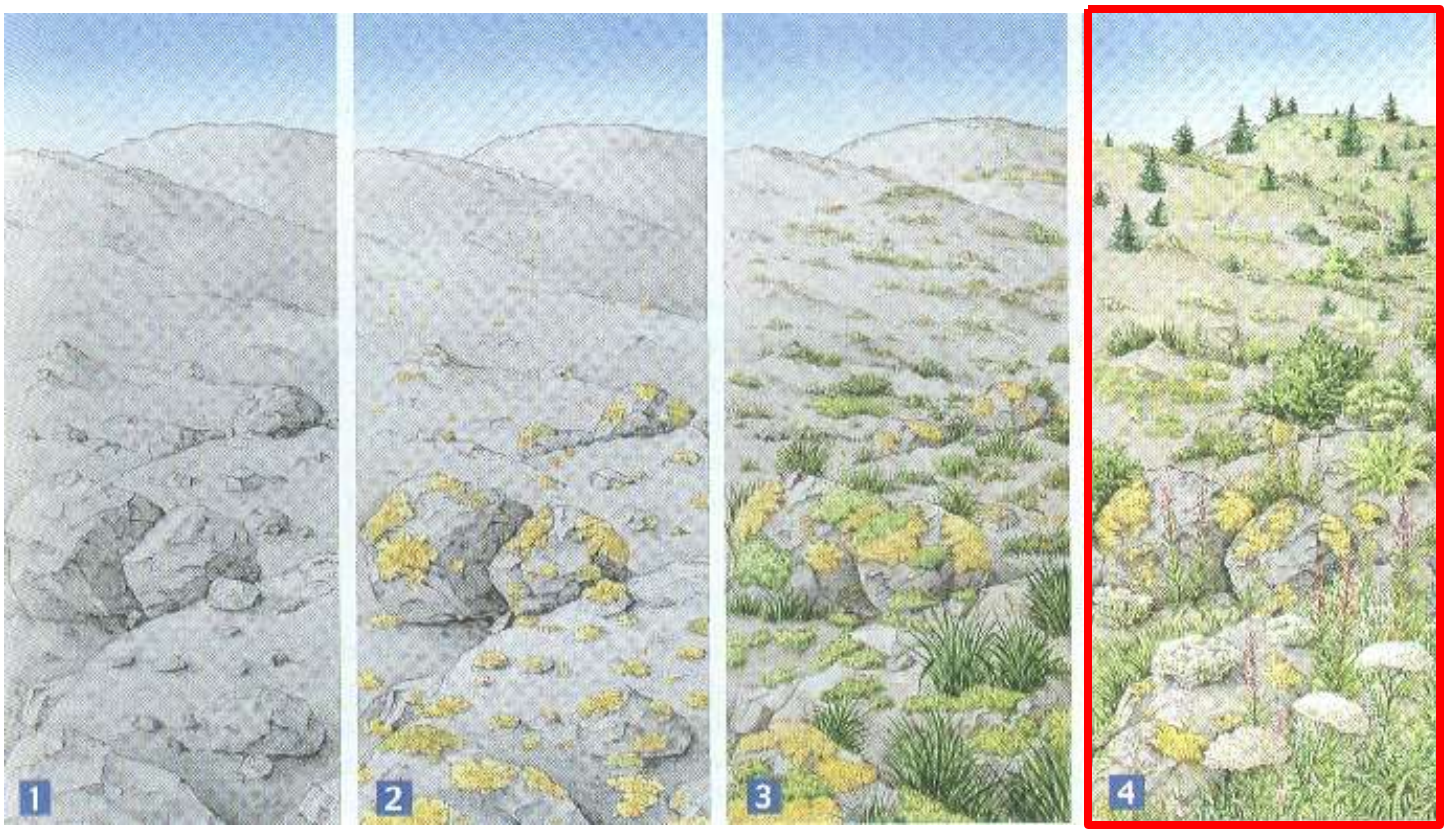


Types of Succession

- Primary Succession – starts where NO SOIL EXISTS!!!
  - 1. Ex. Volcanic Island, Glacier Melting
  - 2. Pioneer species: Usually lichens, then weeds

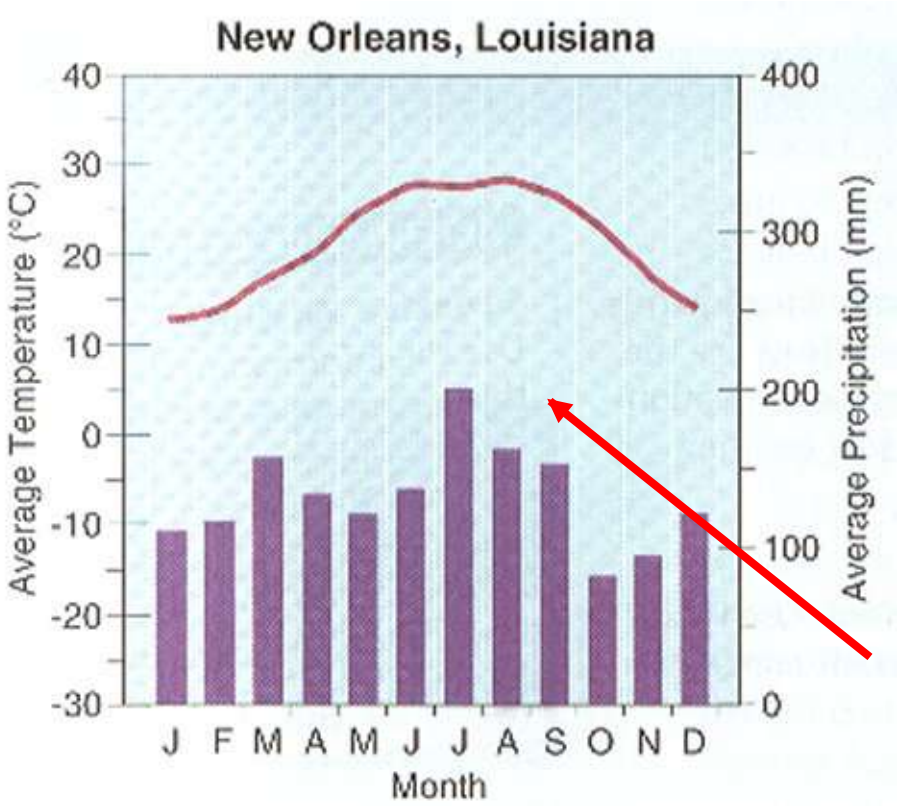
- Secondary Succession – Follows a disturbance where soil still remains
  - 1. Ex. Forest Fire, Abandoned Farm Field, etc.
  - 2. Pioneer Species: Usually weeds

4. Climax community- when succession ends with mature, stable community that does not undergo further succession. Every biome is represented by a particular climax community (e.g. savanna, tundra, desert, etc.)



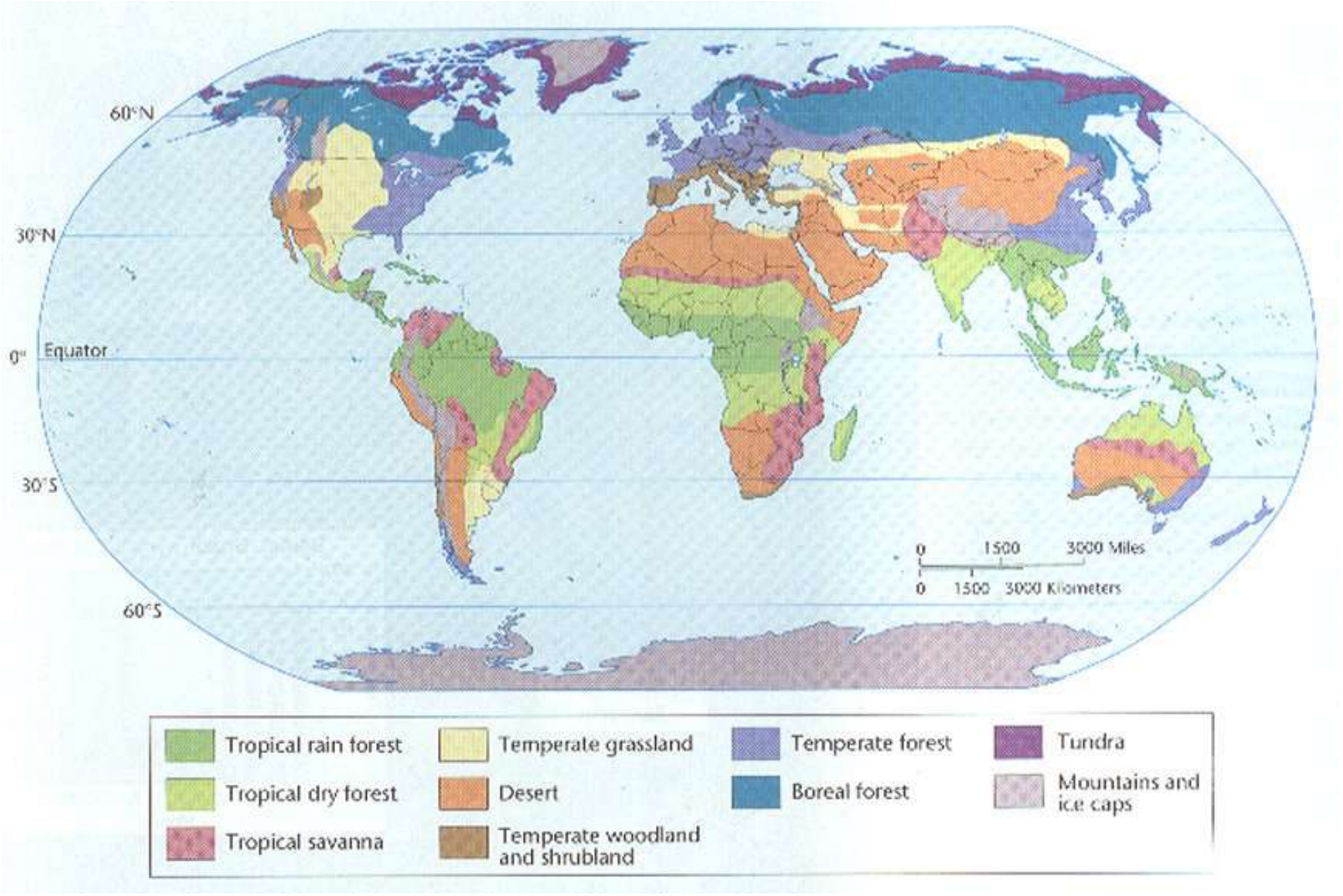
VI. Land Biomes- (biome- geographical region that contains a characteristic assemblage of plants and animals, climax community)

A. Climate and Biomes

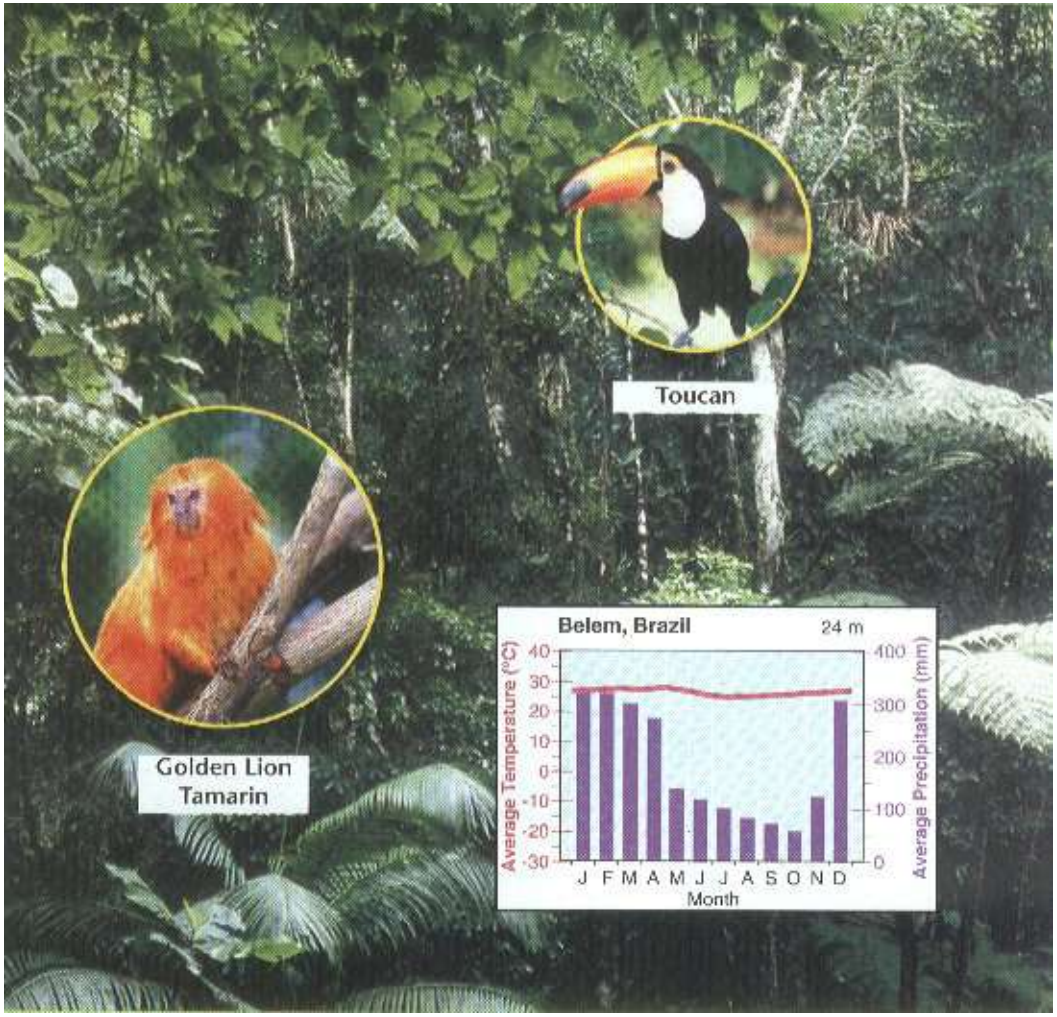


1. Climate very important in determining the characteristics of a biome
2. Two main factors are <u>temperature</u> and <u>precipitation</u> (represented by climate diagram)

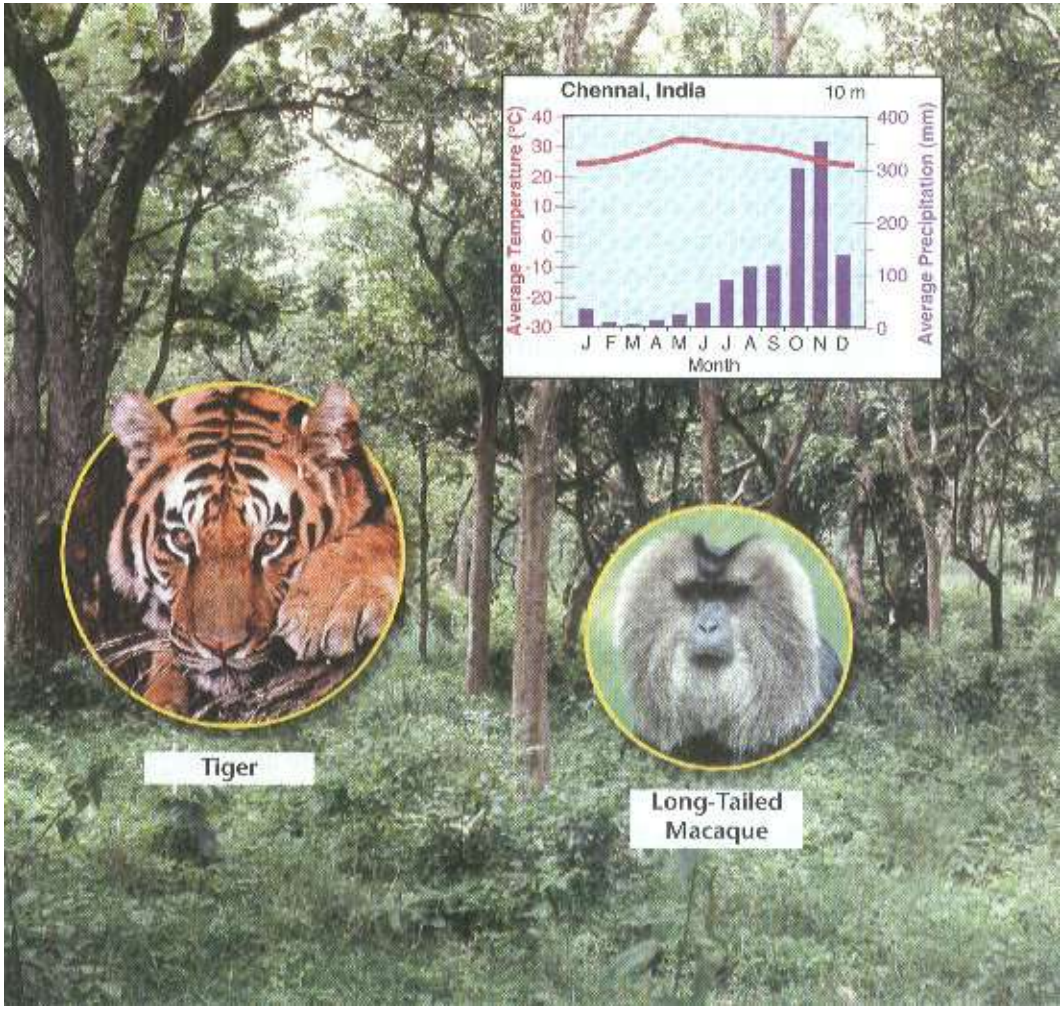
B. Major Land Biomes (9 biomes) each defined by unique set of abiotic factors and characteristic ecological community



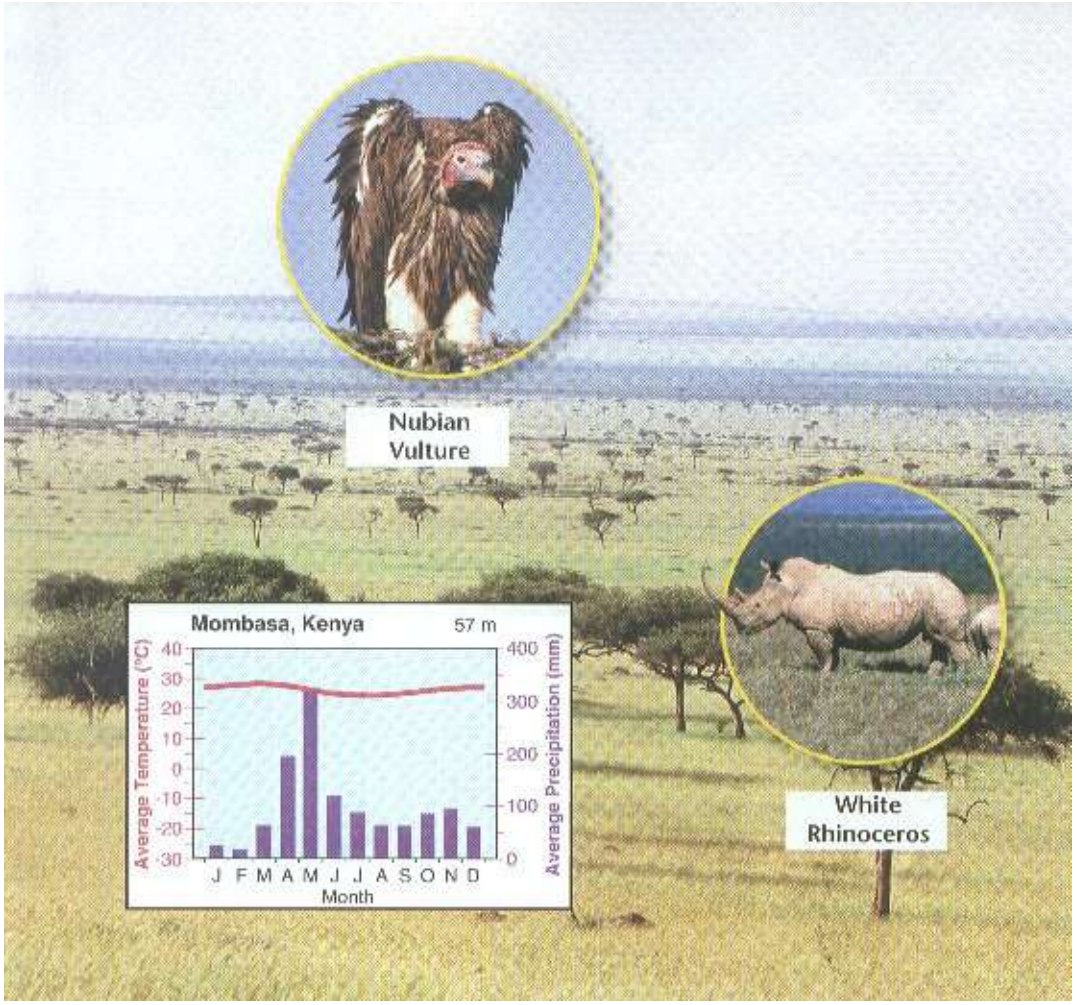
1. Tropical Rain Forests- hot and wet year-around; thin, nutrient poor soils.



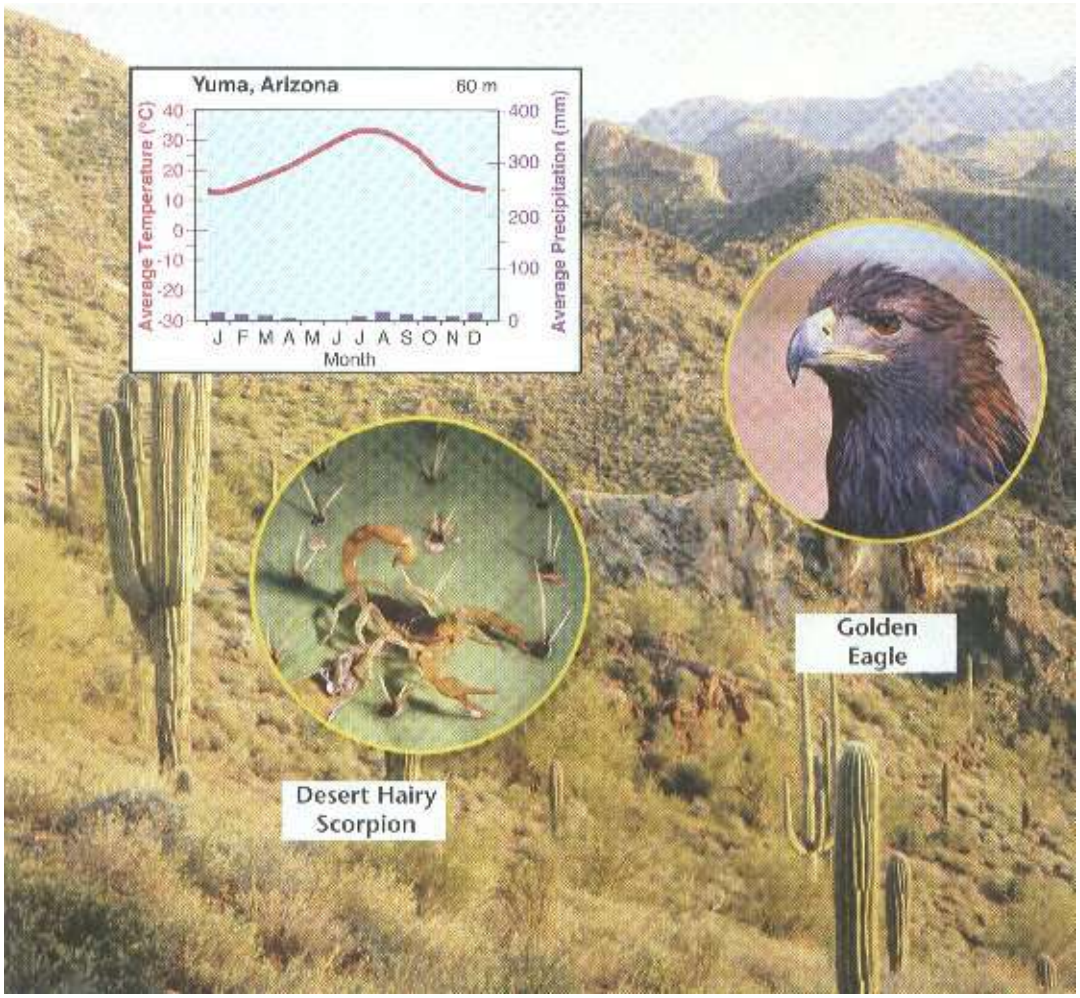
2. Tropical Dry Forest- generally warm year-around. Alternating wet and dry seasons; rich soils subject to erosion.



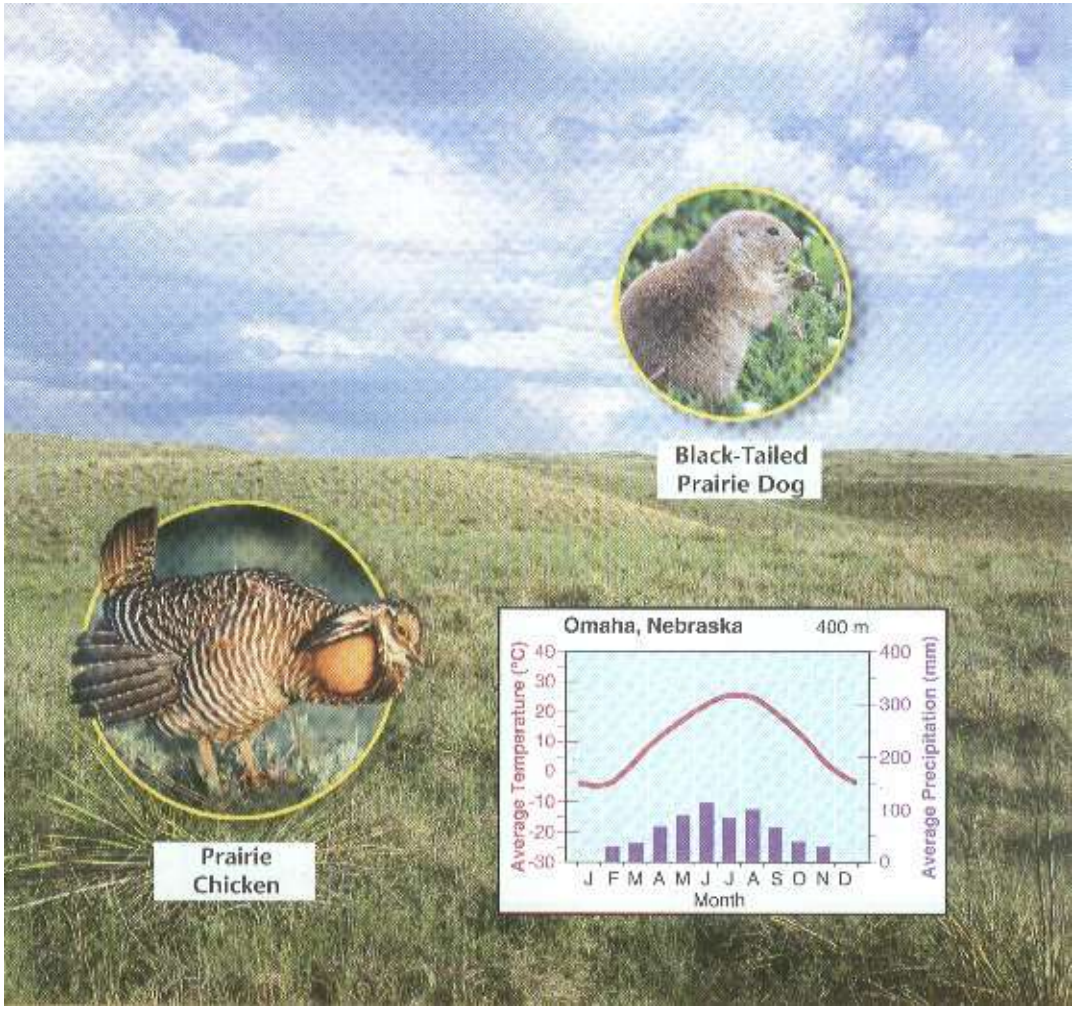
3. Tropical Savanna- warm temperatures; seasonal rainfall, compact soil; frequent fires set by lightning



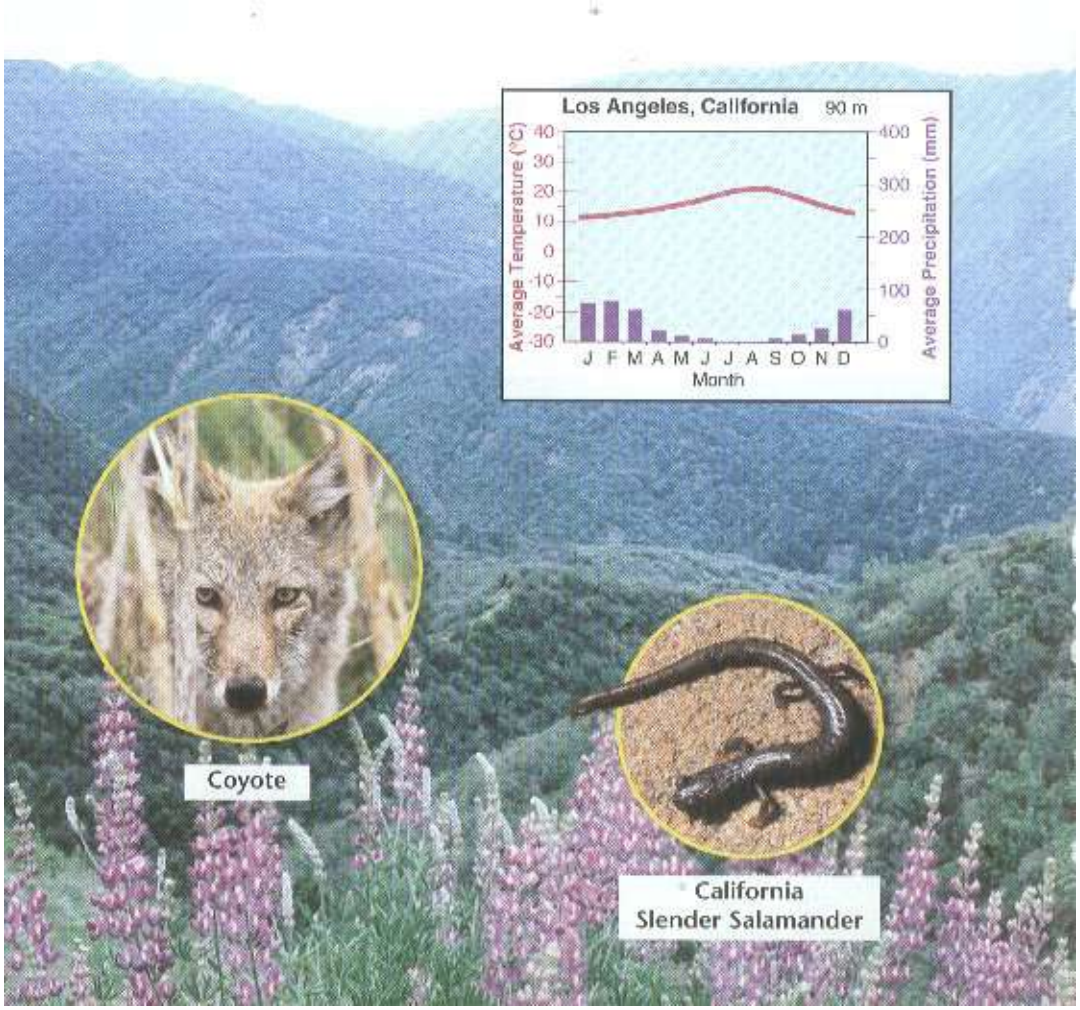
4. Desert- variable temperatures; low precipitation, soils rich in minerals but poor in organic materials



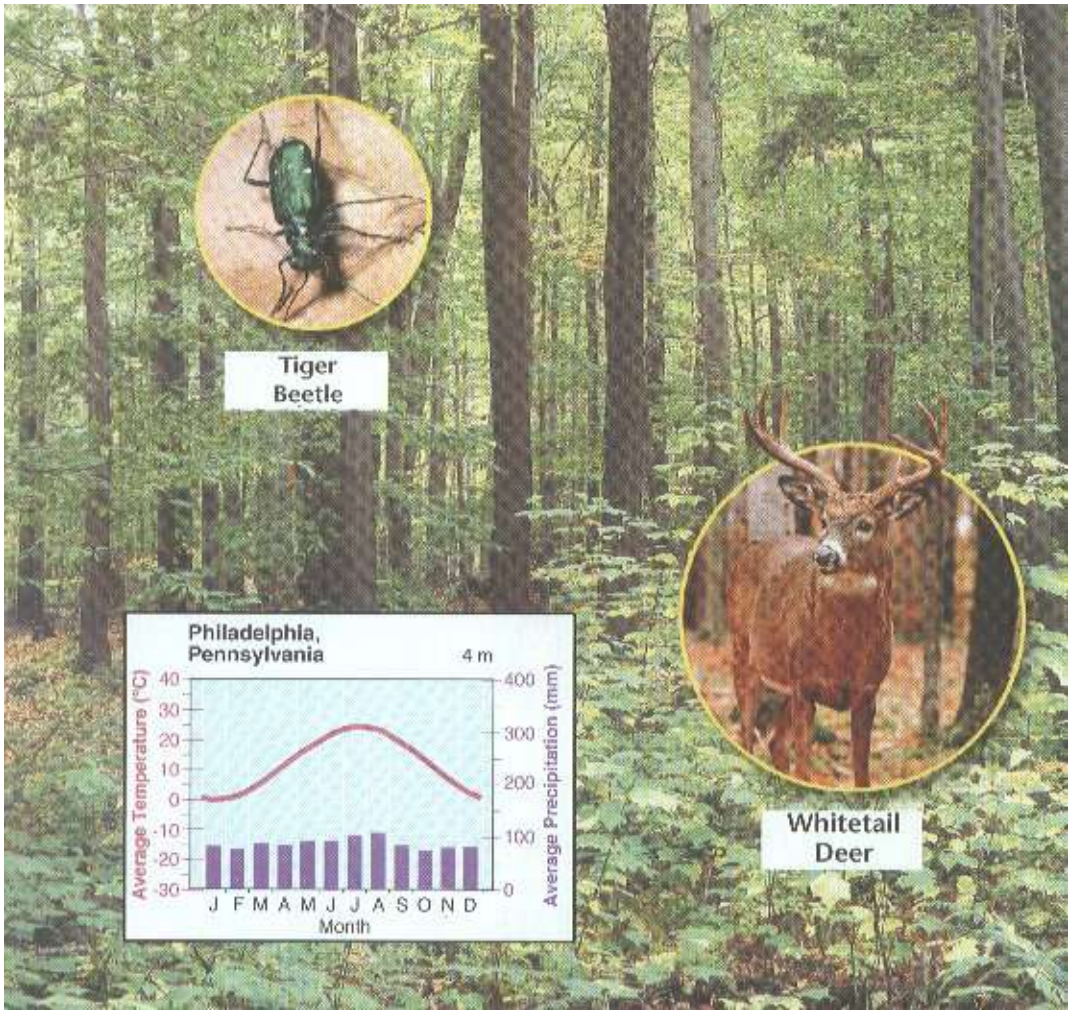
5. Temperate Grassland- warm to hot summers, cold winters, moderate, seasonal precipitation, fertile soils, occasional fires



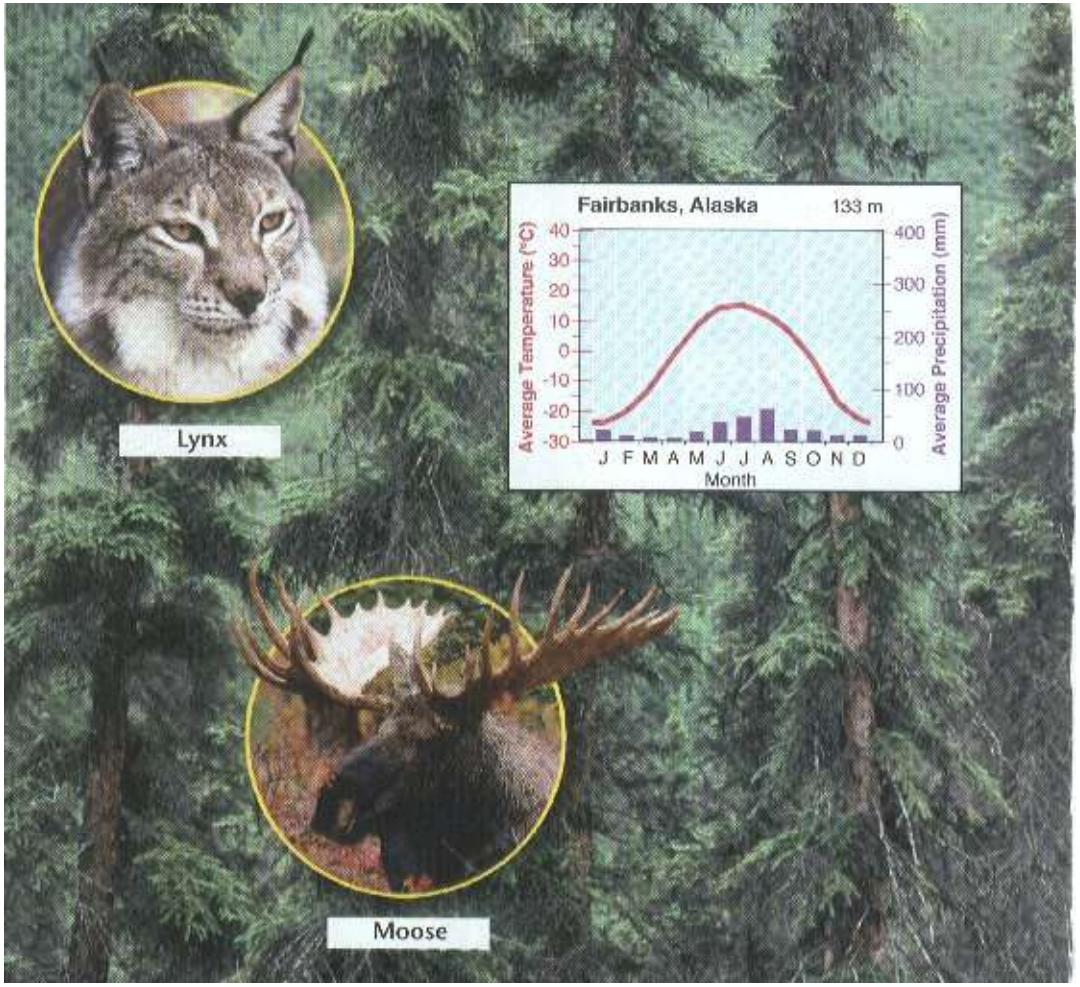
6. Temperate woodland and shrubland- hot, dry summers characterized by drought, cool, moist winters; thin, nutrient-poor soils; periodic fires



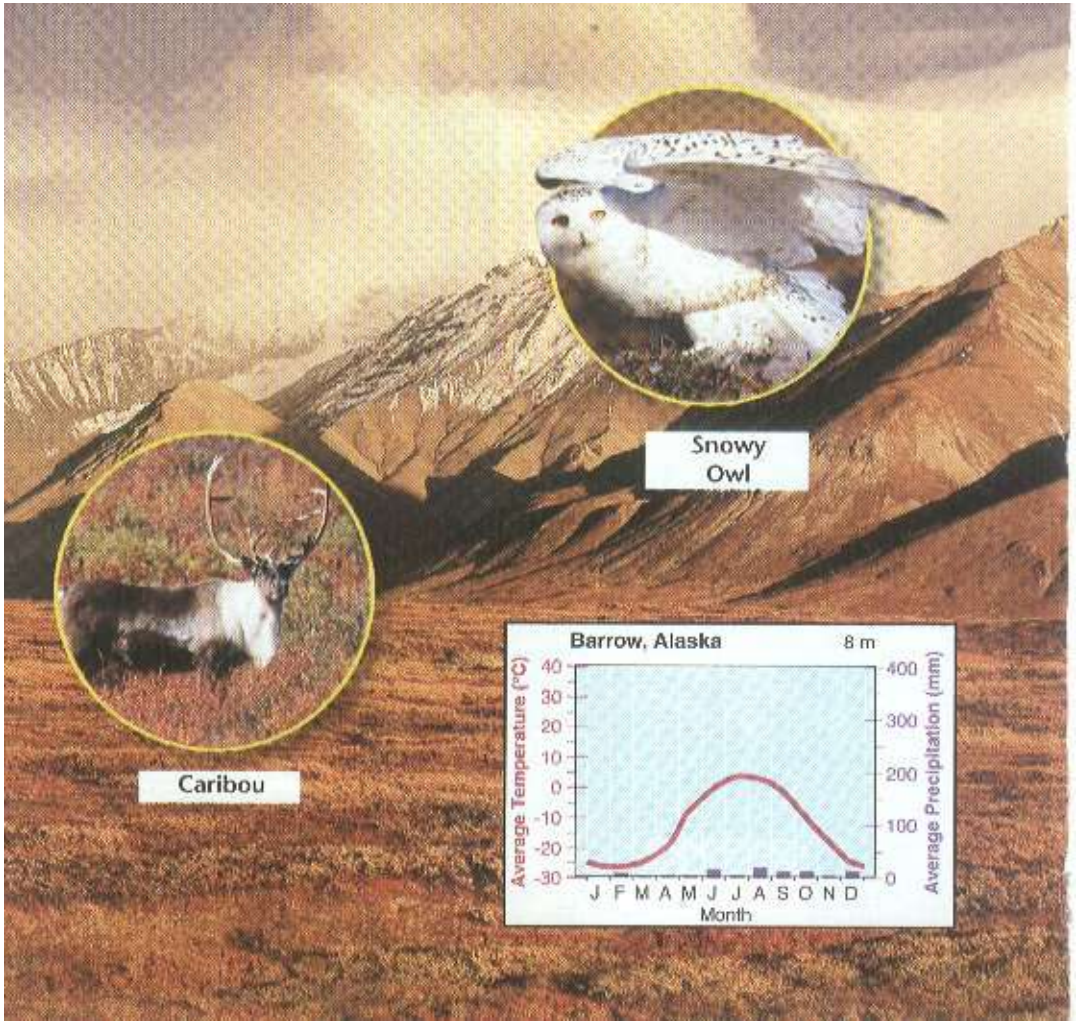
7. Temperate Forest- cold to moderate winters; warm summers; year-around precipitation; fertile soils



8. Boreal Forest- long, cold winters; short, mild summers; moderate precipitation; high humidity; acidic, nutrient-poor soils



9. Tundra- strong winds; low precipitation; short and soggy summers; long, cold, and dark winters; poorly developed soils; permafrost



C. Other Land Areas- some areas do not fall neatly into previous categories

1. **Polar Ice- cold year-around, dark winters, fierce winds. Thick layers of snow, ice caps with no soil.**
2. **Mountain ranges- biomes change with elevation**

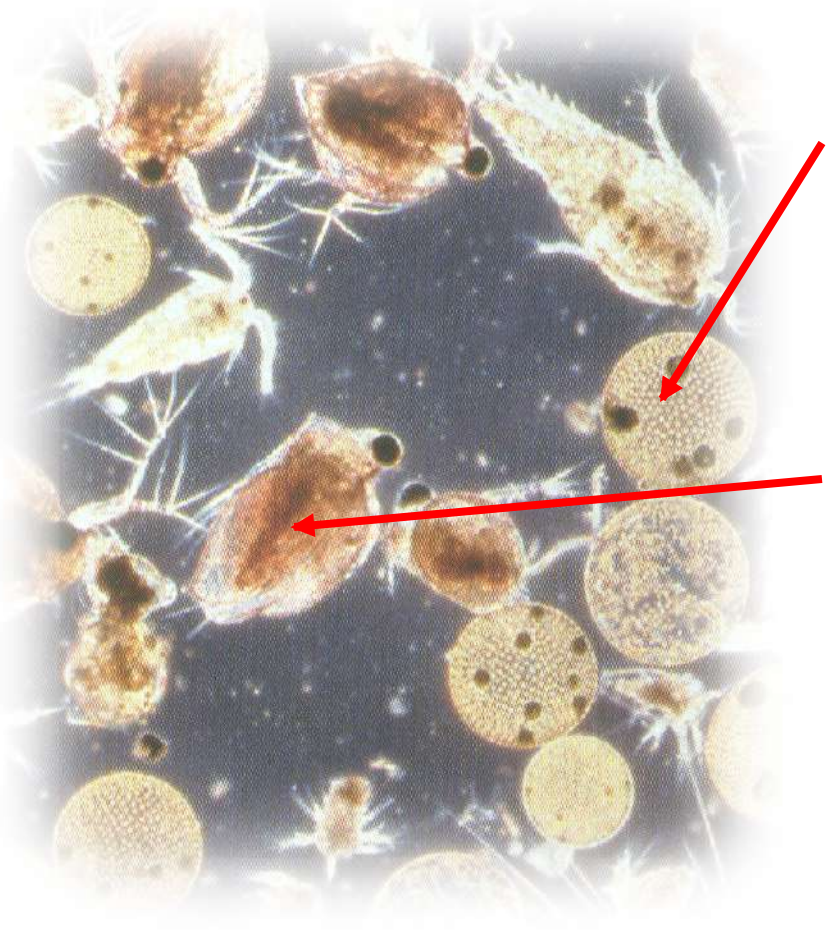
D. Aquatic Ecosystems- 75% or Earth's surface covered by water.

1. Freshwater ecosystems- 3% of Earth's surface fresh water (two main types)

a. Flowing-water ecosystems- rivers, streams, creeks. Well adapted to rate of flow

b. Standing-water ecosystems- lakes and ponds. Provides habitat for many organisms

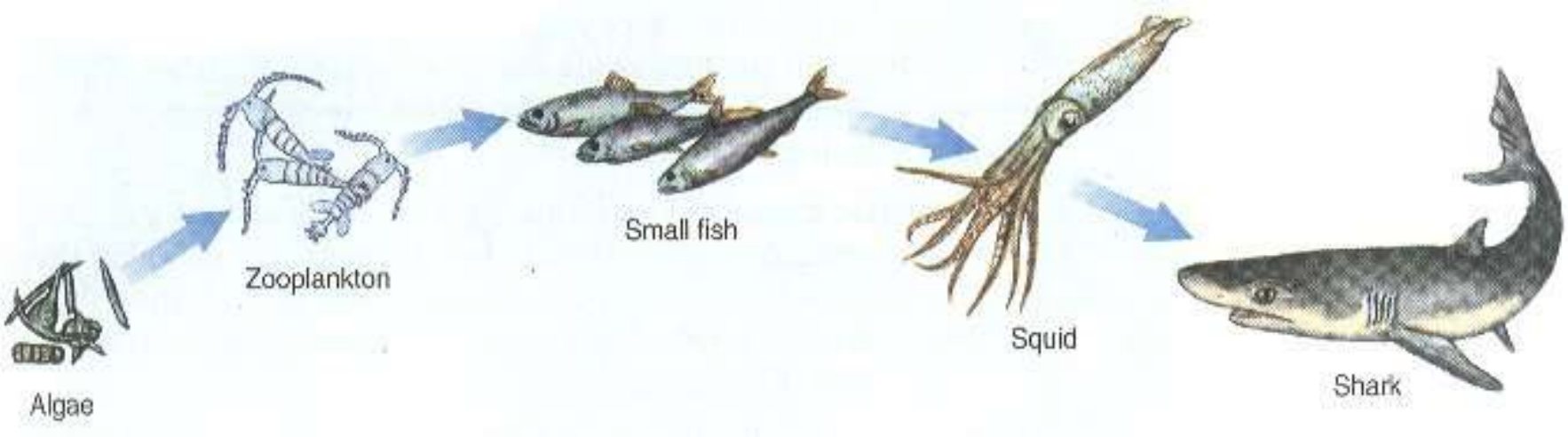
1). Plankton- general term used for tiny, free-floating, weakly swimming organisms



a). Phytoplankton- single celled algae. Form base of aquatic food web

b). Zooplankton- planktonic animals. Feed on phytoplankton

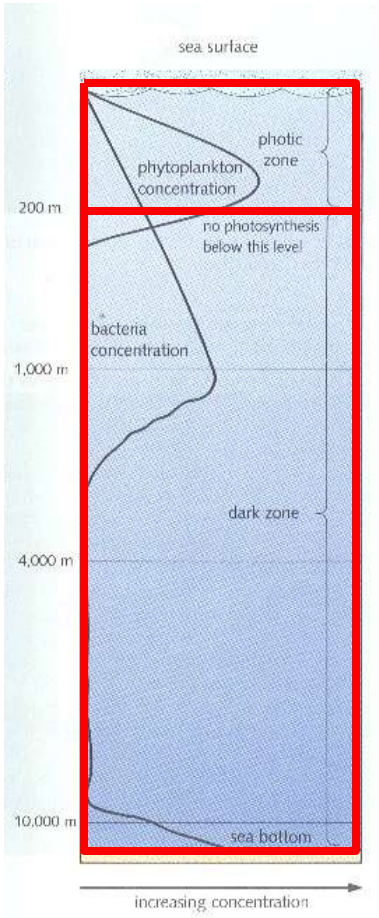
2). Plankton are fed upon by fishes, frogs, turtles, birds, etc.



2. Marine Ecosystems

a. Contain the largest amount of biomass *(living material)* on earth. Most is very small

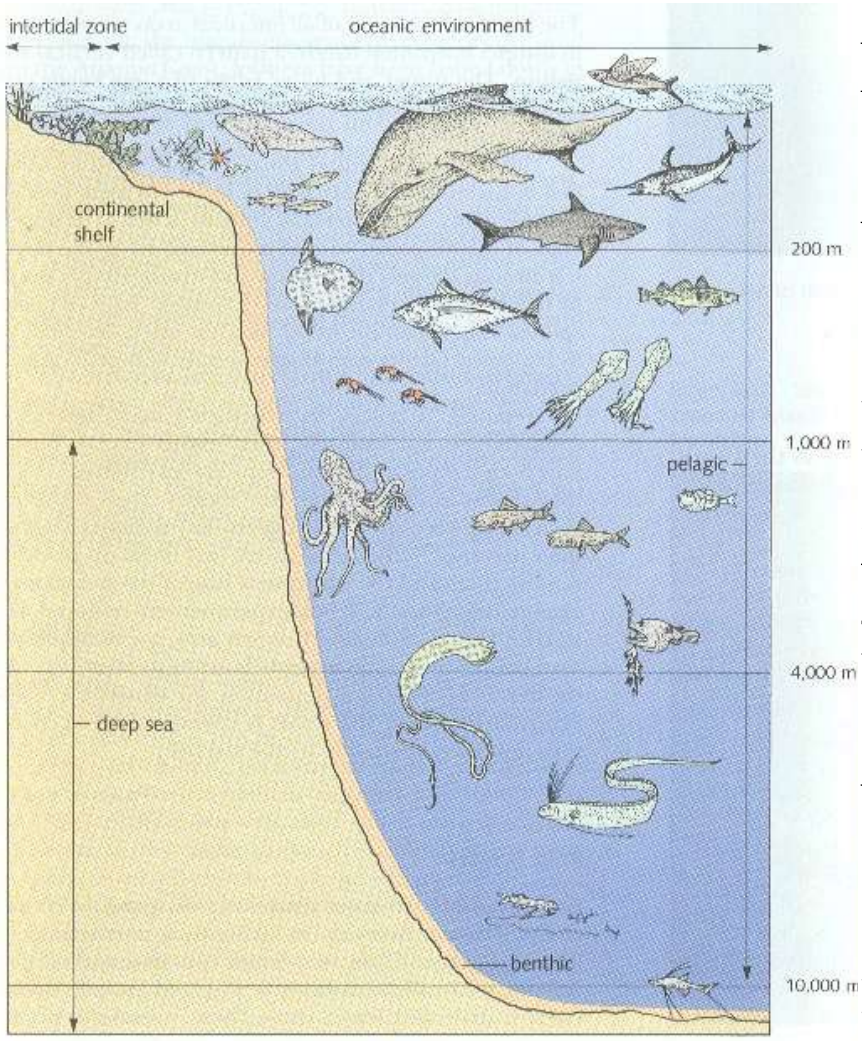
b. Amount of sunlight affects what organisms will exist



1). Photic zone- well-lit upper layer where photosynthesis takes place (up to 200 meters deep)

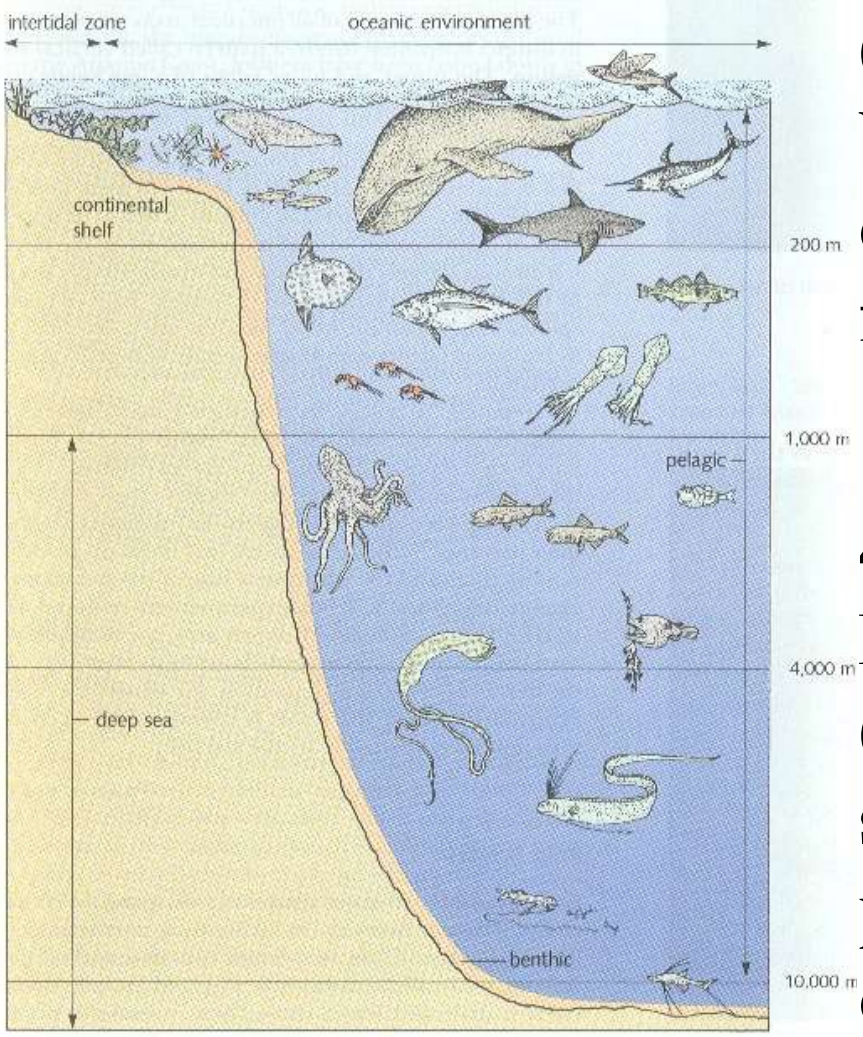
2). Aphotic zone- permanently dark area below photic zone. Chemosynthetic autotrophs only producers

c. Another way marine ecologists classify the ocean is by vertical zones based on <u>depth</u> and <u>distance from shore</u>



1). Intertidal zone- high levels of sunlight, nutrients and oxygen. Organisms often battered by waves, currents, exposed to air, sunlight, and heat.

2). Neritic zone- extends from low-tide to end of continental shelf. Shallow border that surrounds continents. Includes coral reefs and kelp forests



3). Open ocean- largest zone (90% of surface of oceans) Very deep zone, harsh conditions (high pressure, frigid temp, total darkness)

4). Benthic zone- ocean floor. Dead organic material (detritus) drifts down from surface waters. Only producers are chemosynthetic autotrophs around deep-sea vents

3. **Wetlands**- very productive ecosystems in which fresh, salt or brackish water mix. Includes salt marshes, mangrove swamps.
4. **Estuaries**- where fresh water source meets the ocean. Rich in productive food webs

Review

Chapter 4

Ecosystems and Communities

The average year-after-year conditions of temperature and precipitation in a particular region is the region's

a.weather.

b.latitude.

c.ecosystem.

d.climate.

Review Quiz

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Review Quiz

The Earth's climate is, in part, created by the interplay of

a.temperatures, ecosystems, and wind.

b.landmasses, the atmosphere, and the ocean.

c.weather, heat transport, and the environment.

d.solar radiation, surface temperatures, and biomes.

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Review Quiz

The loss of heat to space is slowed by

a.radiation entering the atmosphere.

b.atmospheric gases.

c.solar energy.

d.the biosphere.

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The greenhouse effect is

a.the result of an excess of carbon dioxide in the atmosphere.

b.a natural phenomenon that maintains Earth's temperature range.

c.the result of the differences in the angle of the sun's rays.

d.an unnatural phenomenon that causes heat energy to be radiated back into the atmosphere.

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Earth has three main climate zones because of the differences in latitude and

a.amount of solar energy received.

b.angle of heating.

c.ocean currents.

d.prevailing winds.

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b.sink.

c.absorb heat from the equator.

d.flow parallel to Earth’s surface.

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The unequal heating of Earth's surface

a.drives wind and ocean currents.

b.causes winds that transport heat throughout the biosphere.

c.has important effects on Earth's climate regions.

d.all of the above

Each of the following is an abiotic factor in the environment EXCEPT

a.plant life.

b.soil type.

c.rainfall.

d.temperature.

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a.plant life.

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c.rainfall.

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Which is a biotic factor that affects the size of a population in a specific ecosystem?

a.average temperature of the ecosystem

b.type of soil in the ecosystem

c.number and kinds of predators in the ecosystem

d.concentration of oxygen in the ecosystem

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An organism's niche is

a.the way the organism uses the range of physical and biological conditions in which it lives.

b.all the physical and biological factors in the organism's environment.

c.the range of temperatures that the organism needs to survive.

d.a full description of the place an organism lives.

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Several species of warblers can live in the same spruce tree ONLY because they

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b.eat different foods within the tree.

c.occupy different niches within the tree.

d.can find different temperatures within the tree.

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a.competition.

b.sybiosis.

c.mutualism.

d.predation.

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a.reproduce at different times.

b.eat less.

c.move away.

d.occupy different niches.

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No two species can occupy the same niche in the same habitat at the same time

a.because of the interactions that shape the ecosystem.

b.unless the species require different abiotic factors.

c.because of the competitive exclusion principle.

d.unless the species require different biotic factors.

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