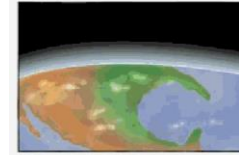


Ecology

	organisms
<i>Organisms that can breed and produce fertile offspring</i>	species
<i>Group of organisms in same species living in the same geographical area</i>	population
<i>Different populations living in the same general geographical area</i>	community
Habitat: NICHE: COMPETITIVE EXCLUSION PRINCIPLE:	Ecosystem
Land & Aquatic	biomes
	biosphere



Biosphere



Ecosystem




Community





Population

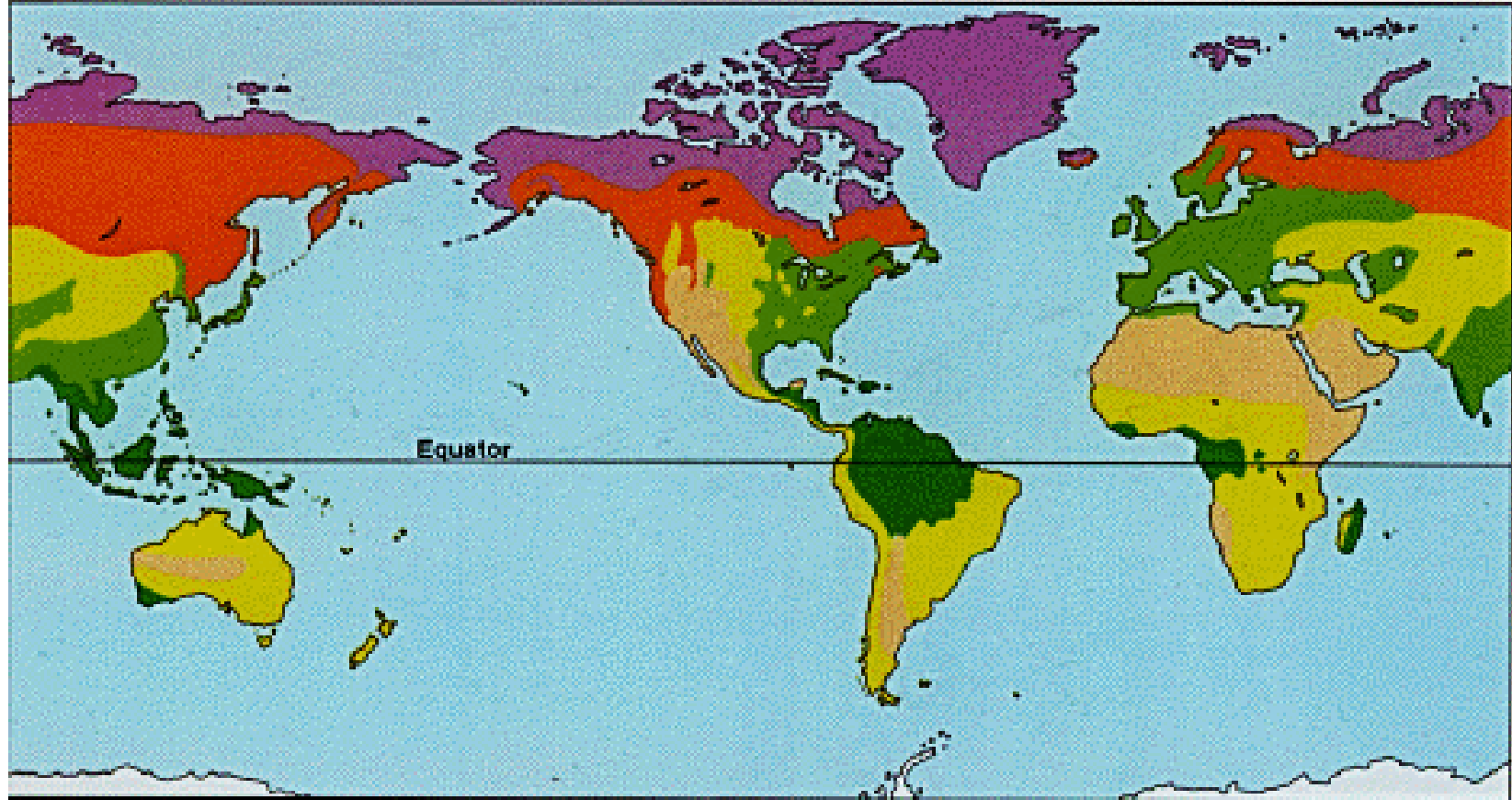


Organism

	organisms	Includes Biotic Factors: <i>All the living things that organism interacts with</i>	Ecology: 
Organisms that can breed and produce fertile offspring	species		
Group of organisms in same species living in the same geographical area	population		
Different populations living in the same general geographical area	community		
Habitat:	Ecosystem	Includes biotic & abiotic factors Abiotic factors:	
NICHE:			
COMPETITIVE EXCLUSION PRINCIPLE:			
	biomes		
	biosphere		

	organisms	Includes Biotic Factors: All the living things that organism interacts with	Ecology:
Organisms that can breed and produce fertile offspring	species		
Group of organisms in same species living in the same geographical area	population		
Different populations living in the same general geographical area	community		
Habitat: <i>where an organism lives within an ecosystem; "address"</i> NICHE: <i>place organism lives PLUS what it does; "job"</i> COMPETITIVE EXCLUSION PRINCIPLE: <i>No two species can share the same niche</i>	Ecosystem: <i>Habitat and niche of organism; includes biotic & abiotic factors</i>	Includes biotic & abiotic factors Abiotic factors: <i>All the non-living things that affect an organism</i>	 
Land & Aquatic	biomes		
<i>Portion of the planet in which all life exists; includes land, water, atmosphere</i>	biosphere ←		

	organisms	Includes Biotic Factors : All the living things that organism interacts with	Ecology: Scientific study of interactions of organisms with each other and with their environment
Organisms that can breed and produce fertile offspring	species		
Group of organisms in same species living in the same geographical area	population		
Different populations living in the same general geographical area	community		
Habitat: where an organism lives within an ecosystem; “address” NICHE: place organism lives PLUS what it does; “job” COMPETITIVE EXCLUSION PRINCIPLE: No two species can share the same niche	Ecosystem Habitat and niche of organism; includes biotic & abiotic factors	Includes biotic & abiotic factors Abiotic factors: All the non-living things that affect an organism	
Land & Aquatic	biomes		
Portion of the planet in which all life exists; includes land, water, atmosphere	biosphere		



Tundra



Temperate forest



Grassland



Taiga



Tropical rain forest



Desert

Biomes: geographic areas that have similar climates and ecosystems

Tundra

General Location: *Canada, Alaska, Siberia; latitudes around North Pole*

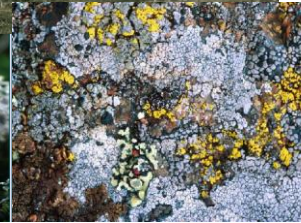
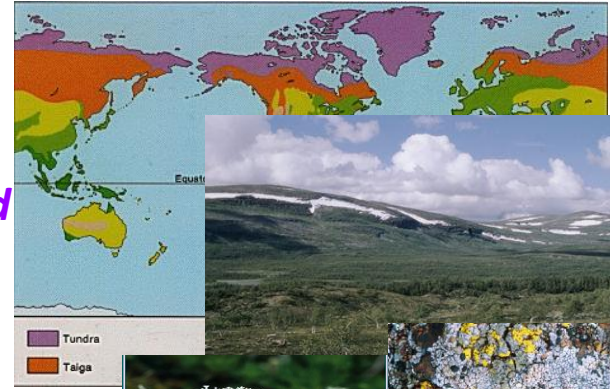
Average Yearly Climate: *less than 25 cm precipitation yearly; Very cold year round (-40°C in winter)*

Soil: *is poor; Permafrost: Layer of permanently frozen soil*

Distinguishing Features: *Cold, dry, treeless region*

Plant Life: *Tundra plants are resistant to drought and cold; Examples: Reindeer moss (a lichen!), Lichens, True mosses, Grasses, Small shrubs and flowers*

Animal Life: *Many animals of the tundra migrate there during the short summer; Caribou, Musk oxen, Lemmings, Biting insects, Snowy owls, Arctic hares*



Taiga or coniferous forest

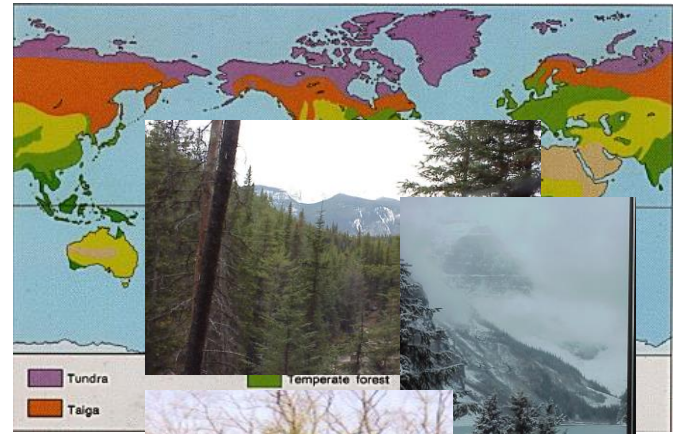
General Location: Canada, Alaska & Russia; latitudes between 50-60 degrees North; largest biome

Average Yearly Climate: 35-40 cm precipitation (mostly snow) ; winters are long & cold;

Soil: no permafrost, so trees can grow
Distinguishing Features:

Plant Life: cone-bearing evergreen trees (firs, spruces, pines, hemlocks, cedars)

Animal Life: moose, black bear, lynx, wolves, badgers, wolverines, ermines, deer



Temperate deciduous forest

General Location: Found in Europe, Eastern US & China; below 50 degrees North latitude

Average Yearly Climate: 75-150 cm precipitation yearly;

Soil: rich in nutrients from layers of decomposing leaves

Distinguishing Features: wide range of temperatures in 4 seasons; below freezing in winter; much warmer in the summer; layers of vegetation (canopy, understory, forest floor)

Plant Life: very abundant; oak, hickory, maple, shrubs, wildflowers, ferns

Animal Life: very diverse; deer, foxes, snakes, bears, birds, raccoons, amphibians, small mammals



Tropical Rain Forest

General Location: near equator in Africa, South America, Australia & Pacific Islands

Average Yearly Climate: hot & humid all year, constant temps around 25 C (77F); 200-225 cm precipitation yearly

Soil: acidic & nutrient poor

Distinguishing Features: lush productive with half of all species on Earth

Plant Life: have shallow roots; over 700 species trees & over 1000 species of flowers; mahogany, bromeliads/orchids, giant ferns

Animal Life: monkeys, exotic birds, snakes sloths, bats, large cats...exotic mammals



Grassland

General Location: found on every continent

Average Yearly Climate: wet season followed by drought season; 25-75 cm precipitation yearly

Soil: very rich, fertile, sod (root system),

Distinguishing Features: tall grasses; aka Prairie/Plains(US), steppe(Asia), Savanna(Africa & Australia), Pampas(S. American)

Plant Life: most important farming areas (cereal & grains), wheat, rye, barley, corn

Animal Life: mostly grazing animals, bison, prairie dog, pronghorn, coyote, gazelle, lion, elephant, giraffe, wallaby, wombat



Desert

General Location:found on every continent

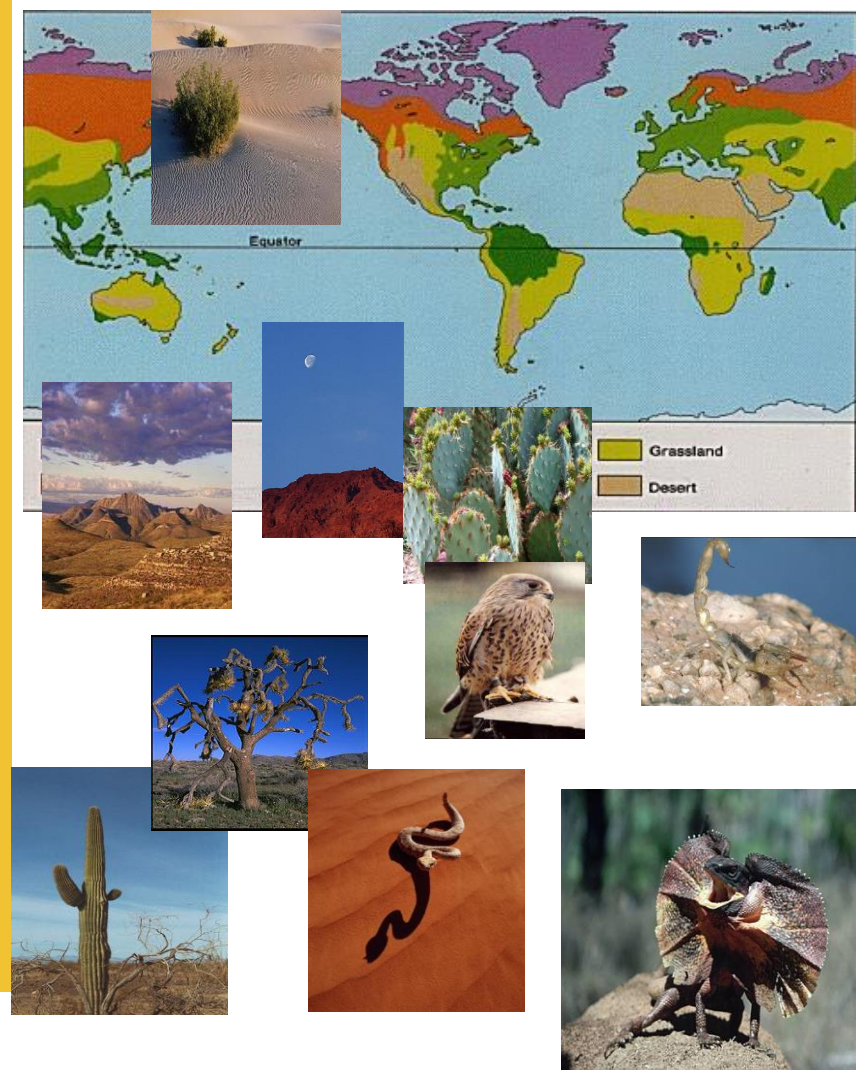
Average Yearly Climate: less than 25 cm precipitation yearly

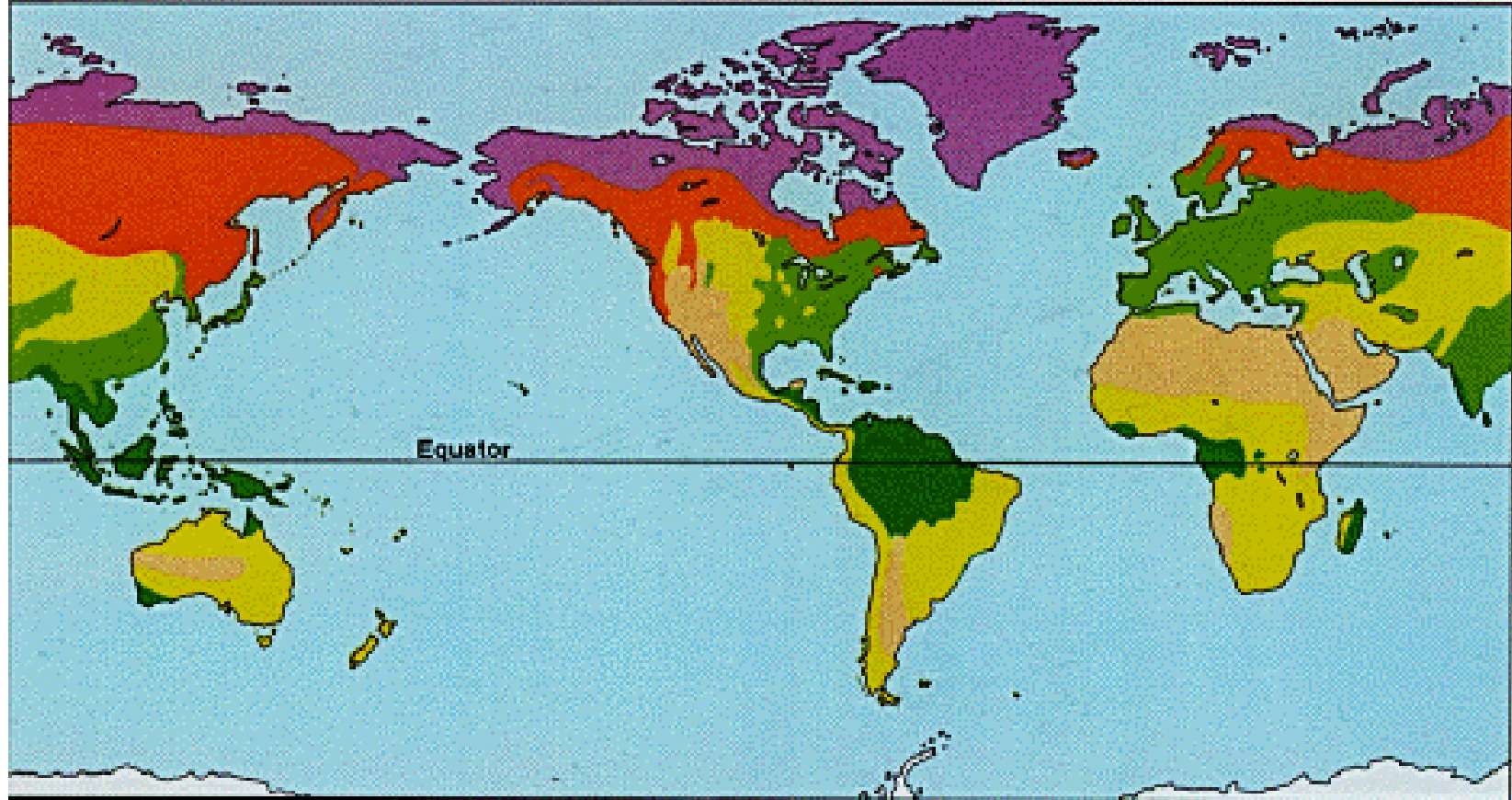
Soil: gravel to sand; nutrient poor

Distinguishing Features:driest biome; extreme temperatures (very hot during day; cold at night)

Plant Life:adaptations for extreme temps & dryness; cactus, mesquite, Joshua trees, wildflowers

Animal Life: lizards, camels, snakes, scorpions, gila monster, tarantula, kangaroo rat, predatory birds





 Tundra

 Temperate forest

 Grassland

 Taiga

 Tropical rain forest

 Desert

Habitat: aka “address”

Where an organism lives;
includes biotic & abiotic factors

Niche: aka “job”

What an organism does in its
habitat

Competitive Exclusion Principle

Two species can NOT fill or perform the same niche in the same
habitat



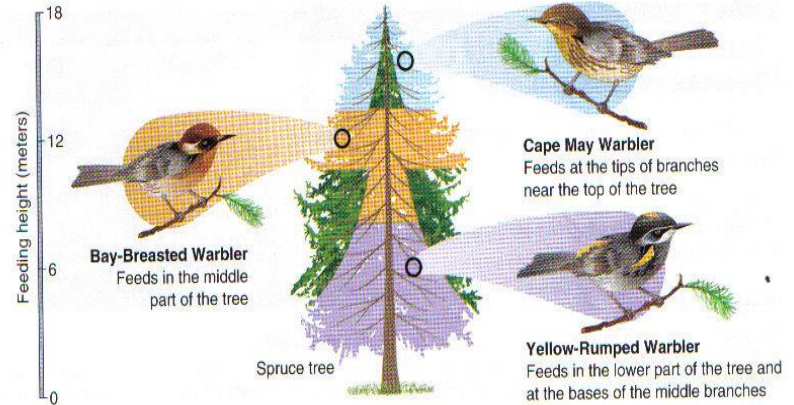
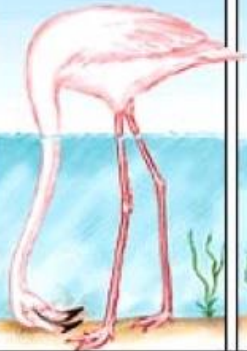
Flamingos feed by
straining mud
through their bills.

Dabbling
ducks feed
on plants.

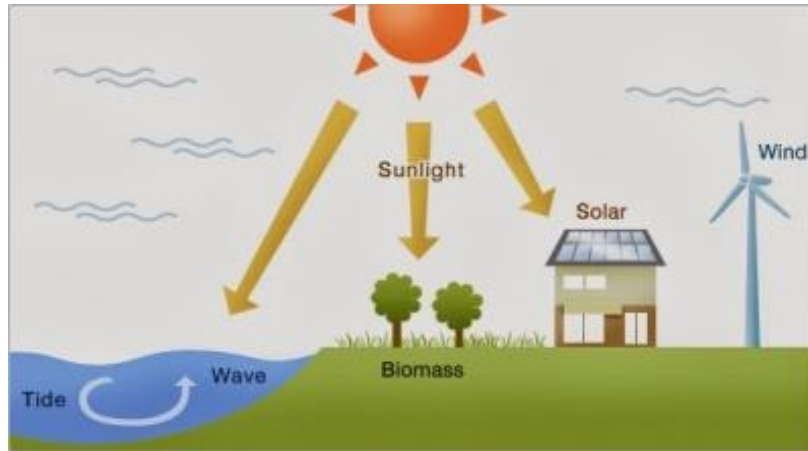
Avocets feed on
insects.

Oystercatchers
pry open shells.

Plovers hunt
for small
insects.



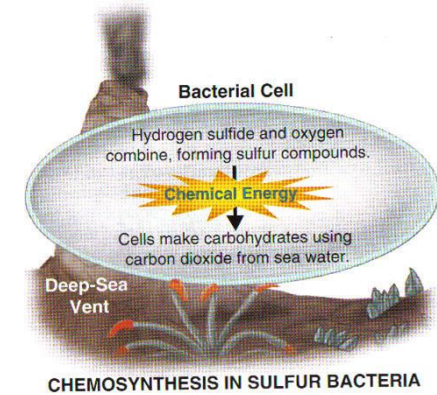
The Earth SOLAR powered; **THE SUN** is the main source of energy for life on Earth because **AUTOTROPHS** trapped energy from sunlight into organic compounds, like glucose sugar, for **HETEROTROPHS** to consume and breakdown for energy.



Autotrophs (AKA **PRODUCERS**):
Can make their OWN food
auto=self; *troph*=feeders

Photosynthesis:
Traps solar energy into bonds
of sugars like glucose

Chemosynthesis: in absence of
light, using chemicals for
making sugars in hostile places





Heterotrophs (aka **CONSUMERS**)

HERBIVORES = eat only plants

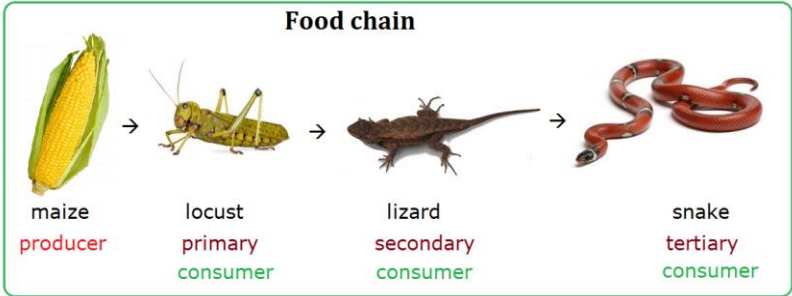
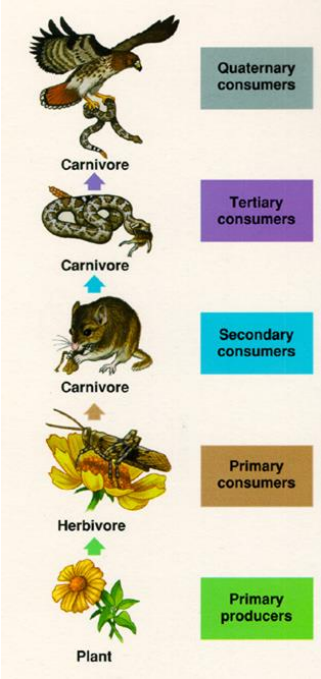
CARNIVORES = eat only animals

OMNIVORES = eat both plants & animals

DETRITIVORES = feed on plant & animal remains

DECOMPOSERS = break down and absorb organic matter

FOOD CHAIN is how energy flows through an ecosystem in a series of “linear” steps in which organisms transfer energy by being eaten (producers → consumers)



Complex “web” of feeding patterns in an ecosystem=

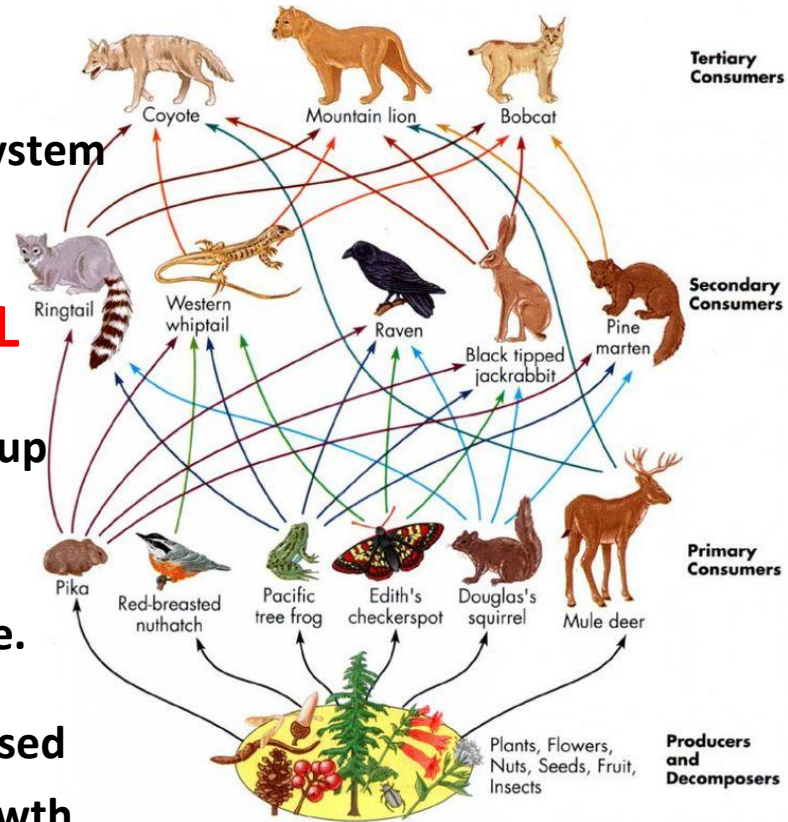
A **FOOD WEB** links ALL the food chains in an ecosystem together.

Each step in a food chain or web = **TROPHIC LEVEL**

PRODUCERS (AUTOTROPHS) ALWAYS make up the **FIRST** trophic level.

Lower levels must be bigger to support the level above.

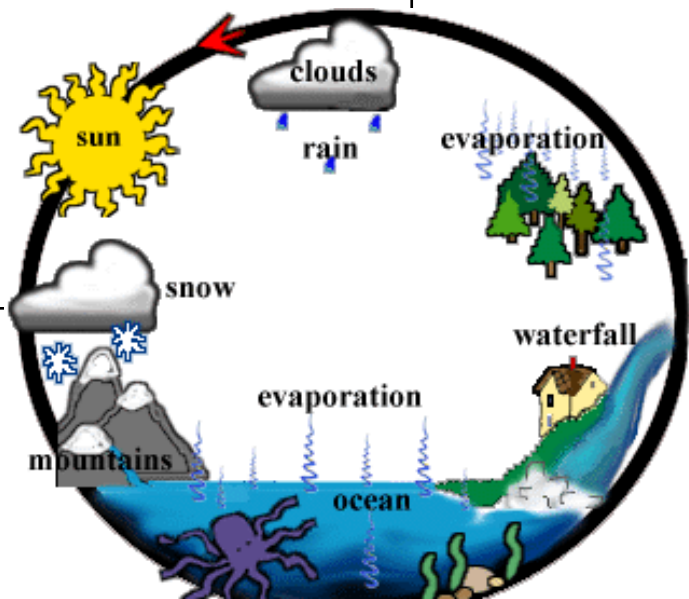
Only about **10%** of the energy from each level is passed on. Some energy is used for life processes such as growth, development, movement, metabolism, active transport, and reproduction. The rest is lost as **HEAT**.



Biogeochemical cycles: matter moving through ecosystem; 95% of body of MOST organisms made of C, H, O, N

Water cycle (aka hydrologic)

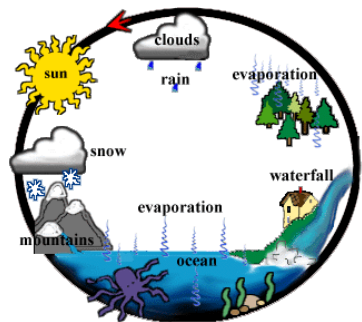
**Oxygen &
hydrogen are in
all building
blocks; solvent**



Biogeochemical cycles: matter moving through ecosystem; 95% of body of MOST organisms made of C, H, O, N

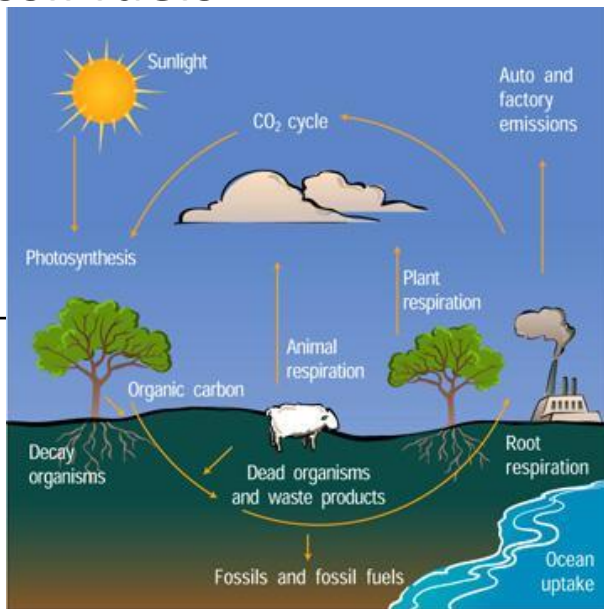
Water cycle (aka hydrologic)

Oxygen & hydrogen are in all building blocks; solvent



Carbon cycle

Carbon in CO₂ in atmosphere and ocean, land in organisms, underground fossil fuels



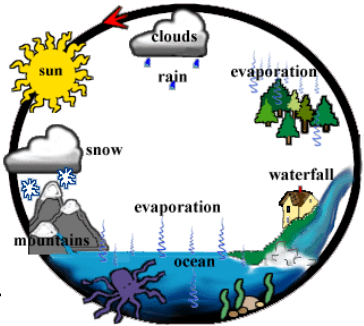
Nitrogen cycle

Phosphorus cycle

Biogeochemical cycles: matter moving through ecosystem; 95% of body of MOST organisms made of C, H, O, N

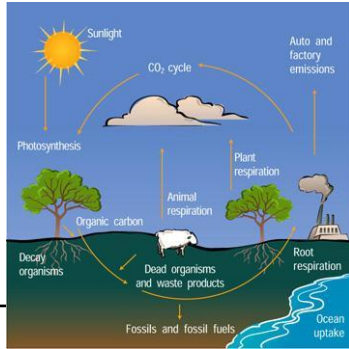
Water cycle (aka hydrologic)

Oxygen & hydrogen are in all building blocks; solvent



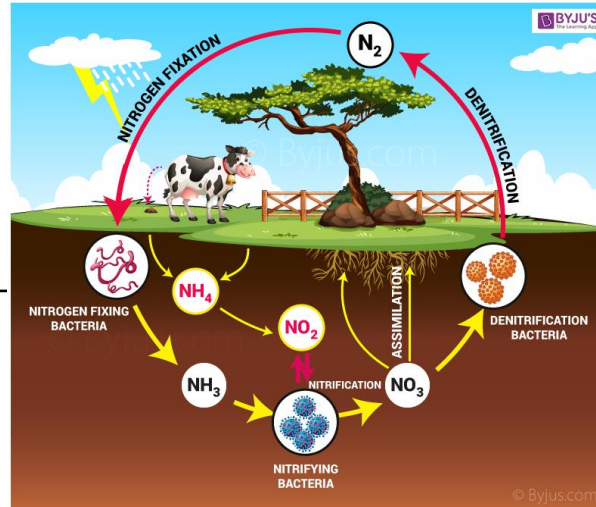
Carbon cycle

Carbon in CO_2 in atmosphere and ocean, land in organisms, underground fossil fuels



Nitrogen cycle

Most of atmosphere is nitrogen-but NOT in a form we can use; bacteria “fix” N for DNA, RNA, ATP & proteins

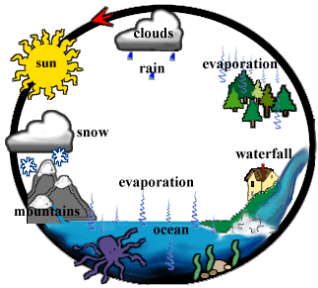


Phosphorus cycle

Biogeochemical cycles: matter moving through ecosystem; 95% of body of MOST organisms made of C, H, O, N

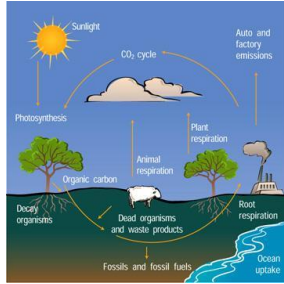
Water cycle (aka hydrologic)

Oxygen & hydrogen are in all building blocks; solvent



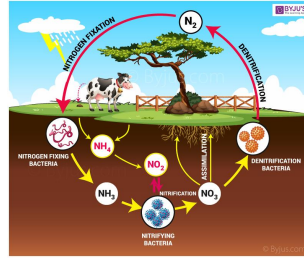
Carbon cycle

Carbon in CO₂ in atmosphere and ocean, land in organisms, underground fossil fuels



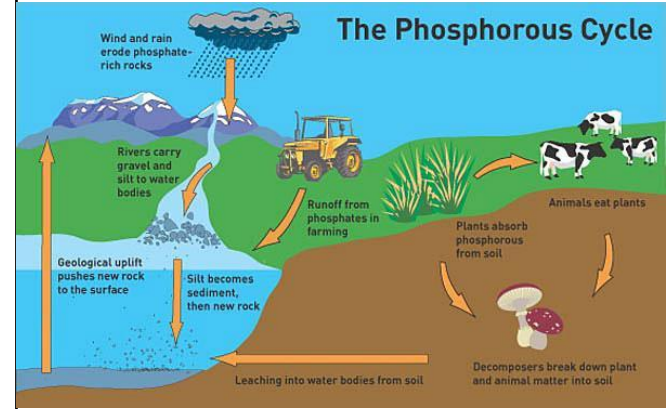
Nitrogen cycle

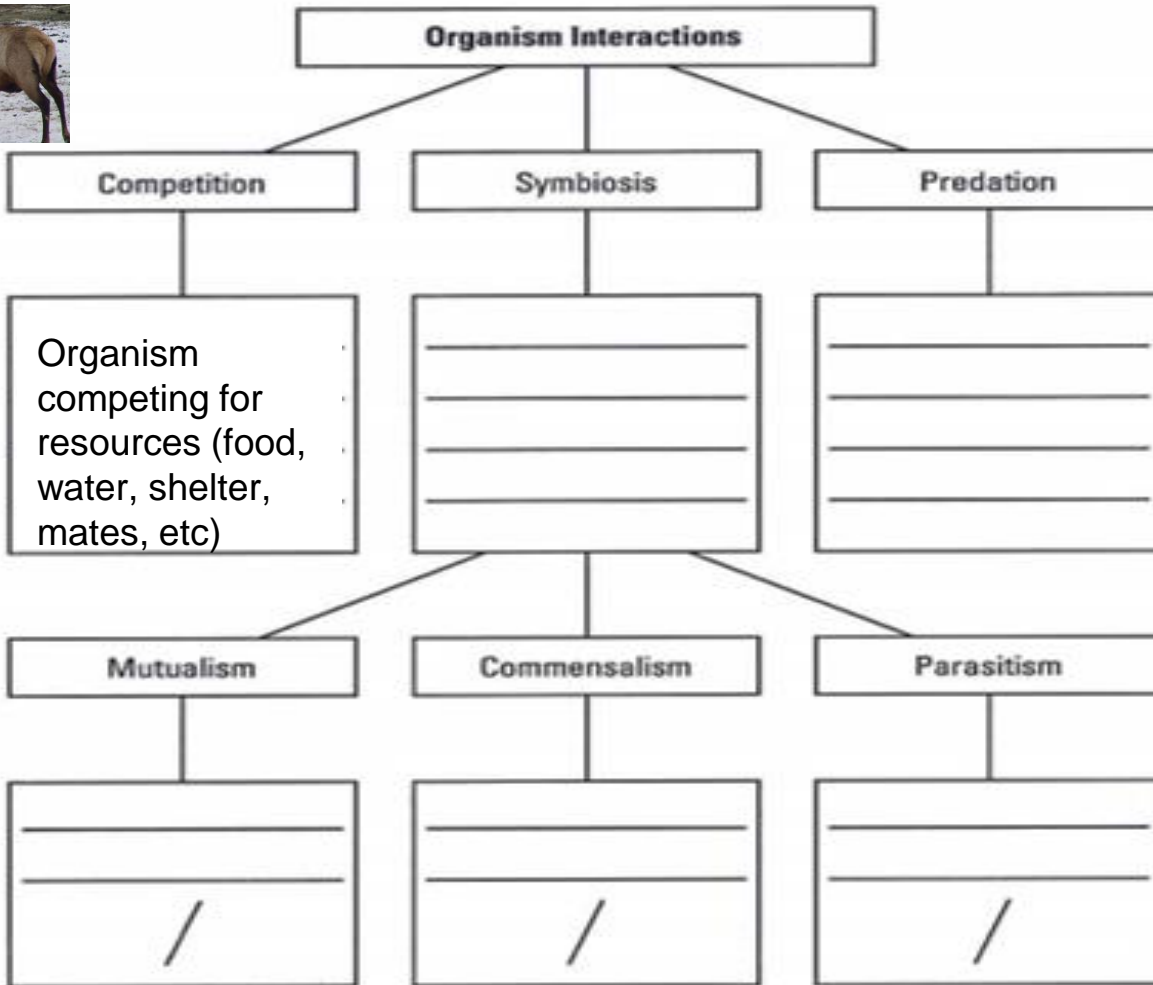
Most of atmosphere is nitrogen-but NOT in a form we can use; bacteria “fix” N for DNA, RNA, ATP & proteins

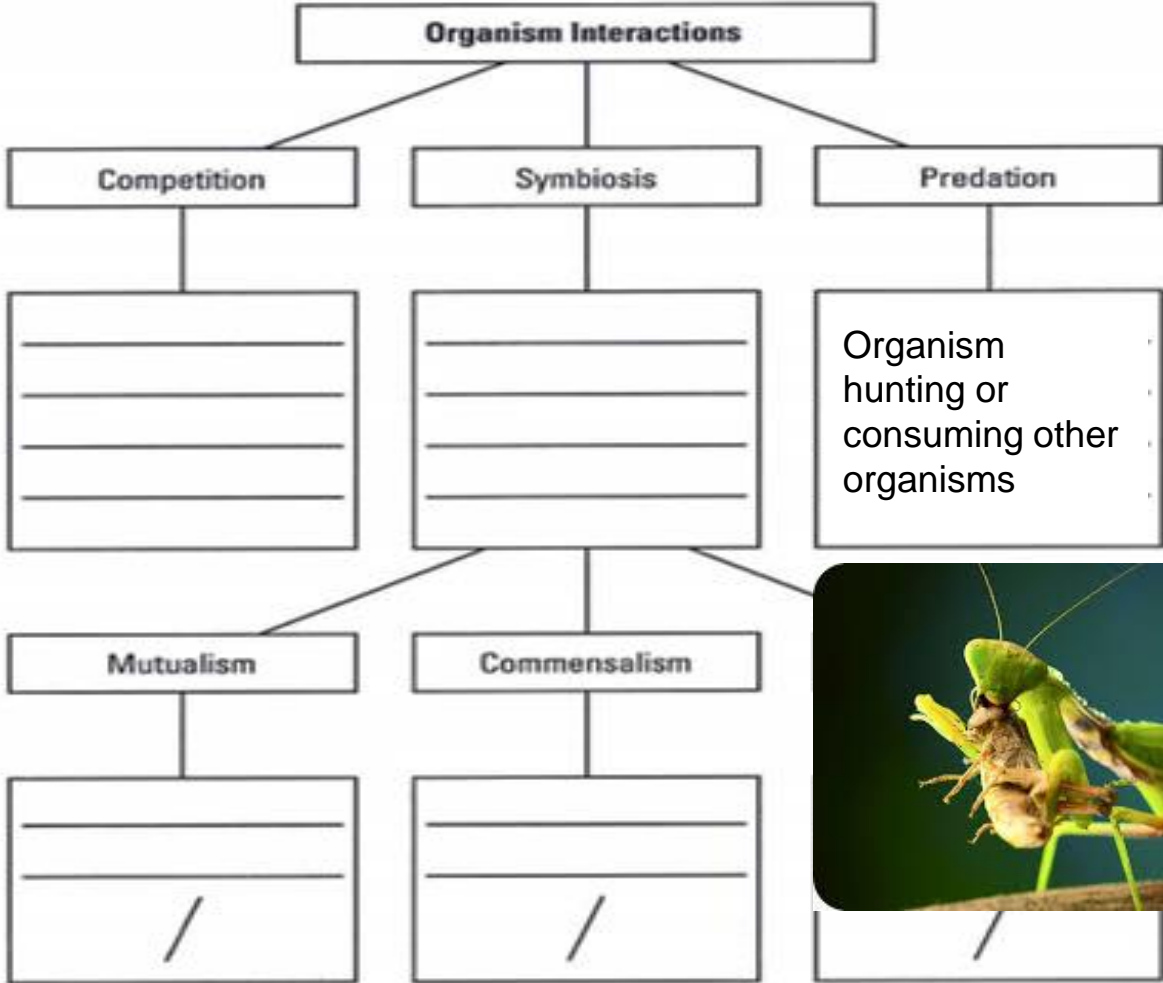


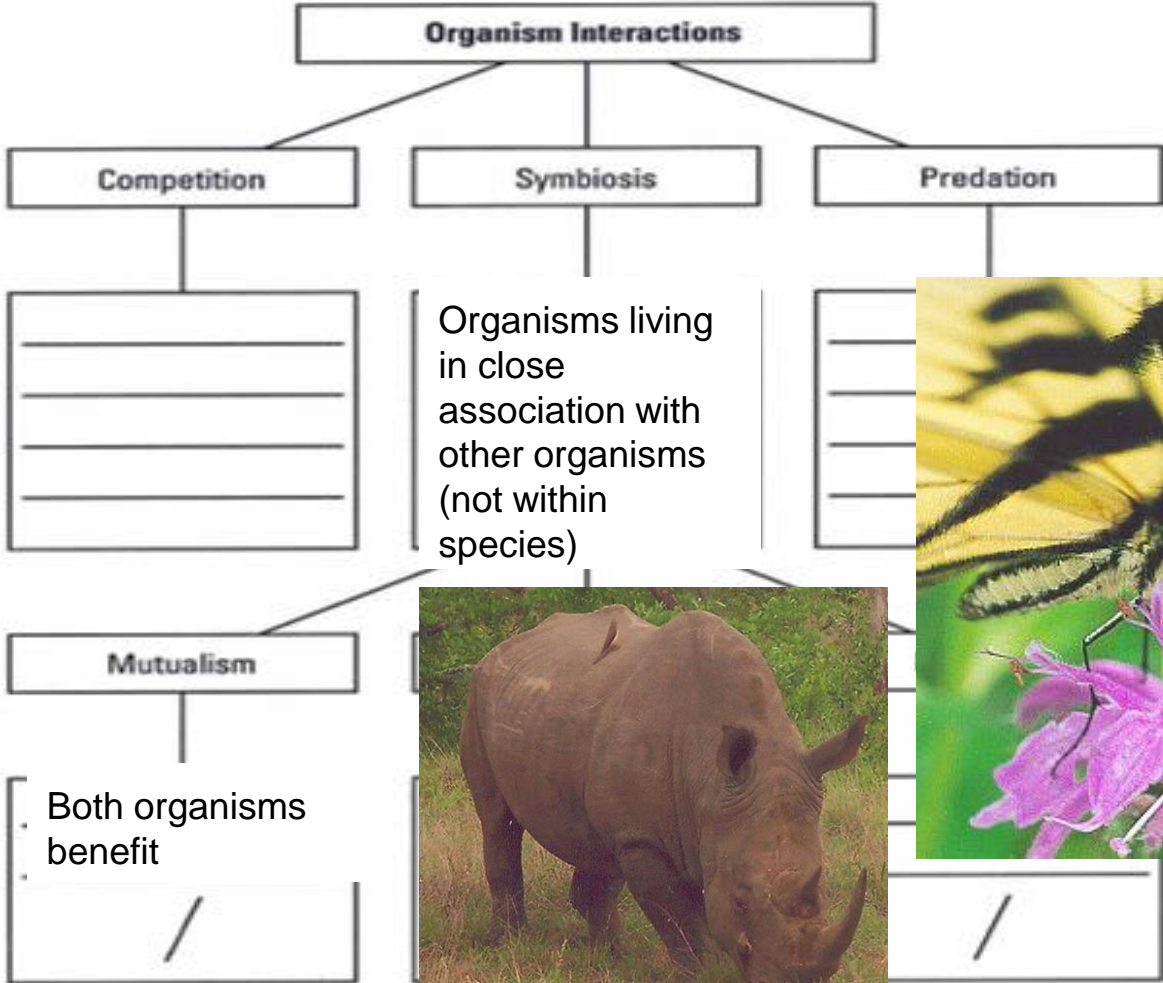
Phosphorus cycle

NOT in atmosphere, needed for DNA, RNA, ATP, phospholipids









Organism Interactions

Competition

Symbiosis

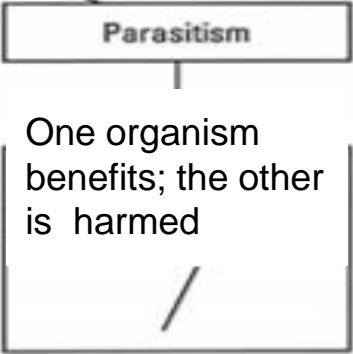
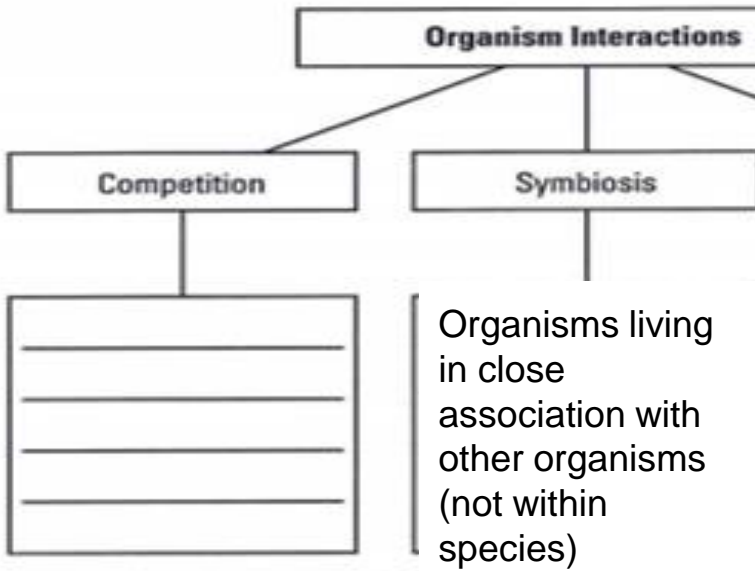
Organisms living in close association with other organisms (not within species)



Commensalism

One organism benefits; the other is not bothered



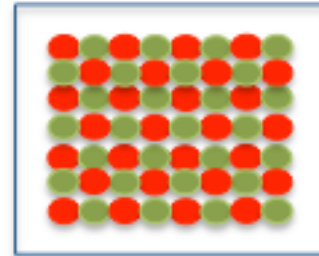
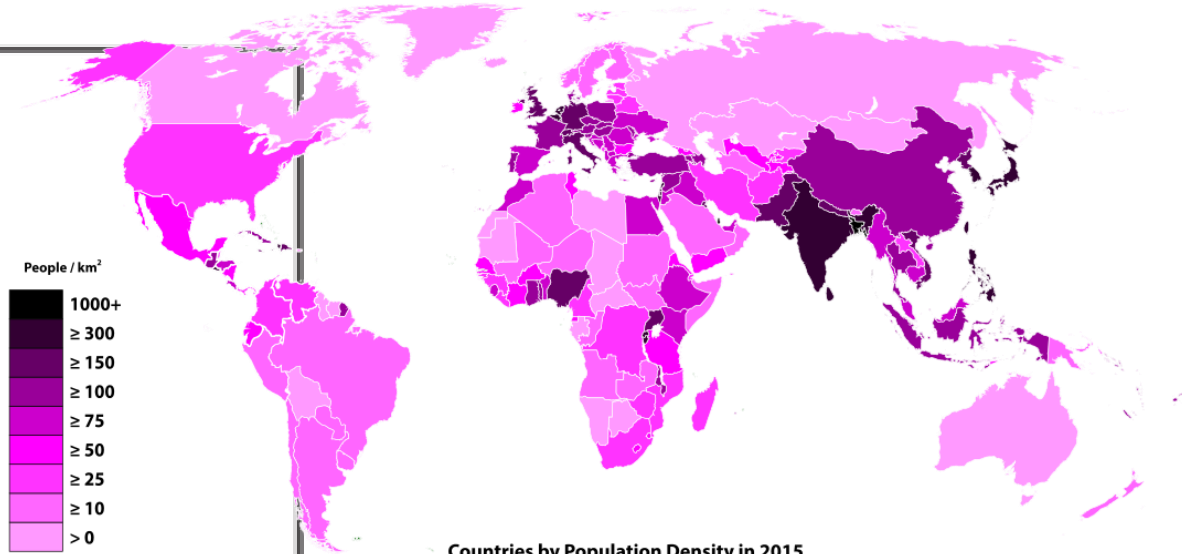
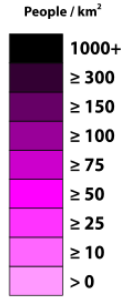


Population density is:

**Measurement of
population by a unit of
area**

Calculated Using the Formula:

$$\frac{\text{Number of organisms}}{\text{Land area}} = \text{Population density}$$



High Density



Low Density

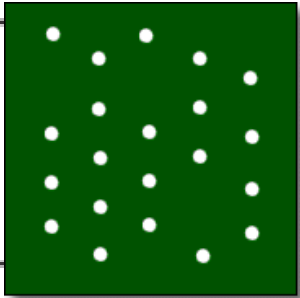
Population dispersion is:

**Geographic or spatial
distribution of organisms
within a specific area**

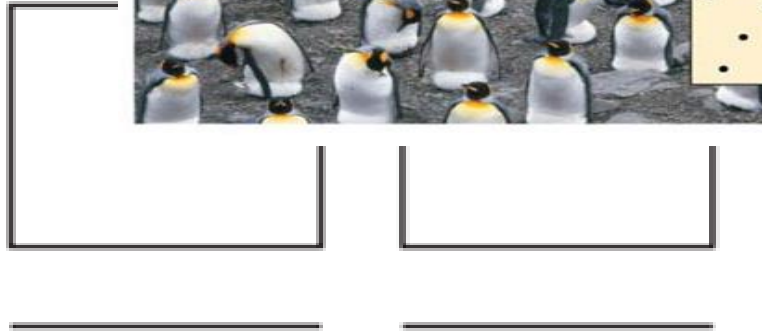


Uniform: Not as common. Used because of scarcity of resources

Three dispersion types:



nearly
uniform

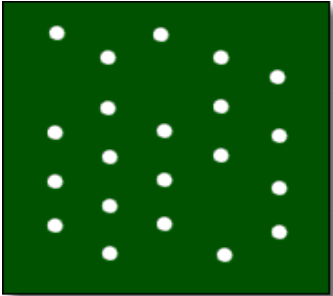


Population dispersion is:

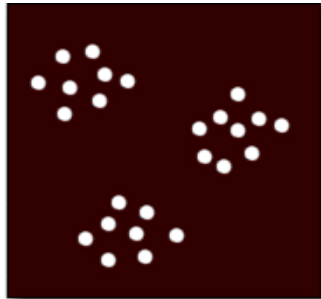
Geographic or spatial distribution of organisms within a specific area



Three dispersion types:



nearly uniform



clumped

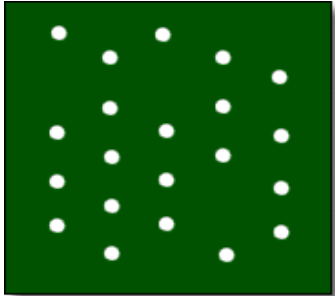


Clumping: Most common. Safety in numbers, social interaction, mating and caring for young, resources are clumped

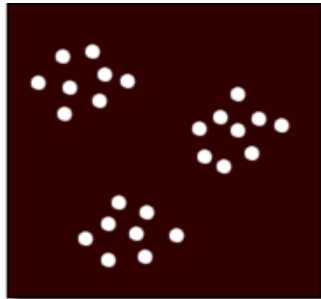
Population dispersion is:

Geographic or spatial distribution of organisms within a specific area

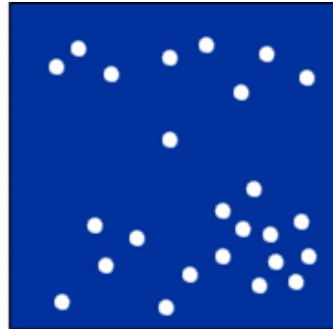
Three dispersion types:



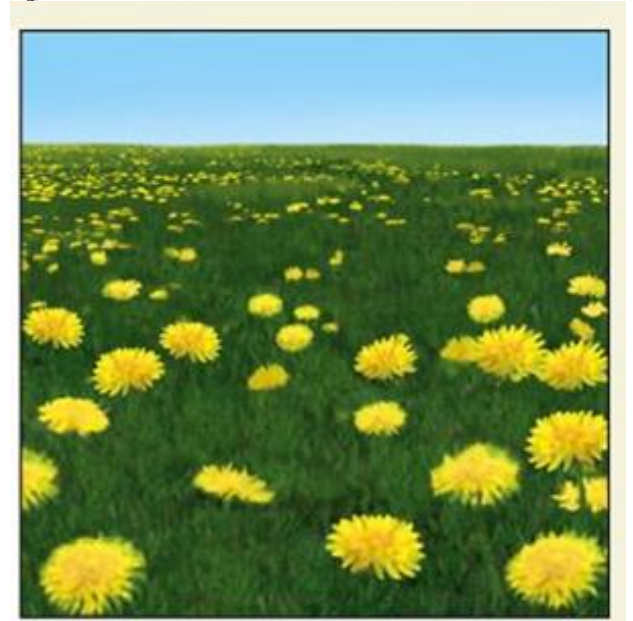
nearly uniform



clumped



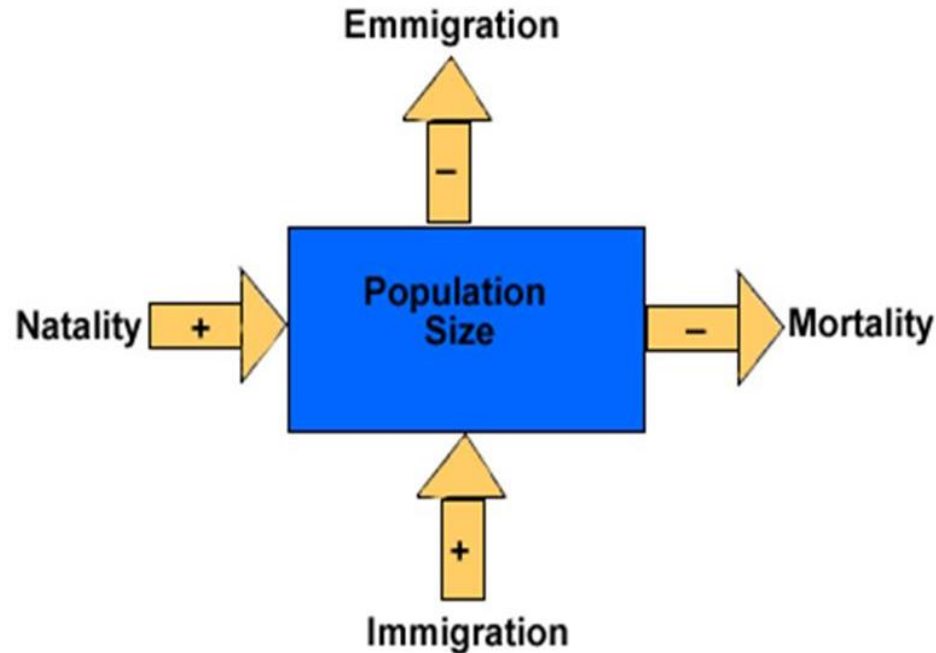
random

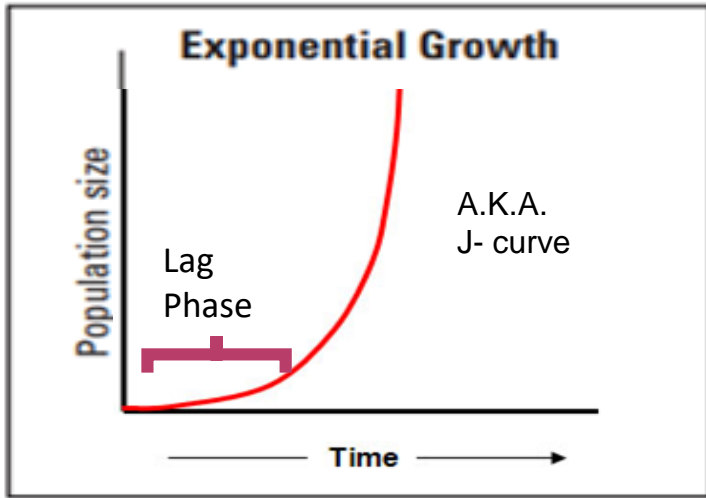


Four factors that affect the size of a population:

- immigration
- births
- emigration
- deaths

Factors affecting population size





- ? The increase is slow at first. This is called the Lag Phase.
- ? Over time the population becomes larger. This is called the exponential growth phase.
- ? Under ideal conditions with unlimited resources, a population will grow exponentially

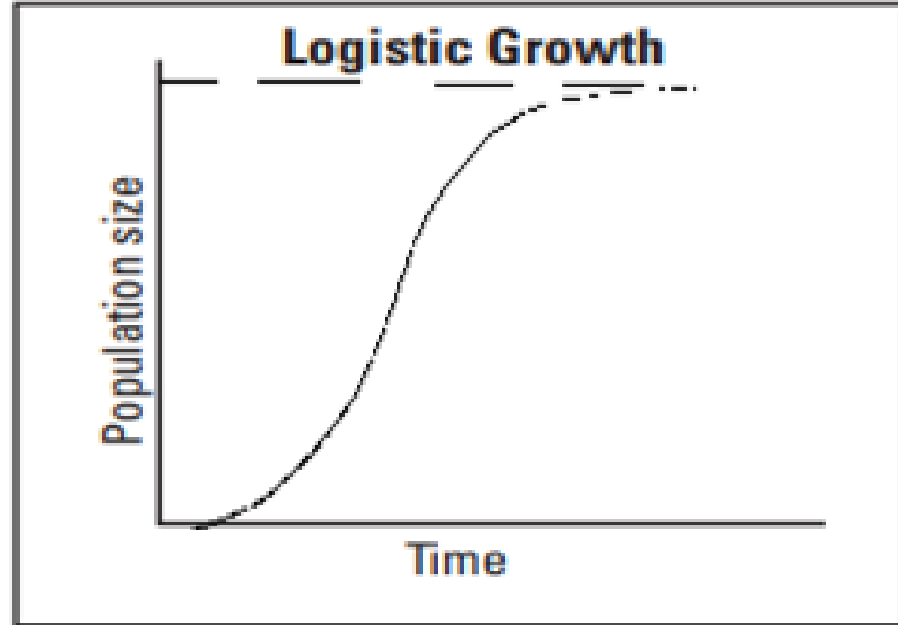
Population growth may slow down when:

death rate increases; birth rate decreases

resources (food, shelter, optimal temperature) are not available

carrying capacity is reached.

- - the maximum number of organisms that can be supported by a given environment

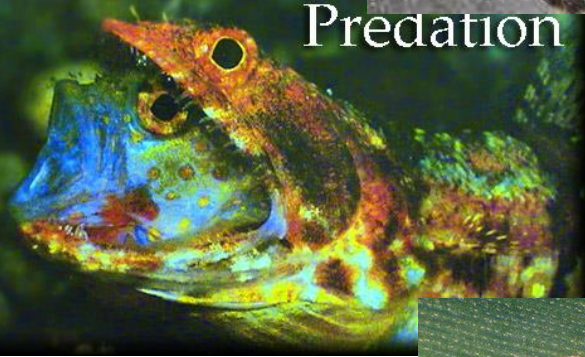


Density-dependent limiting factors:

- competition
- predation
- disease



Predation



© MARLIN RICE

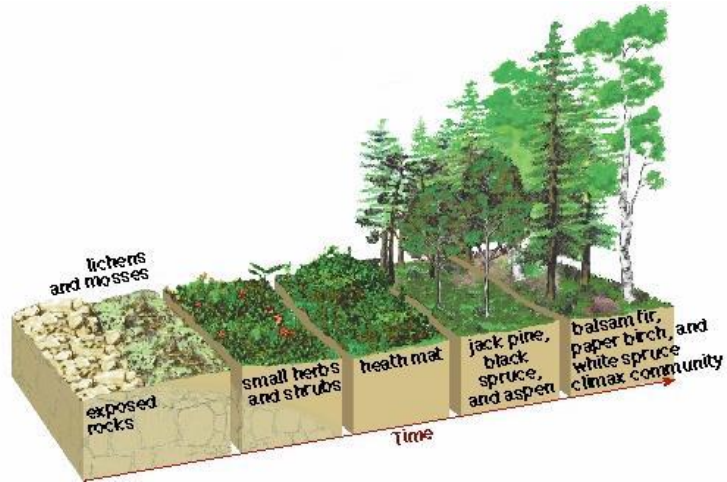
Density-independent limiting factors:

- Unusual weather
- Natural disasters
- Human activities



Succession: **gradual, sequential regrowth of a community of species in an area**

Primary Succession: **has not supported life previously**, such as bare rock, a sand dune, or an island formed by a volcanic eruption. Soil is not initially present.



A pioneer species colonizes an uninhabited area and starts an ecological cycle in which many other species become established

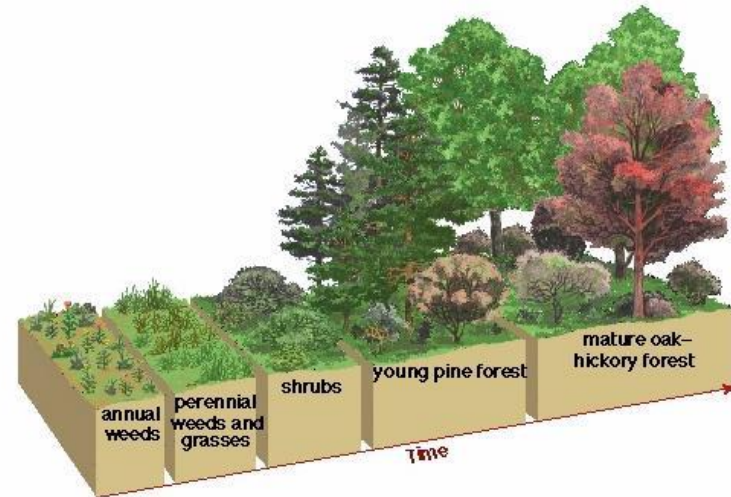
Succession: gradual, sequential regrowth of a community of species in an area

Chernobyl - Twenty Years Later



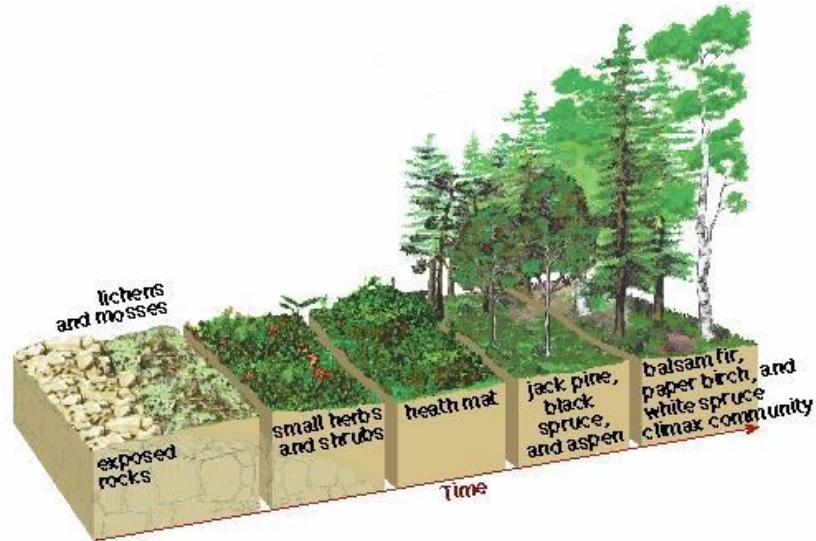
Pripyat town square.

Secondary Succession sequential replacement of species that follows disruption of an existing community; forest fire or a strong storm, human activity, such as farming, logging or mining. Occurs where soil is already present.



Succession: gradual, sequential regrowth of a community of species in an area

Primary Succession: **has not supported life previously**, such as bare rock, a sand dune, or an island formed by a volcanic eruption. Soil is not initially present.



Secondary Succession: sequential replacement of species that follows disruption of an existing community; forest fire or a strong storm, human activity, such as farming, logging or mining. Occurs where soil is already present.

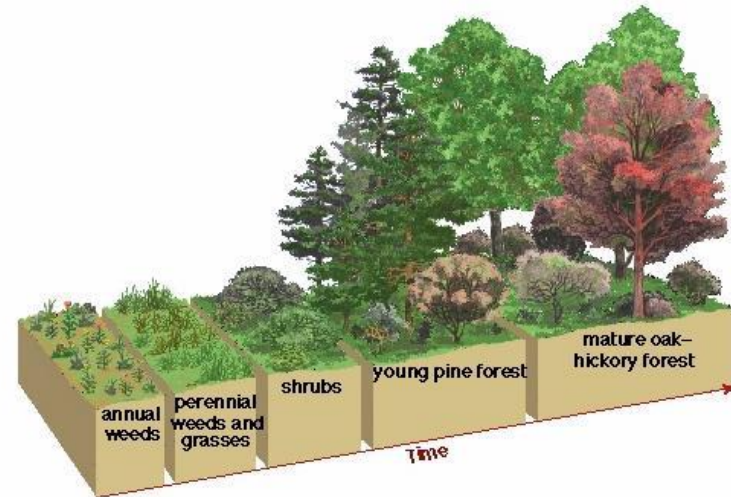
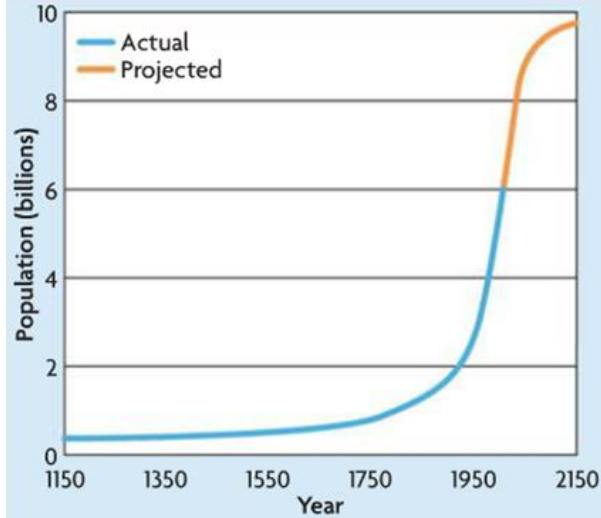


FIGURE 16.1 WORLD POPULATION



Two technological advancements that have contributed to population growth:

- Agricultural advancements: gas-powered equipment
- Medical advancements (antibiotics & antiseptics)



Types of Resources

Renewable

Nonrenewable

Types of energy that are used faster than they form; dead organic material under severe pressure for millions of years to form fossil fuels: examples oil and coal



Types of Resources

Renewable

Resources that cannot be used up, or can replenish in a short time period, examples: wind, solar

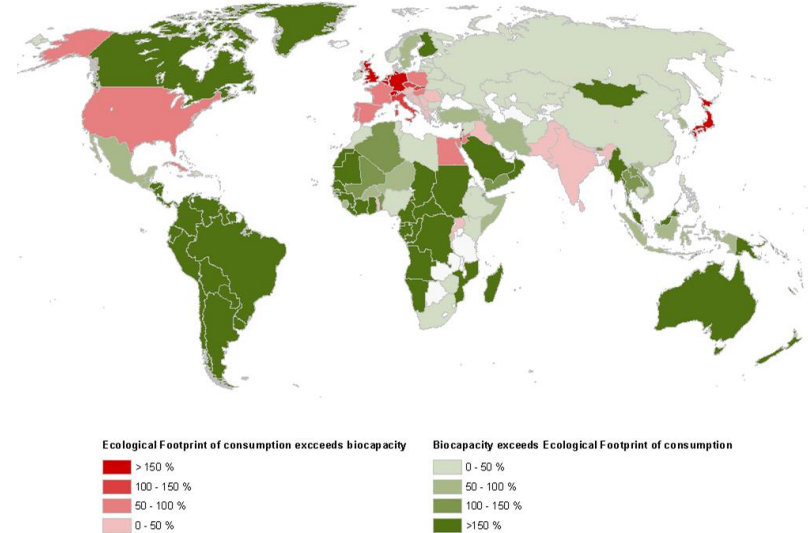
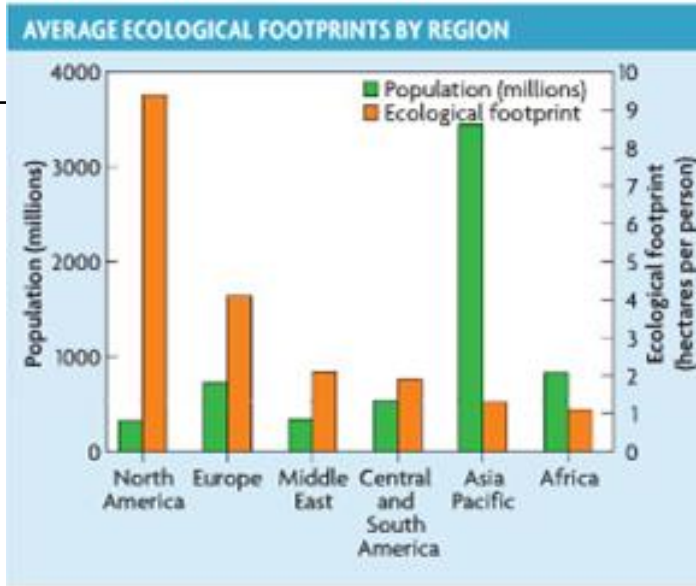
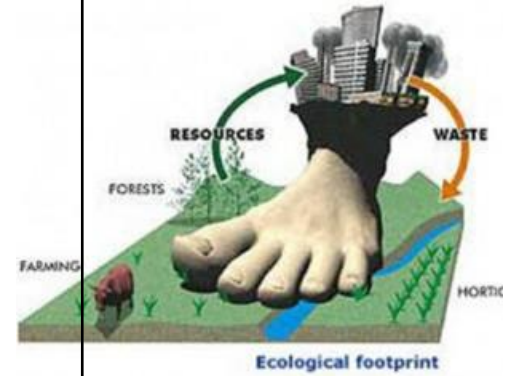
Nonrenewable

fuels:



Ecological Footprint: How much land is necessary to produce & maintain enough food, water, shelter, energy and water to sustain a population

Size of footprint depends on: amount & efficiency of resource use, along with how much waste & toxicity levels



Ecological Footprint of consumption exceeds biocapacity

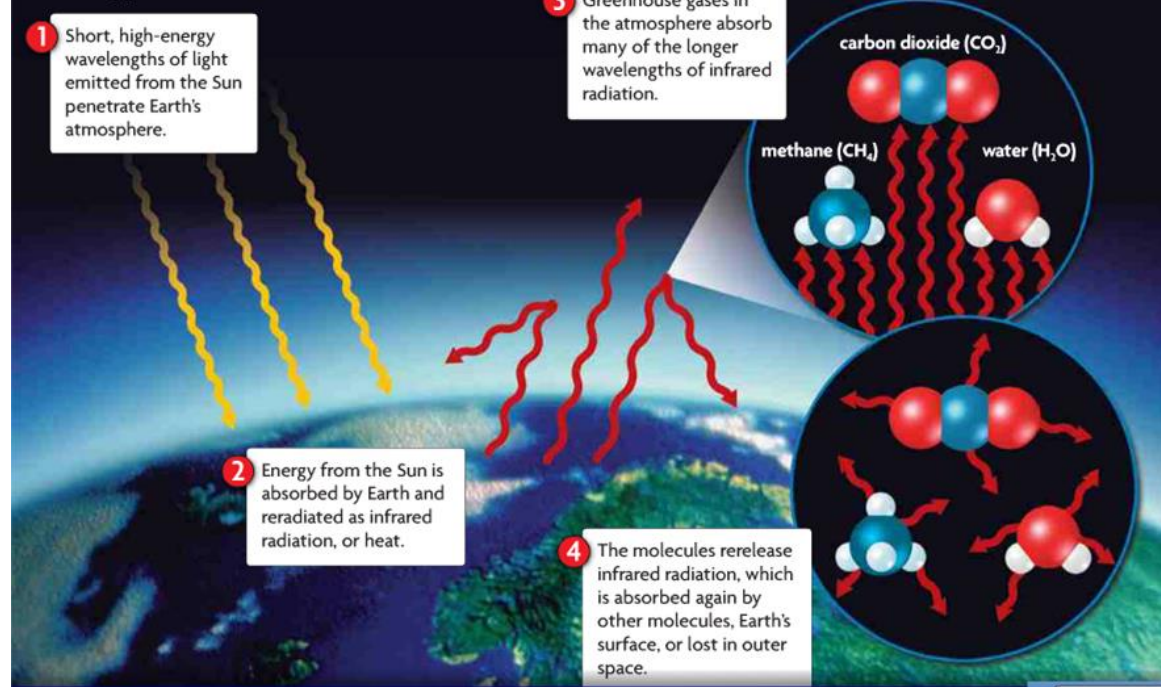
- > 150 %
- 100 - 150 %
- 50 - 100 %
- 0 - 50 %

Biocapacity exceeds Ecological Footprint of consumption

- 0 - 50 %
- 50 - 100 %
- 100 - 150 %
- >150 %

Greenhouse effect occurs when: carbon dioxide, water & methane molecules absorb energy reradiated by Earth's surface and slow the release of energy from Earth's atmosphere

that can support life.



1. light emitted from the Sun penetrates Earth's atmosphere

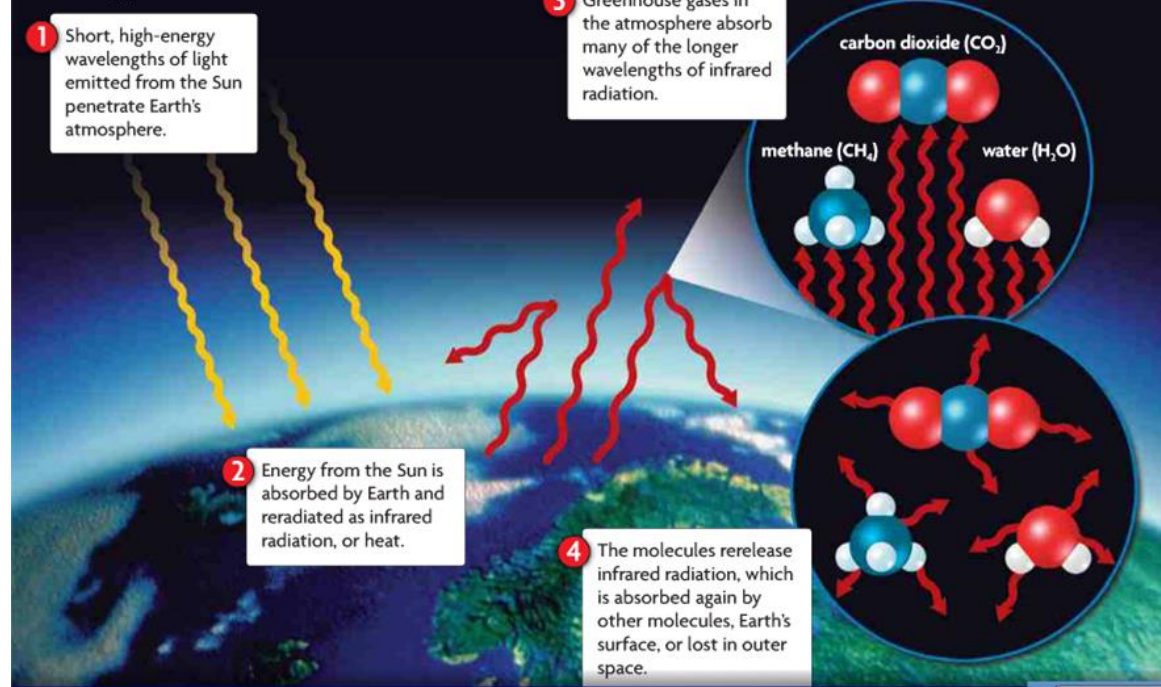
2.

3.

4.

Greenhouse effect occurs when: carbon dioxide, water & methane molecules absorb energy reradiated by Earth's surface and slow the release of energy from Earth's atmosphere

that can support life.



1. light emitted from the Sun penetrates Earth's atmosphere

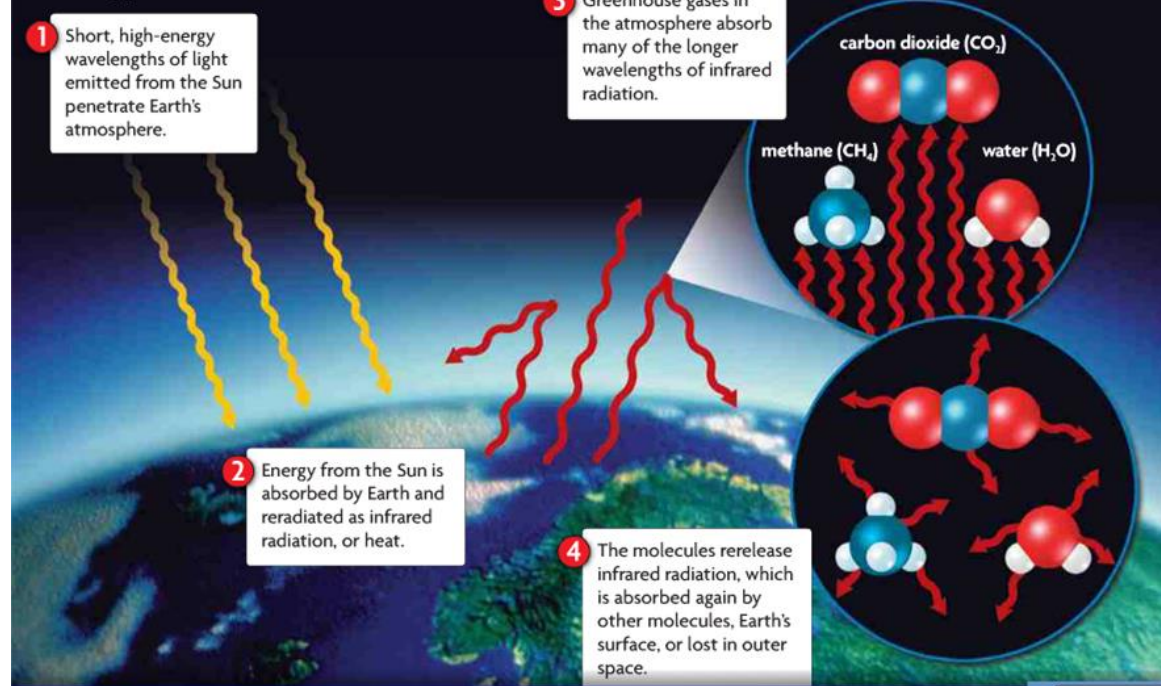
2. Energy is absorbed by Earth and reradiated as heat (aka infrared radiation)

3.

4.

Greenhouse effect occurs when: carbon dioxide, water & methane molecules absorb energy reradiated by Earth's surface and slow the release of energy from Earth's atmosphere

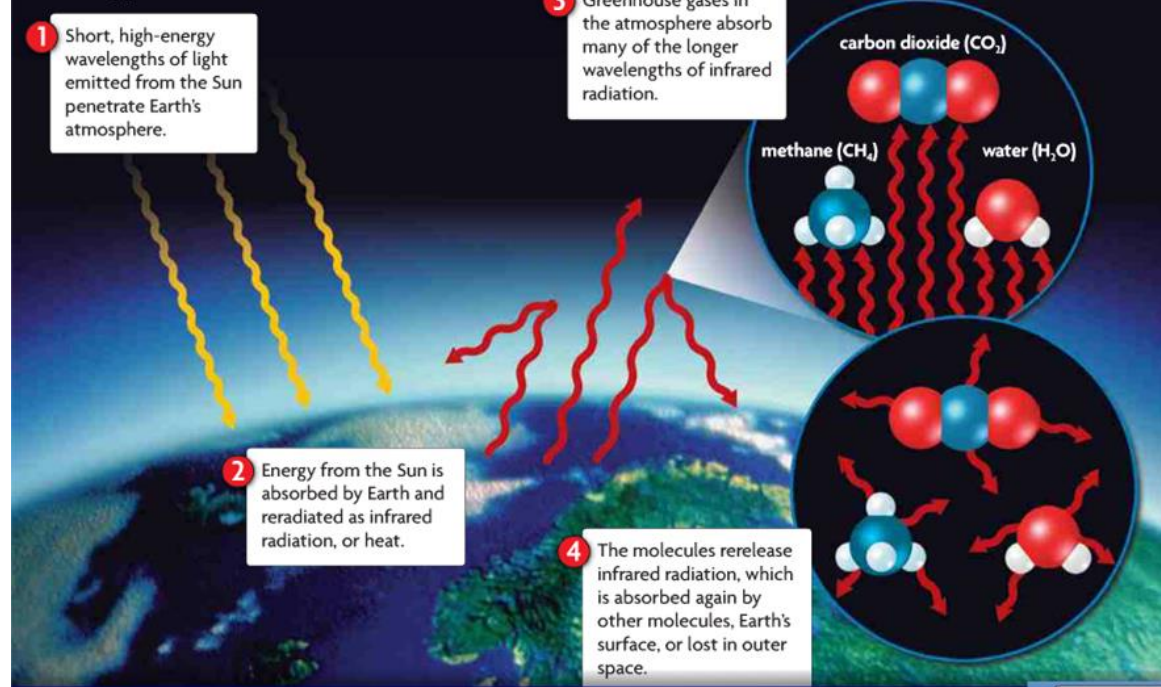
that can support life.



1. light emitted from the Sun penetrates Earth's atmosphere
2. Energy is absorbed by Earth and reradiated as heat (aka infrared radiation)
3. Greenhouse gases in atmosphere absorb many of the longer wavelengths of infrared radiation
- 4.

Greenhouse effect occurs when: carbon dioxide, water & methane molecules absorb energy reradiated by Earth's surface and slow the release of energy from Earth's atmosphere

that can support life.



1. light emitted from the Sun penetrates Earth's atmosphere

2. Energy is absorbed by Earth and reradiated as heat (aka infrared radiation)

3. Greenhouse gases in atmosphere absorb many of the longer wavelengths of infrared radiation

4. Molecules rerelease infrared radiation, which is absorbed again by other molecules, Earth's surface or lost into space.

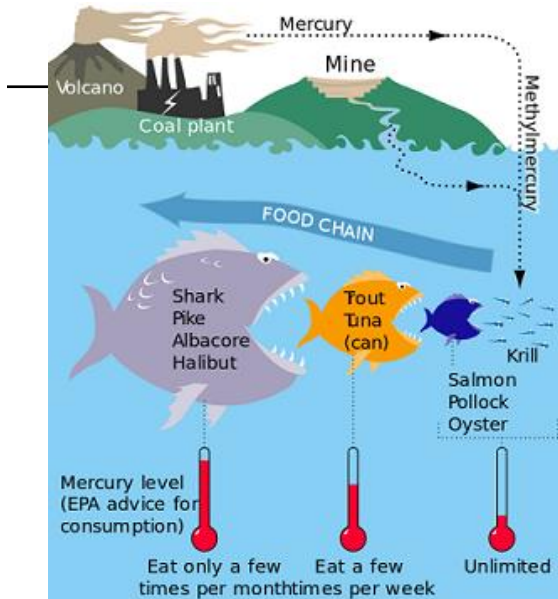
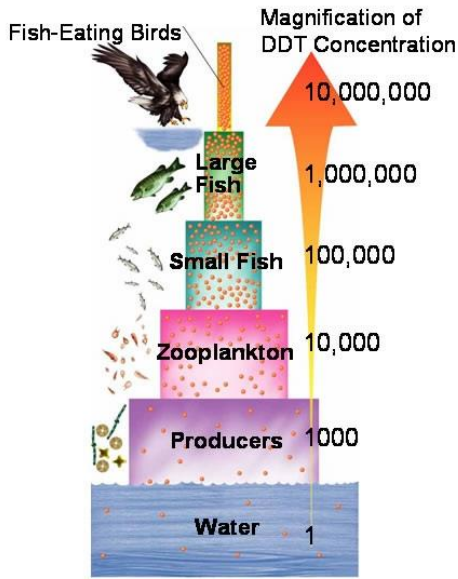
Indicator Species: provides a sign of the quality of the ecosystem's environmental conditions

Biomagnification:

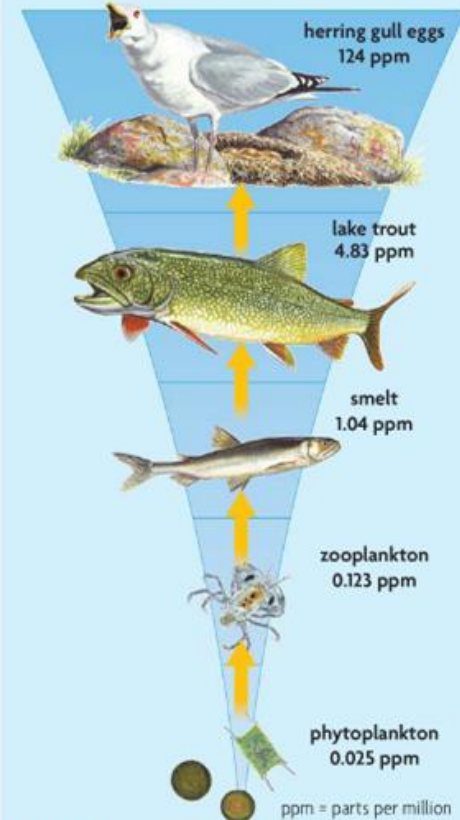


Indicator Species: provides a sign of the quality of the ecosystem's environmental conditions

Biomagnification: process of a pollutant moving UP a food chain and accumulating in higher concentrations; measured in parts per million (ppm)



The movement of fat-soluble pollutants through a food chain results in higher concentrations in the top consumer.



Connect Are humans likely affected by biomagnification? If so, what foods might be dangerous?

Biodiversity importance:

- Decrease in biodiversity of an ecosystem's affects all species



Biodiversity importance:

- Decrease in biodiversity of an ecosystem's affects all species
- Medical & technological advancements that come from nature



Biodiversity importance:

- Decrease in biodiversity of an ecosystem's affects all species
- Medical & technological advancements that come from nature
- Loss of biodiversity can reduce ecosystem's stability



Threats to Biodiversity



Habitat fragmentation:

Barrier is formed that prevents an organism from accessing its habitat, usually due to human activity





Threats to Biodiversity

Habitat fragmentation:

Barrier is formed that prevents an organism from accessing its habitat, usually due to human activity

Introduced species:

Aka invasive species....Any organism brought to an ecosystem as the result of human activities

Burmese python, Florida Everglades..feeds on native species,
including endangered species

Kudzu, SE US...blankets trees & shrubs, kills native plants

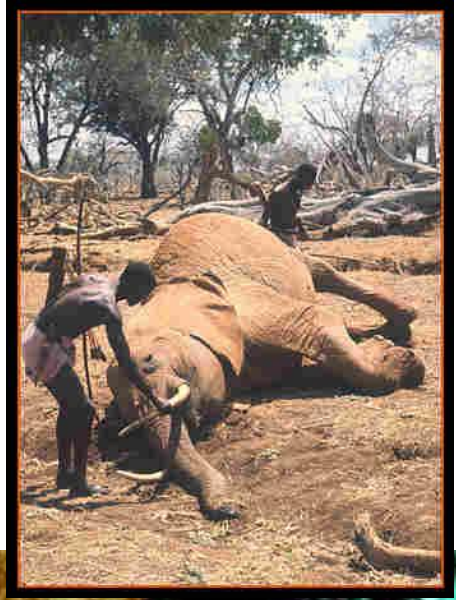
Zebra mussels...



Other Human Impact:

Overhunting:

Hunting & gathering part of human history; but now hunting is more for “fads” or status; examples shark fin soup, white ivory tusks- can lead to extinction of some animals or species



Agriculture

Removal of tropical rainforest--large effect on biodiversity

Development of food growth or animal for consumption; allows for settlement

