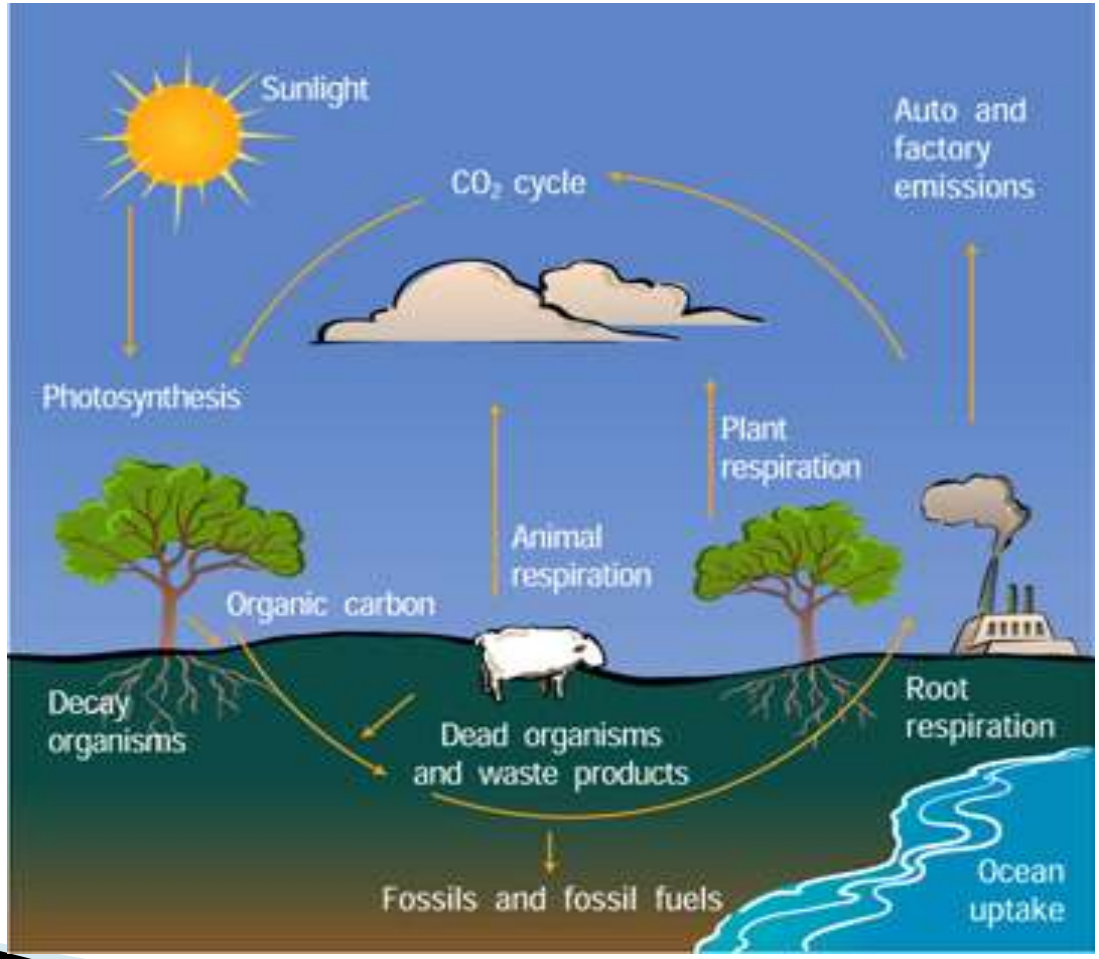
Goal 2

Bio.2.1 Analyze the interdependence of living organisms within their environments.

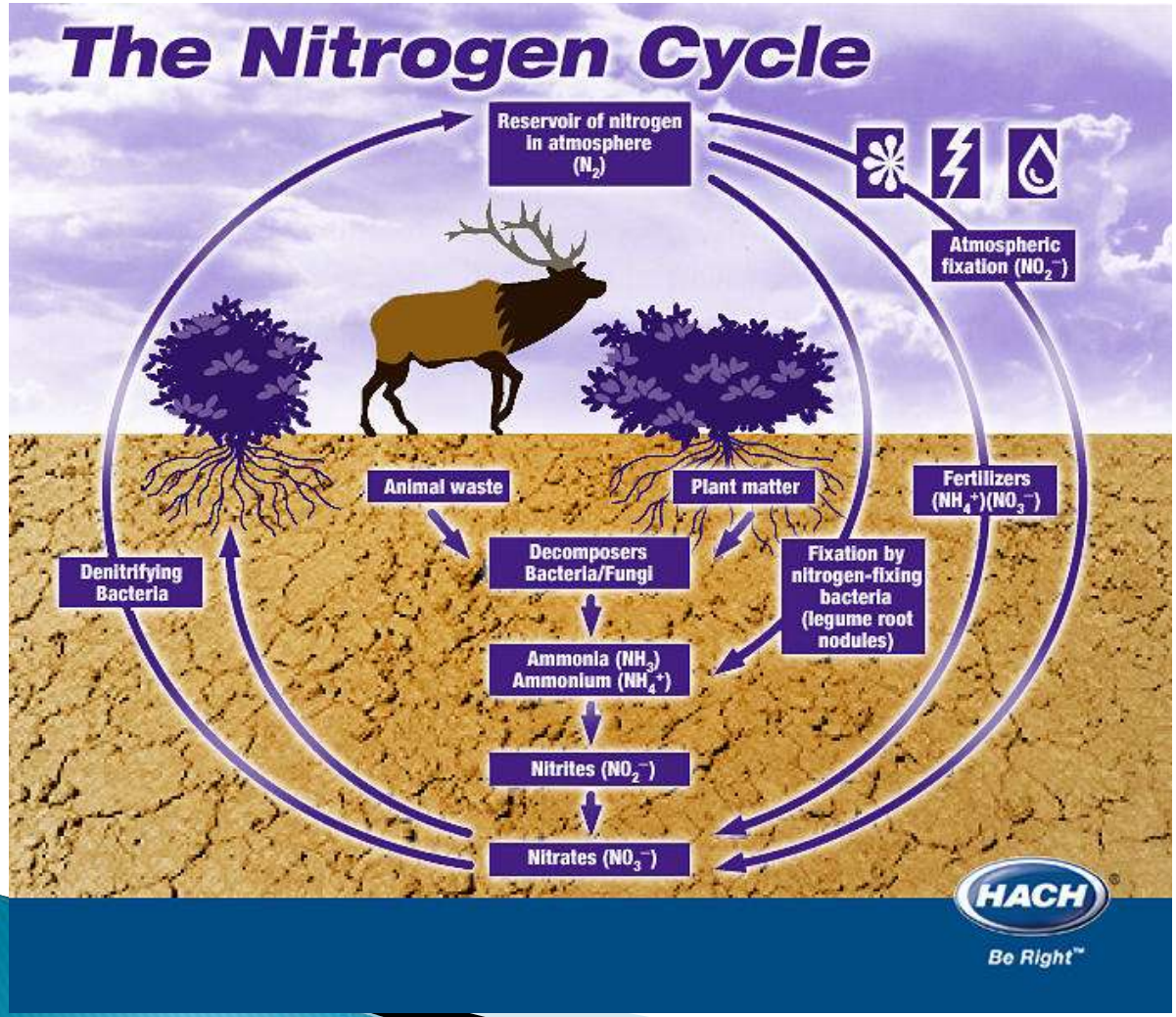
Bio.2.2 Understand the impact of human activities on the environment (one generation affects the next).

Carbon Cycle



Photosynthesis: Absorbs Carbon
Respiration: Releases carbon
Decomposition: Releases carbon

Nitrogen Cycle



- Legumes: Plants such as beans that fix nitrogen.
- Bacteria on roots of plants turn nitrogen into nitrates that a plant can use

Nitrogen Cycle

- All living things need nitrogen
- Nitrogen is needed for amino acids and DNA.
- Some places we have too much nitrogen and other places not enough.

Plants can only intake nitrogen if it is a nitrate or ammonia.

Carbon Dioxide and Greenhouse Effect

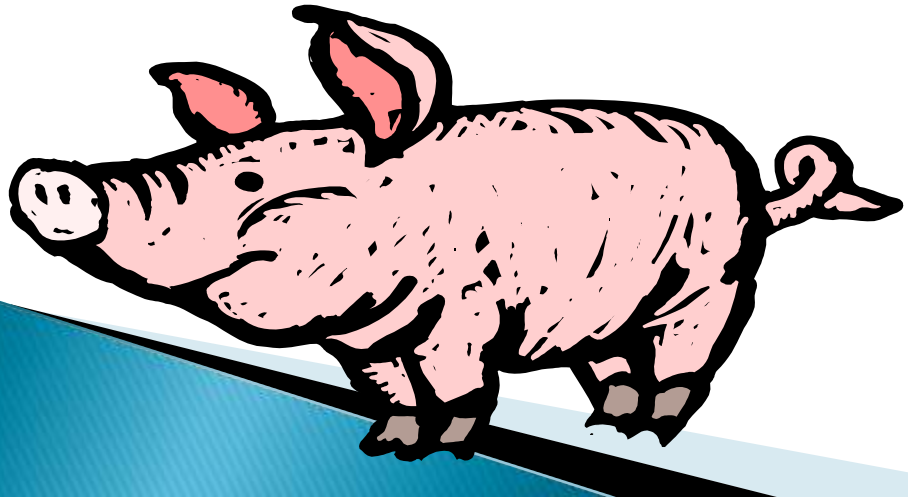
- As carbon dioxide levels go up, temperatures rise.
- Gases trap in the heat.
- Carbon dioxide levels are rising due to
  - Less trees to absorb it.
  - Coal power plants releasing it.
  - Cars releasing it
  - Burning of any fossil fuel releases it.

Greenhouse Effect

- As temperatures go up, the following occurs
  - More severe weather
  - More droughts
  - Sea level rising which causes more floods
  - More insect borne diseases

Nitrogen Cycle Off Balanced

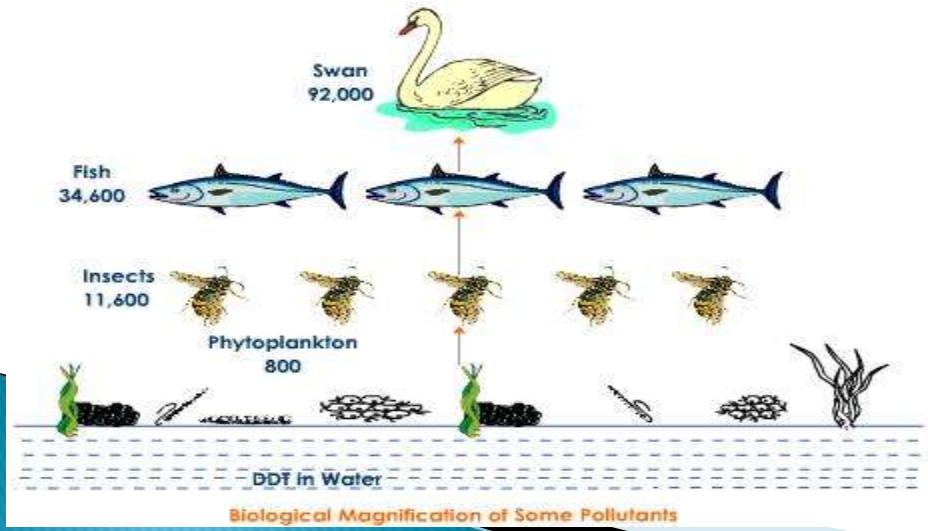
- Hog Waste contains a lot of nitrogen which will runoff and cause many problems:
  - Algae blooms lower the amount of oxygen in a lake and kill the fish.
  - High nitrate levels in drinking water cause blue baby syndrome
  - High nitrate levels cause pfiesteria (a dinoflagellate) to become deadly and cause fish kills.



NC is #2 in the country for its amount of hogs!

Biological Magnification

- As we move down a food chain, the amount of energy decreases.
- However, the amount of toxins or pesticides will increase.
- Organisms at the top of the food chain will have the most toxins. This is called biological magnification.
- Over time these toxins will be stored in the fatty tissues of the organisms. This is called bioaccumulation.

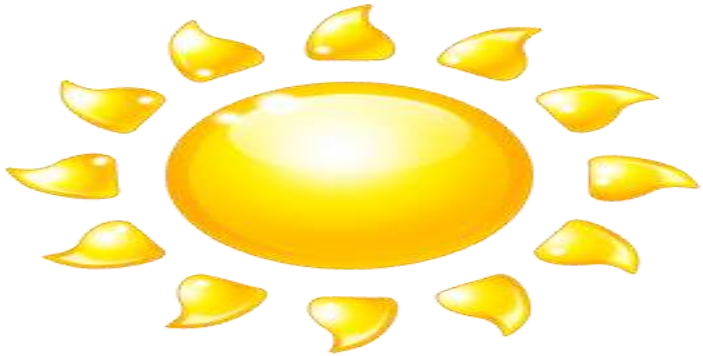


Biological Magnification of Some Pollutants

What organism in this picture has the most toxin?

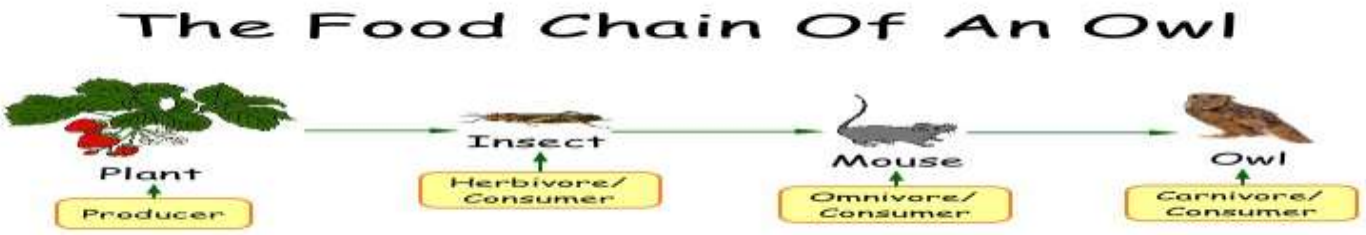
Energy Flow

- Living systems require a continuous input of energy to maintain organization.
- The input of radiant energy which is converted to chemical energy allows organisms to carry out life processes.
- Within ecosystems energy flows from the radiant energy of the sun through producers and consumers as chemical energy that is ultimately transformed into heat energy.
- Continual refueling of radiant energy is required by ecosystems.



Food Chain

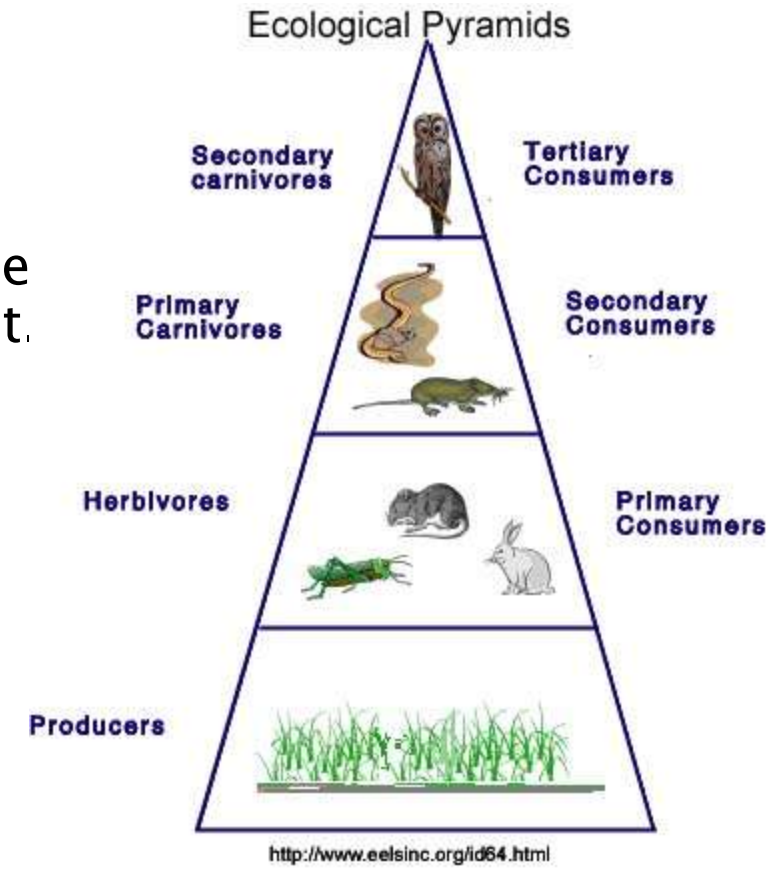
- Food chains show the one way transfer of matter and energy in organisms.
- Decomposers break down the final matter at the end of the chain. Ex: bacteria and fungi
- Producer→Primary Consumer→ Secondary Consumer
- Producer or Autotroph: Example" plants
- Consumer or Heterotroph:
  - Primary consumer: Eats plants: ex: rabbit
  - Secondary Consumer: eats primary consumers: Ex: fox



Food Webs and Energy Pyramids

- Food webs are interweaving food chains.
- Energy pyramids or pyramids of productivity
  - Show how energy is lost at each level.
  - Each organism gets only 10% of the energy from the organism before it.

Grass: 10%
Rabbit : 1%
Snake : 0.1 %
Owl : 0.01 %



Relationships

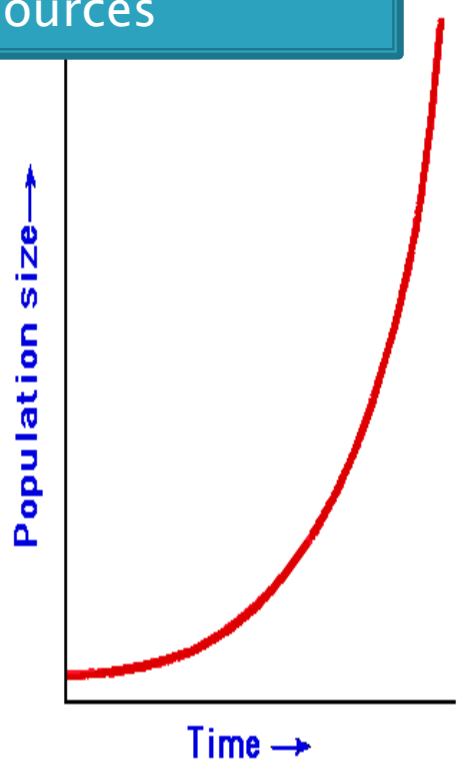
- Mutualism: When both organisms benefit.
  - Example : sea anemone and clown fish
- Parasitism: When one organism benefits and the other organism is harmed: Ex: Tick and dog

Population Growth

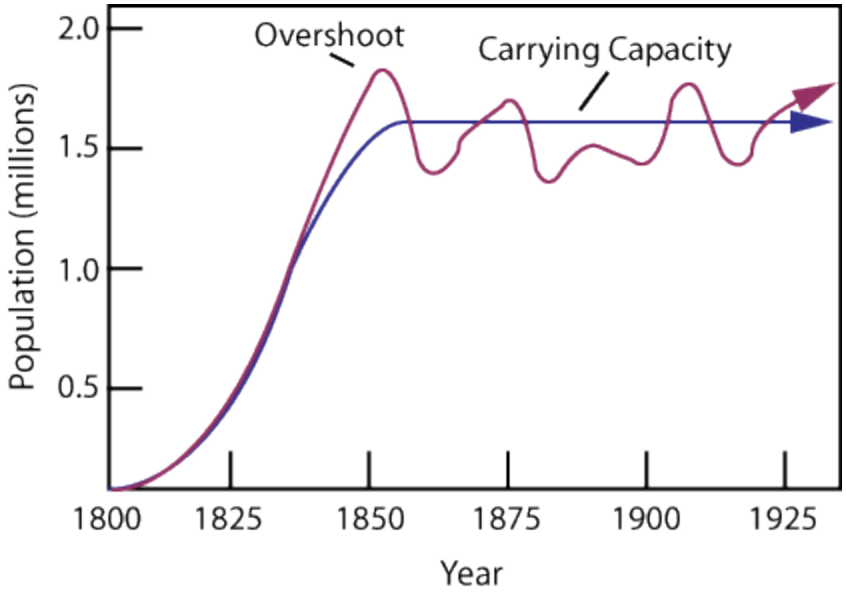
- Density Dependent Factors: Limiting factors that control the size of the population. Examples: amount of food, water, and resources
- Carrying Capacity: The maximum amount of organisms that the population can support.

Population Graphs

Exponential Growth: Unlimited Resources

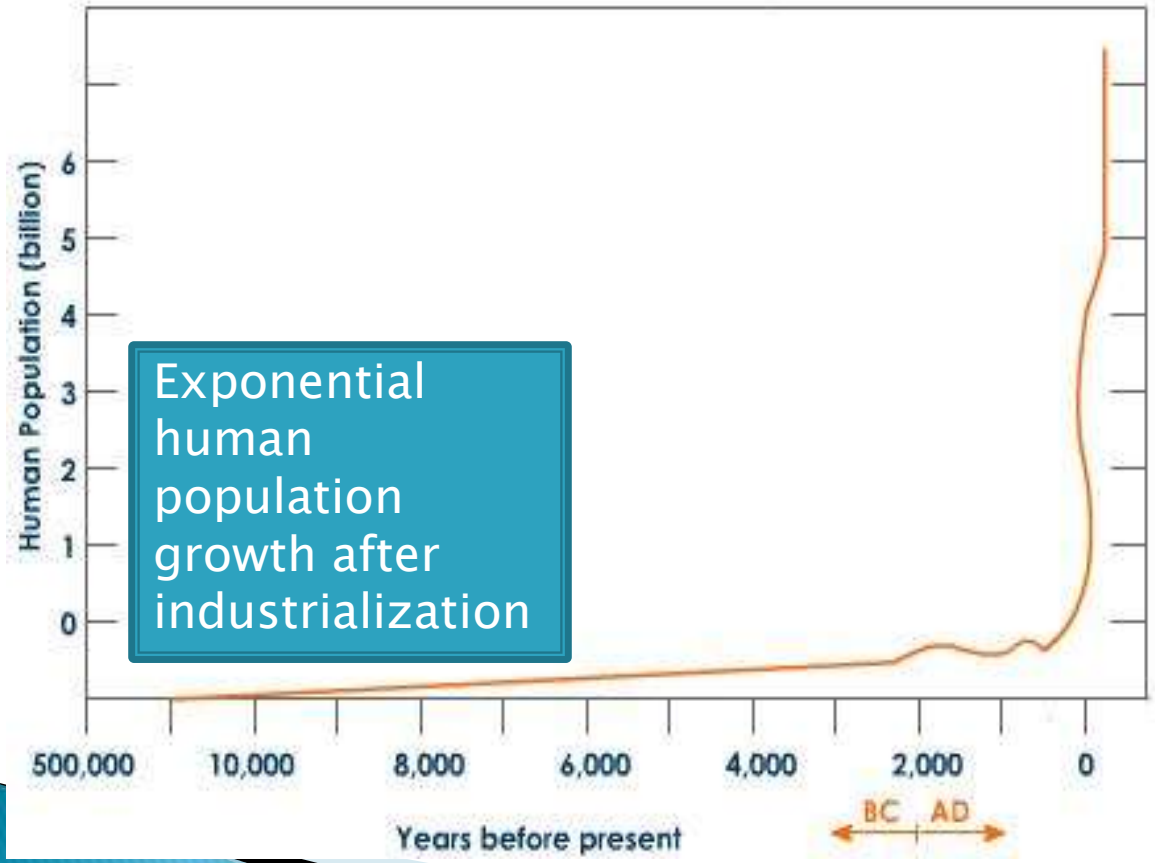


Logistic Growth: Stabilizes around the carrying capacity.



Human Population Graphs

- Population Size= Birth Rate – Death Rate



Death rate decreases due to technology and medicine

Death rate increased during the Black Plague and wars

Impact of disease on a population

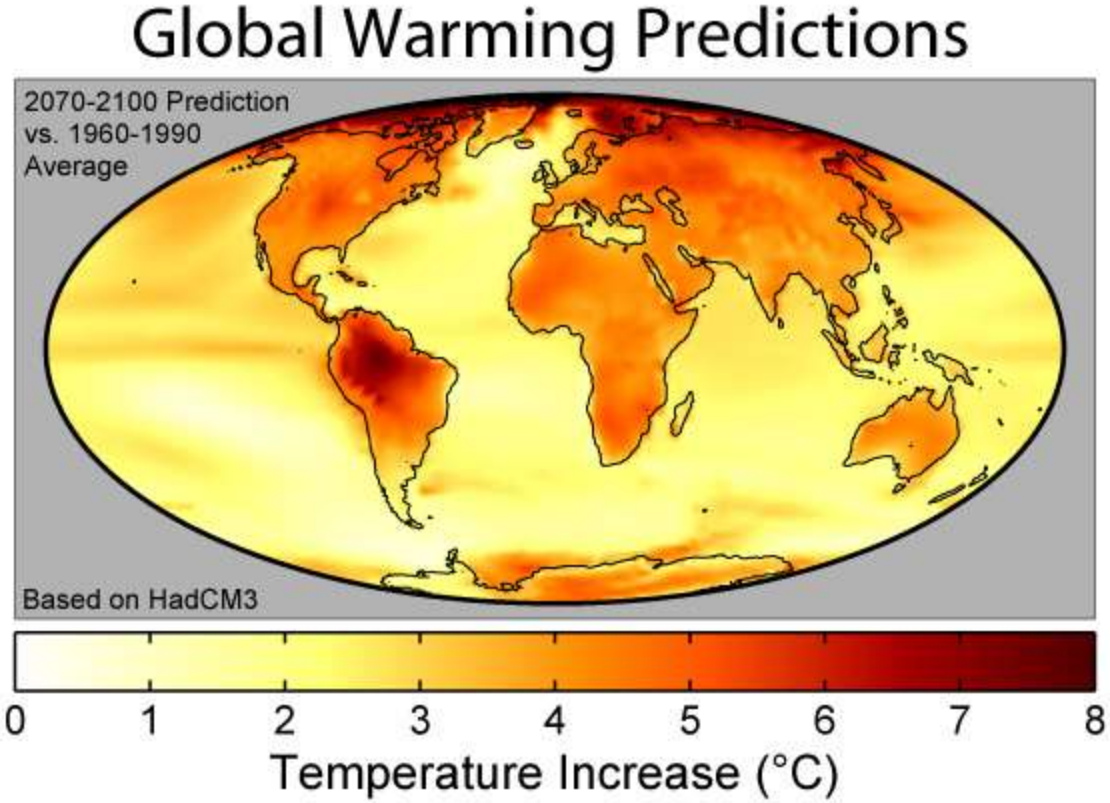
- AIDS: caused by the HIV virus
- Influenza: flu virus
  - Kills more people each year than AIDS
- Tuberculosis: caused by bacteria
  - Has evolved to become antibiotic resistant
- Dutch Elm Disease: fungal infection on trees that is spread by a beetle.
  - INTRODUCED TO NC FROM EUROPE
- Pfiesteria: Protist that has 20+ life forms and can kill fish.

Population Size and Resources

- More people= more pollution
- More people = more deforestation = more habitat loss = more extinction
- More deforestation-> habitat fragmentation
- More people = more burning of fossil fuels for energy = more carbon dioxide= more global warming

Human activities and the environment

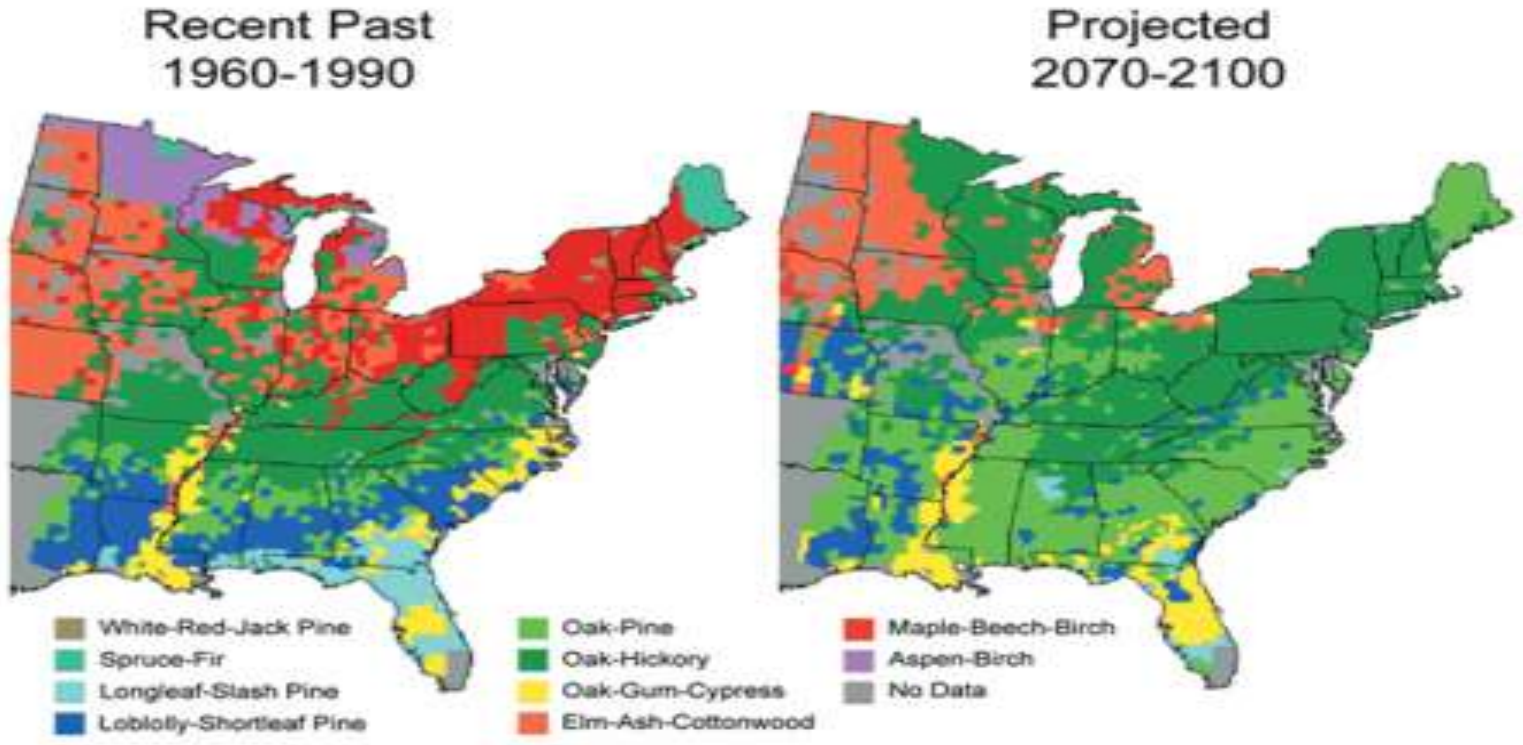
- Summarize how humans modify ecosystems through population growth, technology, consumption of resources and production of waste.
- • Interpret data regarding the historical and predicted impact on ecosystems and global climate.



- What is happening to the temperature?

Historical impact on ecosystems

- Diversity is decreasing.



NC Ecosystems: Acid Rain

Acid Rain: nitric acid or sulfuric acid
  Has a pH less than 5.6
Main source of it in NC: coal power plants releasing sulfur.
Effects on Lakes: Kills Fish
Effects on Trees: Acidic clouds, acid fog and acid rain are killing the Spruce Fir ecosystems.

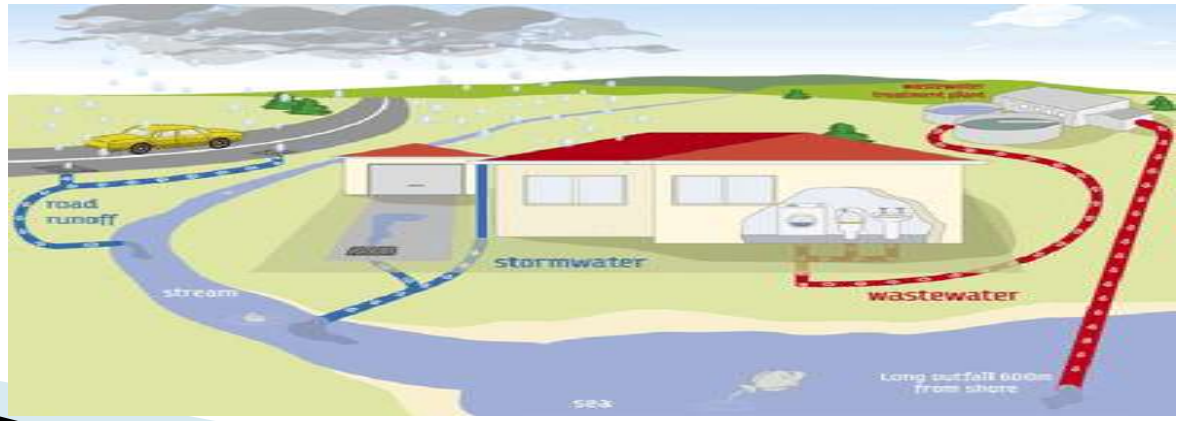
NC Mountains are severely affected!

NC Ecosystems: NC Coasts

- Coastal erosion is the wearing away of land or the removal of beach or dune sediments by wave action, tidal currents, wave currents or drainage.
- Beach erosion is increasing due to amount of storms and development on the beach
- Prevent it by:
  - Dune protection
  - Sand bags

NC Ecosystems: Piedmont

- Urban development in the Piedmont leading to habitat destruction and water runoff.
- Runoff contains fertilizers, sediment, and brake fluid.
- Fertilizers cause algae bloom→ fish kills
- Sediments cause rivers to be turbid and reduce amount of oxygen in the river.
- Watershed: All the land that drains into a body of water.



NC Ecosystems

- NC is #2 in country for amount of hogs
- Hog waste is stored in a hog lagoons on hog farms.
  - Hog waste is high in nitrates, bacteria, etc.
  - Hog lagoons can occasionally spill over and runoff into streams and rivers.
  - Nitrates from hog lagoons can leach into the groundwater and cause health effects.
  - 3800 open-pit hog waste lagoons are contaminating the state's drinking water.

NC Ecosystems

- Kudzu as an invasive plant
- Kudzu was introduced to NC to help with stream bank erosion.
- Like most exotic invasive species, it has taken over many ecosystems.
- Kudzu will cover trees, signs, houses, etc.
- Kudzu grows a foot per day and the roots can grow 12 feet deep.
- Scientists have not found an effective way to control kudzu.

Protection of natural resources by humans

- Explain the impact of humans on natural resources (e.g. resource depletion, deforestation, pesticide use and bioaccumulation)
- Pesticides: Used to kill weeds and insects. Often the chemicals will bio-accumulate in the top predators.

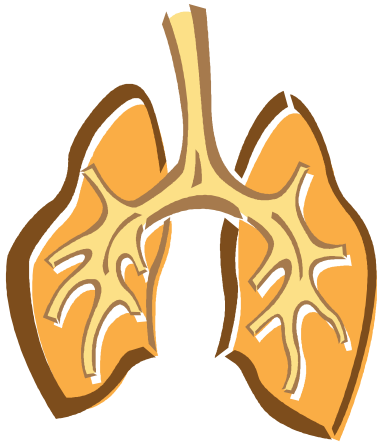
Conservation and Stewardship

- Stewardship: Helping to take care of the environment and our natural resources
- Conservation: Methods to reduce the amount of water, energy, and other resources.
  - Example: Turning off the lights or water when not in use.

Reuse, Reduce, Recycle

Adaptations: Respiration

- Plants excrete water and gases through the stomata.
- Respiratory system in some animals: Removes carbon dioxide that is made in respiration and takes in oxygen.
  - Lungs, bronchi, etc.

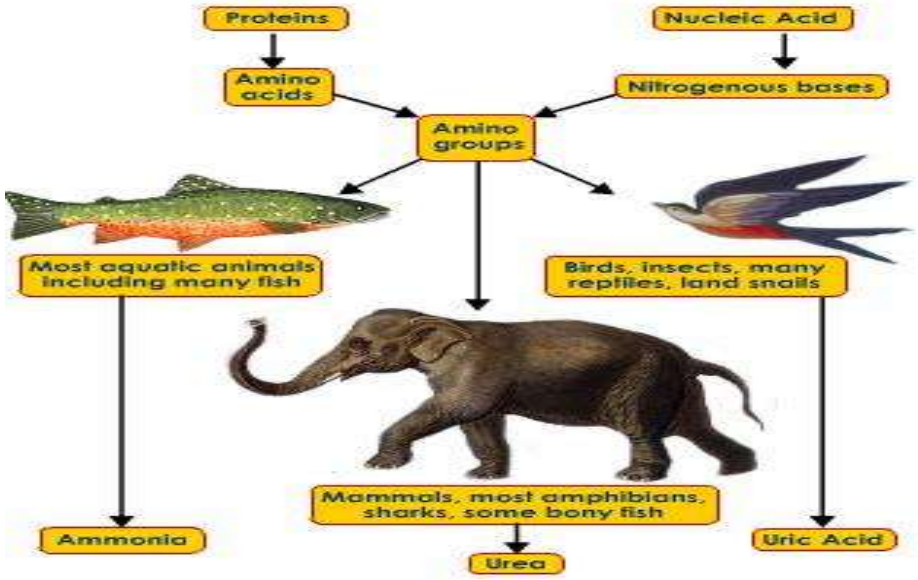


Adaptations: Transport and Excretion

- Transport and Excretion – how different organisms get what they need to cells; how they move waste from cells to organs of excretion.
- Organisms have to maintain balance in pH, salt, and water.
  - Organisms use buffers to keep the pH neutral.
  - Protists have contractive vacuoles to control the amount of water.

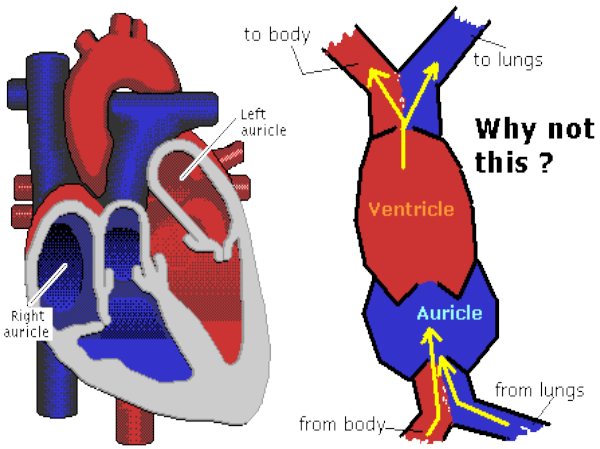
Excretion

- Excretion: Some animals have a urinary tract which regulates water and salt amounts and removes waste.



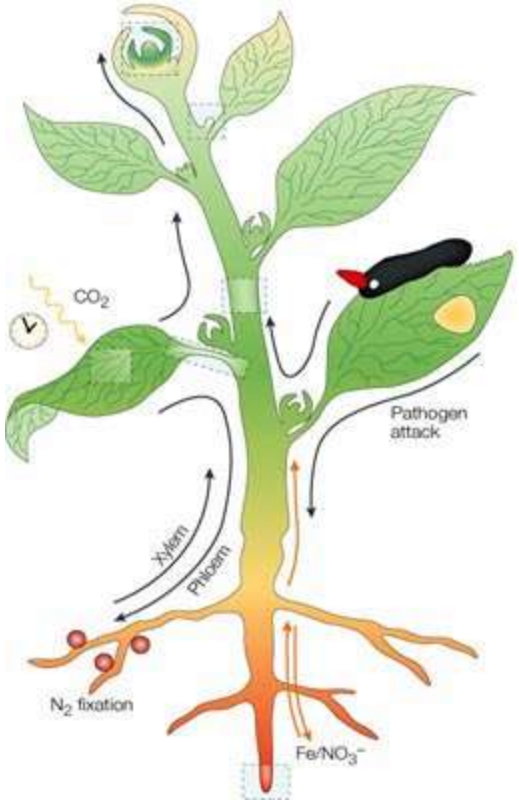
Circulatory/Respiratory Systems

- Circulatory Systems
  - Open Circulatory system: Blood flows through the animal's body to each cell.
  - Closed Circulatory system: Blood flows through blood vessels
  - Heart: Pumps blood
    - Not all animals have one
    - 2 chambered heart: fish
    - 3 chambered heart: amphibian
    - 4 chambered heart: mammals



Adaptations: Transport

Nonvascular Plants	Vascular Plants
Ex: Mosses and liverworts	Ex: Trees ferns, and grasses
Uses diffusion and osmosis to transport nutrients and water to tissues.	Has xylem to move water up a plant
Needs to be near water.	Has phloem to move food down a plant
Have to be small in order to transport nutrients	Vascular system allows them to be large.
Does not have true roots, stems and leaves.	Has true roots, stems, and leaves



Adaptations: Nutrition

- Feeding adaptations
  - Teeth
  - Beaks: Some beaks are better at getting food than other.
  - Filter feeders
- How organisms get nutrition
  - Autotrophic: Make their food through photosynthesis or chemosynthesis.
  - Heterotroph: Consumers, decomposers, detritivores
- How they break down and absorb foods.
  - Some organisms have a digestive system.

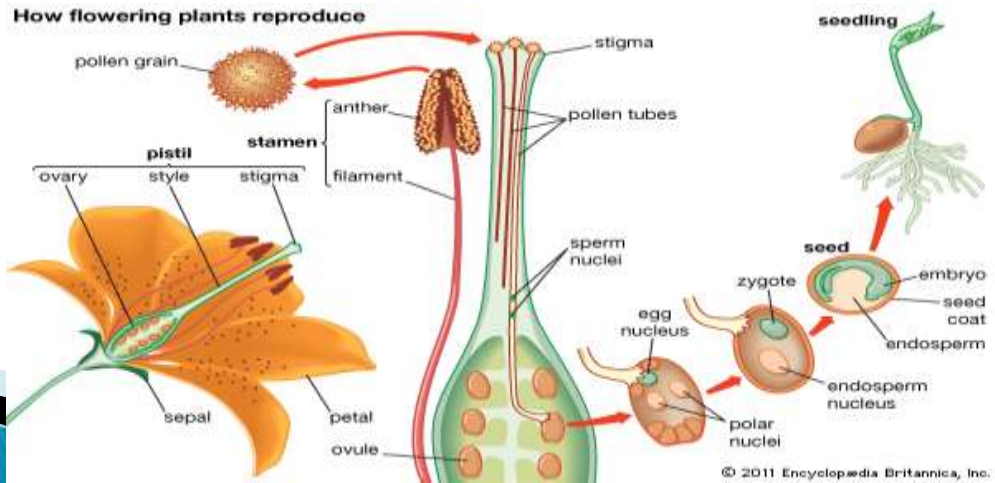
Adaptations: Reproduction, Growth and Development

- **– sexual versus asexual, eggs, seeds, spores, placental, types of fertilization.**

Sexual	Asexual
2 parents	1 parent
Has diversity	No diversity
Examples: eggs, seeds, etc	Examples: spores, budding, fission
Cross Pollination: uses wind, bees, and animals	Self Pollination: Plant has anther and stigma

Reproduction in Vascular Plants

Spore bearing plants	Gymnosperms	Angiosperms
Have to live near water	Seed bearing: seed in cone	Seed bearing: seed in fruit
Releases spores which are diploid		Releases pollen(sperm) to fertilize egg
Small and needs to be near water	Needle like leaves	Has flowers to attract bees to pollinates
Ex: ferns	Ex: pines	Ex. Maple tree



Fertilization: Egg +sperm= zygote

- Internal: Mainly done by mammals and birds
- External: Male releases 1000 of sperm. Female releases 1000 of eggs and some will join. Example: Fish reproduce this way.

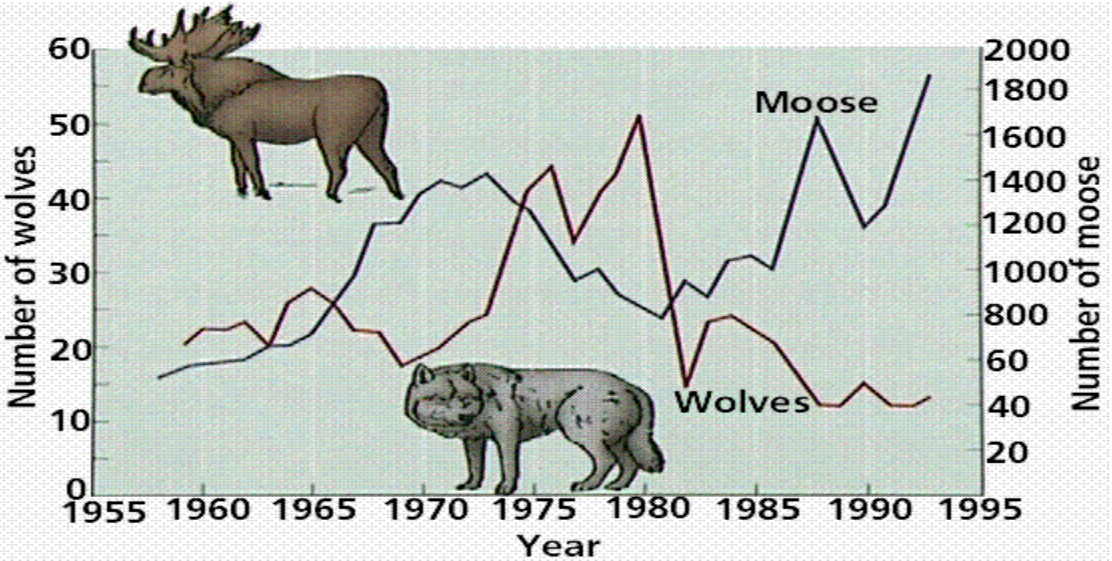
Development: Zygote→ embryo→ fetus → infant

Behavior

- Social Structure: Some insects have queens, kings, and workers
- Communication:
  - Sounds: bird songs
  - Pheromones: chemical messages : used by ants and termites.
  - Body language: Ex: Waggle dance of the honey bees tells where the food is.
- Courtship : The process used to find a mate such as dances, gifts, songs, etc
- Territorial defense : Animals use many methods to protect a territory.
  - (Example: fighting fish).

Relationships

- Predator/prey: The predator eats the prey. When the prey population goes up, the predator population goes up and vice versa.
- Competition: Density dependent factor
  - Limited resources→ increases competition→ natural selection
  - No 2 species can exist on the same resource at the same time. Species do resource partitioning.



Behavior

- Behavior that you are born with the ability to do.
- Suckling: Animals are born knowing they have to suck to get milk.
- Hibernation
- Estivation
- Migration
- Taxis

Innate

- Behavior that the environment influences
- Imprinting: Learning the 1st thing you see is your mother
- Habituation
- Trial and Error
- Conditioning

Learned

Innate Behaviors

Estivation: Holing up to avoid the heat.

Hibernation: Holing up to avoid the cold

Migration: Moving to a new home to escape climatic conditions or to find a food source.

Taxis: Response to a stimuli
Phototaxis: response to light

Learned Behavior

Trial and Error Learning: an animal learns to perform a behavior more and more skillfully by repeating behaviors that result in rewards and avoiding behaviors that result in punishment

Habituation: decrease in response to a stimuli because you are used to it.

Classical Conditioning: Training a reflex: Pavlov trained his dogs to salivate when he rung a bell.