Ecology

1. What is a habitat?

Where an organism lives

- A rotting log is the habitat to many living things such as earthworms, centipedes, ants, and millipedes

2. What is a niche?

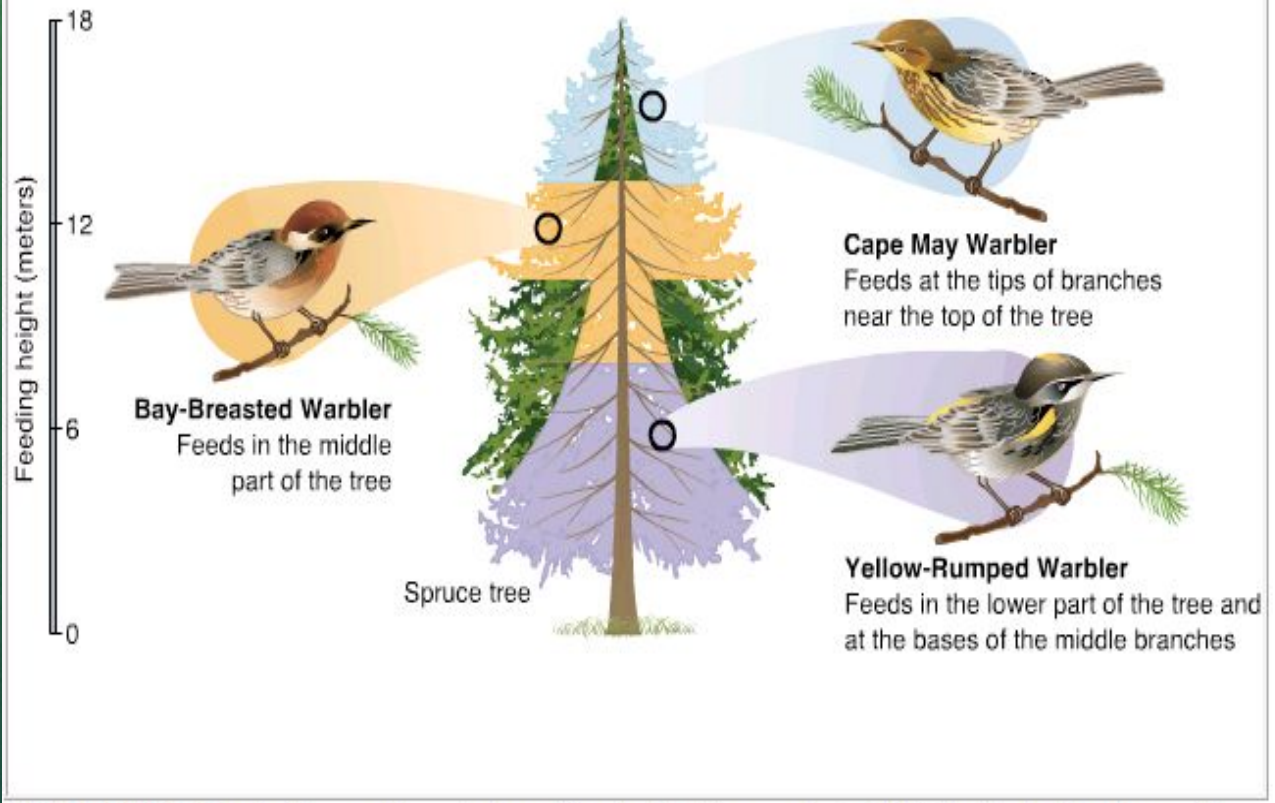
What an organism does, it feeds on or its job.

- Two organisms can share a habitat, but not a niche
- On our rotting log
  - Centipede – predator eat beetles and other animals
  - Worm – nourishment from organic material it eats as it burrows
  - Ants – eat dead insects
  - Millipede – eats dead and decaying leaves near the log

3. Why can these birds live in the same tree?

- Occupy different niches

directions in the pop-up menu.



Warbler Niches Each of these warbler species has a different niche in its spruce tree habitat. By feeding in different areas of the tree, the birds avoid competing with one another for food. **Inferring** ***What would happen if two of the warbler species attempted to occupy the same niche?***

4. List the levels of organization

- Cells
- Tissues
- Organs
- Organ System
- Organism (Species)
- Population
- Community
- Ecosystem
- Biosphere

5. Define the following terms

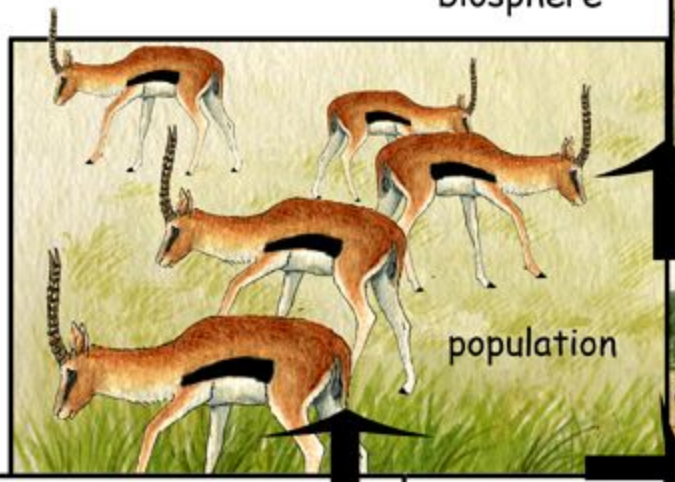
- Population – group of the same species interacting with each other
- Community – group of different populations interacting with each other
- Ecosystem – the community interacting with the non-living things within the environment (abiotic).
- Biosphere – all the different ecosystems

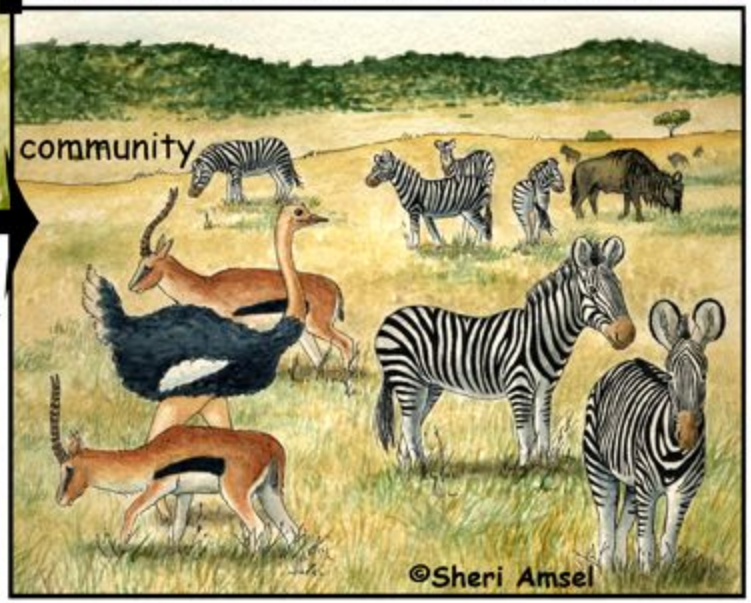
Ecology

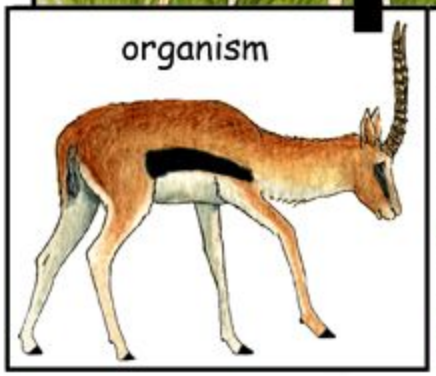
Organizing Living Things in their Environments

biosphere

A **community** together with the non-living environment (air, water, etc.) is an **ecosystem**. All the ecosystems on Earth make up the **biosphere**.







Individual living things are called **organisms**. Many organisms of one species living in one area is called a **population**. Many different populations living in one area is a **community**.

Population distribution
http://www.neok12.com/php/watch.php?v=zX70754558734b15045f5573&t=Ecosystems

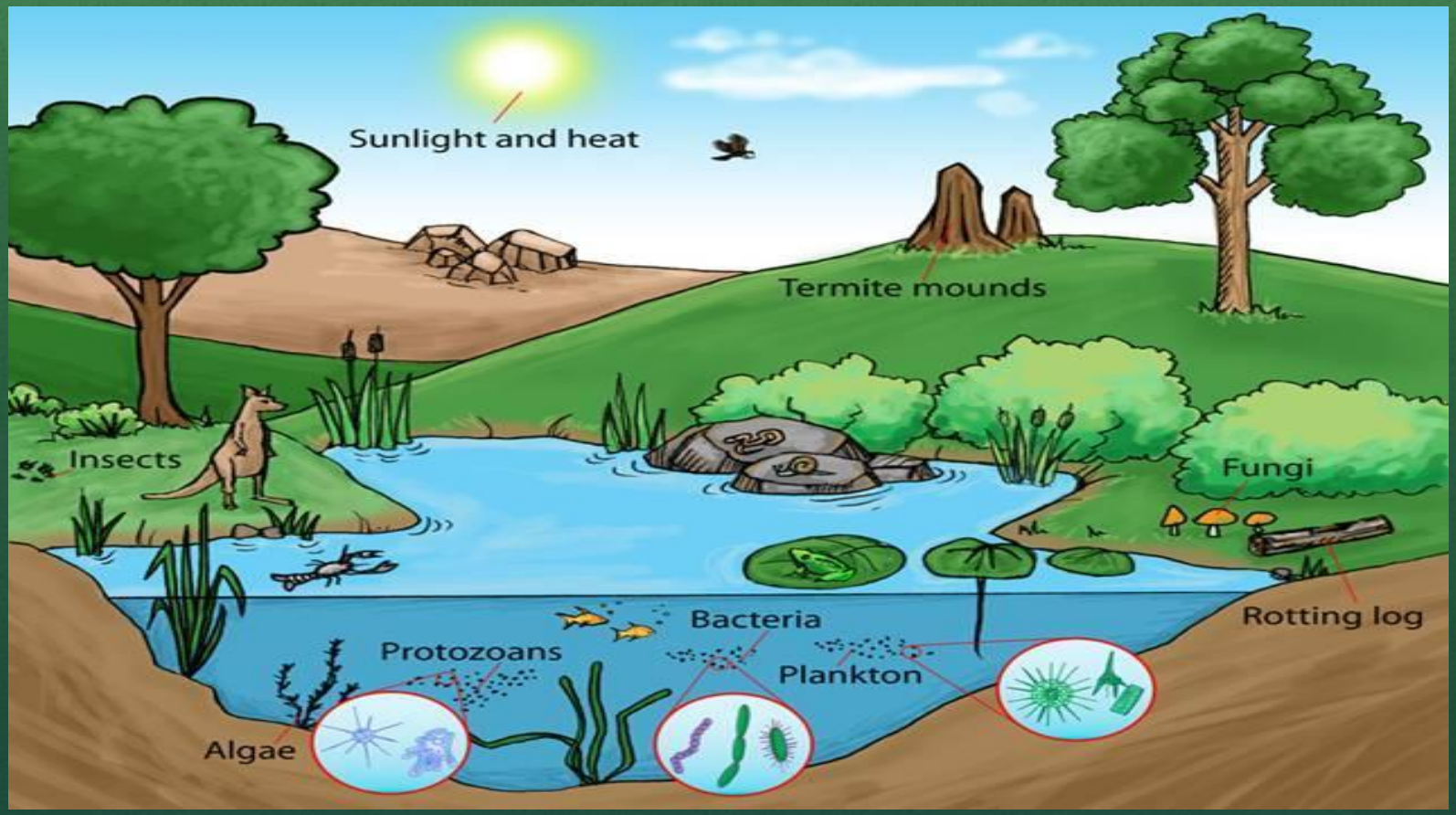
What is an ecosystem
http://www.neok12.com/php/watch.php?v=zX7d0b756f7154415351047f&t=Ecosystems

6. What are abiotic and biotic factors?

- Abiotic – non-living
  - pH, temperature, humidity, amount sunlight, climate, rainfall, natural disasters
- Biotic – living
  - Autotroph – plants (producers) can make their own food
  - Hetertrophs – (consumer) not capable of making their own food
    - Herbivore – plant eaters
    - Carnivores – meat eaters
    - Omnivores – eat both plants and animals

Biotic vs abiotic
http://www.neok12.com/php/watch.php?v=zX4076505852450175000070a&t=Ecosystems

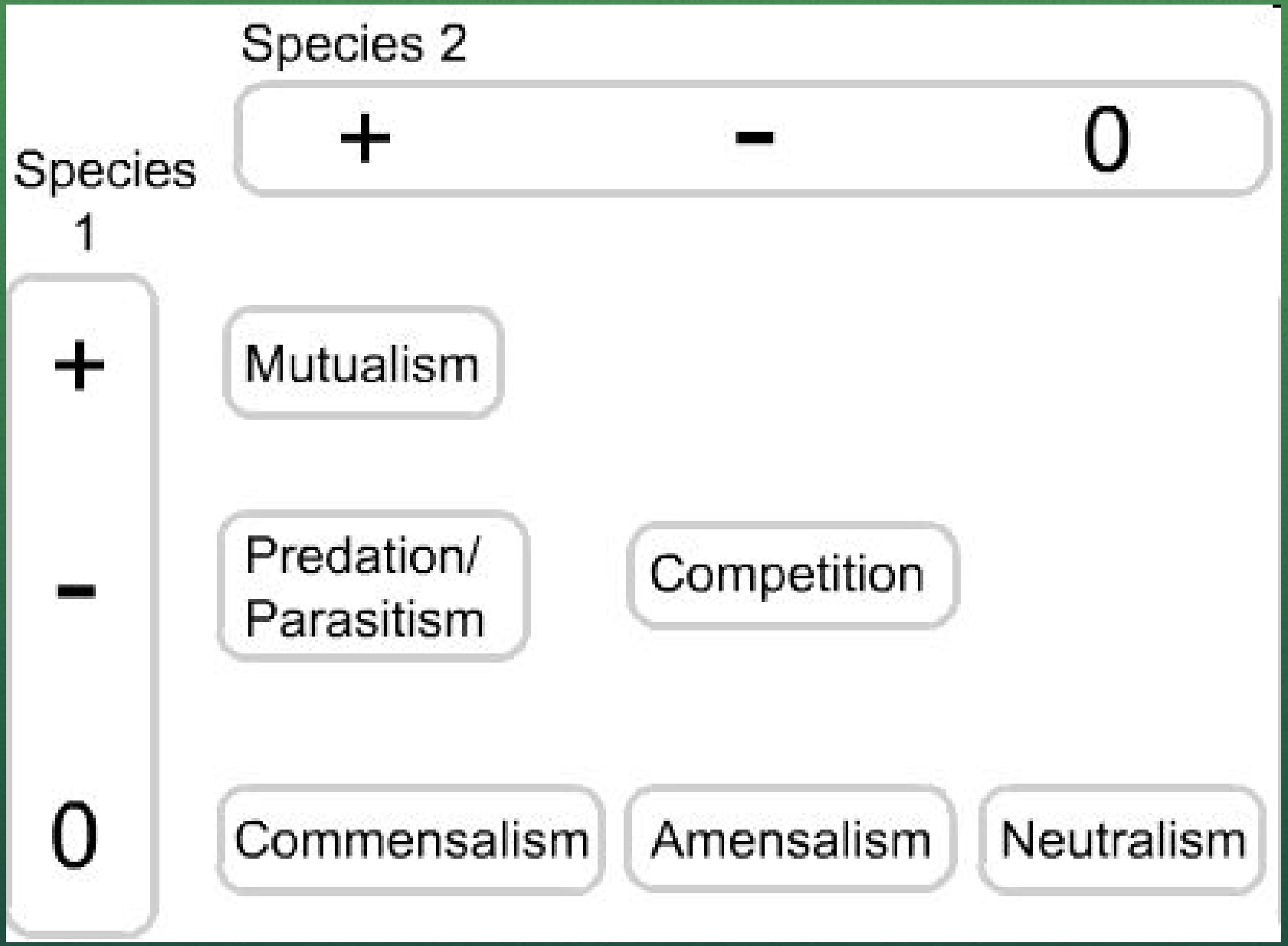
What are the abiotic and biotic factors?

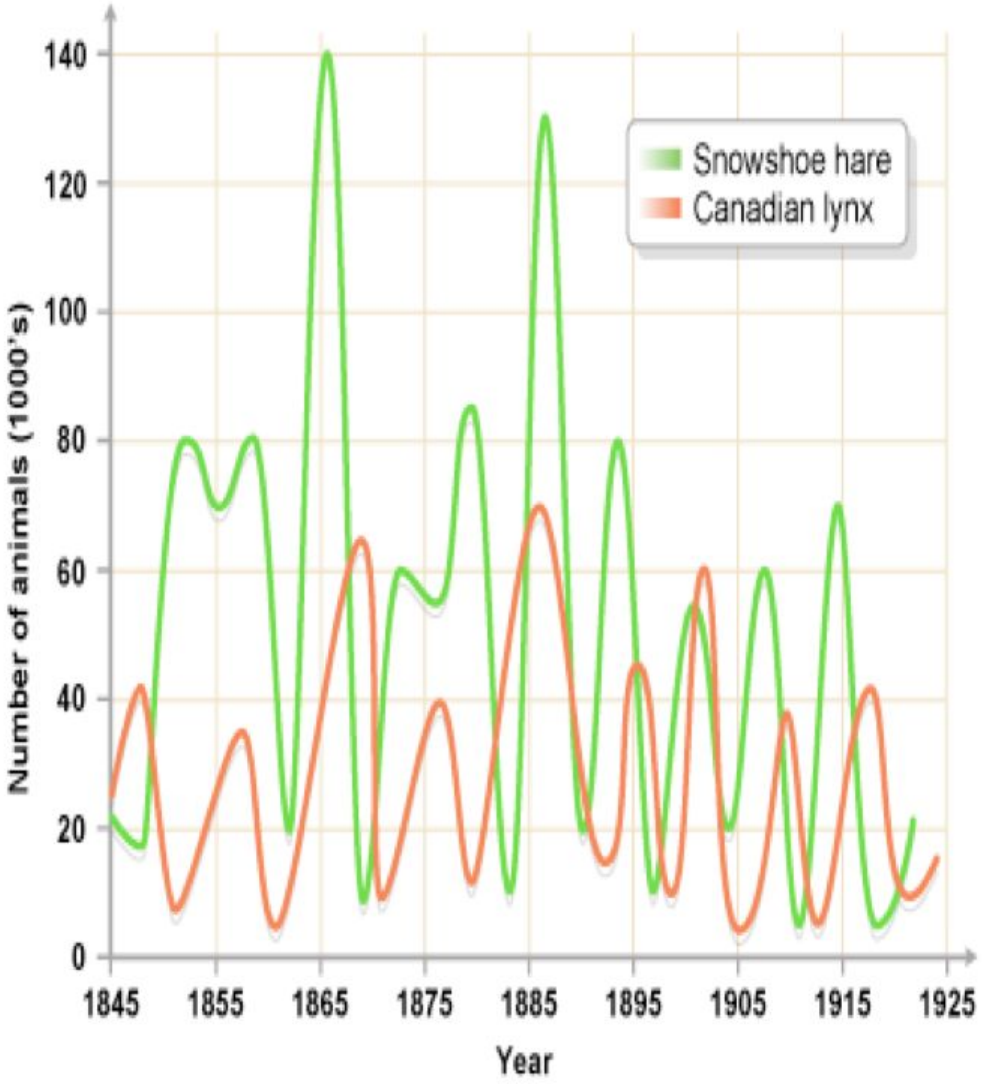


7. What are symbiotic relationships?

Different species interacting with each other.

- Mutualism – both benefit (+,+)
- Commensalism – one benefits, the other does not care (+, ?)
- Parasitism – one benefits, the other is harmed, yet not killed (+, -)
- Predator / Prey – one benefits, the other is killed (+, □)
- Competition - both species harmed by the presence of the other species. (-/-)


Species 2
+
-
0
Species 1
+
-
0
Mutualism
Predation/ Parasitism
Competition
Commensalism
Amensalism
Neutralism


Snowshoe hare
Canadian lynx
Number of animals (1000's)
0
20
40
60
80
100
120
140
1845
1855
1865
1875
1885
1895
1905
1915
1925
Year

Mutualism, Commensalism, Parasitism (18 minutes – optional)
http://www.teachertube.com/viewVideo.php?video_id=154417&title=Symbiosis_Mutualism_Commensalism_Parasitism

*Symbiosis Video (Pick a video) http://www.vtaide.com/png/symbiosis.htm

*Symbiosis Video (9 min)http://www.neok12.com/php/watch.php?v=zX47406078527e6f4c77685d&t=Ecosystems

Population Interactions (Mr. Anderson Lecture)
http://www.neok12.com/php/watch.php?v=zX797e605c645d5f006f7d45&t=Ecosystems

*Competition and Predation (3 minutes)
http://www.neok12.com/php/watch.php?v=zX7609576764576c1b586677&t=Ecosystems

Predator Prey Animations
http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel_pre_2011/environment/populationsandpyramidsrev5.shtml

8. Identify the examples on your sheet

9. Food chains

Grass → Grasshopper → shrew → snake → hawk

Trophic level = feeding step on a food chain

- 1st level is always an autotroph – plant
- 2nd level is a herbivore (plant eater) – a 1st order hetertroph (primary consumer)
- 3rd level is a carnivore (meat eater) – a second order hetertroph (secondary consumer)
- 4th level is a carnivore (meat eater) – a third order hetertroph (tertiary consumer)
- Omnivore eats both plants and animals and can be found in trophic levels 2, 3, or 4.

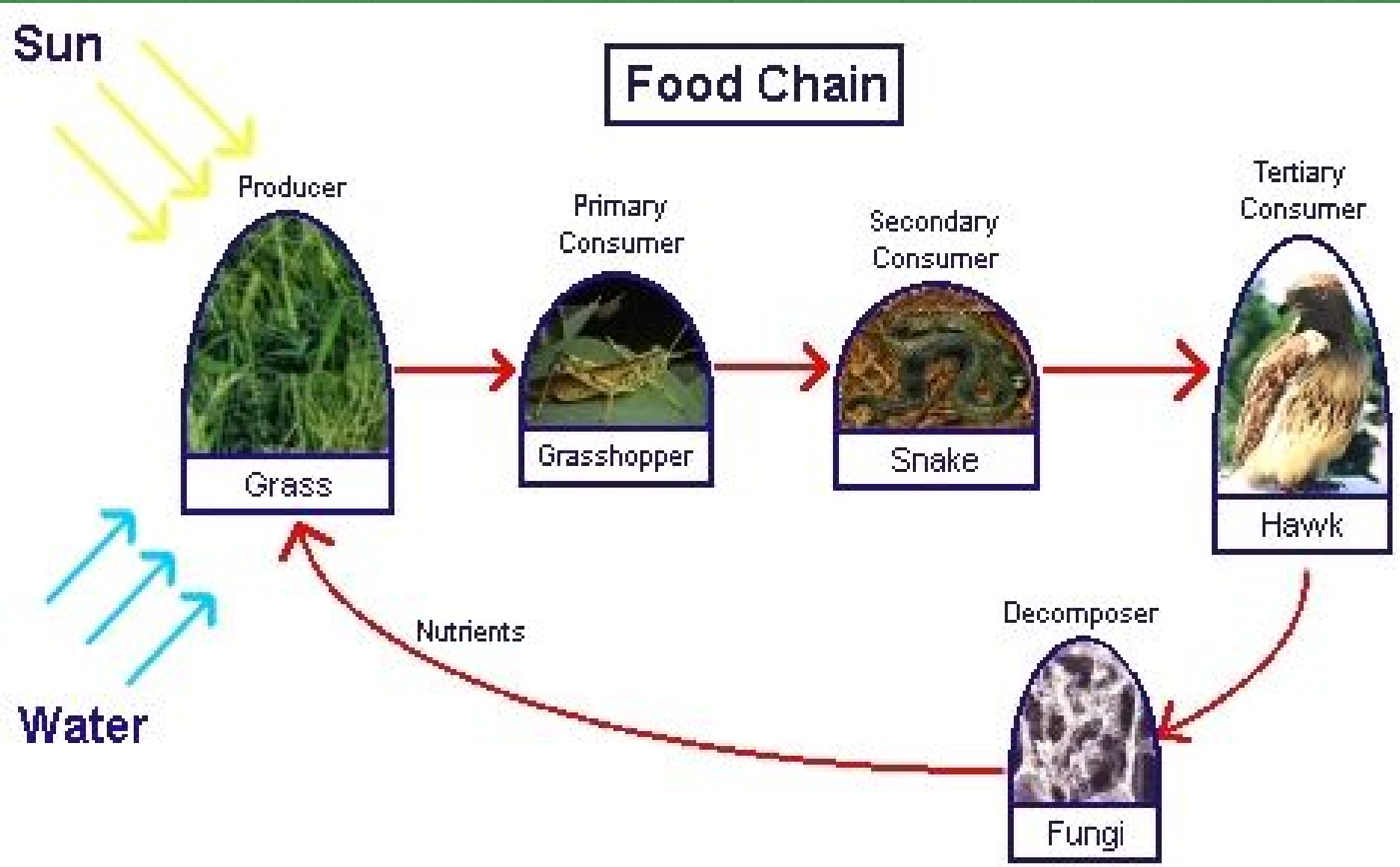
Trophic Levels

Second-level Carnivores: Eat First-Level Carnivores

First Level Carnivores: Eat Herbivores

Herbivores: Eat Plants

Plants: Produce energy from the sun and nutrients

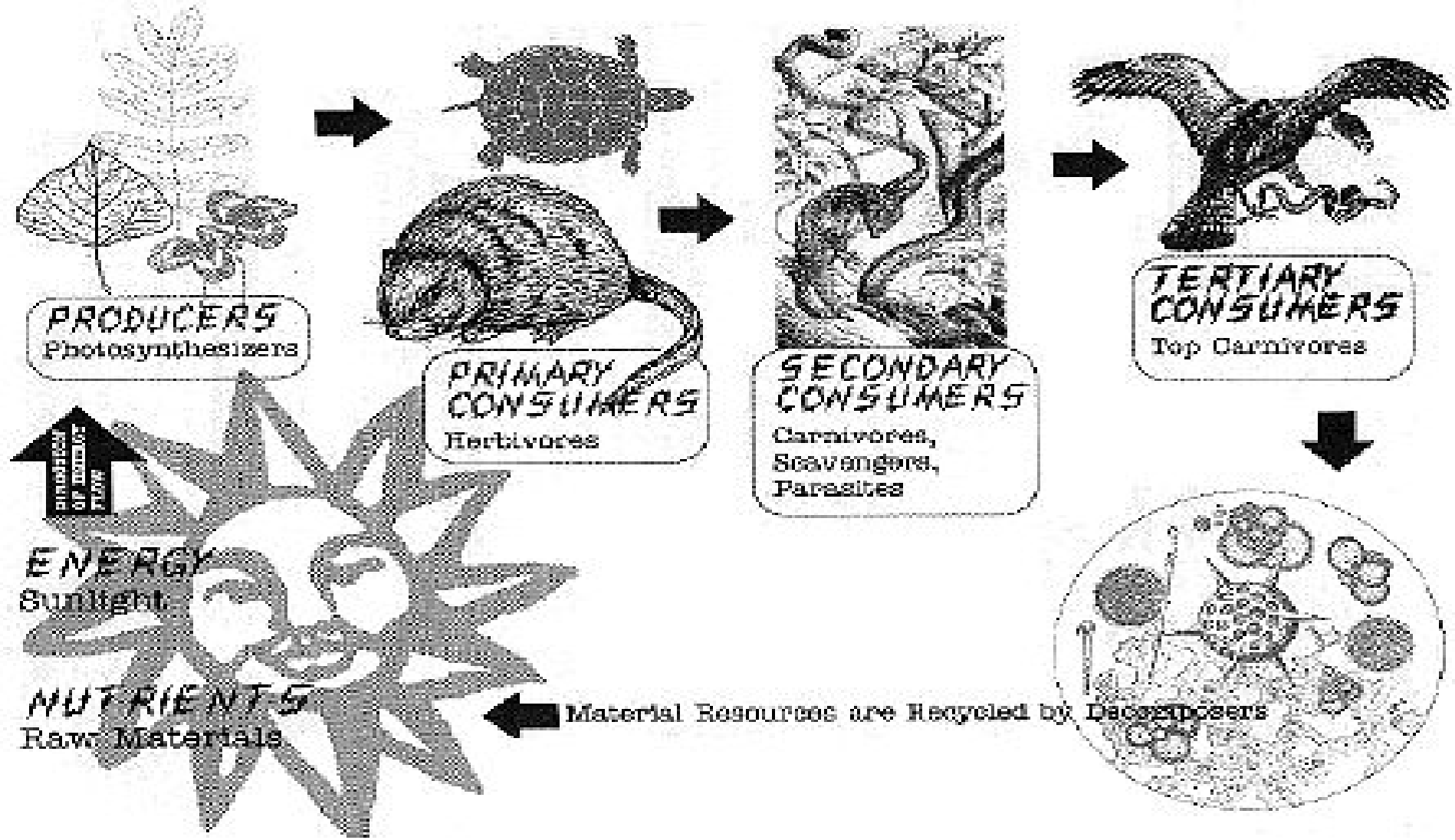

Sun
Food Chain
Producer
Primary Consumer
Secondary Consumer
Tertiary Consumer
Grass
Grasshopper
Snake
Hawk
Nutrients
Decomposer
Fungi
Water

Energy Tranfer

Energy is passed from one trophic level to the next

- Radiant energy from sun → chemical energy → heat
- Only 10% passed
- 90% used by the organism or lost as heat
- Life requires continuous flow of energy to maintain organization.

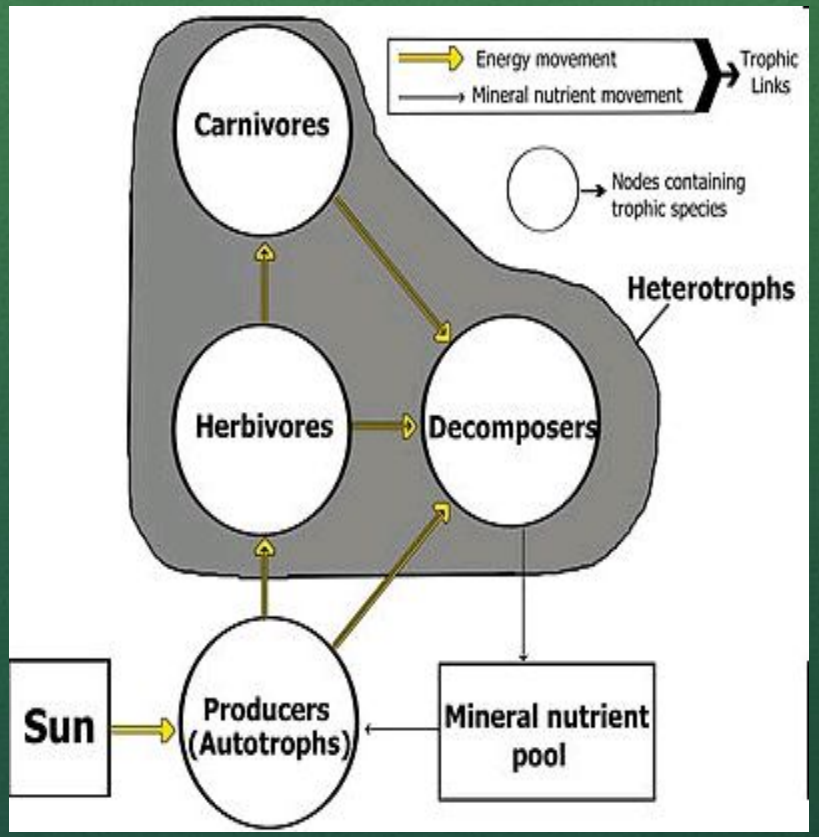
ENERGY FLOW Through an Ecosystem



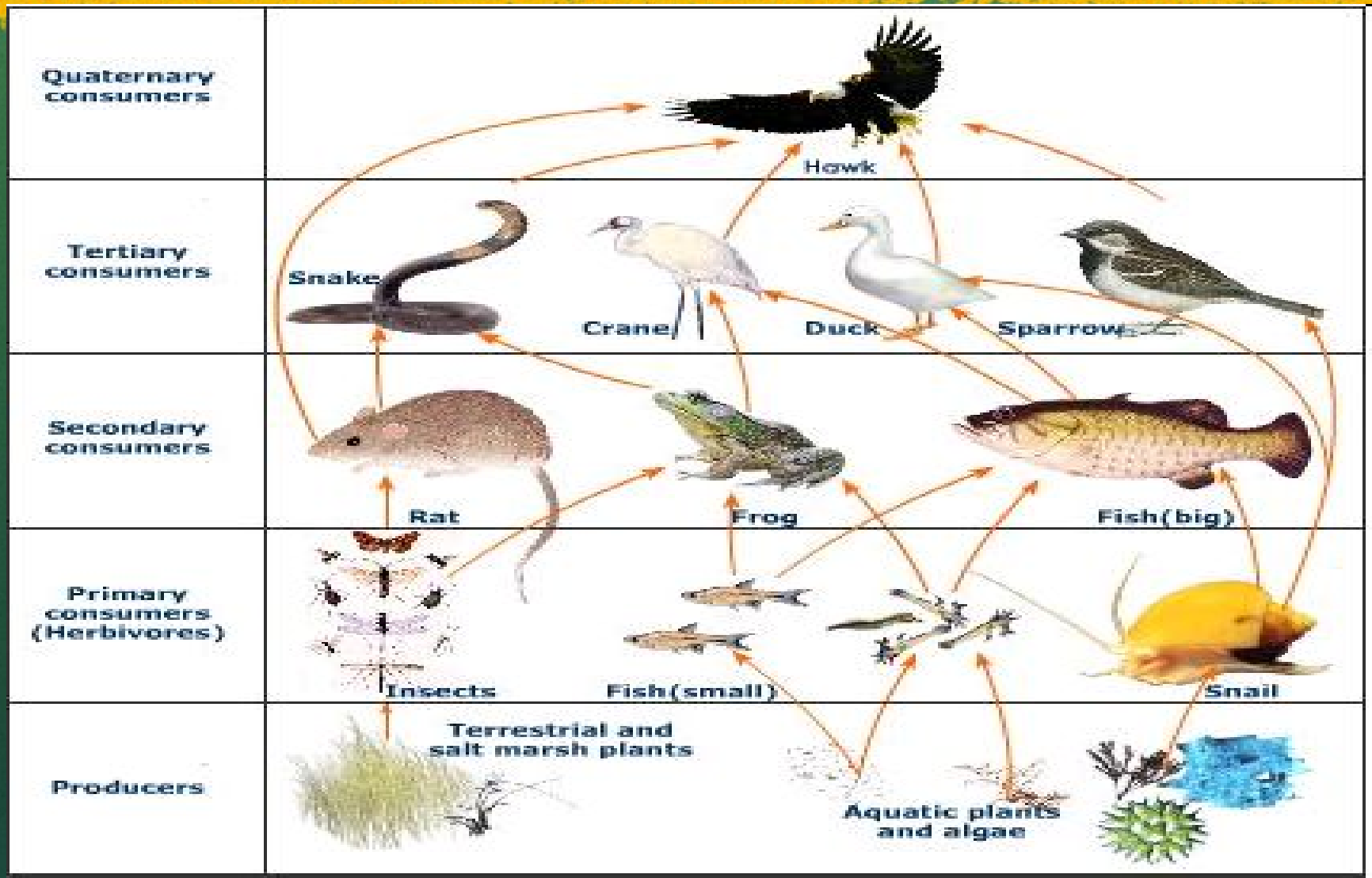
- Answer the questions on your note sheet.

10. Coloring Activity

- autotroph or producer (green)
- herbivore (red)
- carnviores (blue)
- decomposer (yellow). Decomposers break down dead things (plants and animals) and recycle them.



11. What could cause the rat population to decrease?

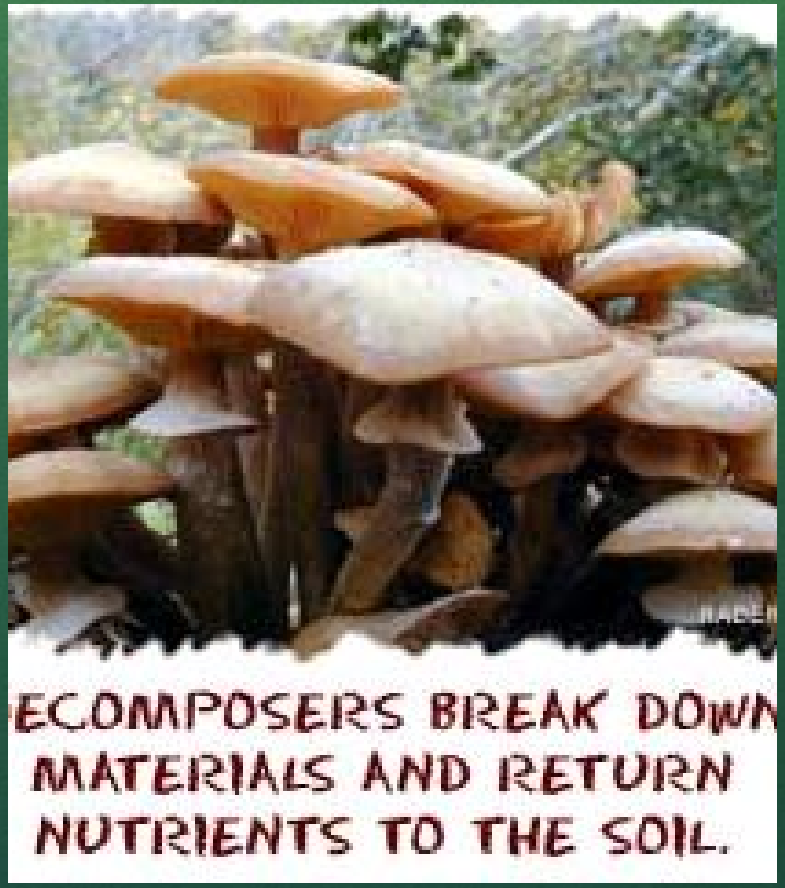


12. What type of hetertroph is a hyena?

- Scavengers search out and eat dead animals (corpses or carrion). They do not kill the food themselves.

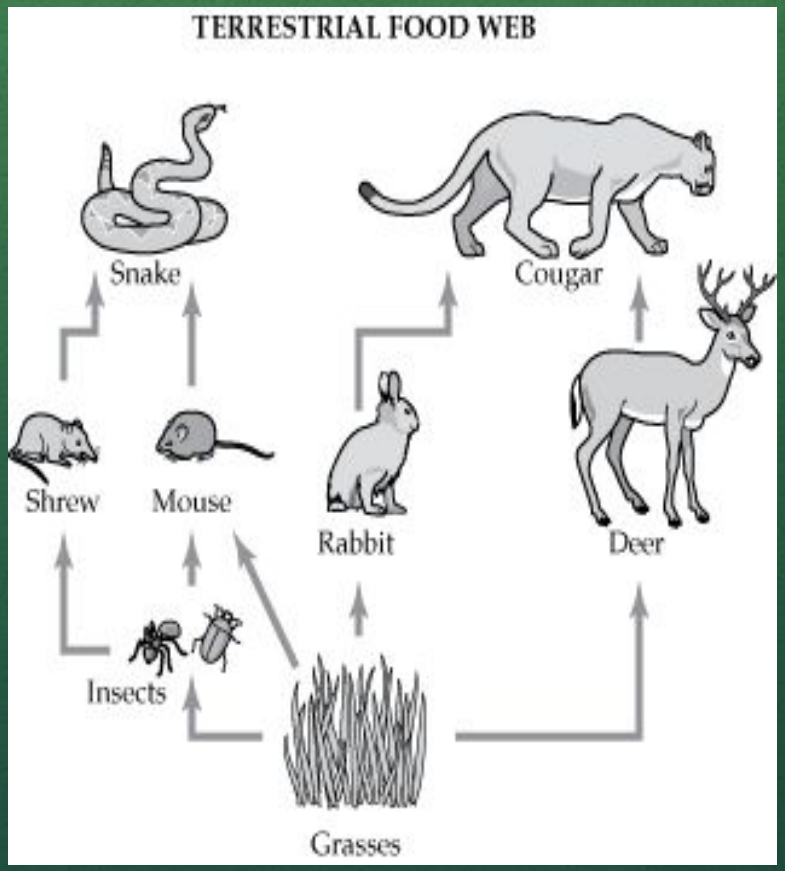
13. What are decomposers?

- *Decomposers* (or saprotrophs) are organisms that break down dead or decaying organisms, and in doing so carry out the natural process of decomposition.



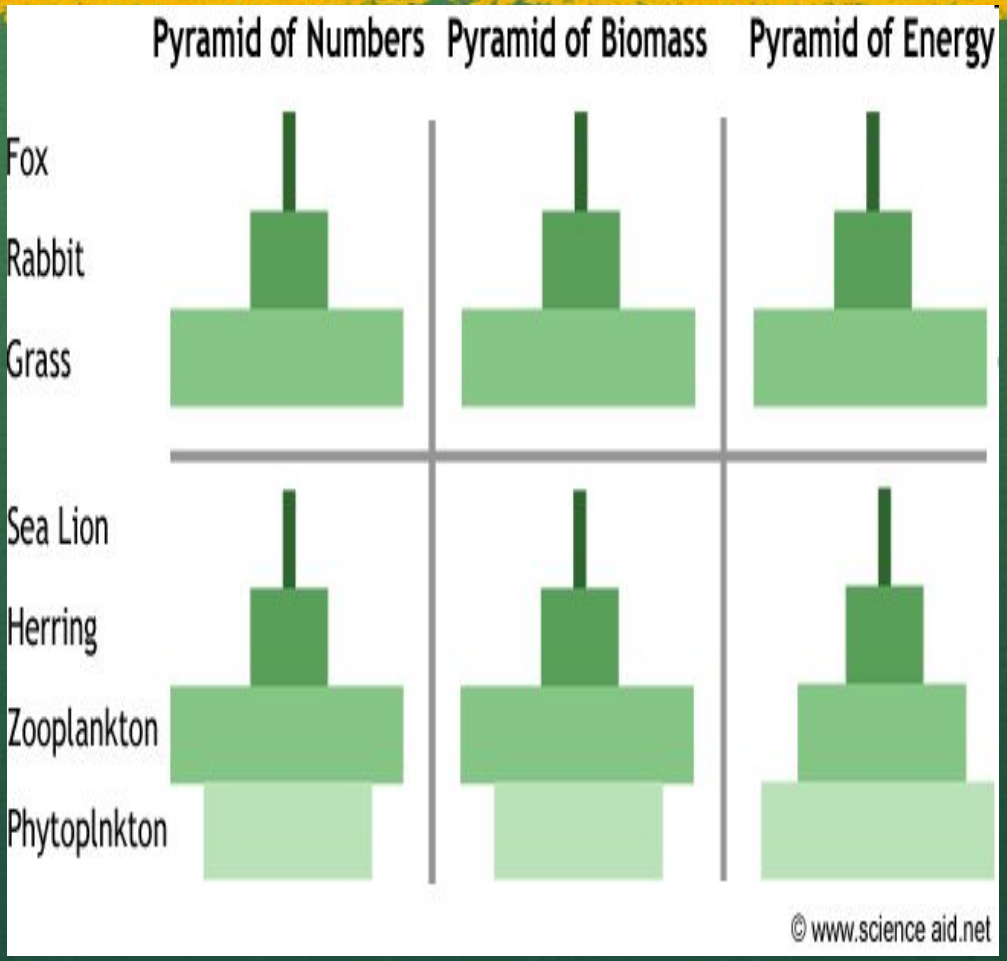
14. Food Webs

- What are the herbivores? Look for the organisms that eat just plants.
- What are the carnivores? Look for the organisms that eat meat?
- What is the mouse?
- What is missing from this food web?

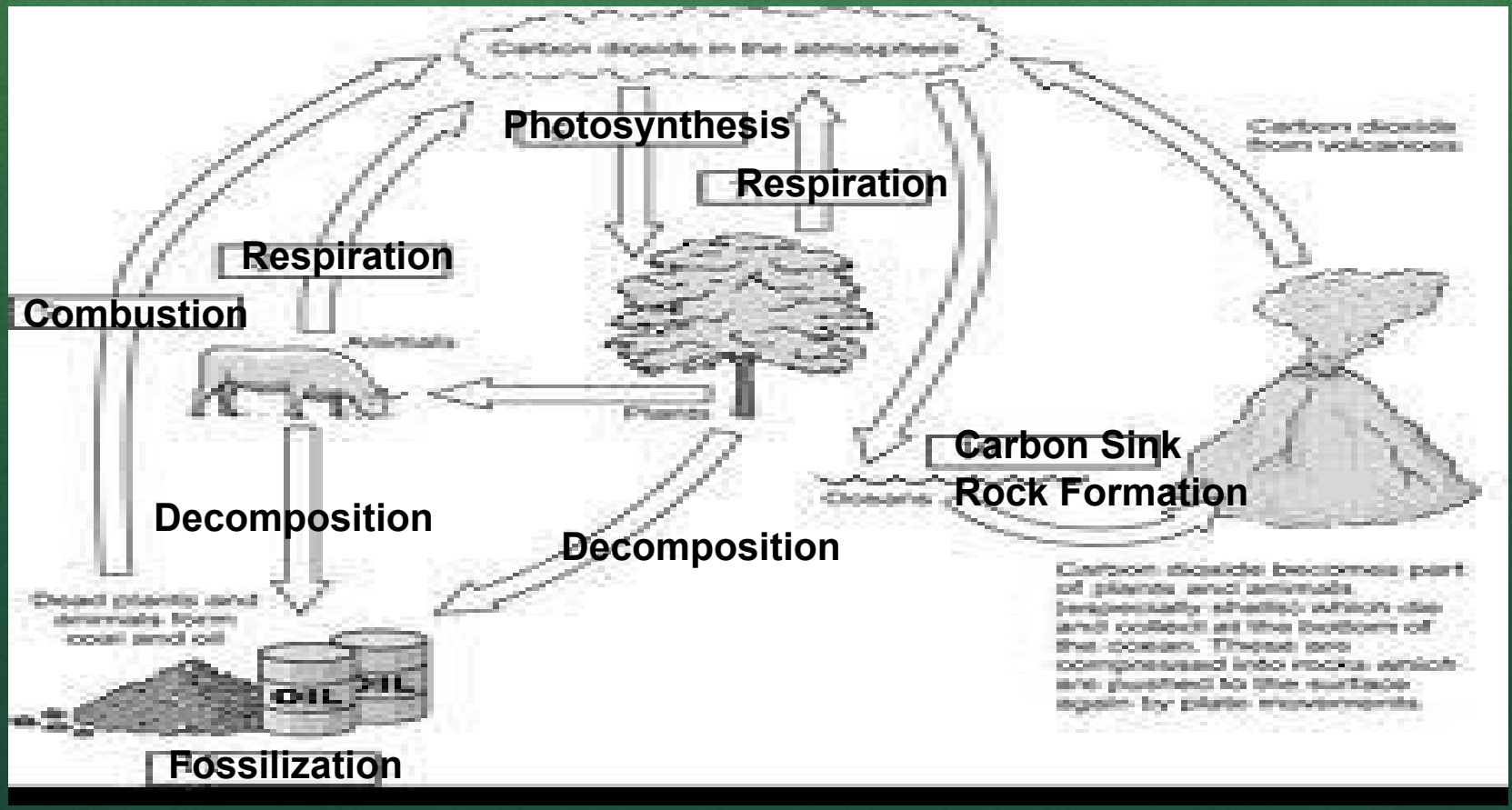


15. Food Pyramids and biomass

- Largest biomass , number and amount of energy is always found at the bottom of the pyramid - Autotrophs



16. Identify the Parts of the Carbon Cycle



Why Carbon Cycle Important?

Carbon Video http://climate.nasa.gov/ClimateReel/KeepingCarbon640360/

Carbon Cycle animation
http://vro.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/soilhealth_organic_carbon-cycle

http://www.kidsnewsroom.org/climatechange/carbon_cycle_version2.html

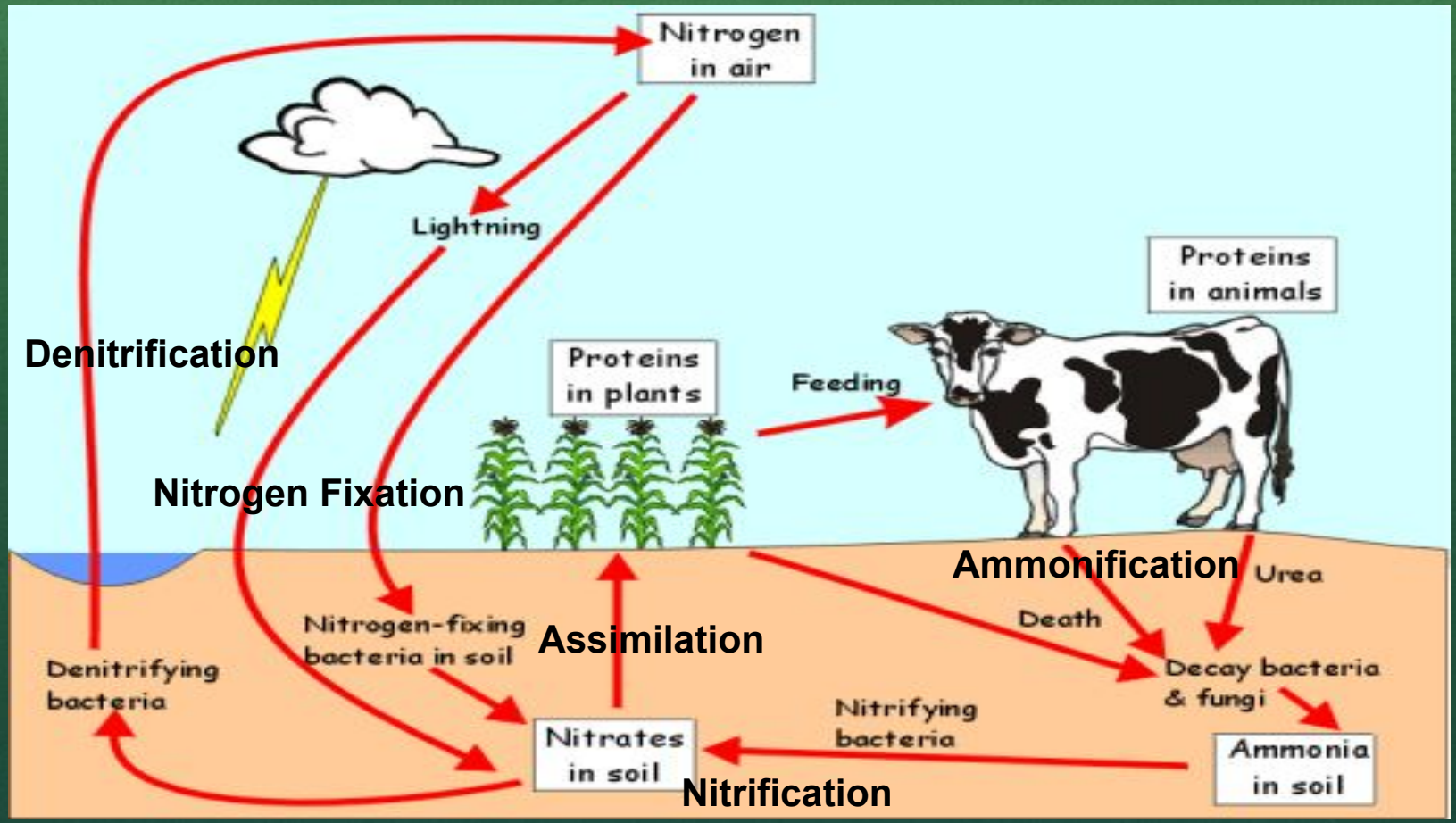
http://bcs.whfreeman.com/thelifewire/content/chp58/5802002.html

http://vro.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/soilhealth_organic_carbon-cycle

http://uccpbank.k12hsn.org/courses/APEnvironmentalScience/course%20files/multimedia/lesson08/animations/2b_carbon_cycle.html

Carbon Cycle Videos Several
http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&sqi=2&ved=0

17. Identify the Parts of the Nitrogen Cycle



Nitrogen Cycle Animation
http://www.classzone.com/books/ml_science_share/vis_sim/em05_pg20_nitrogen/em05_pg20_nitrogen.html

http://bcs.whfreeman.com/thelifewire/content/chp58/5802004.html

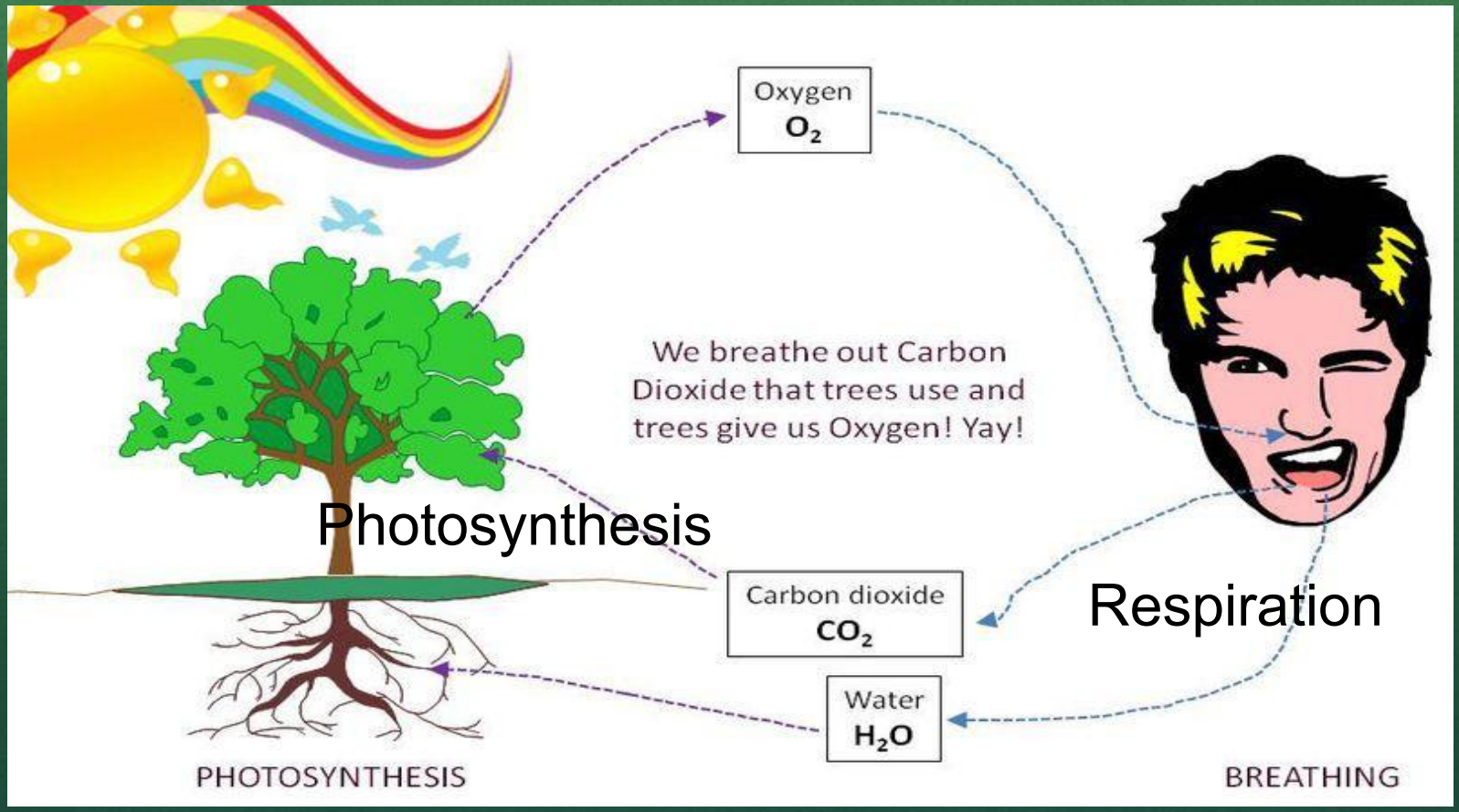
http://www.teachersdomain.org/asset/lsps07_int_nitrogen/

http://uccpbank.k12hsn.org/courses/APEnvironmentalScience/course%20files/multimedia/lesson09/animations/2b_nitrogen_cycle.html

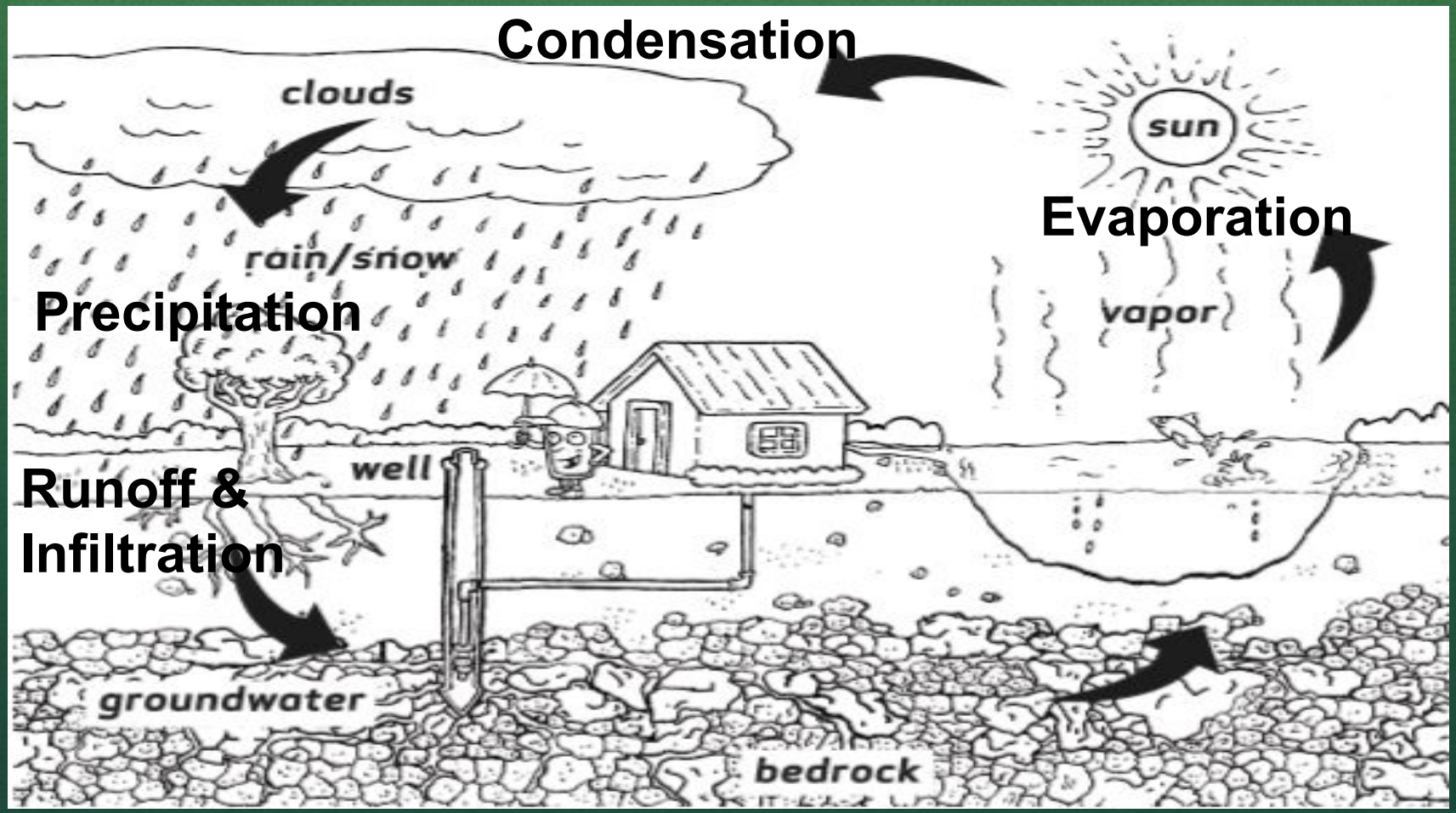
http://www.biology.ualberta.ca/facilities/multimedia/uploads/ecology/ncycle.html

Nitrogen Video
http://www.5min.com/Video/Learn-about-The-Nitrogen-Cycle-117570701

18. The Oxygen Cycle



19. The Water Cycle

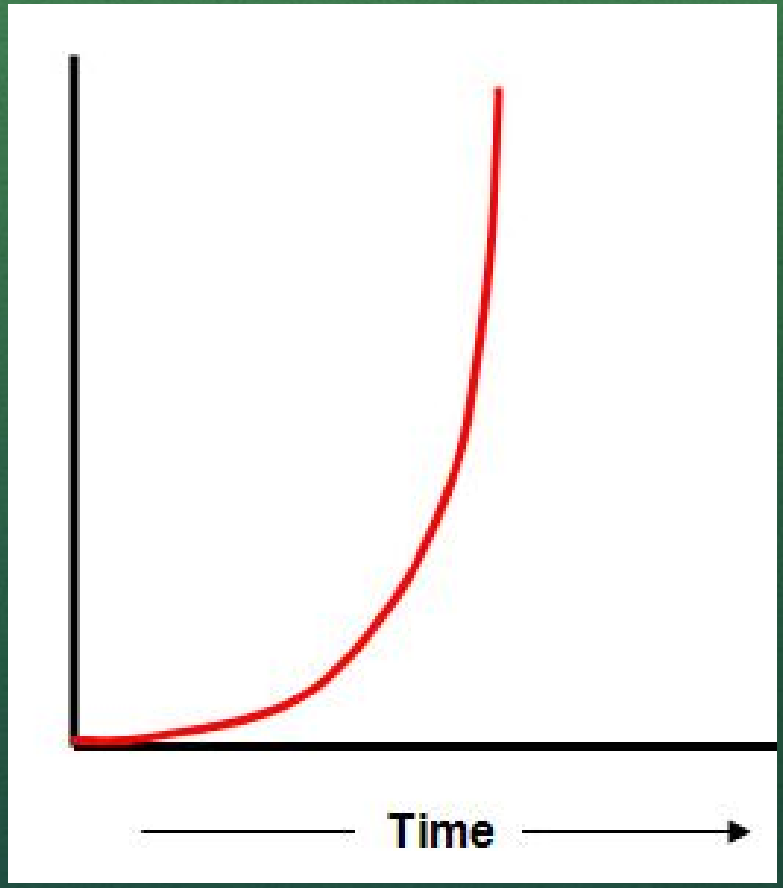


Video: Water, Water everywhere
http://climate.nasa.gov/ClimateReel/WaterWaterEverywhere640360/

20. What is J-shaped growth?

Exponential growth

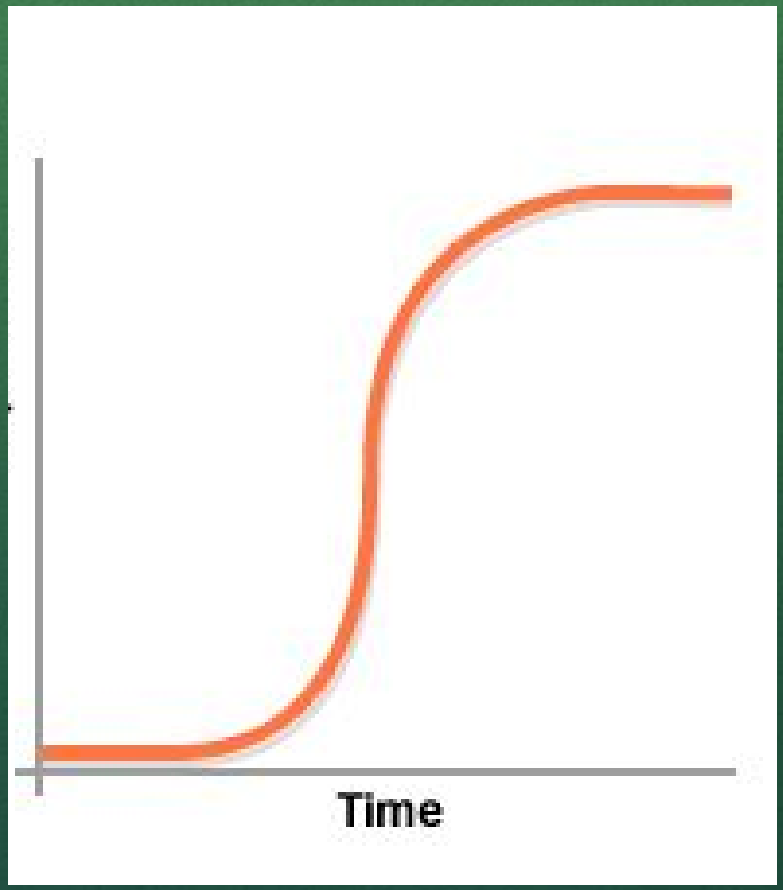
- Starts slow and then grows rapidly
- Represents a population with no restrictions or limitations
- All populations have capacity for exponential growth
- Example – human population



21. What is S-shaped growth?

Logistic growth

- Population that is at or near the limit to which the environment can hold.
- Limited resources create carrying capacities.



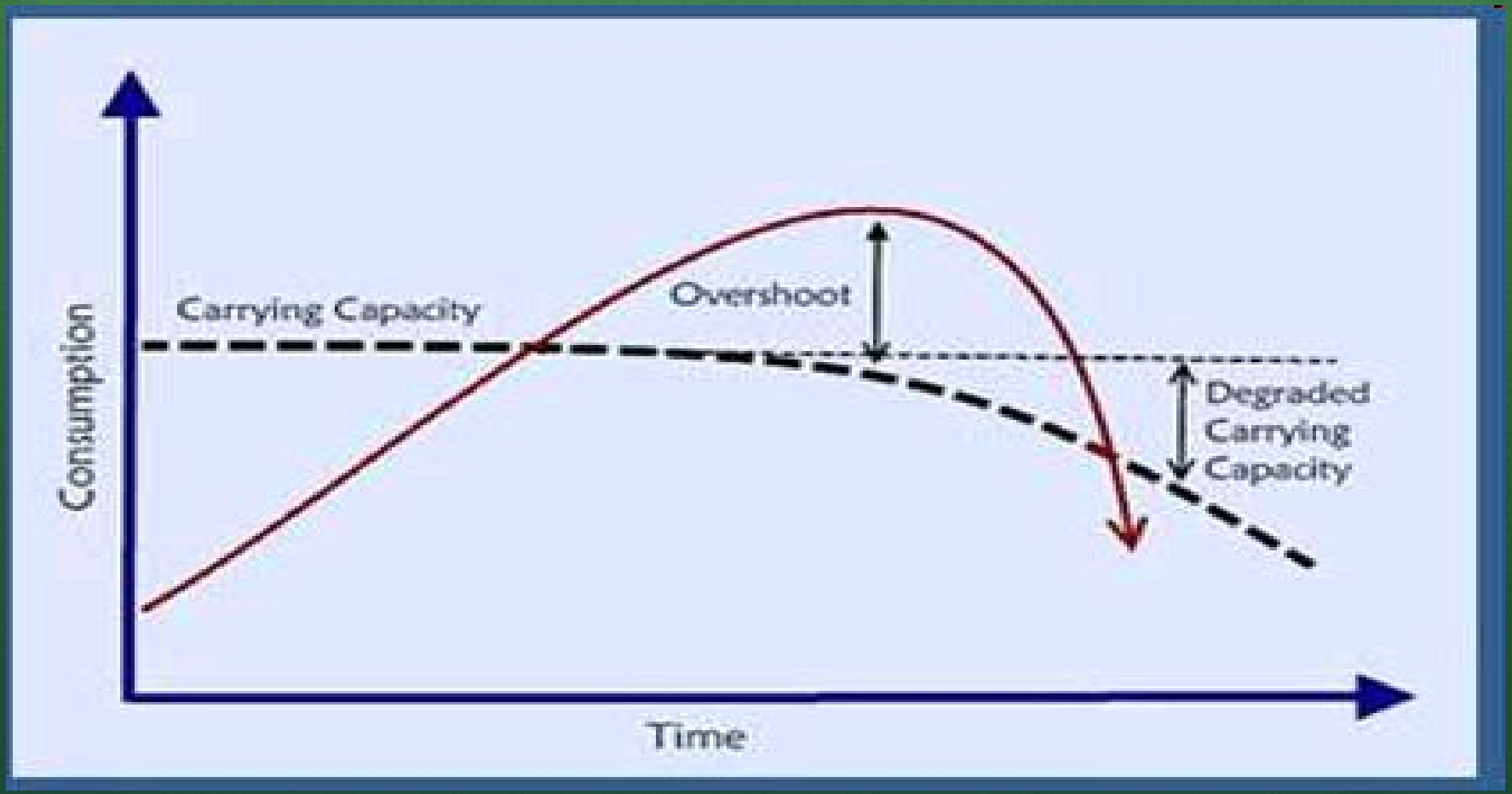
22. What are limiting factors? What are the two types?

- A factor present in an environment that controls the growth, abundance or distribution of a population of organisms in an ecosystem.
  - Density dependent – biotic (spread of disease through a population, food)
  - Density Independent – abiotic (i.e. a flood)

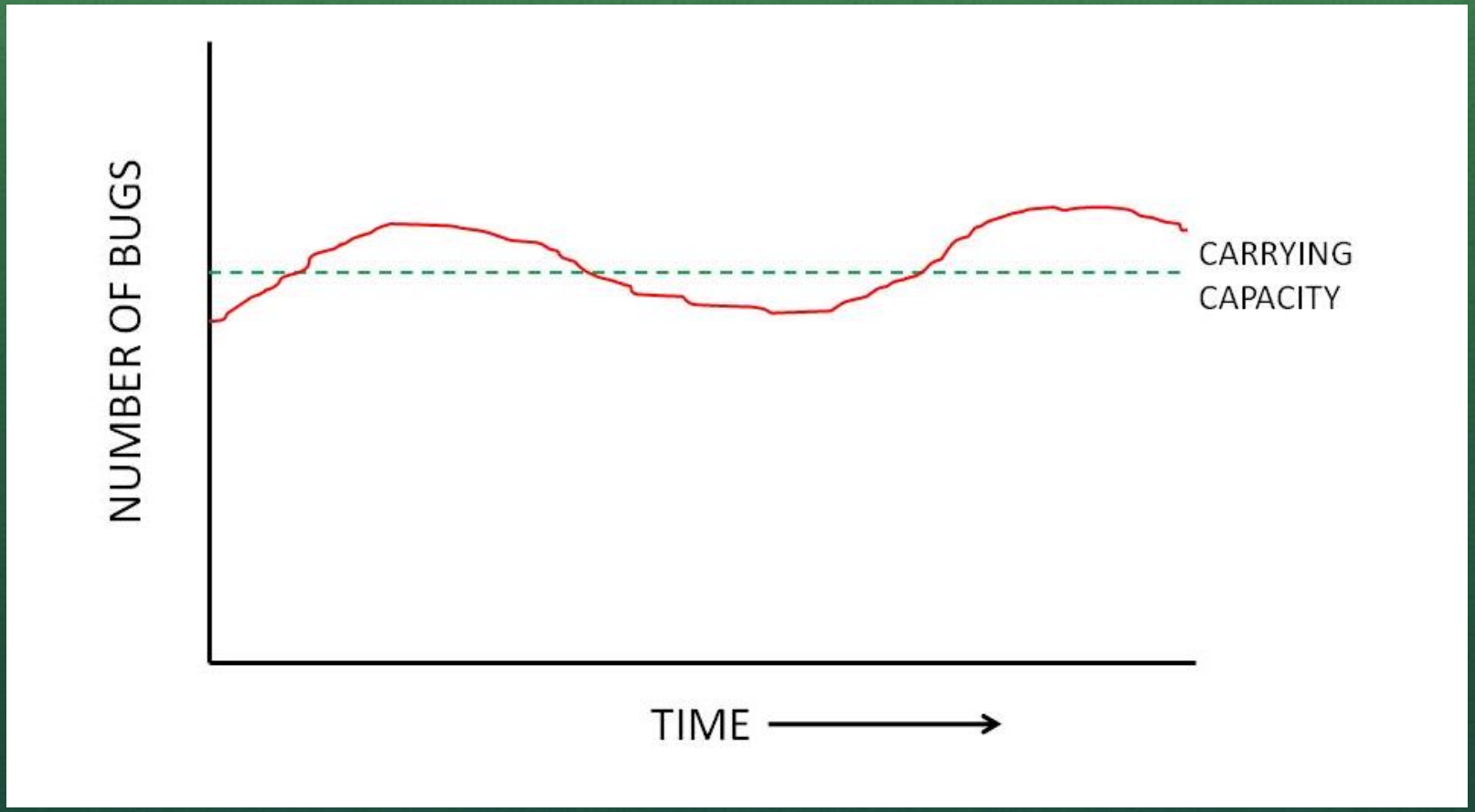
23. What is carrying capacity?

- Largest number of individuals of a particular species that can survive over long periods of time in a given environment, this level depends on the effect of the limiting factors

24. Locate the carrying capacity on the graph?



Locate the carrying capacity on the graph?



Populations and carrying capacity
http://www.neok12.com/php/watch.php?v=zX706b605753534d544d4f55&t=Ecosystems

25. How could you change the carrying capacity of a population?

- The carrying capacity of a population is the population size at which per capita birth rates (BR) are equal to per capita death rates (DR)
  - BR = DR
- Anything which affects these rates can change the carrying capacity.
  - For example, a hard winter can increase the death rate of Bobwhite, which will then decrease the carrying capacity of that population for that year.
  - A decrease (increase) in the amount or quality of habitat (e.g. availability of food) can also decrease (increase) the carrying capacity.

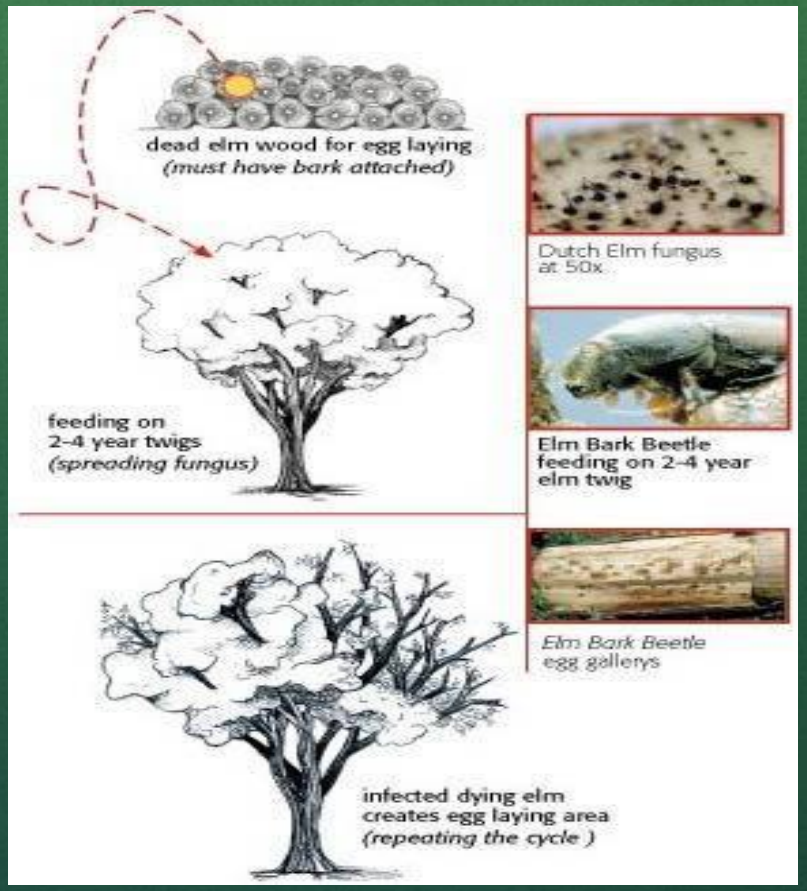
Disease as a limiting factor

- Disease can disrupt ecosystem balance.
  - Dutch Elm disease
  - AIDS
  - Influenza
  - Tuberculosis

How Dutch Elm Disease effected the tree populations?

Killed Elm trees in the US

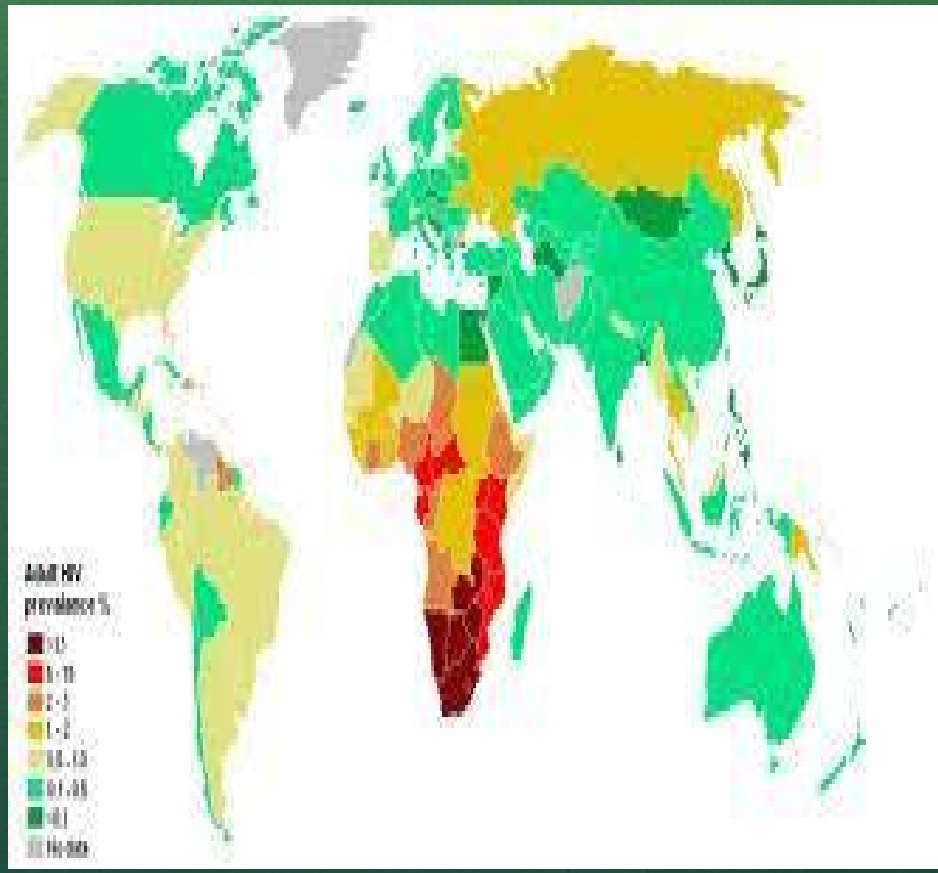
- 17 out of 23 million trees died
  Why? Trees grew close together and disease spread easily
- Could spread from root to root due to close proximity
- Lack of diversity caused disease to spread fast



AIDS a Global Epidemic

Global epidemic

- Caused by virus destroys white blood cells
- 20 million have died; 35 million infected
- No epidemic has had impact on the world population since black plague
- Africa (#1), Asia (#2), Caribbean countries (#3)



HIV and TB
http://www.un.org/works/sub5.asp?lang=en&id=27

What is Influenza and how it could it effect population growth?

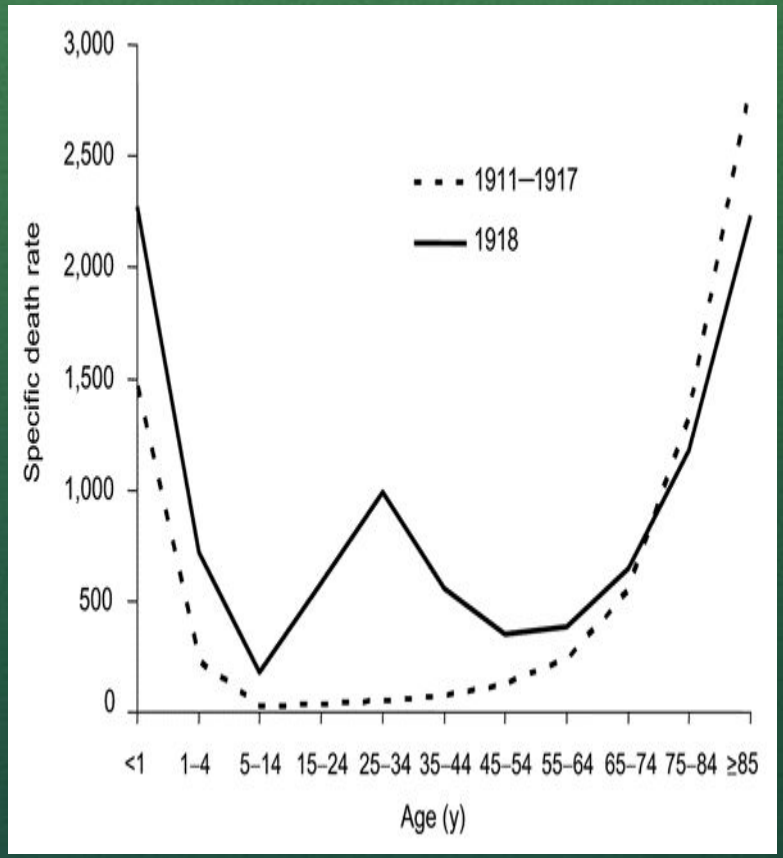
Virus

- Spread from person to person
  - Coughing, sneezing, drinking after someone
- Spread from animals to humans
  - Cows, pigs, birds
- Some cases mild (aches and pains). Can be deadly
  - More killed in cities because of population density

Influenza effects populations

1918 flu

- Spread from animals to humans
- Killed many
  - 8% US population
  - 40 Million world wide (more than WW 1)
- Mostly killed males (20-39)
  - More killed in cities because of population density



1918 Flu
http://www.pbs.org/wgbh/nova/body/1918-flu.html

How a pandemic spreads

http://ed.ted.com/lessons/how-pandemics-spread

What is tuberculosis and how could it effect population growth?

Bacteria infects lungs (can also infect other organs)

- Spread by bloody coughing (more crowded = spread faster)
- Death can occur after infection
- Until 1943 TB was always fatal (usually deadly)
- Mid 1700s TB epidemic in Europe
- More common in Africa, Asia and Latin America
  - More people get it because of poor nutrition and weak immune system due to AIDS

Antibiotic can kill it, yet due to antibiotic resistance slowly coming back

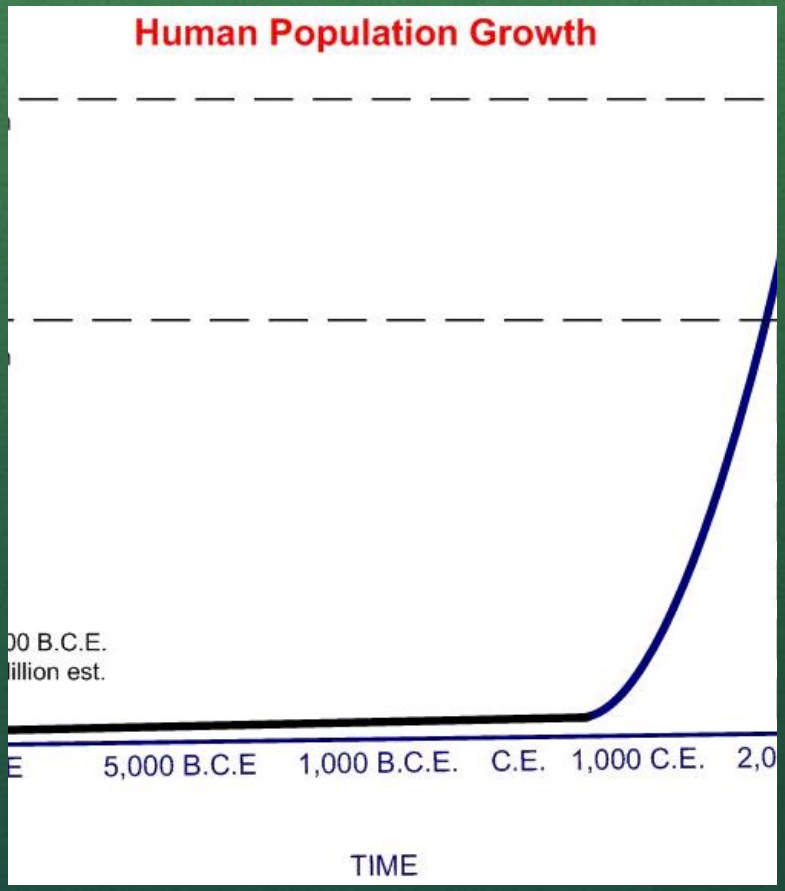
TB epidemic in Urkraine http://vimeo.com/28848503

Dealing with a TB epidemic http://www.cbsnews.com/video/watch/?id=2872800n

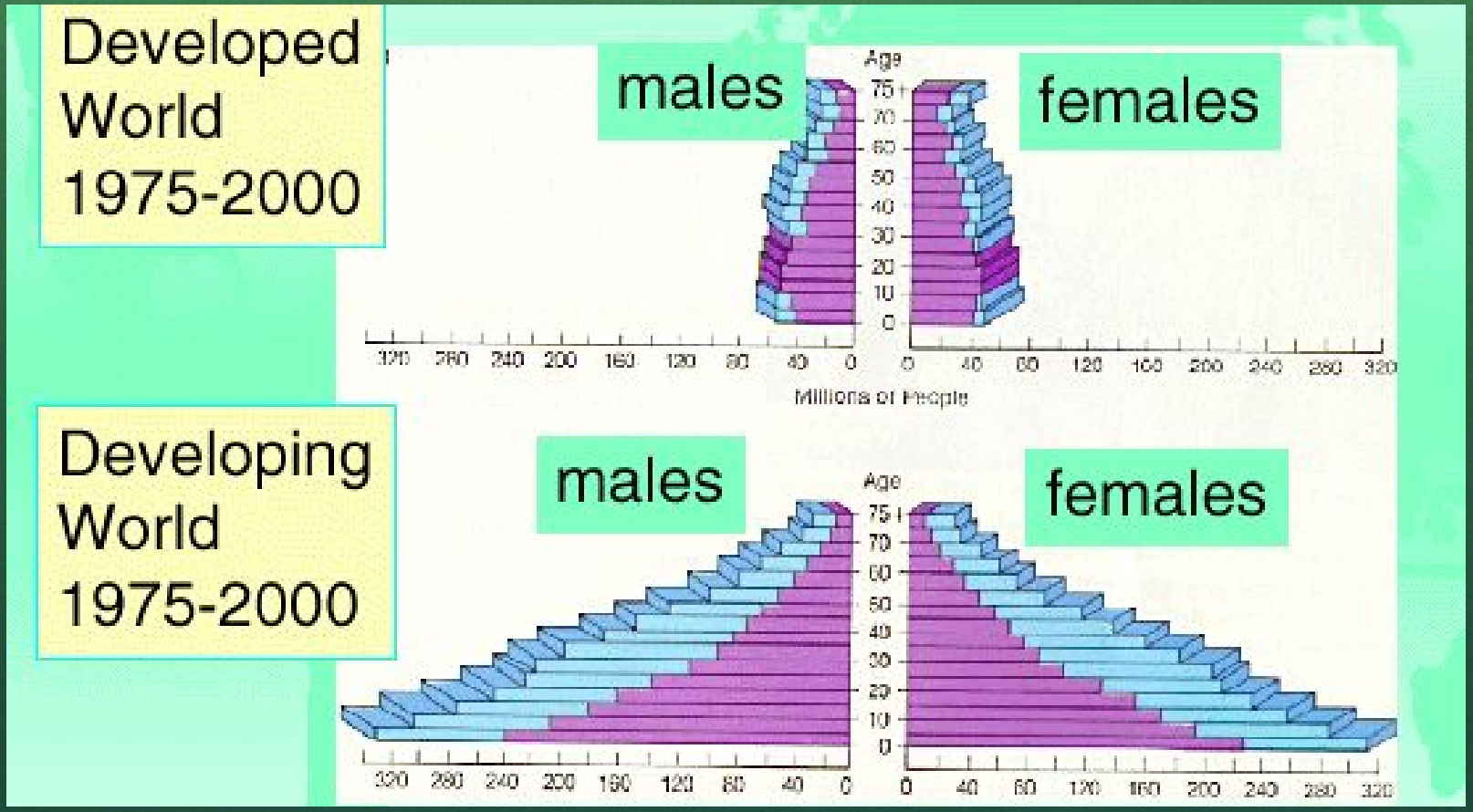
26. What has allowed the human population to grow?

The ability to adapt and/or to change our environment

- Medicine
- Better Nutrition
- Sanitation



Populations Vary By Economy



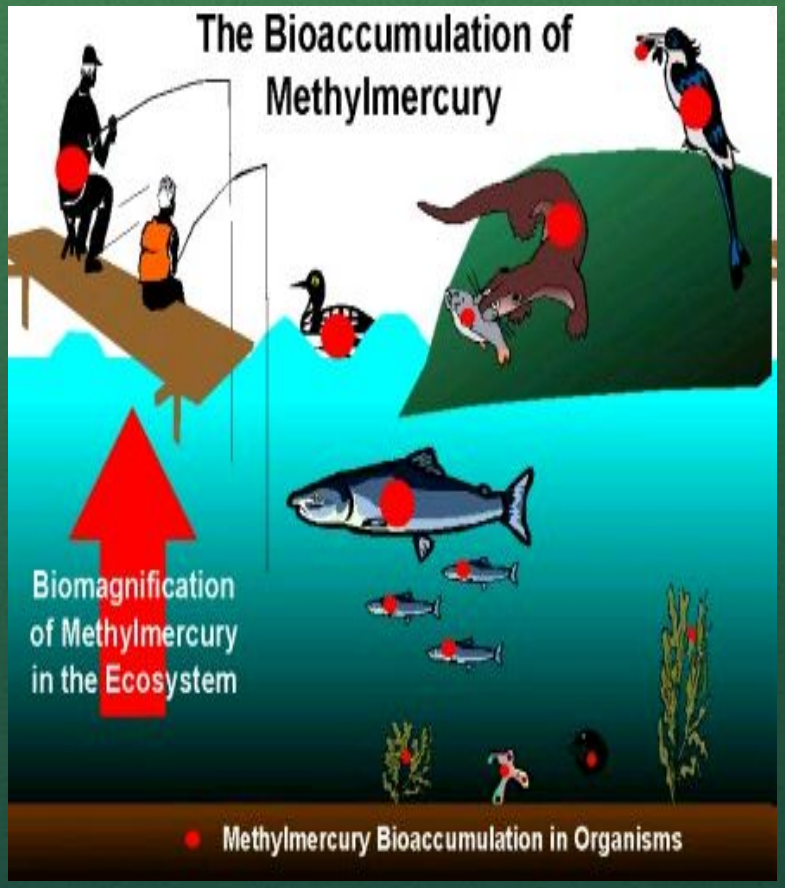
27. What is DDT? What is so bad about it?

DDT – pesticide used in the 1950 and 1960 to kill insects. Was used on crops, livestock even on wallpaper in homes.

- DDT is matter so it can't be destroyed – it just keeps building up.
- It does not break down in the environment
- It persists and is a carcinogen.

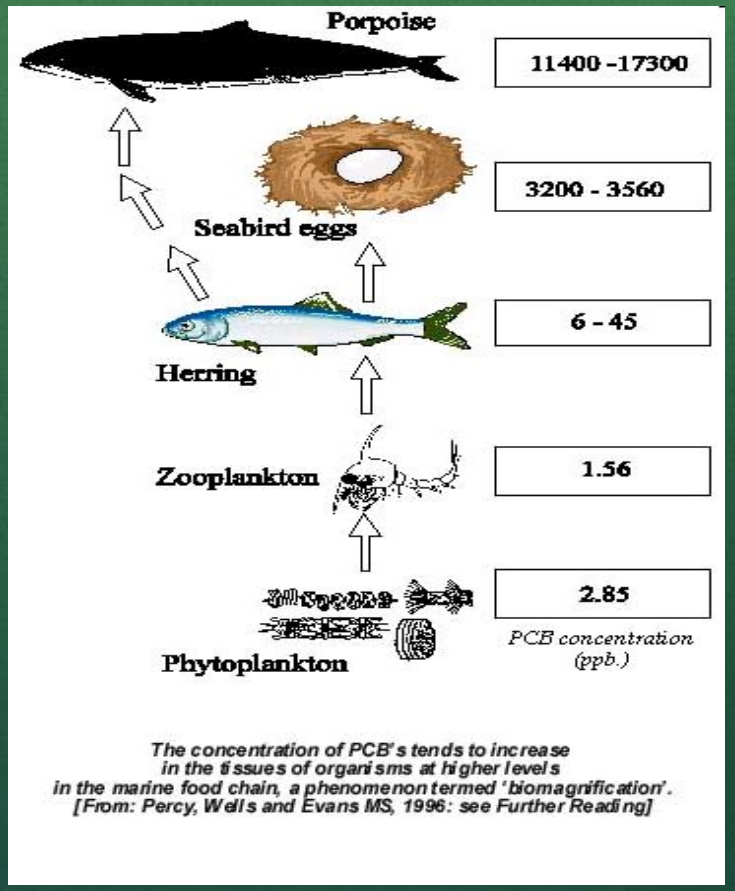
28. What is bioaccumulation?

- *Bioaccumulation* refers to the accumulation of substances, such as pesticides, or other organic chemicals in an organism.

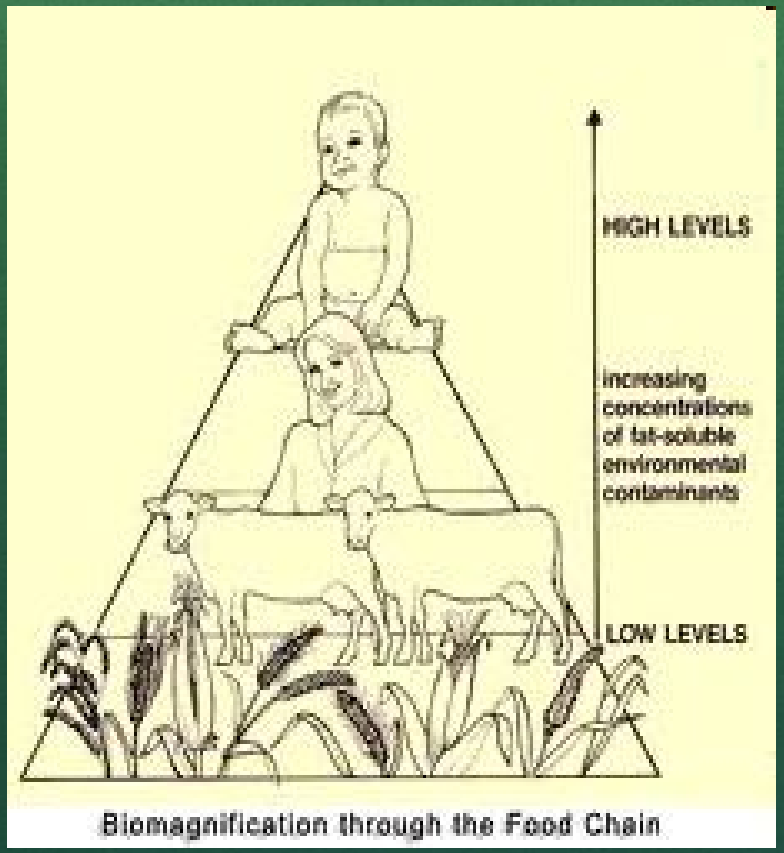


Biomagnification

- **Biomagnification**, also known as **bioamplification** or **biological magnification**, is the increase in concentration of a substance that occurs in a food chain



29. DDT in human tissues. How?



- Get passed through the food chain.

DDT disaster
http://video.answers.com/learn-about-the-ddt-pesticide-disaster-117505946

United Streaming Videos – DDT, PCB, Hg

30. Examples of habitat degradation

- conversion of land to agriculture
- urban sprawl
  - soil erosion, runoff
- infrastructure development
- pollution
  - water, land, air
- Habitat destruction
  - Loss of habitat = loss of biodiversity
- Habitat fragmentation
- desertification
- deforestation
- coral reef degradation
- introduction of invasive (non-native) species

Invasive specieshttp://watchdocumentary.com/watch/scishow-infusion-episode-06-invasive-species-the-story-of-bunny-video_50c7c26cd.html

United Streaming Videos:

- Farmers erosive forces
- Deforestation
- Cane toads
- Ocean pollution
- Sanitary landfills

Human Population http://vimeo.com/29516741

Human population growth
http://dsc.discovery.com/tv-shows/other-shows/videos/powering-the-future-population-growth.htm

Overpopulation
http://watchdocumentary.com/watch/scishow-infusion-episode-05-the-science-of-overpopulation-video_33fd47fac.html

31. What is acid rain and what causes it?

- Precipitation that has a pH below normal rain
  - Normal rain is slightly acidic and has a pH of about 5.5.
  - Most rain in the US has a pH of 4.3.
- Sulfur dioxide (SO_2) and nitrogen oxides (NO_x) are the primary causes of acid rain primarily from the burning of coal.
  - SO_2 and NO_x react with water to make sulfuric and nitric acids

Effects of Acid Rain

- Acidification of lakes and streams
- Tree damage at high elevations (for example, red spruce trees above 2,000 feet) and many sensitive forest soils.
  - NC Mountain affects spruce pine trees

- Accelerates the decay of building materials and paints (buildings, statues, & sculptures)

Acid Rain Video
http://video.nationalgeographic.com/video/national-geographic-channel/all-videos/ngc-acid-rain-invisible-menace/

Effects of acid rain on Washington DC monuments
http://news.discovery.com/videos/earth-acid-rain-eating-washington-dc.html

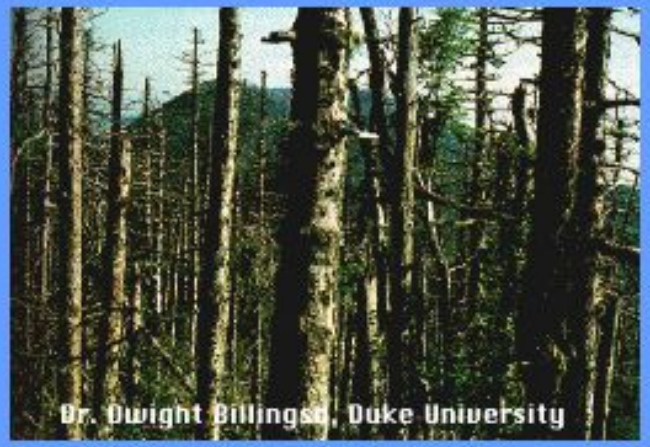
Acid Rain http://www.umac.org/ocp/videos/acidRain.html

Cause and Impact of Acid Rain
http://www.bbc.co.uk/learningzone/clips/causes-and-impact-of-acid-rain/4418.html

United Streaming video – Acid Rain

Acid Rain Effects

Acid Rain Effects on Forests



Dieback of trees from insects and disease

Ophardt, c. 2003

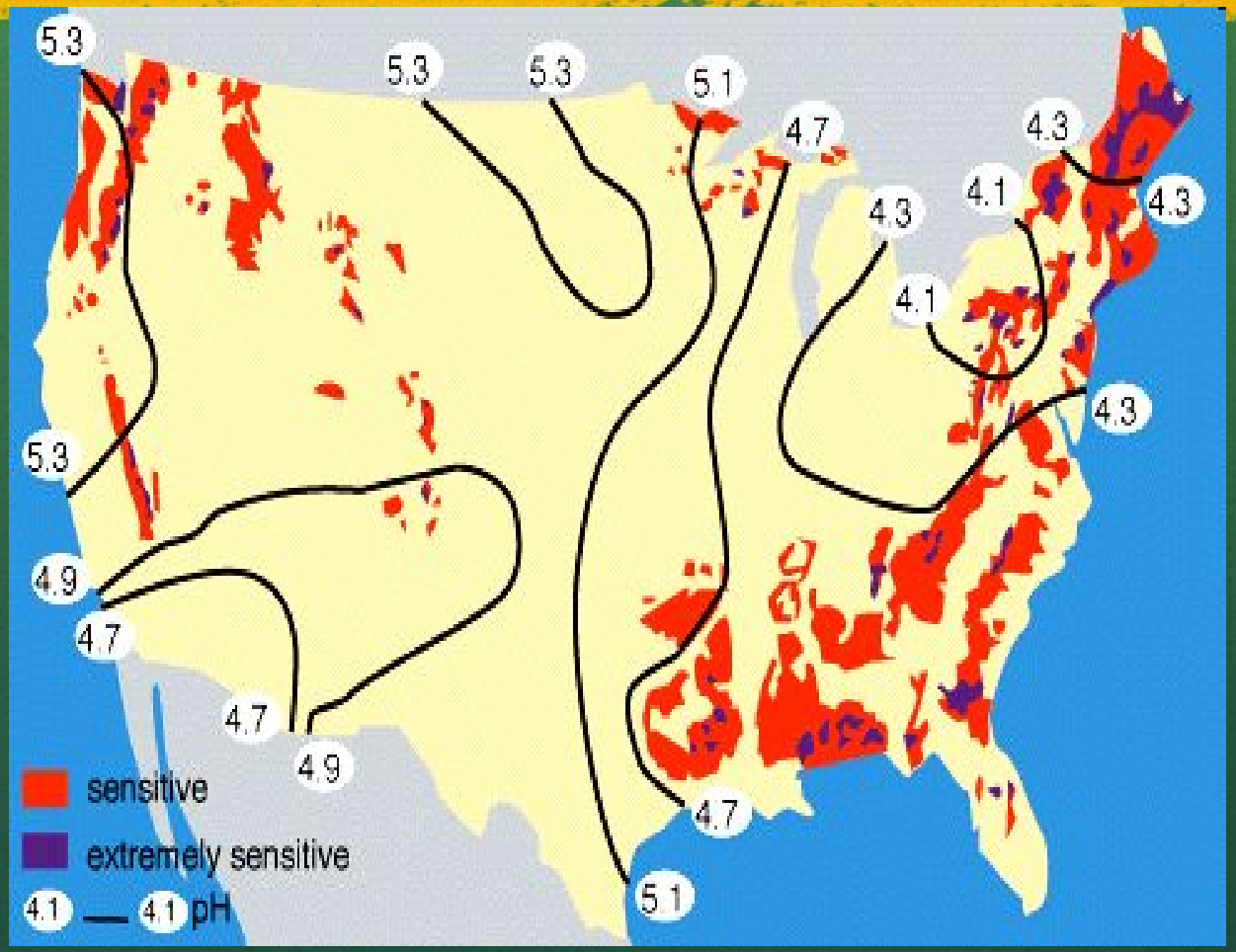
Acid Rain Effects on Sculptures

1908 1969

Ophardt, c. 2003

What is the pH of rain where we live?

- Around 4.4



32. Why is the hole in the ozone layer so bad?

Hole in the ozone layer due to the use of chloroflurocarbons (CFC) commonly found in aerosol sprays and refrigerants (A/C units)

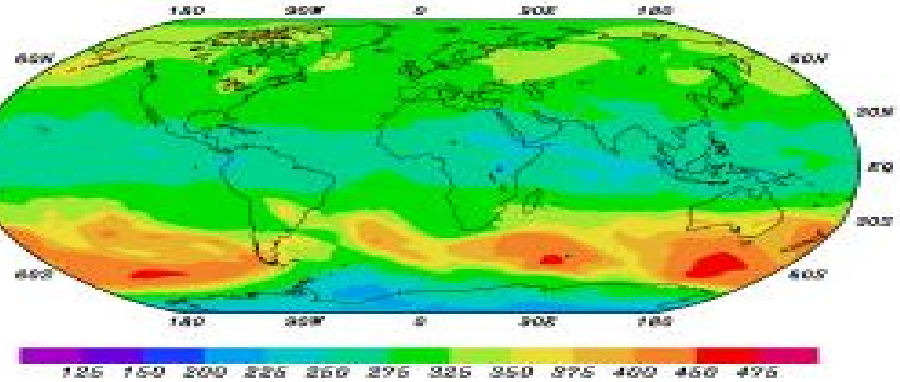
- Ozone layer is what protects us from the harmful UV radiation from the sun
  - cancer

Ozone Video
http://climate.nasa.gov/ClimateReel/ExploringOzone640480/

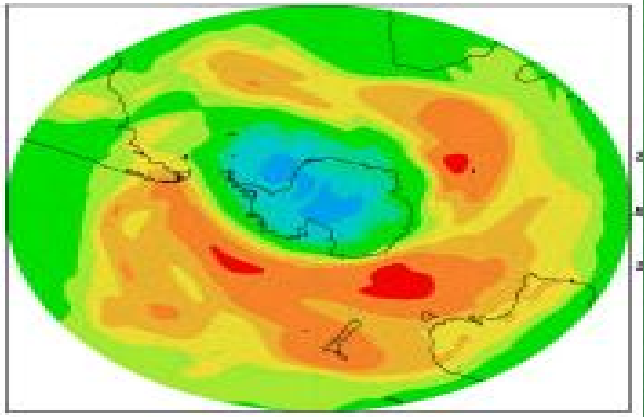
Ozone Hole
http://news.nationalgeographic.com/news/2008/11/081103-ozone-video-vin.html

Ozone hole
http://www.teachersdomain.org/asset/ess05_vid_ozonehole/

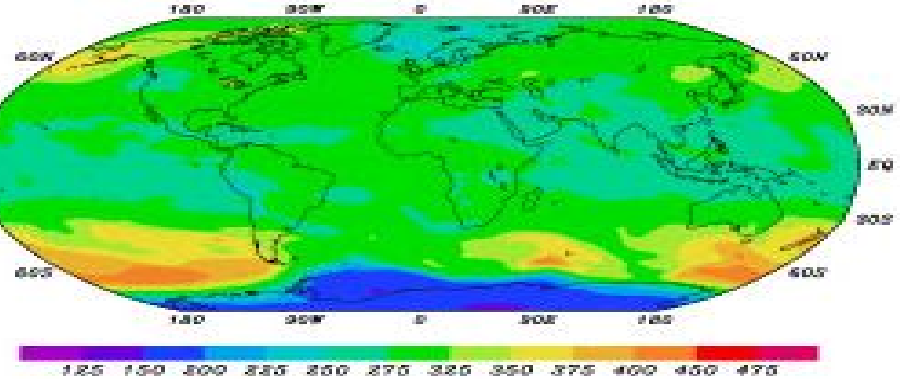
Total ozone in DU from ERA40, 19900930



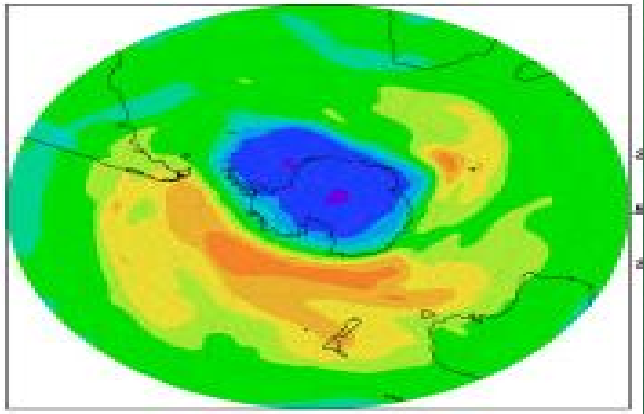
Total ozone in DU from ERA40



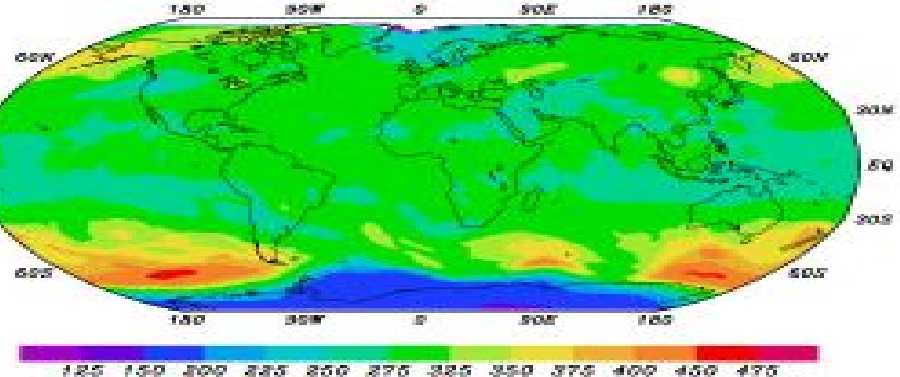
Total ozone in DU from EXP, 19900930



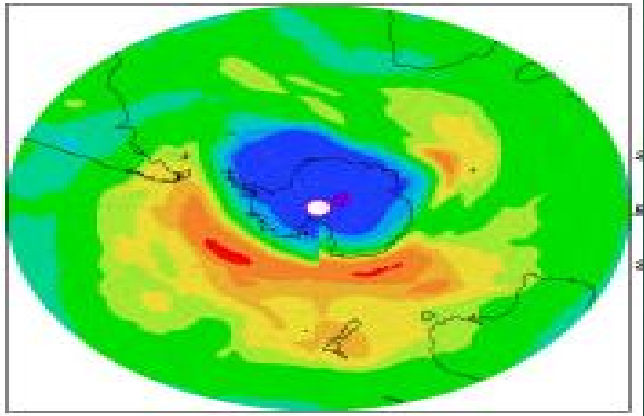
Total ozone in DU from EXP



Total ozone in DU from TOMS, 19900930



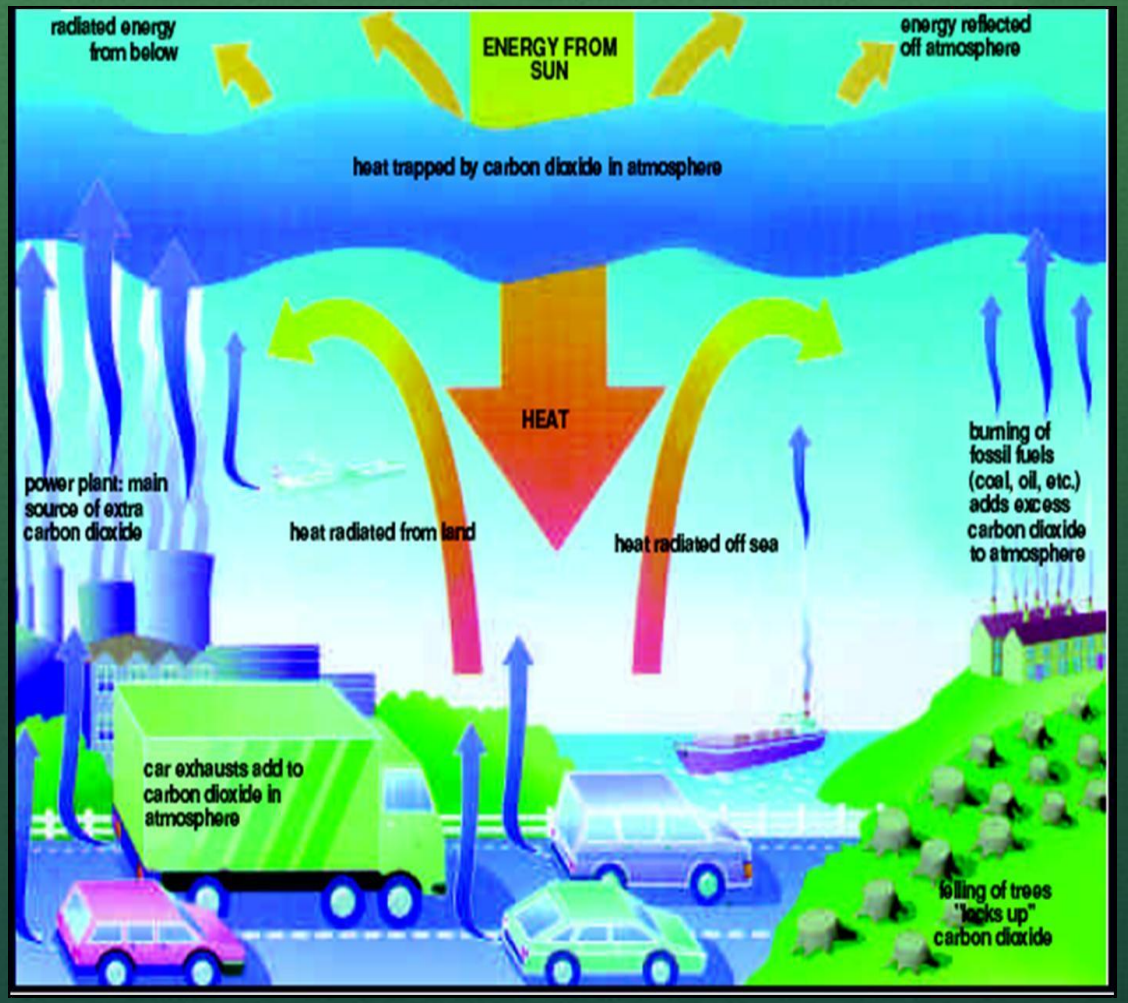
Total ozone in DU from TOMS



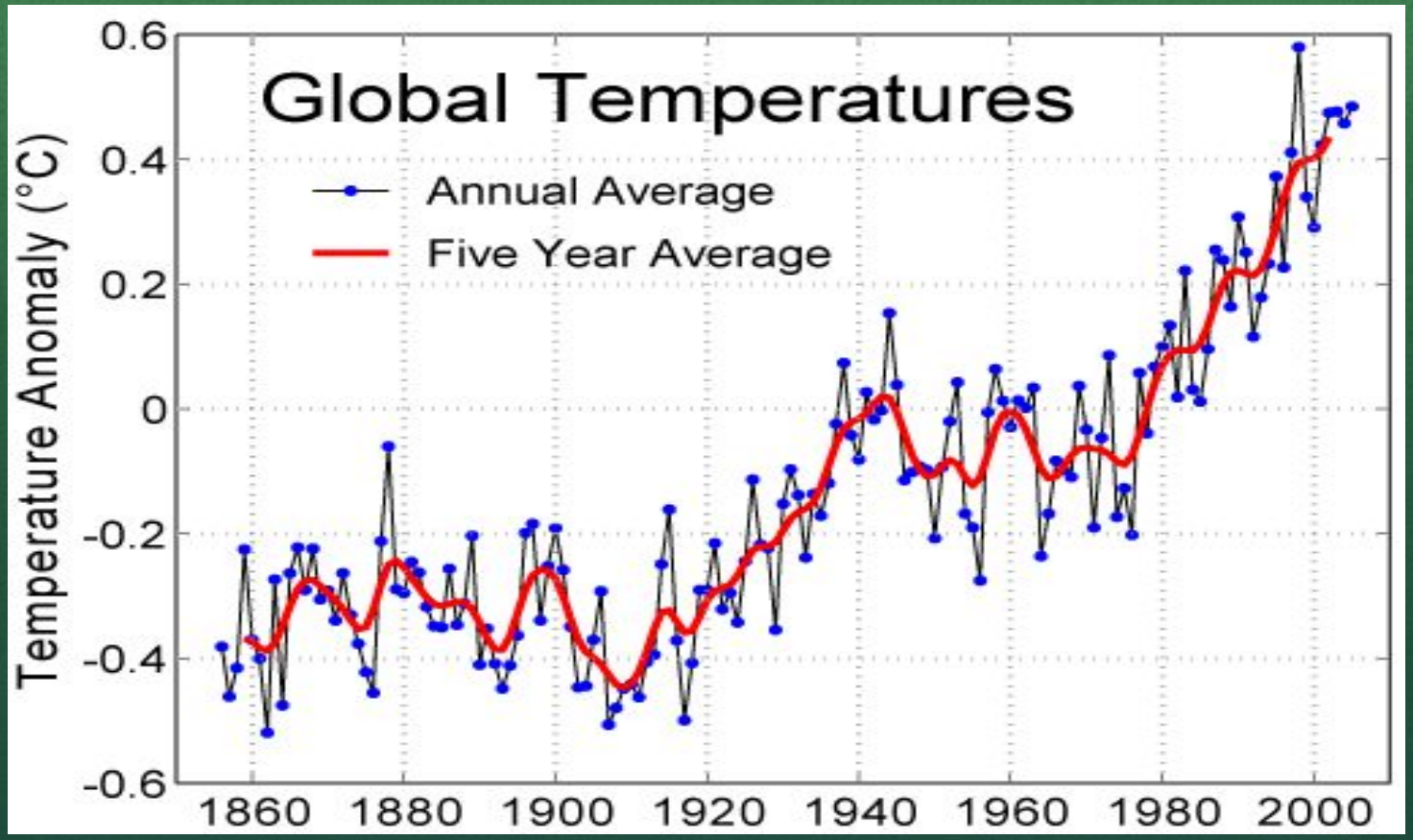
33. What is Global Warming?

Increase of Earth's average surface temperature

- Carbon dioxide emissions from burning fossil fuels
- Deforestation (photosynthesis → removal of carbon dioxide)



Temperature Changes



Global Warming – Physics of Greenhouse effecthttp://www.teachersdomain.org/asset/phy03_vid_greenhouse2/

The greenhouse effect
http://epa.gov/climatechange/kids/basics/today/greenhouse-effect.html

Climate Change
http://watchdocumentary.com/watch/scishow-infusion-episode-03-climate-change-video_6a3fa1563.html

Some effects of global warming

- Rising Seas
- Changes in rainfall patterns
- Increased likelihood of extreme events – Hurricanes, Tornadoes, Flooding, droughts
- Melting of the ice caps
- Melting glaciers
- Widespread vanishing of animal populations
- Migration of southern species northward
- Spread of disease - Malaria
- Bleaching of Coral Reefs due to warming seas and acidification due to carbonic acid formation
- Loss of Plankton due to warming seas

Effects of Climate Change
http://climate.nasa.gov/ClimateReel/MeltingIceRisingSeas640360/

Climate Change (Temperature)
http://climate.nasa.gov/ClimateReel/TemperaturePuzzle640360/

Sea Ice http://climate.nasa.gov/ClimateReel/SeaIce2008640360/

Plants and Climate Change
http://climate.nasa.gov/ClimateReel/PlantProductivity640360/

Climate Change Video http://www.epa.gov/climatechange/kids/index.html

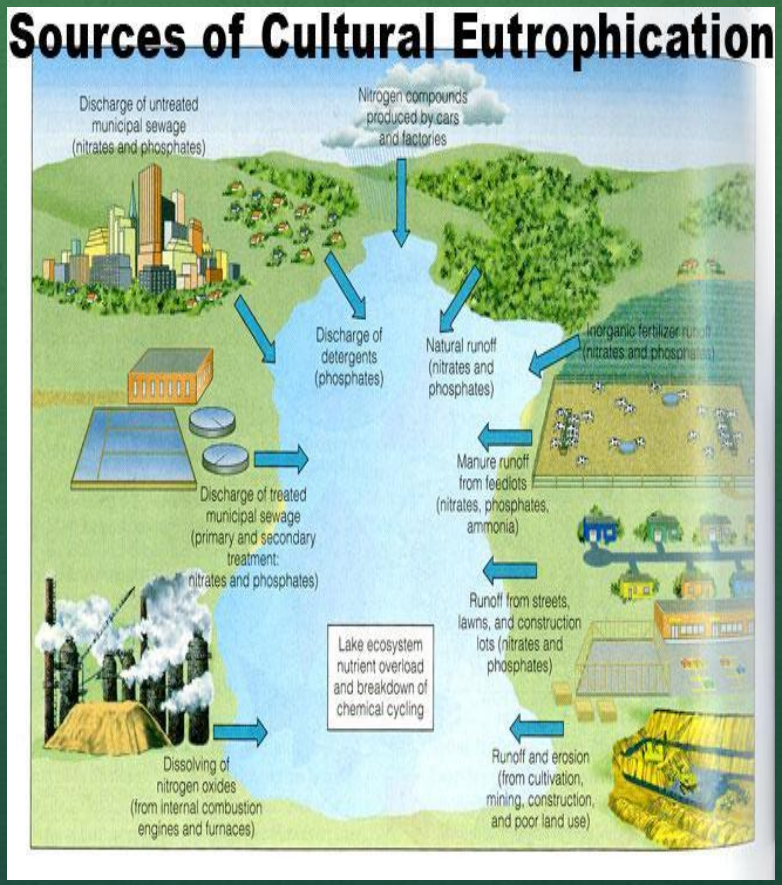
Sea Level Rise animation http://tinyurl.com7ezspsk

Video floating Ice vs land ice (animation)

34. Hog Farms - Eutrophication

Hogs #1 crop in NC

- Raised in industrial farms
- Waste is collected in lagoons (ponds) or sprayed on farm fields as fertilizer
- Problem – Some times ponds overflow and waste reaches water bodies
- Cause – Eutrophication – algae blooms.



Eutrophication Animation
http://www.absorblearning.com/media/attachment.action?quick=v3&att=2228

Eutrophication Animation
http://coseenow.net/blog/2008/11/eutrophication-animation/

Lake Eutrophication
http://uccpbank.k12hsn.org/courses/APEnvironmentalScience/course%20files/multimedia/lesson78/animations/5a_Lake_Eutrophication.html

4 videos on Eutrophication http://nitrogenfree.com/video/science_videos.php.html

Hog Farms – Pfiesteria

Aquatic protist associated with waste

- Kills fish by attaching to their bodies and withdrawing nutrient
- Toxic to humans – secrete neurotoxin that can be inhaled, eaten or contact skin.
  - pain, nausea, memory loss, immune problems & personality problems

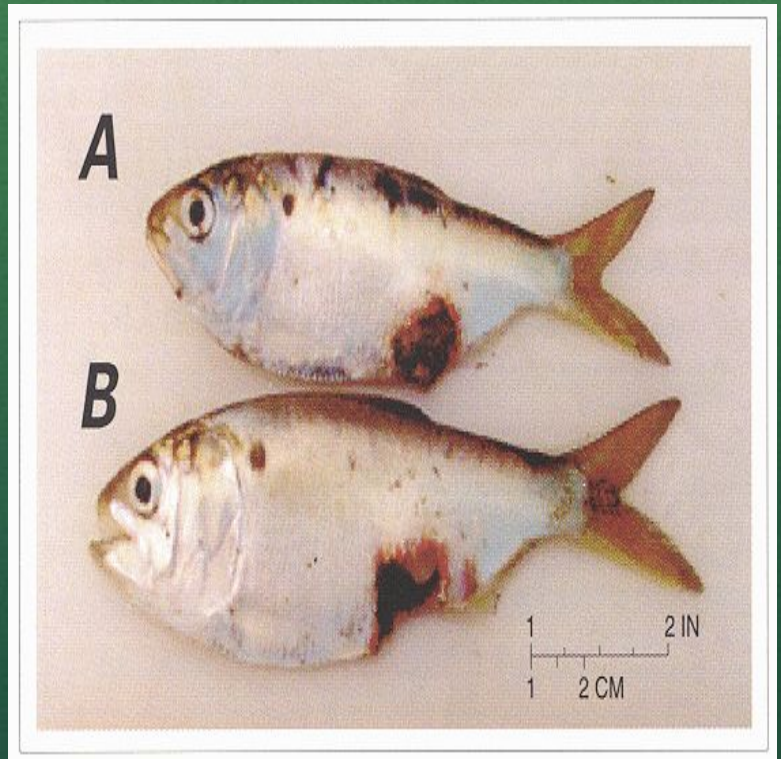


Figure 2. Lesions of menhaden that contain the fungal pathogen: ***A*** early raised lesion; ***B*** advanced ulcerated lesion.

Video Pfiesteria
http://www.c-spanvideo.org/program/91732-1

Video Pfiesteria
http://www.mdsg.umd.edu/CQ/v06n1/videos/index.html

Video Pfiesteria update
http://www.mdsg.umd.edu/CQ/v06n1/videos/index.html