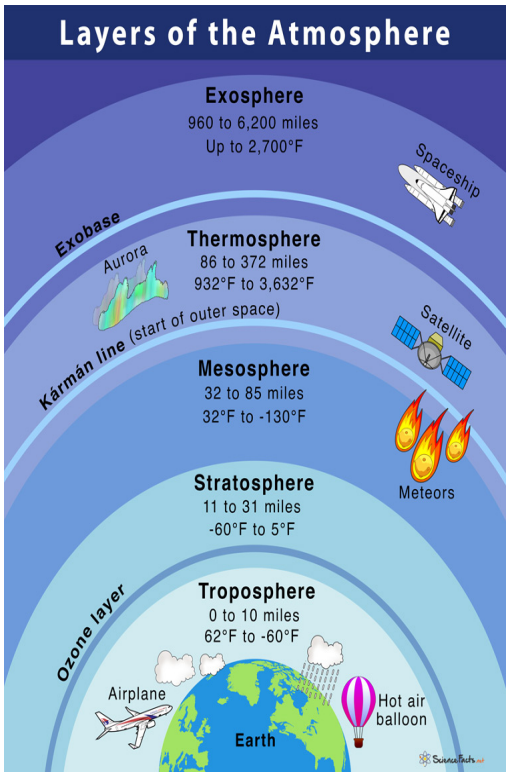
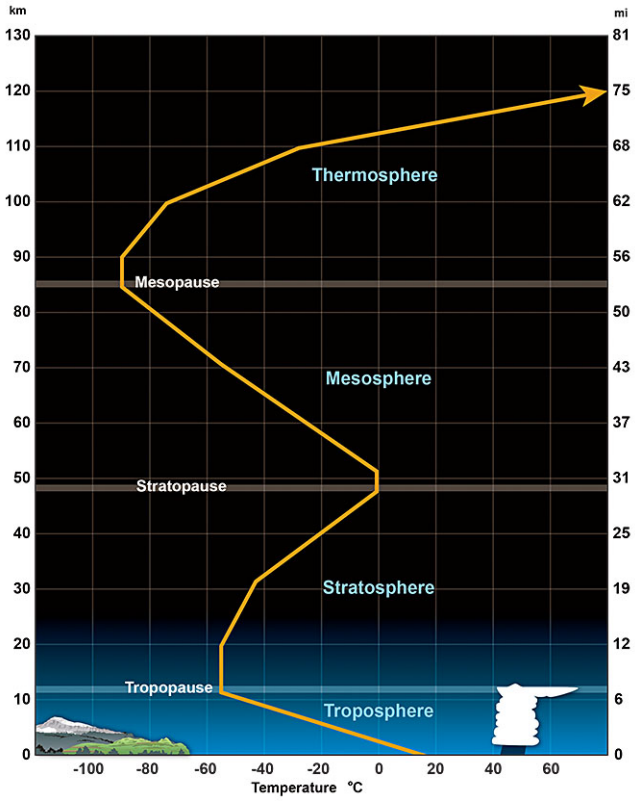
Hi friends!
You need to copy these notes and diagrams (take notes on case studies, do not copy paragraphs) into your notebook in addition to completing the summer assignment. I suggest that you get a composition notebook to keep track of all of your notes for the year.
I will be checking your notebook, as well as grading the summer assignment in the beginning of the school year.
Looking forward to an amazing year! Enjoy your summer break :)
Mrs. K

Aim #1-How do the four spheres support life on Earth?

Atmosphere-gasses that surround the surface of the Earth





Troposphere-weather; air that we breathe
-78% nitrogen, 21% oxygen, 1% other (water vapor, carbon dioxide)

Stratosphere-contains the ozone (O_3) layer

-protection from harmful UV radiation
-thermal inversion

Mesosphere-burns up meteors and asteroids before hitting surface of earth

Thermosphere-where outer space begins, satellites orbit and the aurora borealis is
-thermal inversion

Exosphere-outermost layer of atmosphere, gasses are spread out

Hydrosphere-portion of Earth that contains water, covers roughly 71% of Earth's surface

Examples: groundwater, surface water, ice and water vapor)

97% salt water

3% freshwater

-most of which is solid (polar ice, glacier), less than 1% liquid

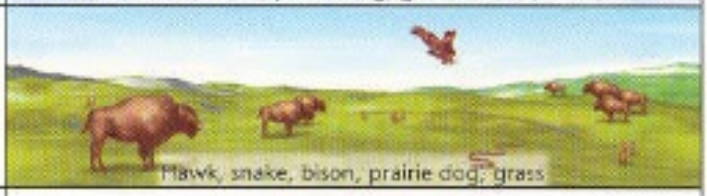
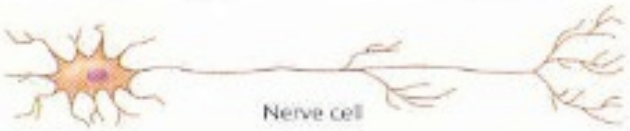
Lithosphere-crust and upper mantle that contains nonrenewable resources

-composed of elements silicon, iron, and magnesium with other elements like aluminum, sodium, and potassium

Biosphere-all of the living things on Earth

organism-any living thing

(animals, plants, fungi, protists, bacteria)

Biosphere	The part of Earth that contains all ecosystems	 Biosphere
Ecosystem	Community and its nonliving surroundings	 Hawk, snake, bison, prairie dog, grass, stream, rocks, air
Community	Populations that live together in a defined area	 Hawk, snake, bison, prairie dog, grass
Population	Group of organisms of one type that live in the same area	 Bison herd
Organism	Individual living thing	 Bison
Groups of Cells	Tissues, organs, and organ systems	 Nervous tissue Brain Nervous system
Cells	Smallest functional unit of life	 Nerve cell
Molecules	Groups of atoms; smallest unit of most chemical compounds	 Water DNA

Aim #2-How do living things obtain energy?

Nutrition-the ability of living things to make or obtain food

- **Autotrophic nutrition**-photosynthesis or chemosynthesis
  - **photosynthesis**-utilizes sunlight, carbon dioxide and water to produce glucose and oxygen (plants, algae, some bacteria)
  - **chemosynthesis**-utilizes sulfur from hydrothermal vents and carbon to produce sugars in absence of sunlight (depth of ocean species)
- **Heterotrophic nutrition**-ingestion of other organisms

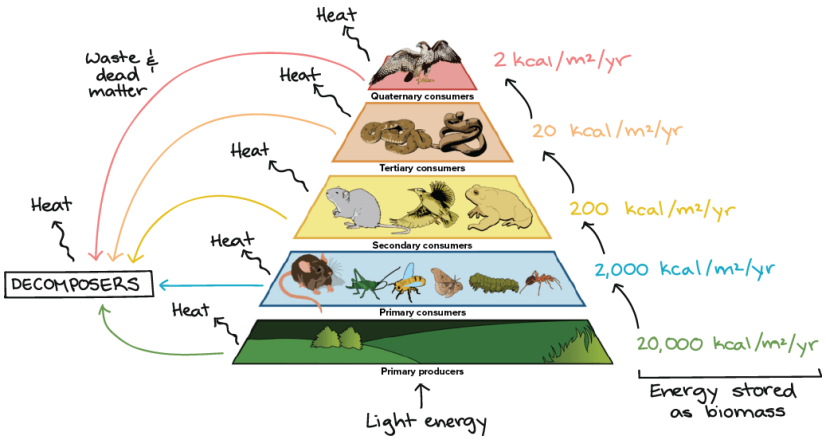
Respiration-turning food into energy (ATP)

- **Anaerobic respiration**-does not require oxygen
- **Aerobic respiration**-requires oxygen

Living organisms must make or obtain food from the environment. Food is then converted into ATP.

ENERGY IS A ONE WAY FLOW THROUGH LIVING THINGS AND IS NOT RECYCLED!

Original source of energy=the Sun



Food Chain-shows transfer of energy in an ecosystem

-arrow represents the direction of energy transfer

Producer-autotrophic organism that contains highest amount of energy

Primary consumer-consumes the producer, 10% of original energy
Secondary consumer-consumes the primary consumer, 1% of original energy
Tertiary consumer-consumes the secondary consumer, .1% of original energy

Herbivores-eat only producers
Carnivores-eat only consumers
Omnivores-eat BOTH producers and consumers

As **energy flows** through the biosphere, **heat is lost** with each transfer to the environment. (**Second Law of Thermodynamics**)

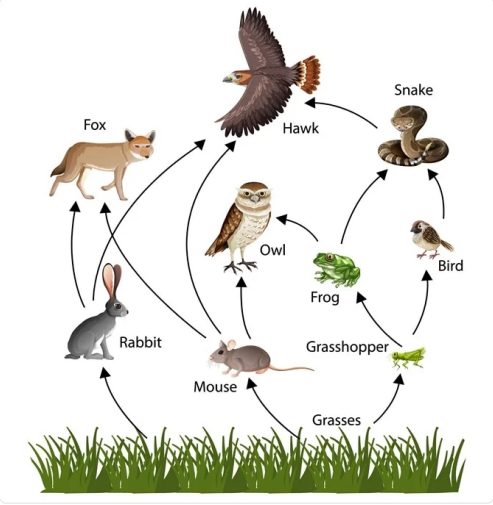
-**10% is transferred** to each subsequent level= ecological efficiency

Decomposers will break down dead organisms and **return nutrients** to the soil.

-**saprophytes-**secrete digestive enzymes to absorb nutrients from dead organisms (bacteria and fungi)

-**detritivores**-start the decomposition process by breaking down large material into smaller pieces, increasing surface area (earthworms, termites)

Food web-shows all possible feeding relationships in an ecosystem

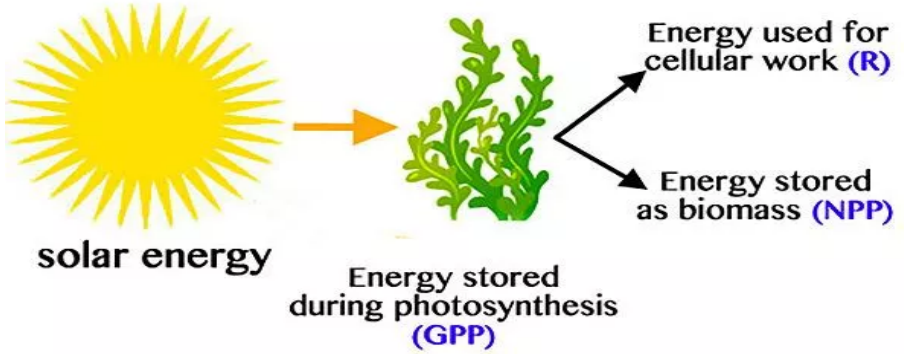


Productivity-the amount of photosynthesis that is conducted in an ecosystem

-**gross primary productivity (GPP)**-the total amount of glucose produced by photosynthesis by species in an ecosystem
-**net primary productivity (NPP)**-the amount of glucose that gets passed on to the primary consumer after respiration

GPP = NPP - R OR NPP = GPP + R

-**respiration loss (R)**=the amount of glucose that is used to keep the organism alive (metabolic processes)



Aim #3-How do organisms interact with each other in a biological community?

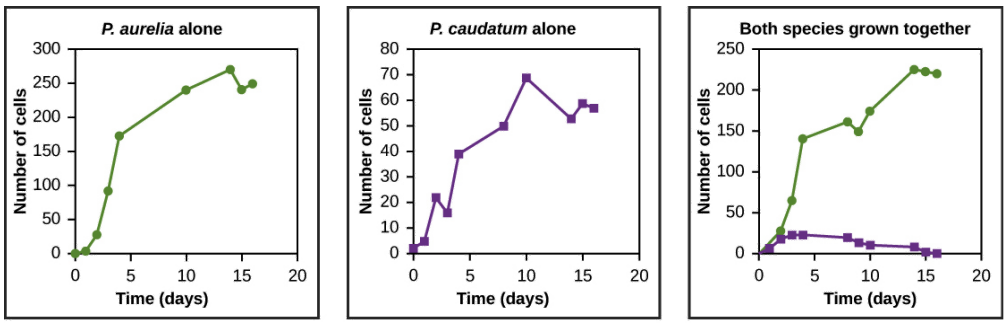
community-populations of different species that live together in the same habitat

All species are **interdependent** (rely on each other).

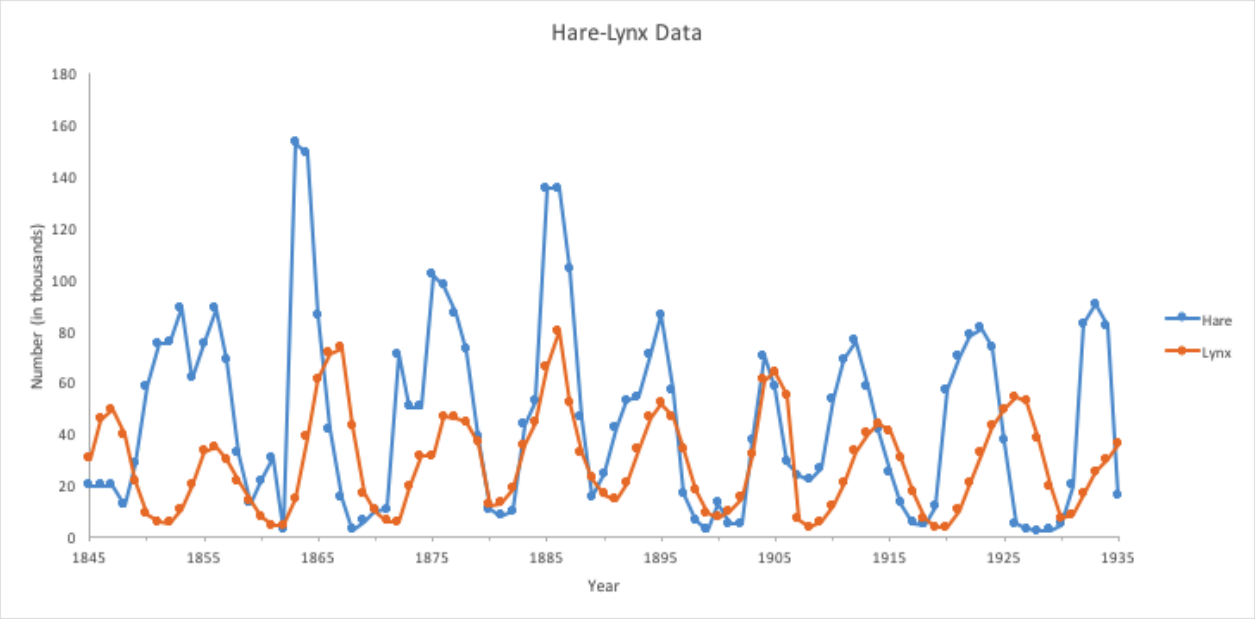
Interactions between individuals in the environment:

1. **Competition**-individuals are fighting over finite resources
   - **intraspecific competition**-individuals of the same species competing
   - **interspecific competition**-individuals of different species that are competing to occupy the same niche
     - **niche**-role of an organism in its environment
     - **resource partitioning**-different species share a resource by using it in different ways

competitive exclusion principle-two species that compete to occupy the same niche can't coexist at constant population values



2. **Predation**-the relationship in which a predator actively hunts and kills its prey



predator-higher trophic level, less abundant
prey-lower trophic level, more abundant

predators-necessary for survival of an ecosystem, control the prey to prevent the depletion of the producers
prey-food source for the predator, feeds on the producer

3. **Symbiosis**-living relationships between species
    - **Parasitism (+,-)** -one organism feeds off of the nutrients of the other
        - **Parasite (+)**-species that benefits
        - **Host (-)**-species that is harmed
    - **Commensalism (+, 0)-**one organism benefits while the other is unharmed
    - **Mutualism (+,+)**-both species benefit from the relationship

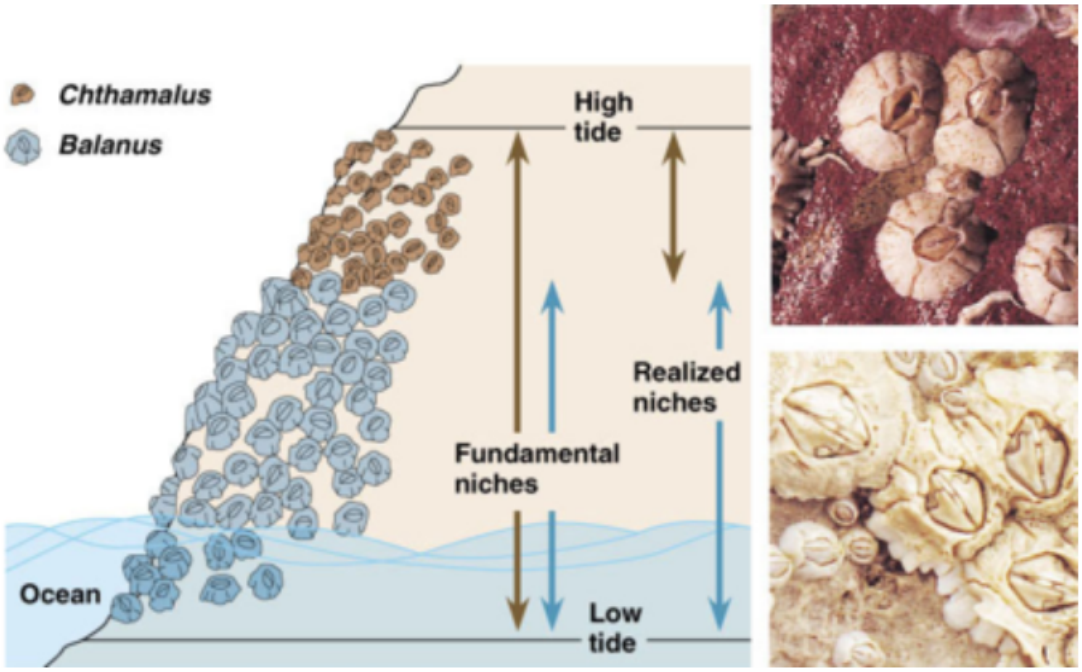
Relationship	Example
Parasitism (+, -)	Tapeworm (+) gets food and shelter from the human host (-), human host loses nutrition as a result Tick (+) feeds on deer's (-) blood to the deer's detriment – nutrient loss, disease transfer Cuckoo (+) may lay its eggs in a warbler's (-) nest - the cuckoo's young will displace the warbler's young and will be raised by the warbler Mistletoe (+) extracts water and nutrients from the spruce tree (-) to the tree's detriment
Commensalism (+,0)	Remora (+) attaches itself to a shark (0) for a ride and to catch scraps of food from the shark's meals, but the shark remains unaffected Silverfish (+) live and hunt with army ants(0) - they share the prey, but they neither help nor harm the ants Hermit crabs (+) live in shells made and then abandoned by snails (0) which neither harms nor benefits the snails Stork (0) uses its saw-like bill to cut up the dead animals it eats and as a result, the dead animal carcass is accessible to some bees (+) for food and egg laying Buffalos (0) walk through grass, insects become active and are seen and eaten by cowbirds (+) which neither harms nor benefits the buffalo Barnacles (+) create home sites by attaching themselves to whales (0) which neither harms nor benefits the whales
Mutualism (+,+)	Sea anemone (+) provides a home/protection as the clownfish (+) is immune to its sting. The clownfish drops food particles that the anemones can use as nutrition Ostriches (+) and gazelles (+) feed next to each other and both watch for predators and alert each other to danger Intestinal bacteria (+) that feeds on everything that the human (+) body is not able to process and digests it partially, facilitating the work of the human intestine Oxpeckers (+) feed on the ticks found on a rhinoceros (+)

Aim #4-How do different organisms shape a biological community?

Niche-role of an organism in its environment

Fundamental niche-full range of environmental conditions and resources an organism can possibly occupy and use, especially when limiting factors are absent in its habitat

Realized niche-set of environmental conditions actually used by an organism after interactions with other species (predation and especially competition) have been taken into account



Native species-species that naturally thrive in an ecosystem

Non native species-species that have been introduced intentionally or accidentally into a new ecosystem

1. **Rabbits in Australia**-Rabbits were introduced when Europeans first settled in Australia in 1859. They were brought there for two main reasons – the domesticated rabbit was a ready source of meat, and the wild rabbit introduced later for hunting. The rabbit populations exploded because they reproduced much quicker than they were hunted. To control the problem from spreading, an 1833km fence was built to try to prevent the rabbits from spreading, but it was a complete failure. Kangaroos and emus were negatively affected as they would get caught in the fence just like dolphins are affected by drifting nets in the ocean. The rabbits are partially blamed for the extinction of almost an eighth of

the mammal species in Australia and have caused millions of dollars of agricultural and soil damage a year. To control the problem, a virus was injected into the rabbit population that usually killed the infected rabbit within 14 days, but could be spread to others by mosquitoes or fleas.

2. **Water Hyacinths in Louisiana**-The water hyacinth was first brought from South America to the U.S. as part of a fair held in New Orleans. They proved to be popular gifts and were transported to garden ponds around the city. The hyacinths reproduced and quickly spread to neighboring waterways. With no natural controls, such as disease or predators, it soon covered immense areas of Louisiana, clogging canals used for boating and fishing. Water hyacinths have been considerably reduced by the introduction of insects that would feed on the plants, heavy doses of herbicides, and physical removal.

3. **Asian Long-horned Beetles in New York** Native to Eastern Asia, the long-horned beetle accidentally made its way to New York in wood packing material. Spread of the Asian long-horned beetle is accomplished through infested tree-based materials, including live trees, fallen timbers and firewood. This can be difficult to address, due to the larvae being deep within the wood. Larvae develop out of the eggs and chew “galleries” into the inner parts of the tree, on which they will feed during the overwinter process. Adults emerge during the spring through these holes that can be found on various spots on the tree, mainly around the branches and trunk of the tree. There can be thousands of the holes that the adults appear from in an infested tree. By making so many holes, adults cause the tree to lose nutrients to maintain its life needs, such as water and sap. To prevent the spread, tree removal and then quarantines are established which prohibit the movement of infected wood.

4. **Brown Tree Snakes in Guam** Indigenous to Australia, Indonesia, and the Solomon Islands, the brown tree snake was accidentally transported from its native range in the South Pacific to Guam either as a stowaway in ship cargo or by crawling into the landing gear of Guam-bound aircraft shortly after World War II. Because of the absence of natural predators, brown tree snake populations reached unprecedented numbers. Snakes caused the local extinction of most of the native forest vertebrate species, especially birds (the Guam rail) and lizards. This, in turn, caused a spike in the spider population. To control the problem, mouse bait injected with Tylenol (which was poisonous to the snakes), was released in the environment.

5. **Cane Toads in Australia** Cane toads were intentionally introduced in Australia in 1935 to help combat cane beetles that were destroying sugar cane crops. They completely failed at regulating the cane beetles, and instead turned their attention to other native insects. Cane toads will eat just about any insect and they reduced prey for native insectivores which created imbalance in the native food webs. Since the initial release of 3,000 toads, cane toad populations in Australia number in the millions and their range continues to expand. In addition to Australia, they're found in south Florida, throughout the Caribbean, and in other tropical and subtropical locales. Cane toads are also poisonous throughout their lifecycle. Whether they're eggs, tadpoles, or full-grown adults, cane toads can poison and potentially kill anything that ingests them. Cane toad poisoning in household pets, such as dogs, has become quite common in Australia and Hawaii. Manual removal is the main management strategy for cane toads. Although toads can be removed as adults, it's easiest to collect the jelly-like strings of cane toad eggs from local creeks or ponds. Also, mesh fencing is used to stop the spread of the toad, but native fauna can also get caught up in the nets. In Australia especially, there is a widespread education campaign to warn people about the dangers of cane toads and invasive species.

6. **Asian Carp in the Mississippi River** Asian carp were brought to the United States in the 1970s to help control algae in catfish farms of the Deep South. The carp escaped into the Mississippi River system during flooding episodes in the early 1990s, established self-sustaining populations in the lower Mississippi River, and then began moving northward. Thus far, the fish have been restricted to the Mississippi River watershed; however, it is feared that they will be able to enter the Great Lakes. They are fierce competitors, capable of pushing aside native fishes to obtain food, and their populations grow rapidly, accounting for 90% of the biomass in some stretches of the Mississippi and Illinois rivers. Once in the Great Lakes ecosystem, they could wreak havoc on the foundations of the food chains of the major lakes and adjoining rivers. To deal with this potential menace, two electric fish barriers have been placed within a 1,500-foot stretch of the canal. Electrical pulses emanating from the barriers keep the fish at bay while also allowing barge traffic to move up and down the waterway. This measure, however, may not be 100% effective. In addition, rotenone, a biodegradable piscicide (fish poison) is added to the water whenever repairs to the electric barriers are required.

Keystone species-species that have a tremendous impact on the ecosystem

Sea otters of Pacific Northwest Kelp Forest-keep sea urchins that eat kelp in check to prevent depletion of producers in the ecosystem

Grey Wolves in Yellowstone National Park-keep herbivores (elk, bison) in check to prevent depletion of producers in the ecosystem

Indicator species-species that provide feedback to humans about the health of the ecosystem

-**amphibians**-live in terrestrial and aquatic ecosystems at different stages in their life

-**lichen**-indicate air pollution levels based on coloration
green=healthy, pale yellow/grey=unhealthy

-**birds**-songbirds can indicate toxic air pollution levels in their inability to survive, predatory birds can be impacted by DDT levels in the environment in that their shells can be softened impacting offspring

Generalist	**vs.**	**Specialist Species**
-smaller individual organisms		-larger individual organisms
-lower individual survival rates		-higher individual survival rates
-greater adaptability to a changing environment		-lower adaptability to a changing environment
-broad niche		-narrow niche
-fast reproductive rate		-slow reproductive rate
-many offspring		-few offspring
Example: cockroaches		Example: humans

Aim #5-What are the abiotic factors present in an ecosystem?

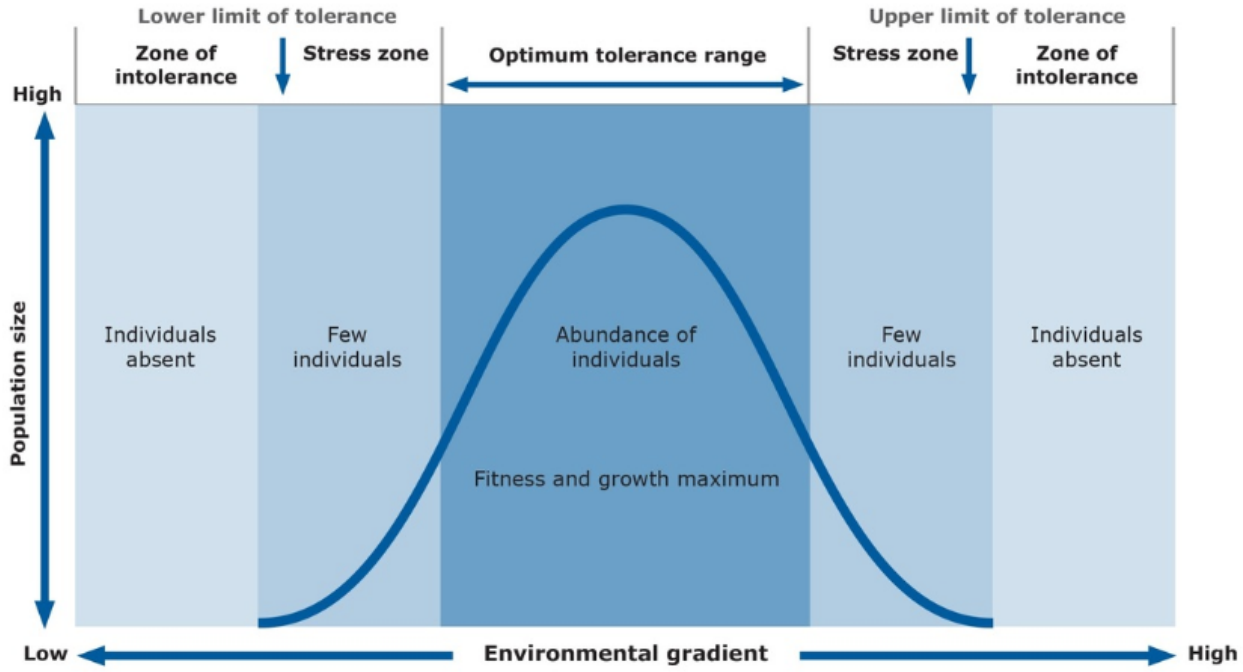
abiotic-non living factor in the environment

-**resources** such as nutrients in soil such as nitrates and phosphates, dissolved oxygen in aquatic ecosystems, sunlight

-**conditions** such as temperature, salinity, pH

Limiting factors-any factor that limits the growth of a population

-can be **abiotic** (sunlight, carbon dioxide) or **biotic** (predation, disease, competition)



Range of tolerance-the environmental conditions that are necessary for a population to exist in an ecosystem

Zone of intolerance-the environmental conditions that inhibit a population from existing in an ecosystem