

Aim: What is Ecology?

A branch of Biology that studies the interactions of organisms with each other and their physical environment

What is the basic unit studied in Ecology?

- Ecosystem
- An ecosystem involves interactions between Abiotic (physical) and Biotic (living) factors. The members of the community in the ecosystem must interact to maintain balance

An ecosystem is self-sustaining if the following requirements are met:

1. A constant source of energy and a living system that can transform this energy into organic molecules (food)
2. A cycling of materials between organisms and their environment.

plants
algae

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In all environments, organisms with similar needs may Compete with each other for resources, including food, space, water, air, and shelter

Abiotic Factors: those physical and chemical factors which affect the ability of organisms to survive and reproduce

What are some Living Things surrounding us

Biotic Factors

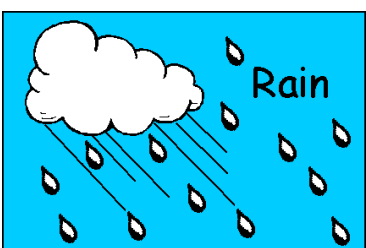
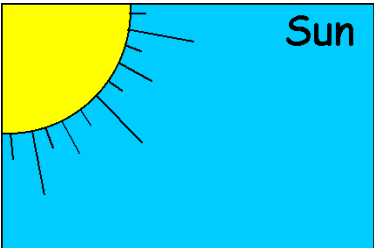
worms, birds, squirrels
grass, trees

What are some nonliving things surrounding us

Abiotic factors
rocks, soil, water
Sunlight
minerals (N₂, CO₂)
[Nitrates]

..

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Abiotic : those physical and chemical factors which affect the ability of organisms to survive and reproduce

Examples of Abiotic Factors:



1. intensity of light
2. range of temp.
3. amount of moisture
4. type of soil or rock
5. availability of inorganic substances such as Minerals [N₂]
6. supply of gases such as oxygen, carbon dioxide, and nitrogen
7. pH

* * Each of the abiotic factors changes the environment and may act as a Limiting factor determining the types of organisms that exist in that environment.

Some examples:

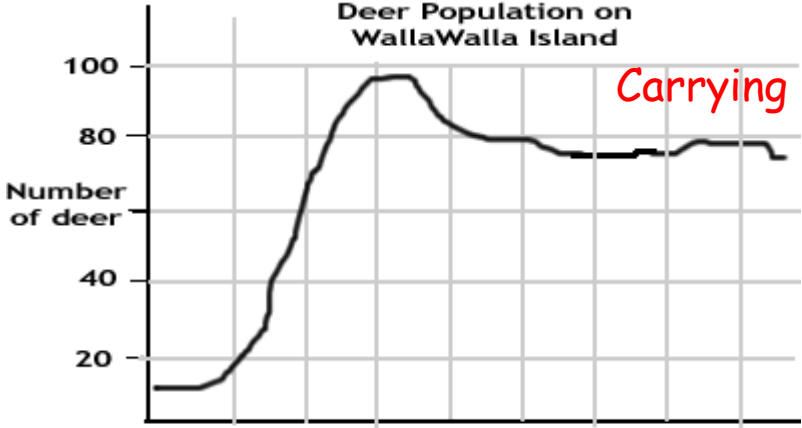
Low Annual temp. found in the northern latitudes determines the species of plants which can live in that area. [mosses]

- The dry desert region limits the organisms that can live there (cacti)

May 24 - 10:18 AM

Deer Population on WallaWalla Island



Carrying capacity

The maximum number of organisms the resources of an area can support is called its carrying capacity

The carrying capacity of the environment is limited by the available Biotic and Abiotic resources, as well as the ability of ecosystems to recycle dead organisms through the activities of bacteria and fungi.

Decomposers

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What are the biotic factors in an ecosystem?

- all the organisms in the ecosystem
- the organisms, their parts, interactions, and wastes are all biotic factors.



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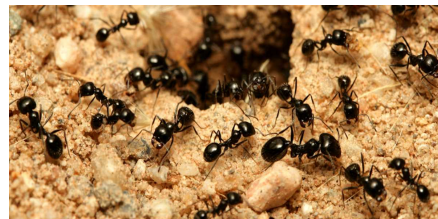
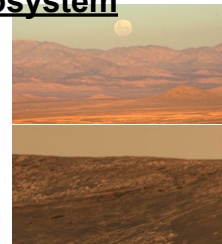
AIM: How is an ecosystem organized?

Organization of Living things in an ecosystem

Population:

- All the members of a SPECIES living in a given location.

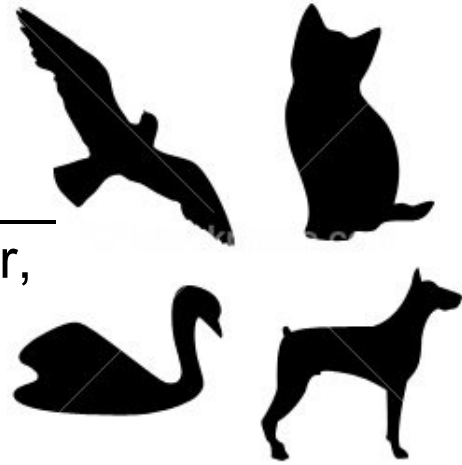
example: all the Ants of a particular species living on my lawn.



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Community

- all the interacting populations in a given area
example: all the populations of ants, worms, grass, clover, dandelions on my lawn



All living things in a particular area.

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Ecosystem:

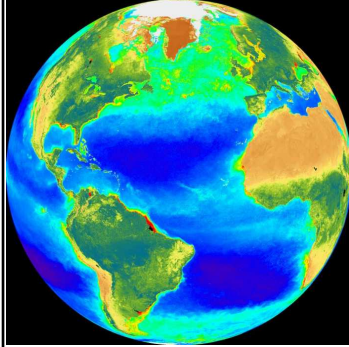


The living community and the physical environment functioning together as an independent and relatively stable unit example: my lawn, including the community mentioned above + physical environment



May 23 - 6:02 PM

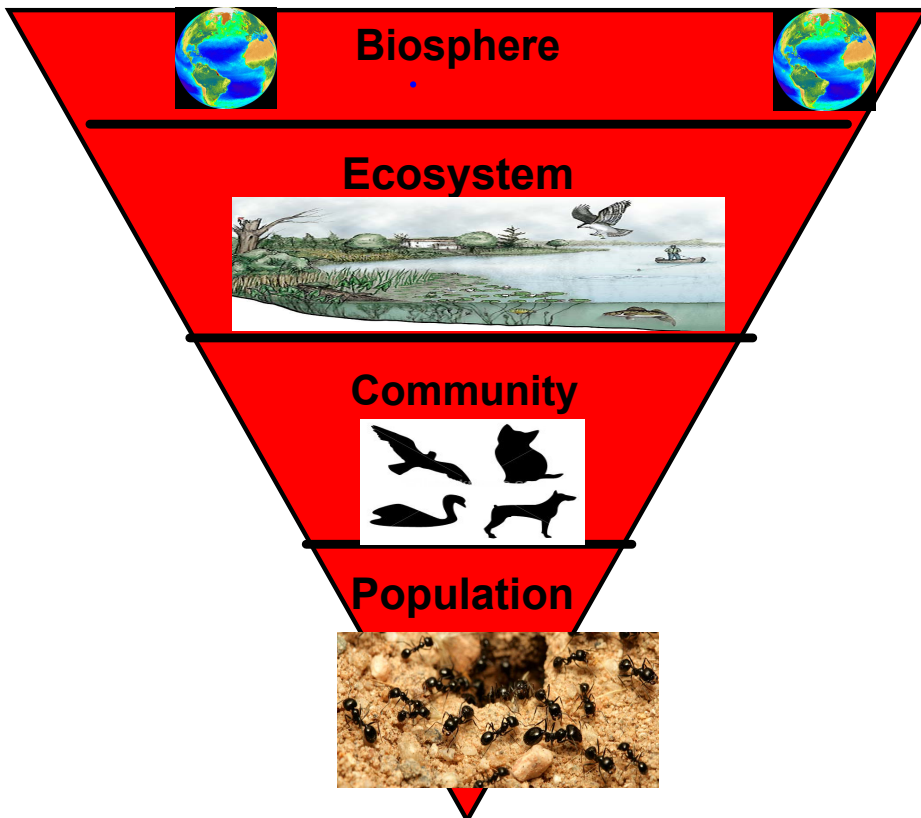
Biosphere



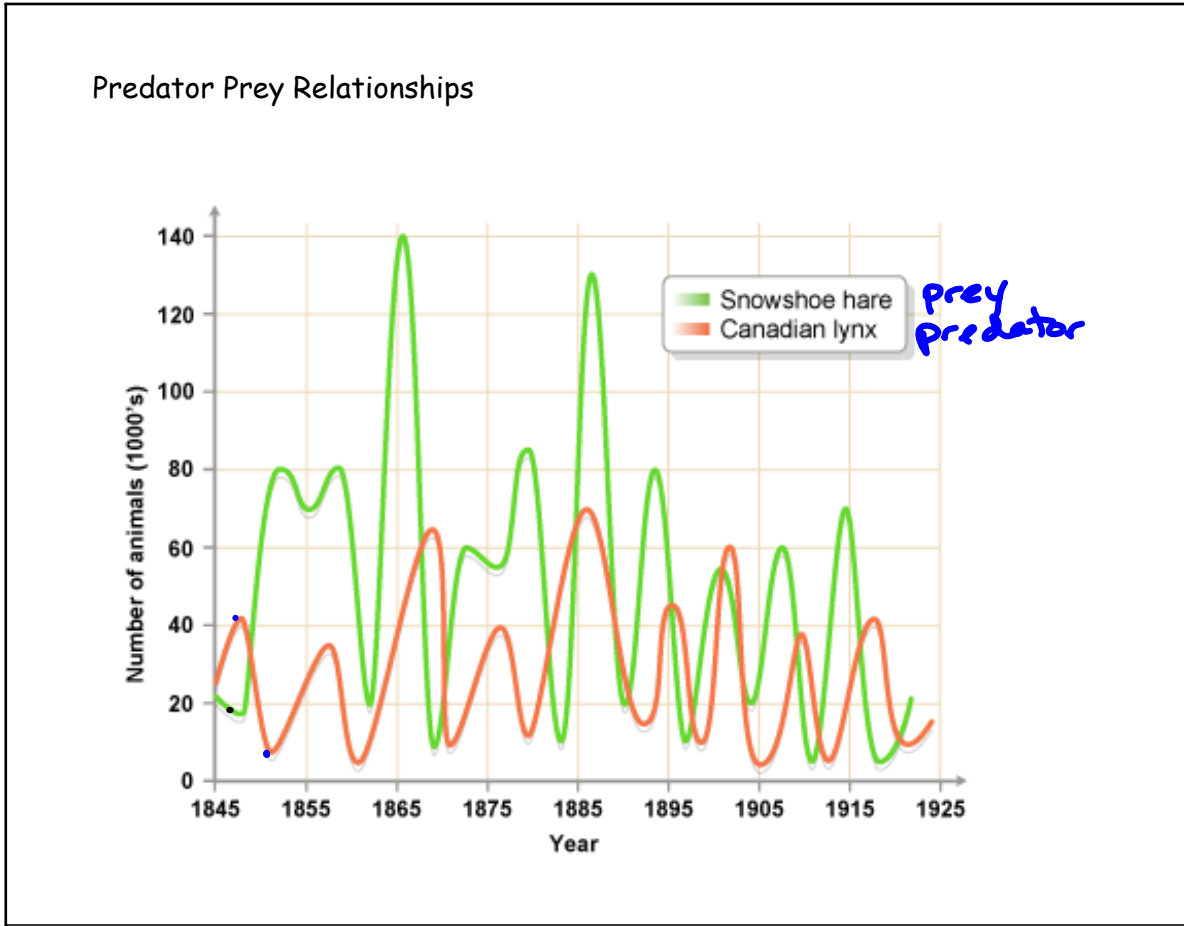
- The part of the Earth where Life is found
- the biosphere is composed of many complex ecosystems
- example: all parts of the earth except where there is no life

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Organization of Living things in an ecosystem



May 24 - 11:08 AM



May 28-6:50 PM

How do organisms interact with each other?

- they have Nutritional relationships.
- they have Symbiotic relationships.

What are the 2 types of Nutrition ?

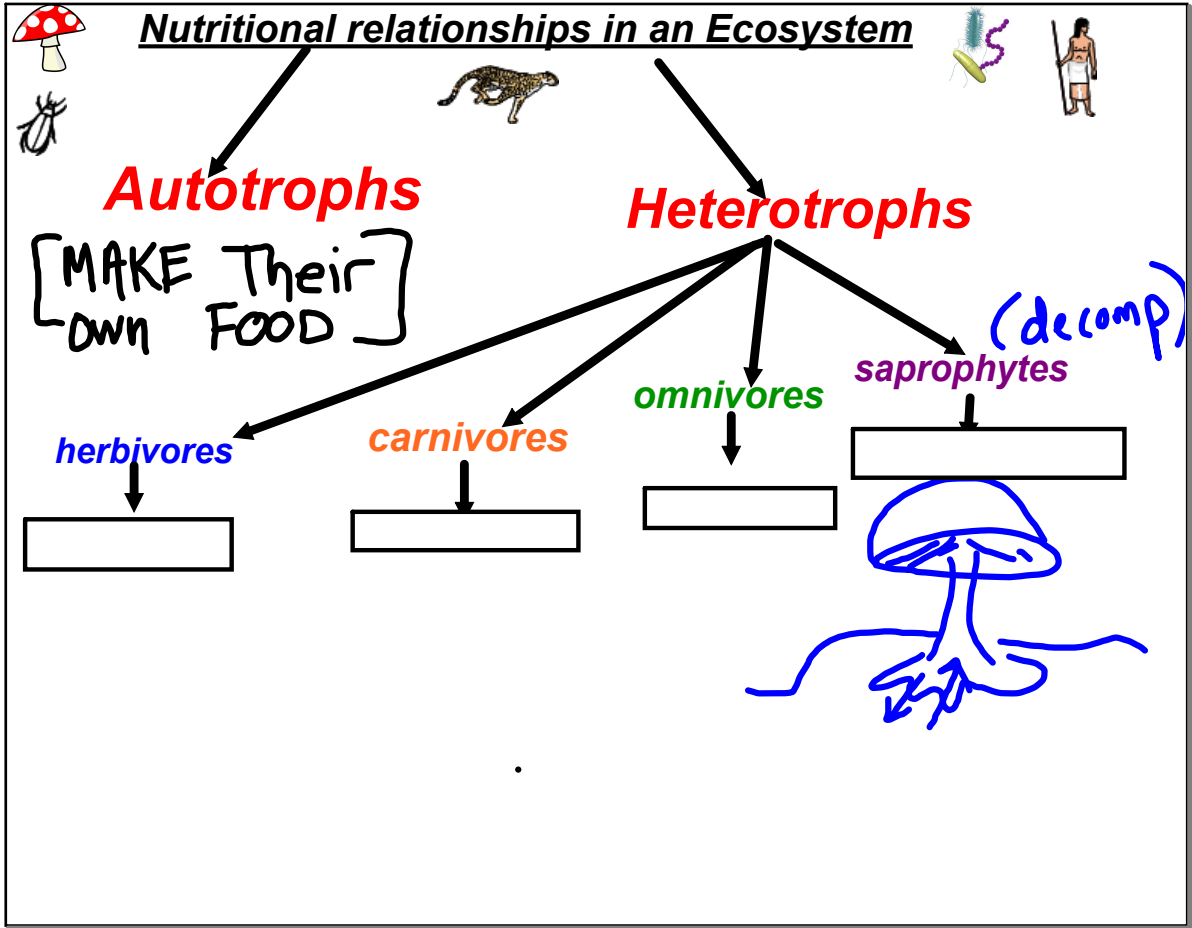
autotrophs: can Make their own food from inorganic compounds and a usable energy source

heterotrophs: can NOT synthesize their own food and depend on other organisms for their food

Heterotrophs

Handwritten notes: Sunlight (with arrow pointing to energy source), Make (with arrow pointing to NOT)

Jun 1-7:58 PM



Nutrition → Autotrophs
[make their own food]

Type of Heterotroph	Characteristics
Saprophytes	<ul style="list-style-type: none"> live off dead matter decomposers ex. Fungi, bacteria
<u>Herbivores</u>	<ul style="list-style-type: none"> plant-eating animals ex. cow, giraffe, deer
Omnivores	<ul style="list-style-type: none"> eat both plants and meat (other animals) ex. humans, bears
<u>Carnivores</u> ▶ predators ▶ scavengers	<ul style="list-style-type: none"> meat-eating animals (other animals) animals which kill and consume their prey those animals that feed on other animals that they have not killed ex. hyena, vulture

Jul 28-9:27 AM

AIM: How does energy flow in an ecosystem?

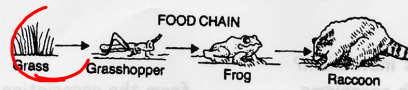
* * If an ecosystem is to be self-sustaining it must contain a flow of energy.

- Those life activities that are characteristic of living organisms require a use of energy.
- The pathways of energy through the living components of an ecosystem are represented by Food chain & Food webs.

Producers change the light energy of the sun into the chemical energy of food.
ex. plant, algae, phytoplankton

What is a food chain?

- involves the transfer of energy from green plants through a series of organisms with repeated stages of eating and being eaten.

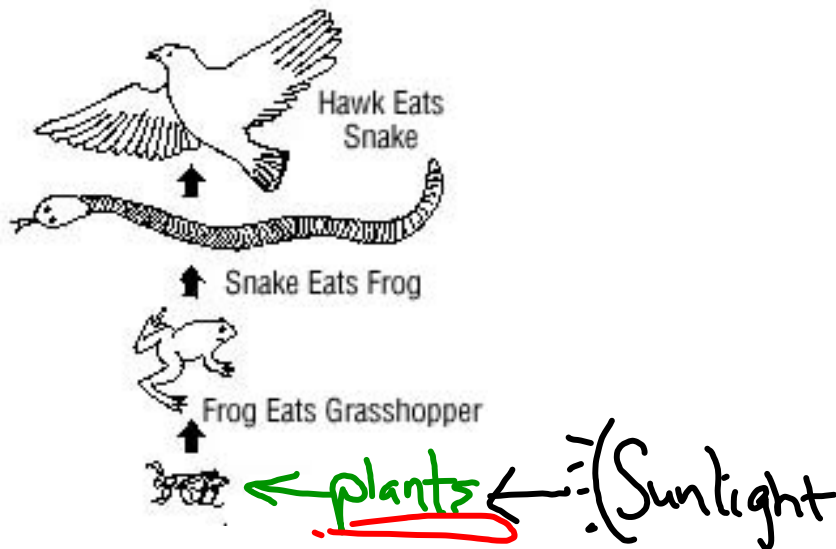


**In a natural community, the flow of energy and materials is much more complicated than shown by any one food chain.

- Since practically all organisms may be consumed by many species, many food chains are interconnected to form a food web.

How do the organisms in a FoodWeb interact?

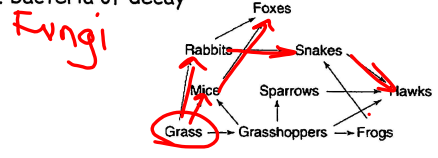
Jun 5-9:45 PM



Food Chains:
 The transfer of energy from plants through a series of organisms with repeated stages of eating and being eaten

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- producers : (plants) -- the energy of the community is derived from the organic compounds in plants (grass in the web below) *carbs (glucose)*
- primary consumer: always herbivore -- feeds on plants (mice, grasshoppers, and rabbits in the web below)
- Secondary : (always a carnivore) -- feeds upon other consumers (frogs, sparrows, snakes, and foxes below) (The hawk is a secondary or 3rd level consumer depending on the availability of food.)
--Omnivores may be primary or secondary consumers.
- decomposers: break down organic wastes and dead organisms to simpler substances *(minerals for plants)*
- ex. bacteria of decay *Fungi*



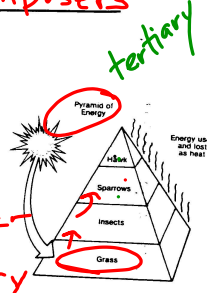
** Through decomposition, chemical substances are returned to the Soil where they can be used by other living organisms.

Energy flows through ecosystems in one direction, from the Sun, through photosynthetic organisms, including green plants and algae, through herbivores, (phytoplankton)

Jun 5-9:47 PM

to carnivores, and finally decomposers

** There is a decrease in the energy in each level as you move up the food web. This means that there is much more energy in the producer level in a food web than at the consumer levels. Also, this means that there is more energy at the primary consumer level than at the secondary consumer level.



** Each consumer of the food pyramid uses approximately 10% of its ingested nutrients to build new tissue. This new tissue represents food for the next feeding level.

** The remaining energy is lost in the form of heat or is used during the organisms life processes. Eventually, the energy in an ecosystem is lost and is radiated from the earth.

Soo..., an ecosystem can not survive without the constant input of energy from the Sun.

Biomass : amount of organic matter (tissue) *(mass)*

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Food Web in the Sagebrush-Steppe Ecosystem

A food web is a model that shows how energy is passed in the form of food from one organism to another. The arrows between the organisms show the direction of energy flow. They point from what is being eaten to what is eating it.

Larger Predators

Small Predators, Carnivores, Insectivores

Plant Eaters / Primary Consumers

Primary Producers

FOOD WEB :

The interconnected food chains in an ecosystem

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** The decrease of energy at each successive feeding level (trophic level) means that less biomass can be supported at each level. So..., the total mass of carnivores in a particular ecosystem is less than the total mass of the producers (A pyramid of biomass shows this.)

level D = producers
 level C = primary consumers
 level B = secondary consumers
 level A = tertiary consumers

90%
 90%
 90%

Lost as heat carry on life processes

Sun

Jun 5-9:49 PM

Pyramid Of Energy

Energy Pyramids:
 illustrate the loss of usable energy at each feeding level
 Producers contain the greatest amount of energy in the ecosystem
 — those at the top of the pyramid contain the least energy.

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Pyramid Of Energy

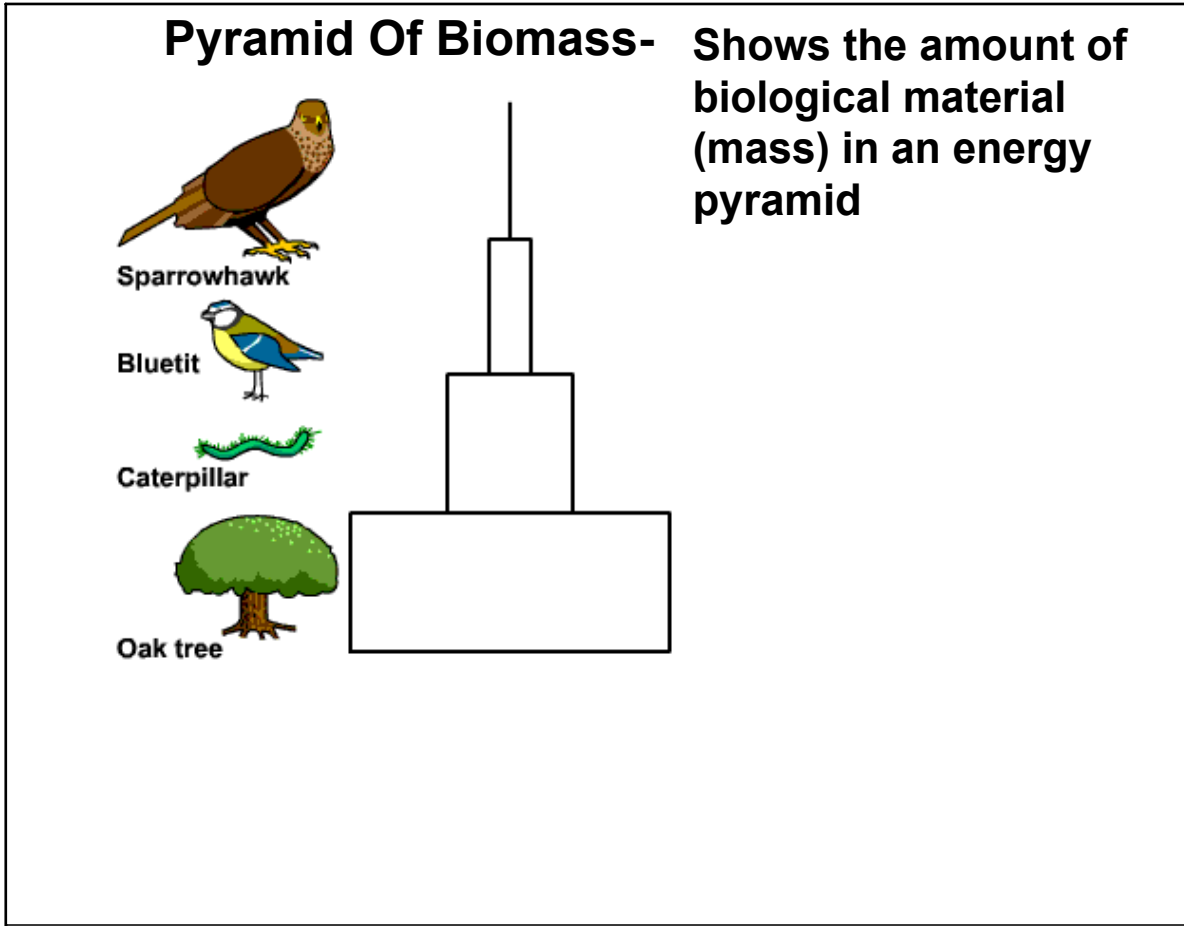
Tertiary Consumers
 are carnivores
EX: FOX

Secondary Consumers
 are omnivores
EX: LIZARD

Primary Consumers:
 Herbivores in the food chain
EX: Insects

Producers:
 autotrophs in the food chain
EX: Plants

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May 25 - 7:34 PM

DoNow:

Hawk Eats Snake

Snake Eats Frog

Frog Eats Grasshopper

grasshopper

grass

predator
scavenger
decomposer

REVIEW

Who is the producer?
Grass

Who is the primary consumer?
Grasshopper

Which organisms have the most amount of available energy?
Grass

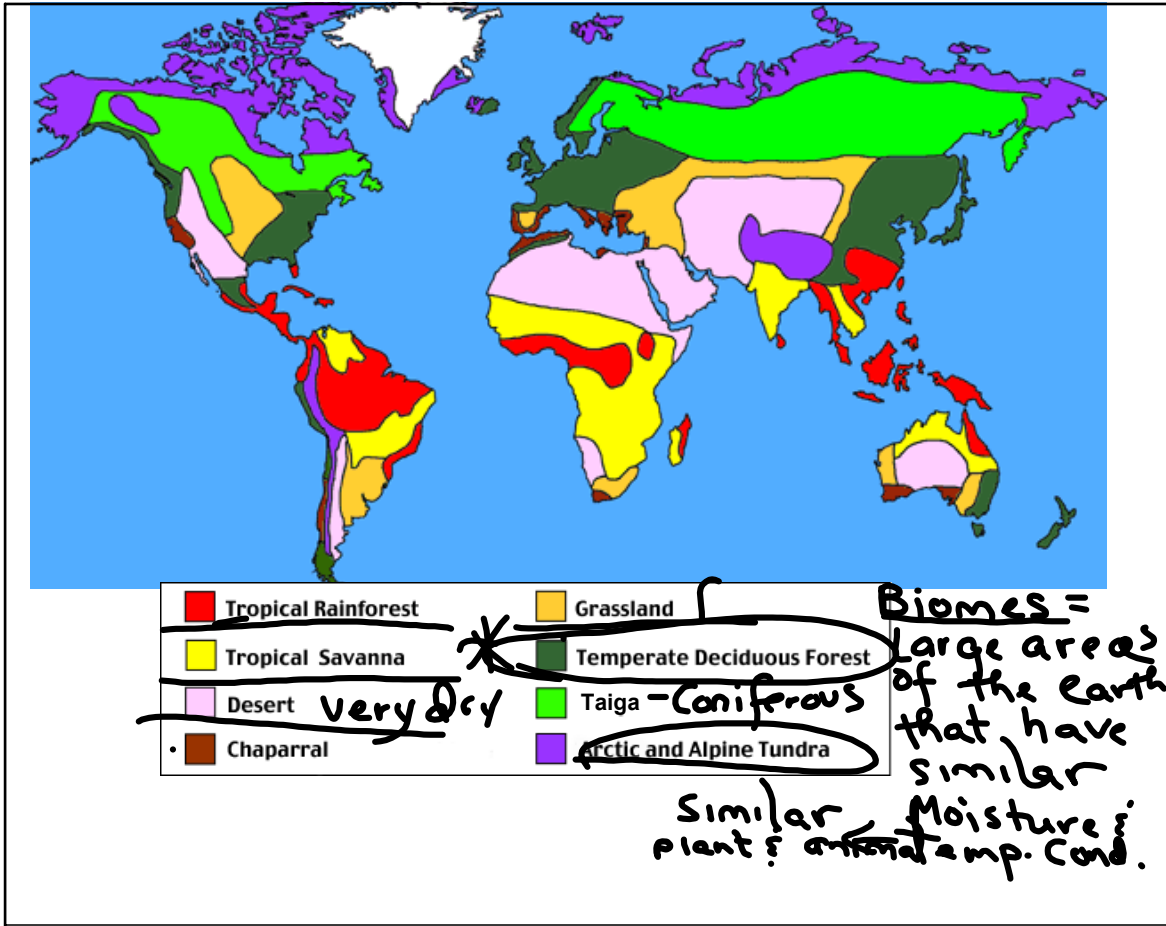
Which organisms have the least amount of available energy?
Hawk

Give an example of one biotic and one abiotic factor in this food chain

Biotic Grass **Abiotic Sunlight**

H.W. Review Sheet Packet

May 31 - 12:16 PM



Jun 3-11:45 AM

What are Symbiotic Relationships?

- a relationship in which one organism lives together with another organism in a close association

What types of symbiosis are there?

- Commensalism + 0
- Mutualism ++
- Parasitism + -

What is commensalism?

- one organism is helped and the other is not affected (+,0) [epiphyte]
- ex. barnacles on whales, orchids on tropical trees

Whales *Rock*

What is mutualism?

- both organisms benefit from the association
- ex. Legumes & nitrogen fixing bacteria
- cleanfish & sea anemone

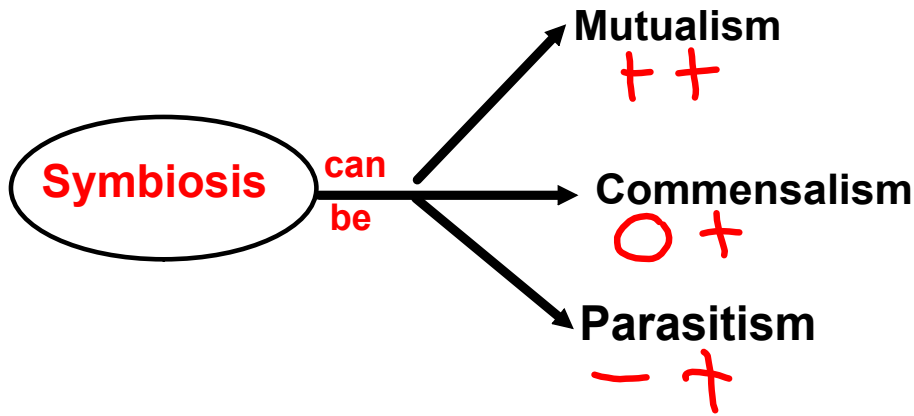
What is parasitism?

- the parasite benefits at the expense of the host
- ex. mosquitoes
- tapeworm and heartworm in dogs

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Symbiosis:

relationships in an ecosystem where organisms live in close association with one another



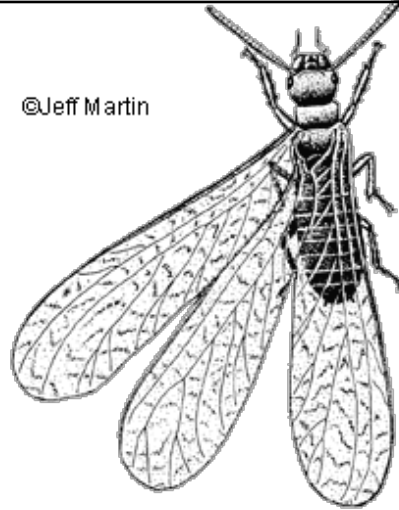
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Commensalism:

one organism benefits while the other is not affected



Jun 4-8:21 PM



clownfish/sea anemone

termite/protist


+ +

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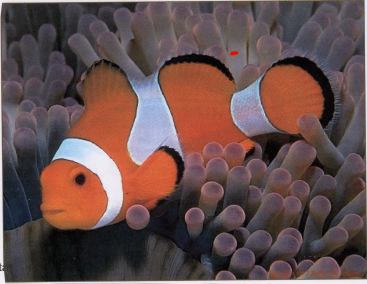
Mutualism: Both organisms benefit from the relationship

FOLIOLIC LICHENS 130 d Page 1 of 1

Image: Foliose lichens 130 d



Foliose



<http://botit.bot> 5/25/2007

Jun 2-9:18 PM

Parasitism: One organism is harmed while the other benefits Page 1 of 1

The diagram illustrates the life cycle of a tapeworm. It starts with a person eating undercooked beef (final host). Larva emerges from a cyst in the person's stomach. The scolex buds off new proglottids continually. Gravid proglottids drop off and exit with feces. A resistant egg is released on grass. A cow ingests the egg (intermediate host). The egg hatches, and the larva migrates to the cow's muscles. The cycle then repeats when a person eats undercooked beef.

Hymenolepis: the rat tapeworm. Ref: hymenol1.

<http://www.cals.ncsu.edu/course/zo150/mozley/fall/TapewormLC.jpg> Biology - Intro, 5/25/2007

Jun 2-9:14 PM

Parasitism

Tick

Mosquito

Parasitism:
One organism is harmed while the other benefits

harmed organism = host

+ -

May 24 - 8:25 PM

AIM: How are materials recycled between organisms and the environment?

How old is the earth?

4.5 billion



Cycles of Materials

- In a self sustaining ecosystem, various materials are recycled between organisms and the abiotic environment

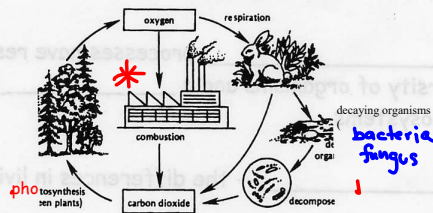
- This allows materials to be used over and over again by living organisms

May 25 - 8:18 PM

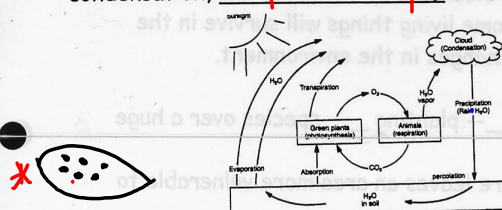
MATERIAL CYCLES

** In a self-sustaining ecosystem, materials must be cycled among the organisms and the abiotic environment. Thus the same materials can be reused.

1. **Carbon-Oxygen Cycle** -- involves the processes of photosynthesis & respiration

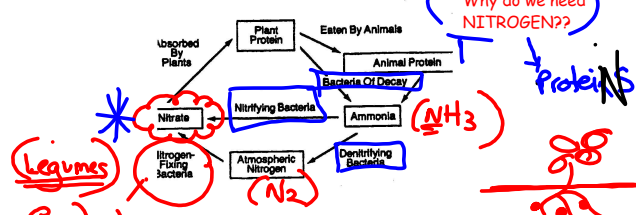


2. **Water Cycle:** involves the processes of photosynthesis, transpiration, evaporation and condensation, respiration, and excretion



Jun 5-9:50 PM

3. Nitrogen Cycle: involves the processes of decay nitrifying, denitrifying, nitrogen fixing and protein synthesis



Evolutionary processes have resulted in a diversity of organisms and a diversity of roles in ecosystems.

Biodiversity -- the differences in living things in an ecosystem

- Increased biodiversity increases the stability of an ecosystem.
- Increased biodiversity increases the chance that at least some living things will survive in the face of large changes in the environment. [pathogen infection]

Monoculture -- planting 1 species over a huge area

- Monoculture leaves an area more vulnerable to

Jun 5-9:53 PM

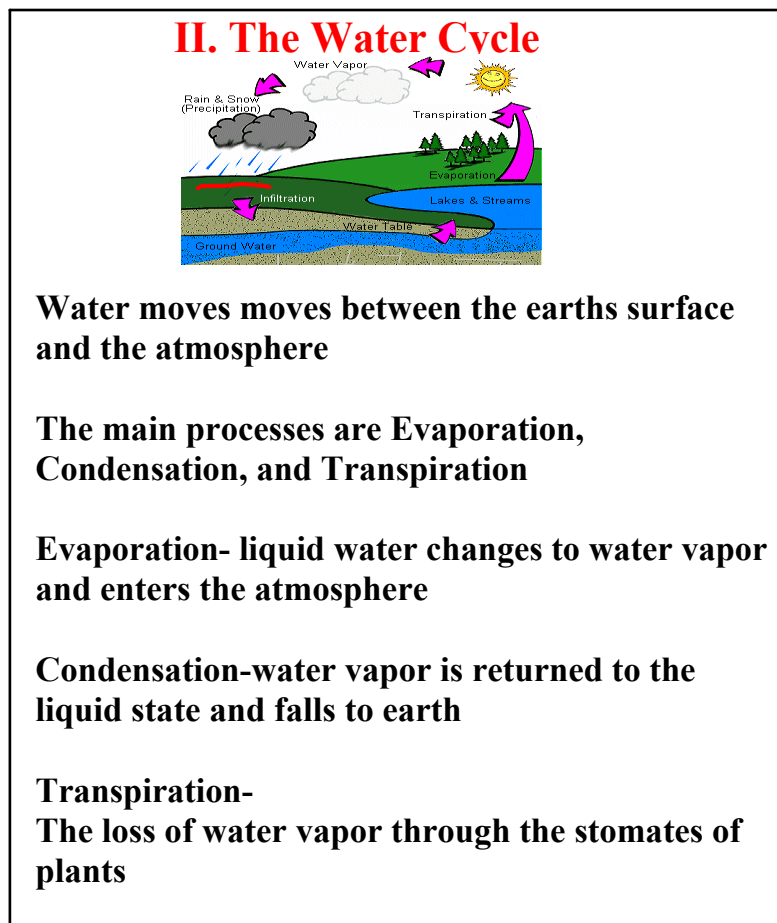
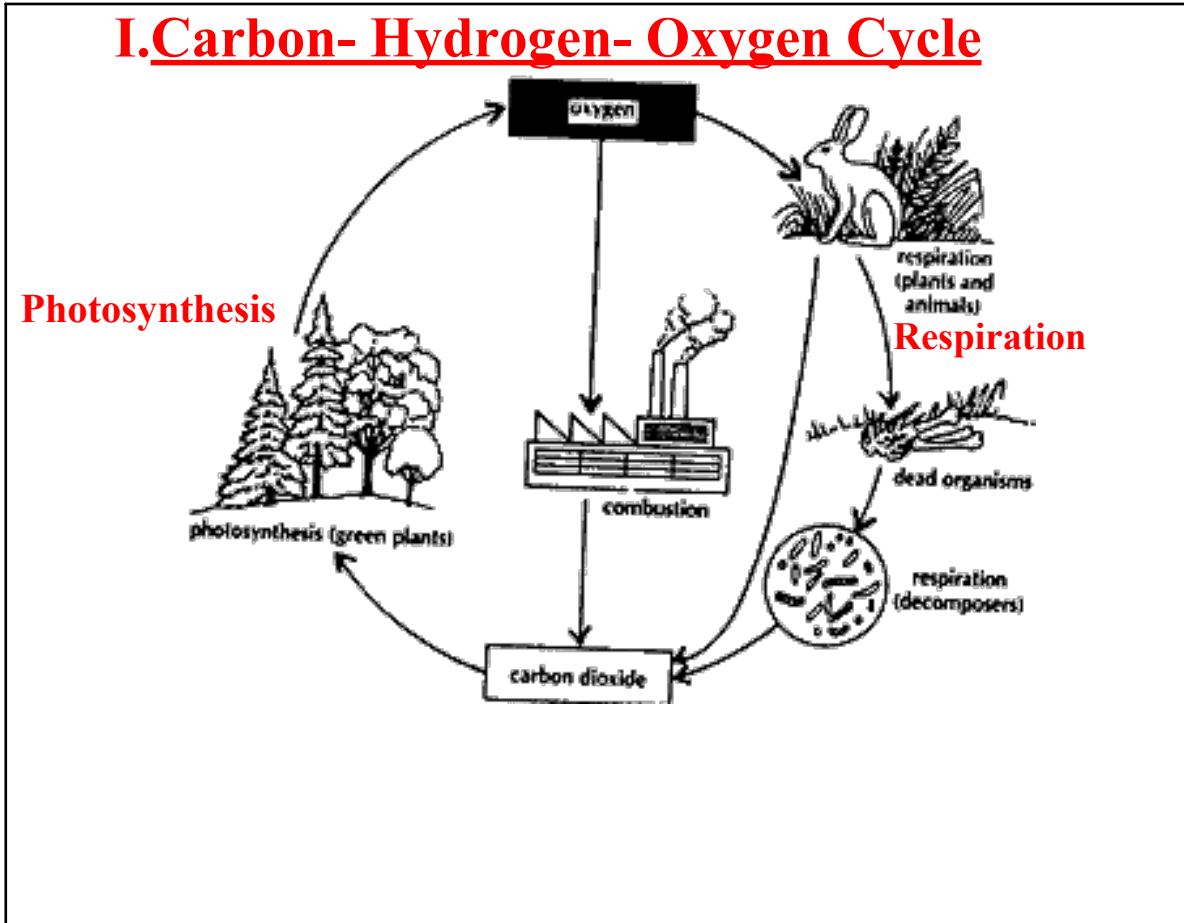
- predation or disease.

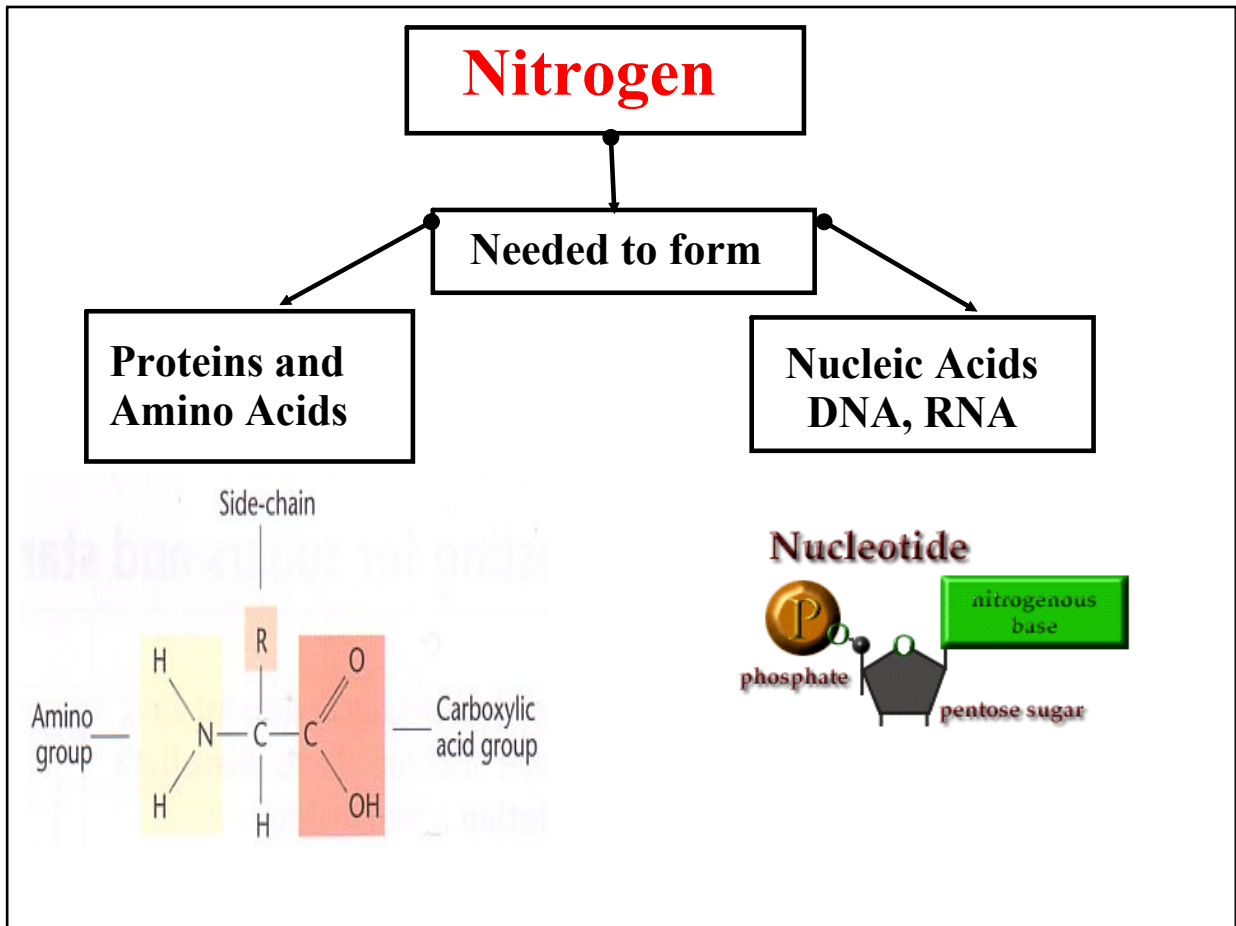
What are some other reasons biodiversity is valuable?

- Biodiversity ensures the availability of a rich variety of genetic material that may lead to future agricultural or Medical discoveries with significant value to humans. (if this is lost we lose the sources of these materials for discovery)
- Biodiversity adds aesthetic qualities to the environment. *

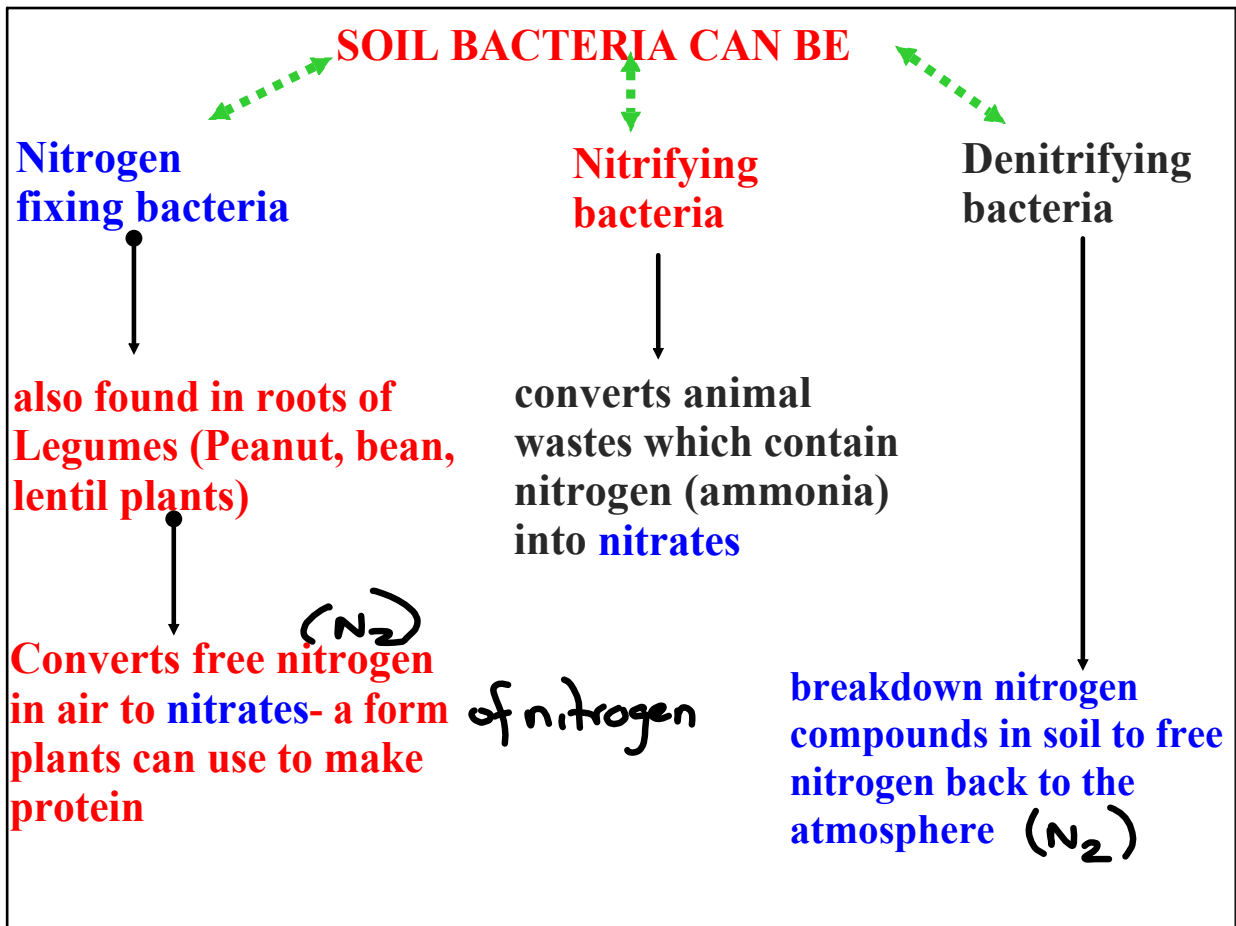
Aesthetic

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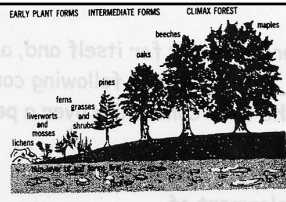




Jun 1 - 10:11 AM



Jun 1 - 10:18 AM



What is succession?

- replacement of communities in a habitat as it moves toward a stable state
- The environment may be changed in ways through the activities of org., including humans, or when the climate changes. Although these alterations are sometimes fast (ex. natural disasters), in most cases species replace others, resulting in long-term grad. change in ecosystems.
- Ecosystems tend to change with time until a stable system is formed. The type of ecosystem that is formed depends on the climatic limitations of a given geographical area.

What are pioneer organisms?

- first organisms to inhabit a given location
- ex. lichens on bare rock / mosses

Each community modifies its environment, often

Jun 5-12:00 PM

5/31

Day 3 HW
Complete Lab

Aim: What is secondary succession?
How do humans impact the Earth?

Do Now: Complete WS

<https://video.search.yahoo.com/search/video?fr=mcafee&p=how+wolves+change+rivers#id=1&vid=1cf3e737fc338627f967ed87af869bde&action=click>

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May 31-9:19 AM

making it more difficult for itself and, apparently, more favorable for the following community which takes over the first community over a period of years.

What is primary succession?

- the development of plant communities on newly formed habitats that previously lacked plants
- ex. a lava flow

What is secondary succession?

- the return of an area to its natural state following a disruption or removal of the original climax community

ex. An example of a PRIMARY SUCCESSION

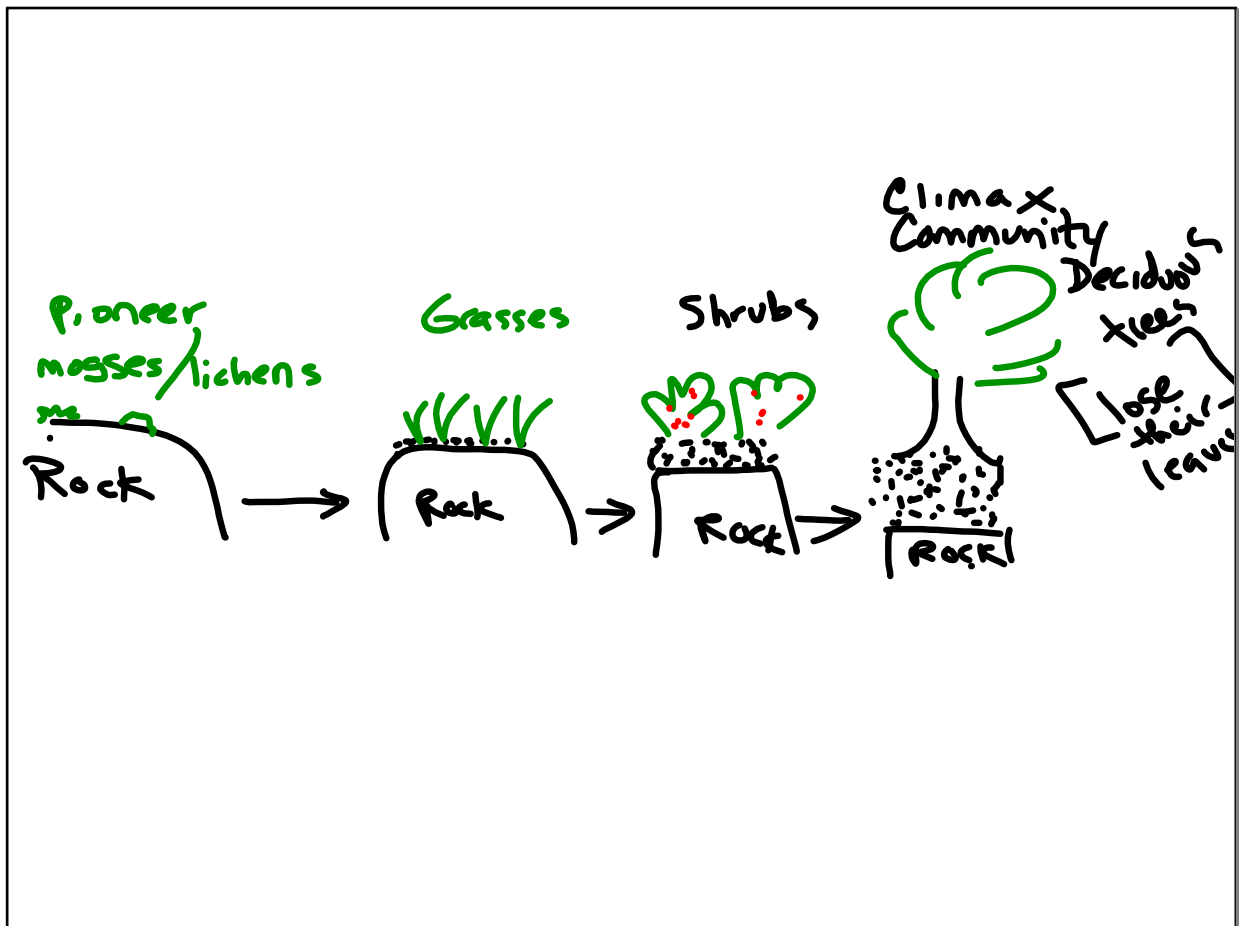
Adirondack Bog Succession

1. water plants at pond edge
2. sedges and sediments begin to fill pond
3. sphagnum moss and bog shrubs fill pond (Labrador tea & cranberries)
4. black spruce and larch
5. birches, maple, or fir

An example of Secondary Succession

1. plowed field
2. annual grasses
3. shrubs and briars
4. cherries, alders, and birches (trees)

Jun 5-9:57 PM



Jun 6-9:26 AM

5. climax community -- Northern N.Y. (hemlock, beech, maple) -- Southern N. Y. (oak, hickory)

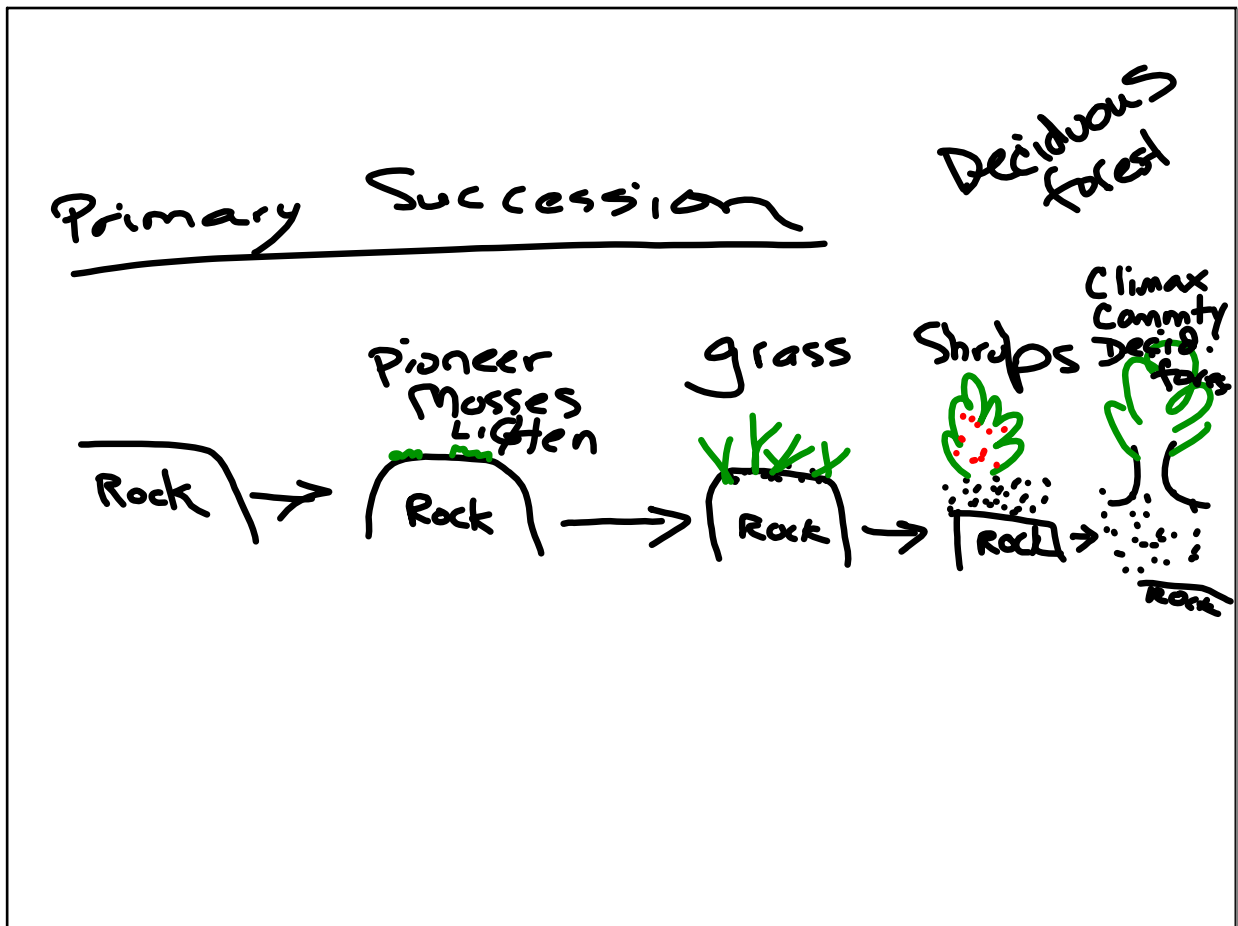
What is a climax community?

- a self maintaining community in which populations remain stable and exist in balance with each other and their environment
- The climax community of a region is always its dominant plant species
- • A climax community persists until a catastrophic change of a major biotic or abiotic nature alters or destroys it.
 - ex. forest fires, abandoned farmlands, floods, areas where the topsoil has been removed
 - After the original climax community has been destroyed, the damaged ecosystem is likely to recover in stages that eventually result in a stable system similar to the original one.

Ponds and small lakes, for example, fill in due to seasonal dieback of aquatic vegetation and erosion (land) of their banks, and eventually enter into a terrestrial Succession terminating in a terrestrial climax community

Flora plant species -- dominate in the sense that they
Fauna animal species

Jun 5-9:58 PM



Jun 1-12:05 PM

they are the most abundant food sources

** Plant succession is a major limiting factor for animal succession.


** Climax communities are identified by the dominant plant species -- the one that exerts the most influence over the other species present.

Competition : occurs when two different species or organisms living in the same environment (habitat) use the same limited resources, such as food, water, space, light, oxygen, and minerals.

** The more similar the requirements of the organisms involved, the more intense the competition.

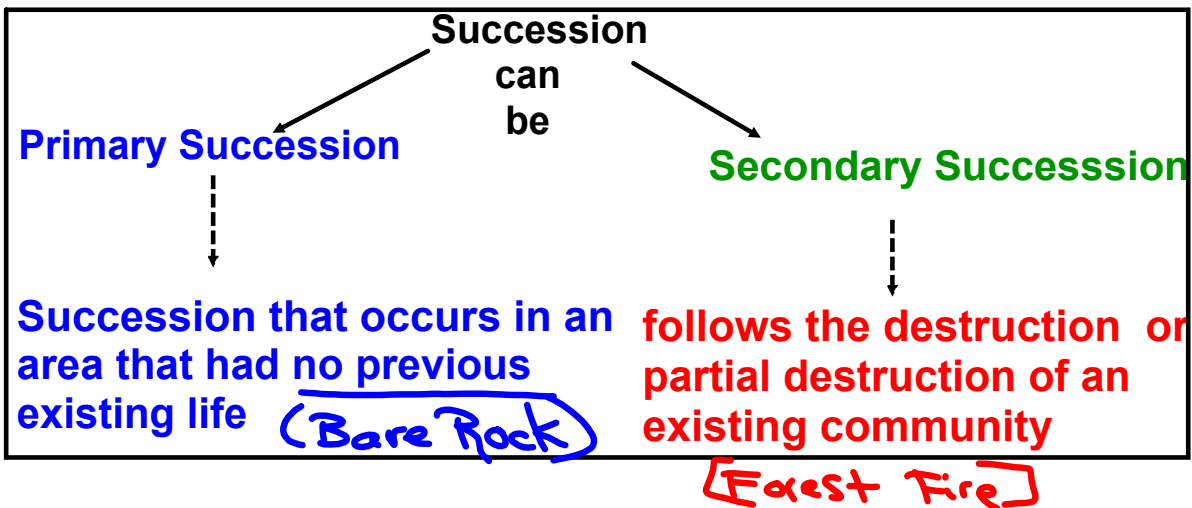
If two different species compete for the same food source or reproductive sites, one species may be eliminated. This establishes one species per niche in a community.

*Niche : the organism's role in the community
 (type of food, when it hunt, sites of shelter)



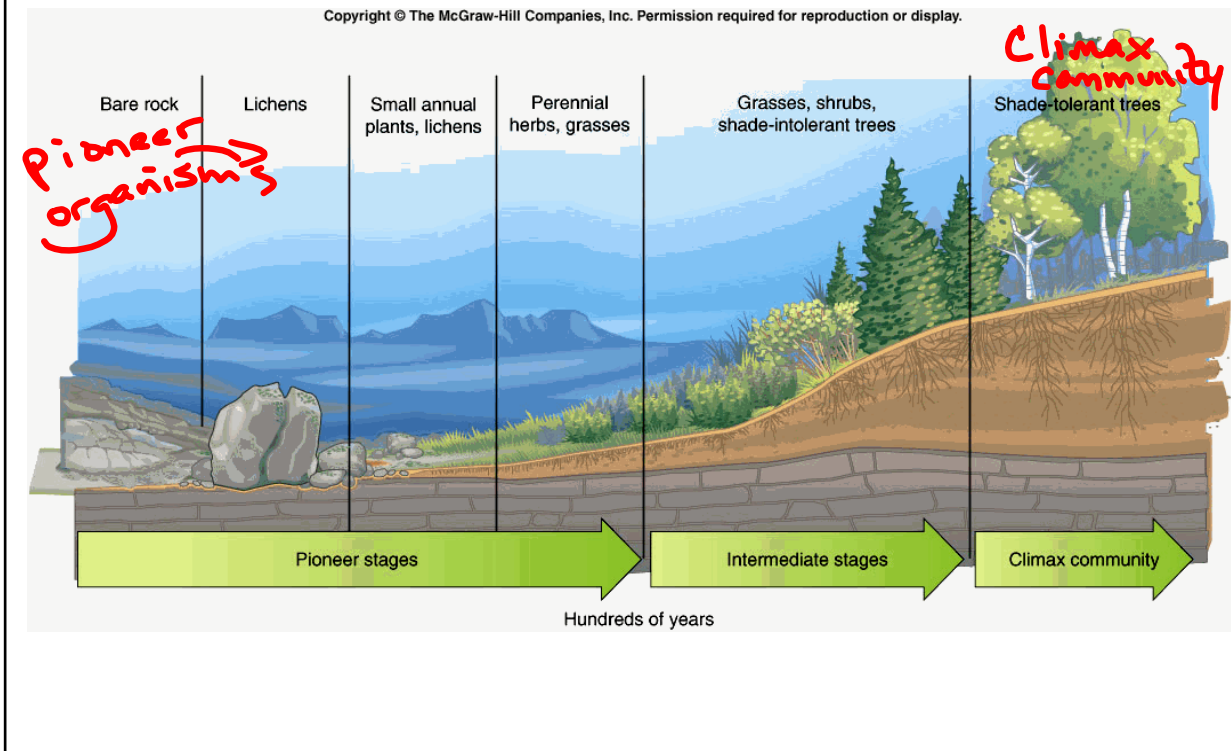
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ECOLOGICAL SUCCESSION:
 the replacement of one community by another until a stable (climax community) is reached



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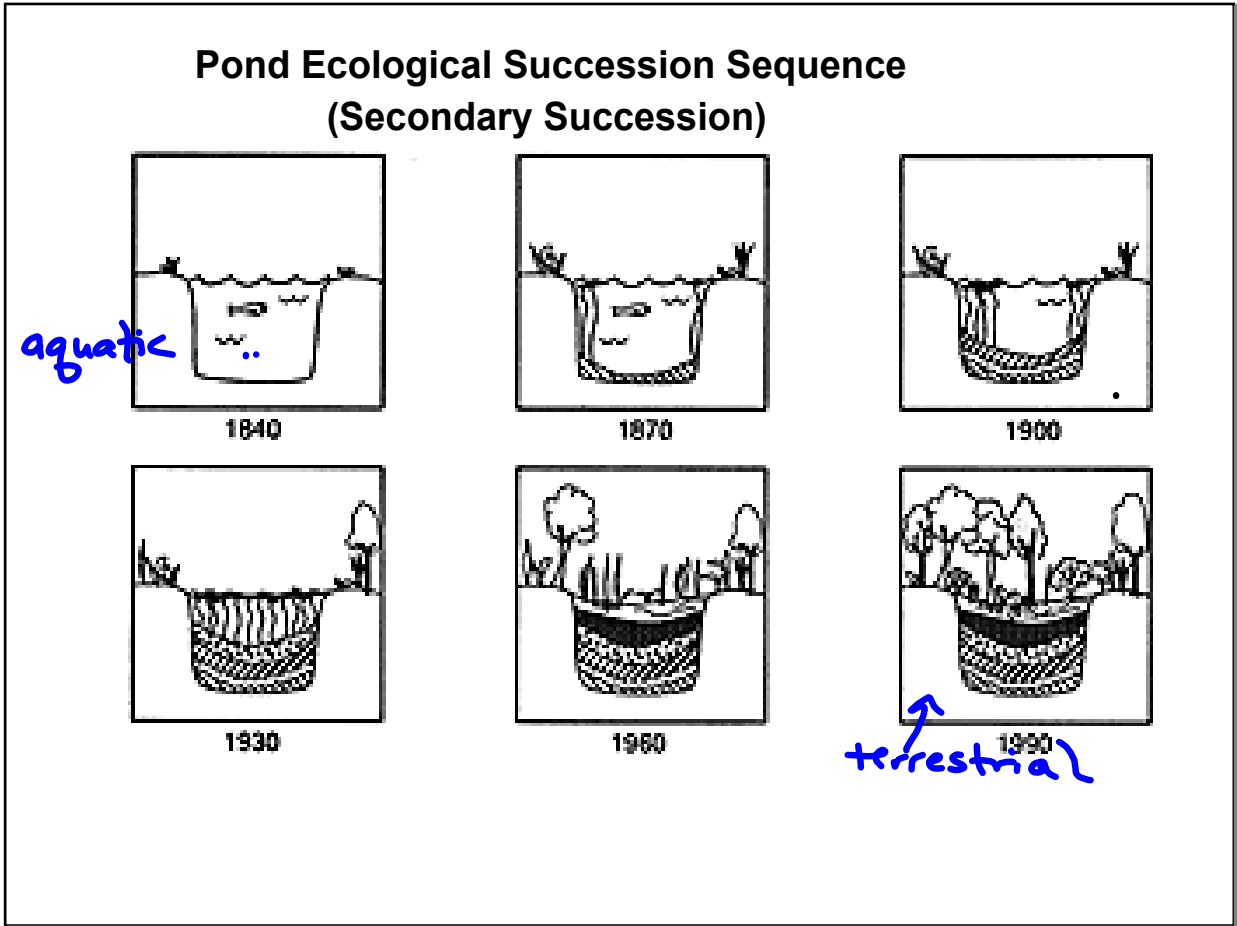
Primary Succession



Jun 2 - 10:58 AM

Pioneer organisms (species) :
 the first living things to populate a given area.
 They change their environment, making it more favorable
 for another community to grow there

Jun 5-12:09 PM



Jun 1 - 6:47 AM

AIM: Human Impact on Ecosystems

Human population size (billions)

The Plague

Why? *Has the population grown so much?*

- Medicine/Health care
- Sanitation
- Increased food supply

(Better Health Better medicines Care)

**If we don't slow population down we will soon reach carrying capacity

Famines
disease
wars over
resources

Jun 6-6:00 AM

Human Activities and the Loss of Diversity

(so many diff. species of living things)

- Direct Harvesting
destroying a species or removing it from its habitat

- whales/oil
- baby seals/pelts
- elephants /tusks-ivory
- passenger pigeons
- Dodo

<http://video.google.com/videoplay?docid=4844687588840076520>



Planet in peril

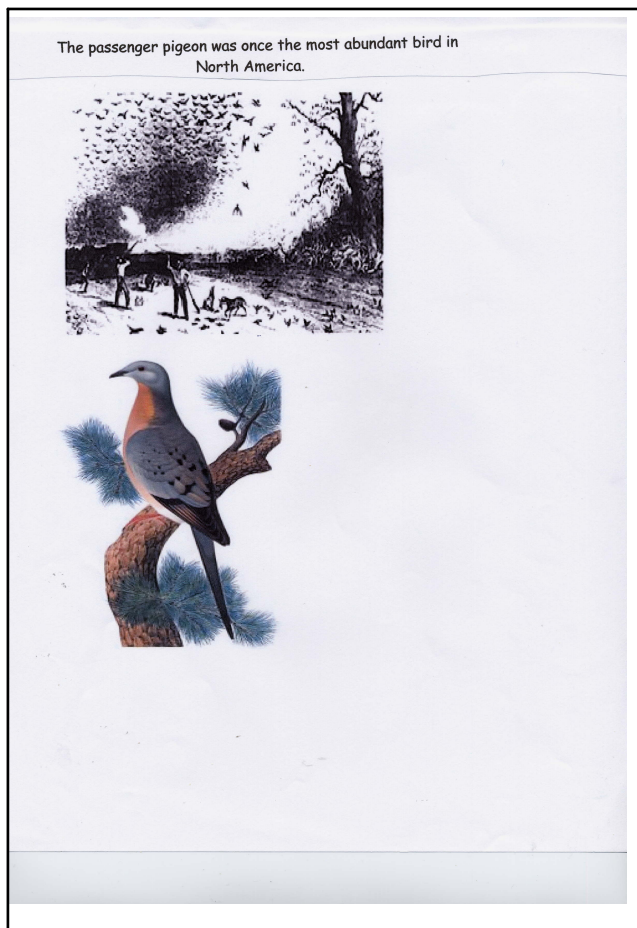
Jul 29-9:26 AM

<https://www.youtube.com/watch?v=zSmL2F1t81Q>

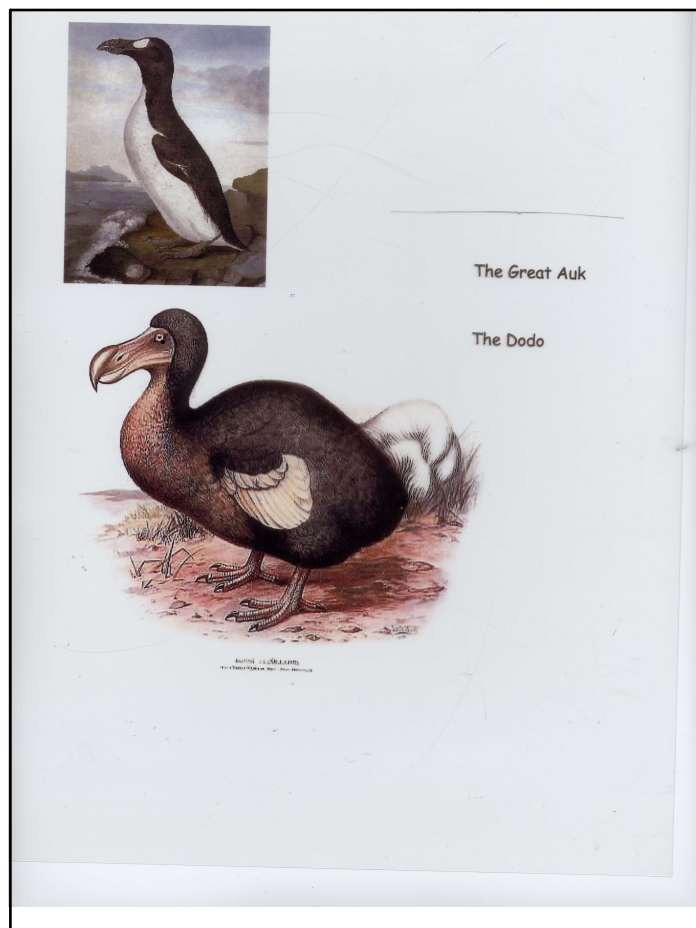


symbiosis

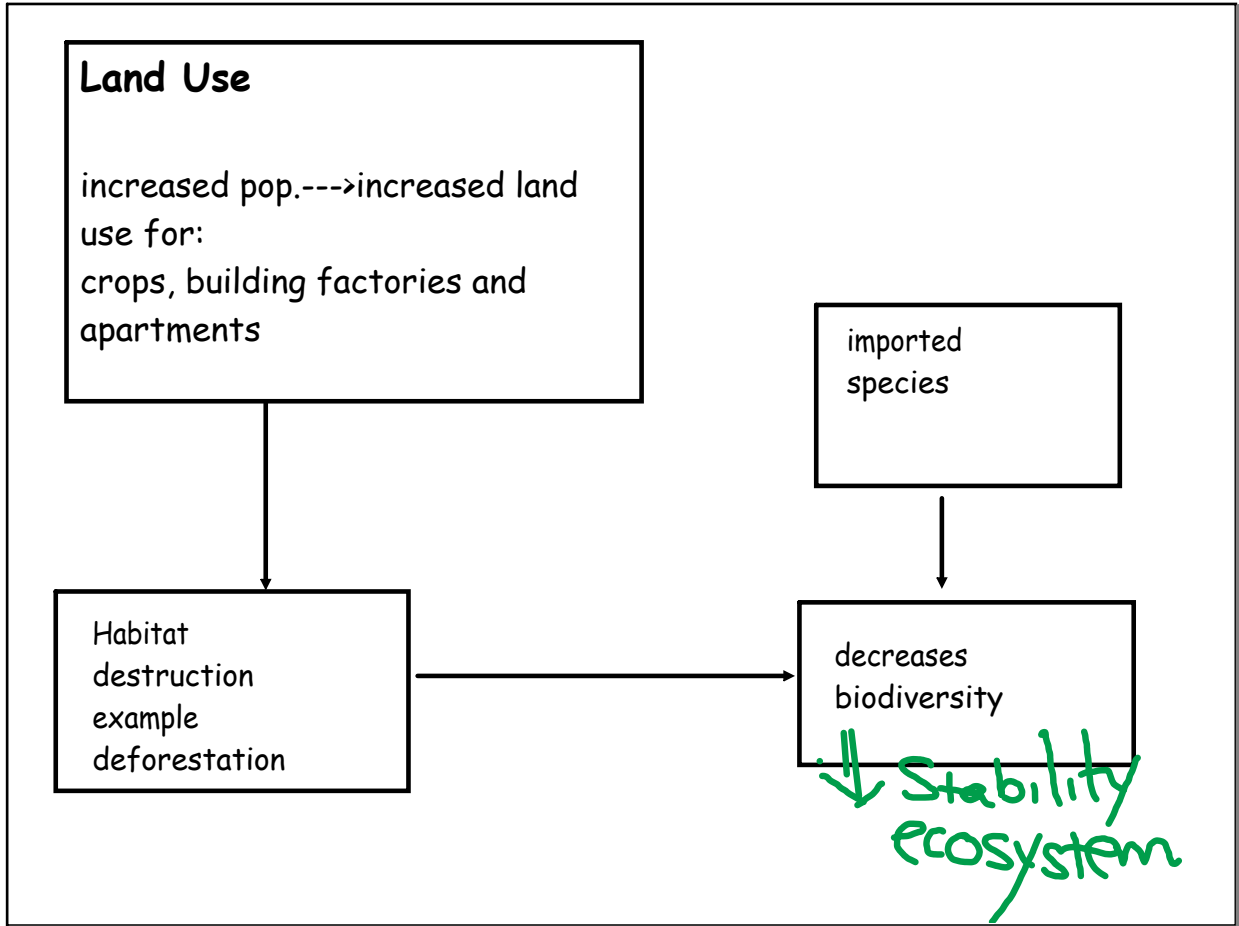
Jun 10-12:14 PM



Jun 5-12:12 PM



Jul 31-12:59 AM



Jul 29-9:31 AM

Imported Species: when people import and release a species from one environment into another.

Gypsy Moth



The gypsy moth is not native to the United States. It comes from Europe and Asia. Like all moths, when they hatch, they are caterpillars. When they are caterpillars, birds don't seem to like to eat them because they are so hairy!

<http://www.youtube.com/watch?v=4mvV8OT-mmE&NR=1&feature=fvwp>

Cane toads






The complex block contains text, images, and a link. At the top, it defines "Imported Species". Below this, it introduces the "Gypsy Moth" with a photograph of a hairy caterpillar and an adult moth. Text explains that the gypsy moth is non-native to the US, originates from Europe and Asia, and is hairy as a caterpillar, which makes it unpalatable to birds. A YouTube link is provided. Next, it introduces "Cane toads" with a photograph of toads on a tree trunk and a close-up photograph of a cane toad.

Jun 4 - 1:14 PM

The Impact of Technology and Industrialization

- increased industrialization causes increased need for energy sources

Renewable resources (can be replaced with time)	Nonrenewable resources (cannot be replaced)
<p>Example: -Food supply</p>  <p>-Solar energy using sunlight to make elect.</p>  <p>-Wind turbines → elect.</p> <p>-Hydroelectric running water → Elod.</p> <p>-Geothermal → using hot magma heat water → elect.</p> <p>*No release of waste gases (No CO₂) No Burning of fossil fuels used</p>	<p>Example: Fossil Fuels</p> <p>coal petroleum (oil) gas (natural)</p>  <p>examples:</p> <p>* Cars (Gasoline from petroleum) * Does release CO₂ (Green-House Gas) [Pollution]</p>

Jul 29-9:40 AM

<http://www.youtube.com/watch?v=E5P-UoKLxIA>

Biological magnification:

the increase in concentration of a pollutant from one link in a food chain to another

Example:

DDT (Pesticide)

Bioconcentration

hawk 10's

trophic level

weasel
mice
wheat (crops)
(plants)

eggs to be fragile in Birds of prey.

Air Pollution
 CO₂ From-- Burning of Fossil Fuels - Coal
 Oil - Gas
Global warming
 CO₂ is GH gas. (traps heat energy)
 Nitrogen and Sulfur oxides from factories when combine
 with water form acid rain
Acid rain (low pH) . destroys forests
 . harmful to aquatic life
 Chlorofluorocarbons from refrigerants CFC's
 Destroy OZONE layer (O₃)
 No protection from UV rays
 ↑ SKIN cancer, ↑ cataracts
 . ↑ mutations

Jul 30-9:36 AM

Industrialization leads to Pollution

What is pollution?
 Any substance that is put into the environment in concentrations high enough to hurt living things

Water Pollution

- Fertilizer
- Pesticides
- Toxic Wastes
- Thermal pollution - temp. of H₂O gets too warm ↓ O₂ concentration fish/aquatic ↓

Jun 2 - 10:30 AM

During the past 40 years, the world has seen an alarming increase in the incidence of [malignant skin cancer](#); the rate today is tenfold higher than in the 1950s. Although the entire increase cannot be blamed on ozone loss and increased exposure to ultraviolet radiation, there is evidence of a relationship. Scientists estimate that for each 1 percent decline in ozone levels, humans will suffer as much as a 2 to 3 percent increase in the incidence of certain skin cancers.

Ozone depleting substances
 Ozone layer thinning is caused by ozone depleting substances (ODS), released as a result of human activity.

They include:

- Freon — used in cooling technologies and refrigerators;
- halons — used in fire-extinguishers;
- methyl-bromide — used in agriculture; and
- various solvents and pesticides.

ODS ■
 Ozone layer disintegration ■

Jun 6-6:03 AM

Camouflage

- [cryptic coloration](#) - an organism matches its background, hiding (camouflaging) it from predators and/or prey.

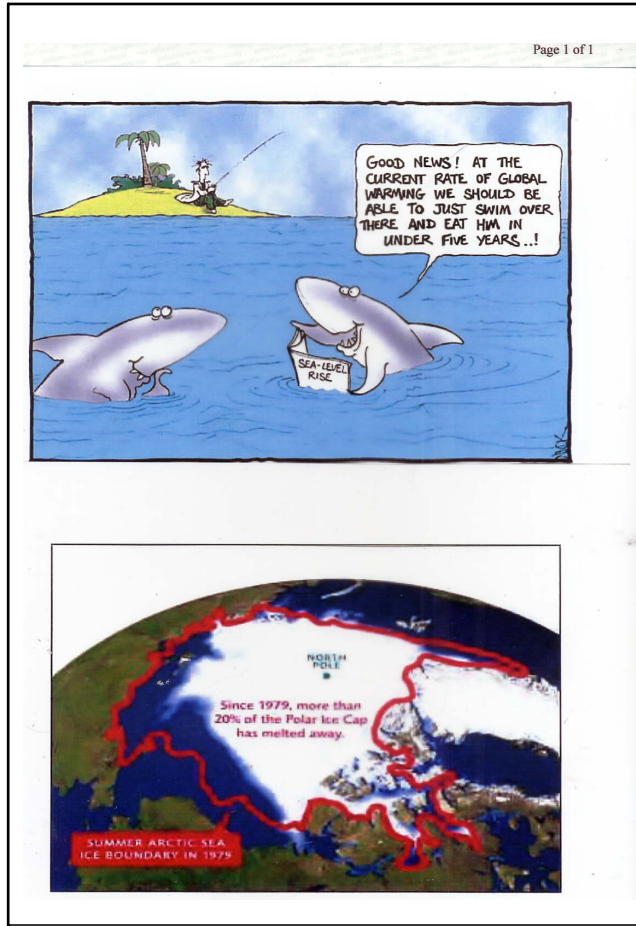
Aposematic (warning) coloration, as exhibited by the poison dart frog, signals danger to potential predators by their bright colors.

Mimicry

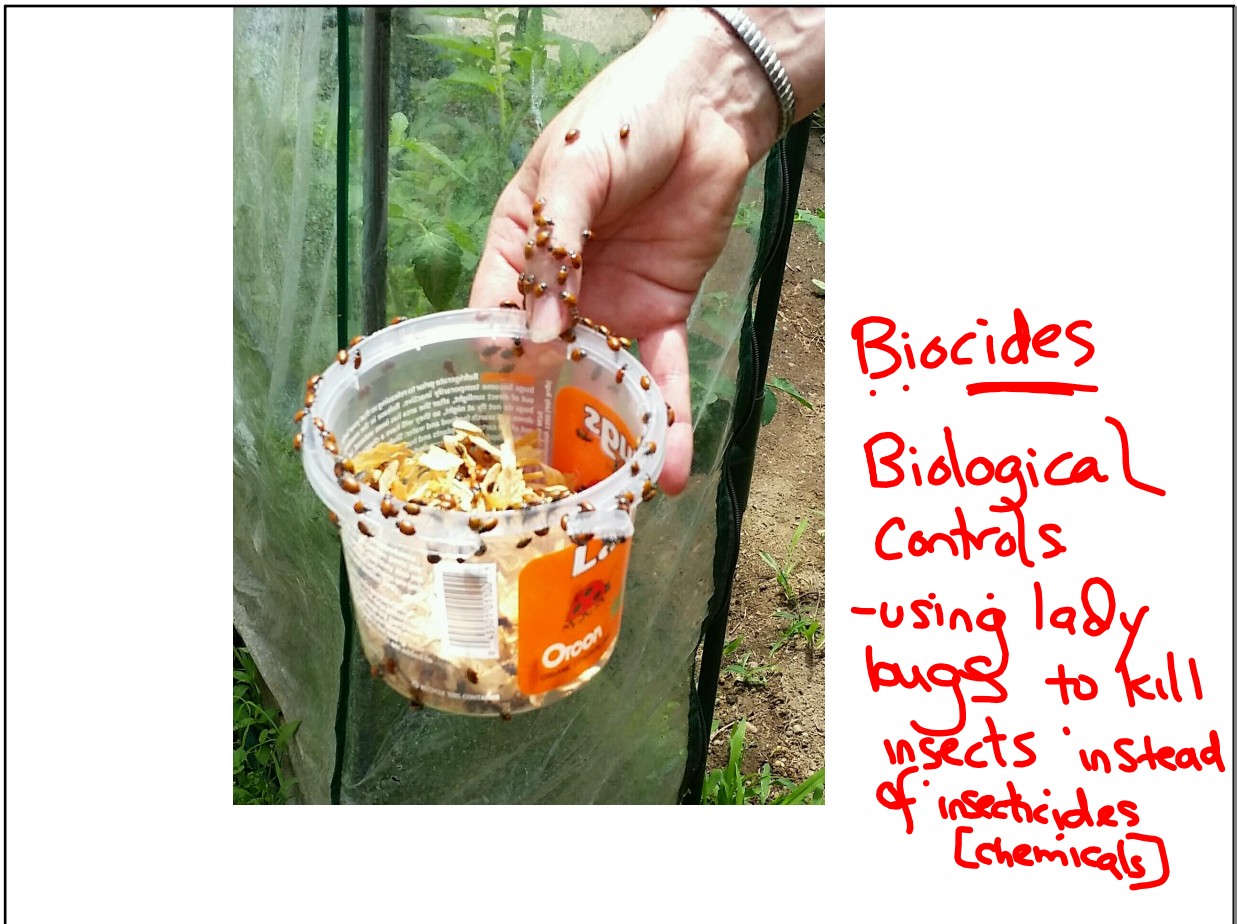
- [mimicry](#) - the advantageous resemblance of one species to another, often unrelated, species or to a feature of its own environment.

- **warning coloration** - conspicuous markings of an animal that make it easily recognizable and warn would-be predators that it is a poisonous, foul-tasting, or dangerous species.

Jun 4-8:19 PM









Jun 6-6:26 AM



Biocides
Biological
Controls
-using lady
bugs to kill
insects instead
of insecticides
[chemicals]

Jun 9-10:22 AM

Attachments

-  Introduc.asf
-  Food_Cha.asf
-  Pyramids.asf
-  Cycle_Se.asf
-  Water_Cy.asx
-  The_Nitr.asf