

ECOLOGY New Picture

Add:
Definition of Ecology
Ex of types of Eco



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Inquiry:

Put an L next to all of the things you think are living and an N next to the things you think are nonliving:

- | | | |
|-------------------|----------------------|-------------------|
| <u>L</u> Plant | <u>L</u> Human | <u>N</u> Water |
| <u>N</u> Sunlight | <u>L</u> Flower | <u>N</u> Minerals |
| <u>N</u> Wind | <u>L</u> Yeast | <u>N</u> Rock |
| <u>L</u> Frog | <u>L</u> Bird | <u>N</u> Rain |
| <u>L</u> Mold | <u>N</u> Temperature | <u>L</u> Bacteria |
| <u>N</u> Oxygen | <u>N</u> Humidity | <u>N</u> Fire |

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Limiting Factors

Abiotic = Parts of an ecosystem that are not alive.

Ex: Rocks, Soil, Sun

Biotic = Parts of the ecosystem that are living.

Ex: Birds, Bacteria, Fish



Name 2 biotic factors:

Name 2 abiotic factors:

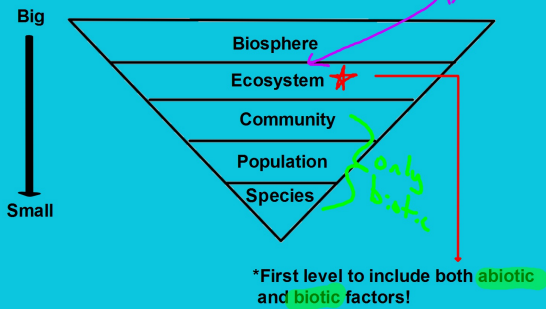
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What is a LIMITING FACTOR?

- Limits the growth of a population and prevents it from growing exponentially
- They can be biotic and abiotic.

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Ecological Levels of Organization



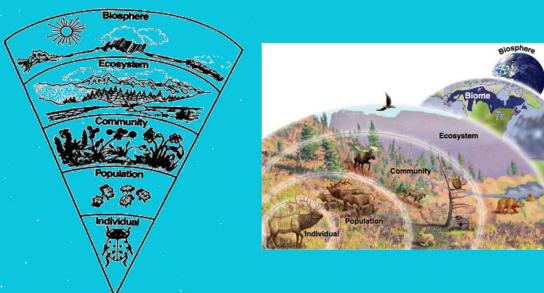
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Place the terms in order from smallest to largest (at the bottom of the page)

- Atoms
- Molecules
- Macromolecules
- Organelle
- Cell
- Tissue
- Organ
- Organ System
- Species/Individual
- Population
- Community
- Ecosystem
- Biosphere

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Levels of Biological Organization: Ecology Emphasis



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Relationships

Biotic (Living) factors in an ecosystem interact in 2 major ways:

1) Symbiotic relationships: two organisms depend on each other.

A) **Mutualism** - both organisms benefit (+, +)

Ex: Bee and flower, bacteria and human gut

B) **Parasitism** - one organism benefits and one is harmed.

Ex: tapeworm and pig, flea or tick and dog (+, -)



Key to Symbiotic Relationships:
 ☺ = Positive Benefit
 ☹ = Negative

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Commensalism (+, 0)

Identify what type of relationship is described below.

Description	Type of Symbiosis
Ostriches and gazelles feed near one another. They both watch for predators in different ways and alert each other to danger.	M
Ticks feed on the blood of a deer. Ticks get nutrients from the deer, but the deer loses those nutrients.	P
Oxpeckers eat insects that bother the rhinoceros.	M
The remora is a small fish with a sucker on its head that attaches to the underside of a shark. It feeds on the shark's leftovers. <i>The shark is unaffected by the remora.</i>	C
The bacteria <i>E. coli</i> lives in the digestive tract of humans. In addition to shelter, there is food available in the digestive tract for the <i>E. coli</i> . In addition to living in the digestive tract, <i>E. coli</i> aids in digestion for the human.	M

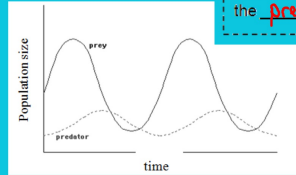
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2) Feeding relationships:

A. Predator-Prey: Organism hunts and kills another for food (aka predation).

Oscillation:
back + forth

Explanation:
As the prey increases, so does the predators.
When the prey decreases, so does the predators.



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C) Scavenger: Organism eats the remains of a dead animal after another has already killed it.

Ex: Vulture

D) Feeding:

- **Carnivore:** eats only meat.
- **Herbivore:** eats only plants.
- **Omnivore:** eats both plants and animals
- **Decomposer:** eats dead and decaying matter (returns it to the soil)



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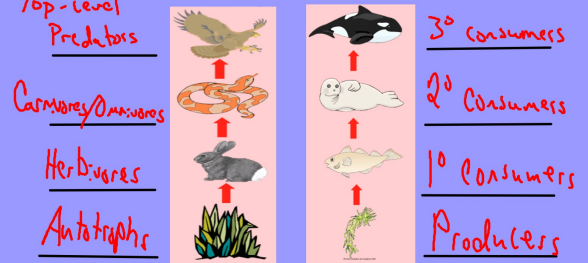
Food Chains and Energy Pyramids

- food chains/webs-show who eats whom!

The arrow points towards the organism that does the eating.

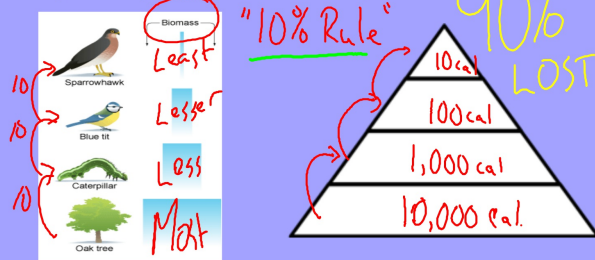
- Each level = trophic level
- Arrows show energy flow

1^o = Primary
2^o = secondary
3^o = tertiary



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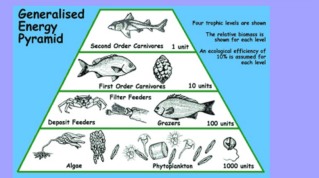
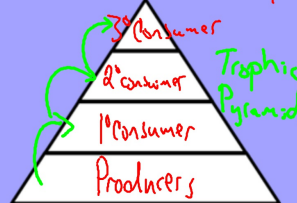
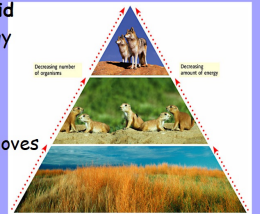
- Number of Organisms:** Biomass: *amount of matter that is alive*
- Shows how many at each level
 - Should always be more producers than consumers
 - Only 10% passed on to the next trophic level



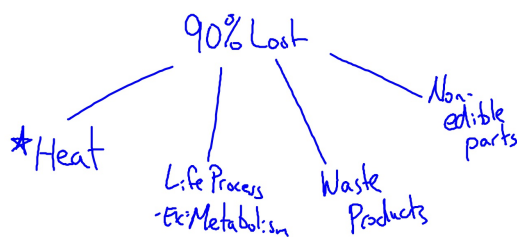
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Movement of Energy: The Energy Pyramid

- The Sun is the source of all energy
- Energy must be constantly put into an ecosystem
- Energy does not cycle
- 90% is lost as heat as it moves up a food web



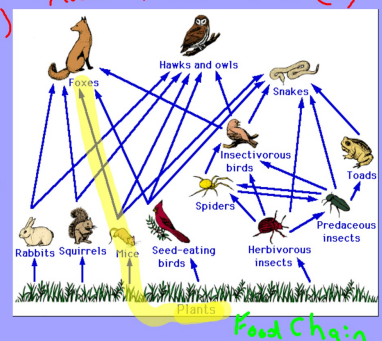
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Food webs: Using the food web below, identify the following organisms

- Producers/autotrophs: (1)
Plants
- Primary consumers:
Rabbits + 2 more
- Secondary consumers:
Fox + 2 more
- Tertiary consumers:
Hawk + 2 more



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Movement of Matter--The Carbon Cycle: *Most Carbon is found in Oceans*

- Carbon comes in solid and gas
- Plants use CO₂ (gas) and turn it into glucose (solid) in photosynthesis
- Animals eat plants and turn it into CO₂ gas in cellular respiration
- Matter is recycled! (*Conservation of matter*)
- Humans interrupt the carbon cycle by burning Fossil Fuels. This can lead to the Greenhouse Effect and Global Warming

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The Nitrogen Cycle:

- Nitrogen is used to build amino acids and proteins
- It can be found in the atmosphere, but cannot be used by organisms in this form
- Bacteria can fix the nitrogen from the atmosphere and turn it into a form that can be used by plants. ($NH_3 + NO_3$) = N-compounds
- Animals eat the plants as a source of amino acids to build proteins
- Decomposers such as fungi and bacteria break down dead organisms and return nitrogen to the atmosphere

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Nitrogen Cycle

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① $N_2(g) \xrightarrow[\text{Bacteria}]{\text{Nitrogen-Fixation}} NH_4$ (Ammonium)

② $NO_3^-(g) \xrightarrow[\text{Bacteria}]{\text{Denitrification}} N_2(g)$ (Nitrate)

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Key terms for nitrogen cycle!

nitrogen fixation: process by which bacteria attached to the roots of plants (aka. legumes: beans, etc) fix nitrogen compounds into usable forms for plants to take up.

denitrification: process by which decomposers convert nitrogen in the soil to nitrogen gas to release back into the air.

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Population Growth: Several factors limit population growth.

Density-independent limiting factor: Affects all populations in similar ways, regardless of the population size. Usually abiotic.

(Size Does NOT matter)

Examples:
- Most climate/weather
Ex: Flood/Fire

Density-dependent limiting factor: DEPENDS on the population size. Affects the population if the population increase, or number of organisms, reaches a certain level. Usually biotic. (Size matters)

Examples:
Competition: food, space (resources)

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Population Growth can follow one of two patterns:

<p>Exponential Growth = "J" Curve</p> <p>Grows at a fast, <u>exponential</u> rate</p> <p>* Assumes <u>Unlimited Resources</u></p> <p>Exhibited: - lab (bacteria) - invasive species</p>	<p>Logistic Growth = "S" Curve</p> <p>Levels off due to <u>limiting</u> factors</p> <ul style="list-style-type: none"> Reaches <u>carrying capacity</u> = largest # of organisms the ecosystem can support <p>Carrying capacity (K)</p> <p>limited resources</p>
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Directions: Represent the following tables as graphs so you can analyze the information. Then, using your knowledge about population growth and limiting factors, interpret the graphs and explain the relationships you see. Be sure to label your axes and title your graphs, including all necessary information! All questions must be answered in **complete sentences**.

Data Set 1: Rabbit Population Growth

Generations	Number of Rabbits
1	100
2	105
25	1000
37	1600
55	2400
72	3350
86	8000
100	13150

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Analysis Questions: Answer in complete sentences!

1. Discuss the results of your graph. What trends do you see?

gradual increase followed by a rapid ↑

2. What type of growth is exhibited by this population? How can you tell?

Exponential: as pop'n ↑, the rate ↑'s more

3. Did this population reach carrying capacity? Why or why not? If so, indicate WHEN the population reaches carrying capacity and indicate the maximum number of individuals that can be supported.

No, b/c it has not leveled off

est: generation = 130-140 pop'n # = ~14,000-16,000

4. What factors are responsible for this type of growth pattern?

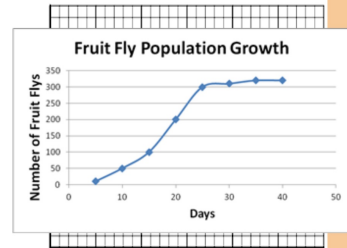
Ab predators, enough space, food (resources)

5. If predators like foxes and cats, which often prey on rabbits, were introduced into this environment during the 10th generation, what would happen to the population growth? Explain AND sketch your answer below.

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Data Set 2: Fruit Fly Population Growth

Days	Number of Fruit Files
5	10
10	50
15	100
20	200
25	300
30	310
35	320
40	320



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Analysis Questions: Answer in complete sentences!

1. Discuss the results of your graph. What trends do you see?

2. What type of growth is exhibited by this population? How can you tell?

3. Did this population reach carrying capacity? Why or why not? If so, indicate WHEN the population reaches carrying capacity and indicate the maximum number of individuals that can be supported.

4. What factors are responsible for this type of growth pattern?

5. What factors would allow this population to exhibit the other type of growth pattern (hint: what things need to be present in the environment?)

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Human Population Growth

-Currently exponential growth, but can't do that forever

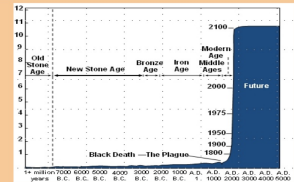
-We underwent a Industrial Revolution. Throughout history we've had ↓ birth rates and ↑ death rates, so populations remained stable. With advances in medicine, nutrition, and sanitation, we now have ↓ death rates so the world population is growing rapidly.

Four things can affect the size of a population:

1. Number of births (+)
2. Number of deaths (-)
3. Infant Mortality (# babies that die)
4. Number who enter (immigration) or leave (emigration) the population

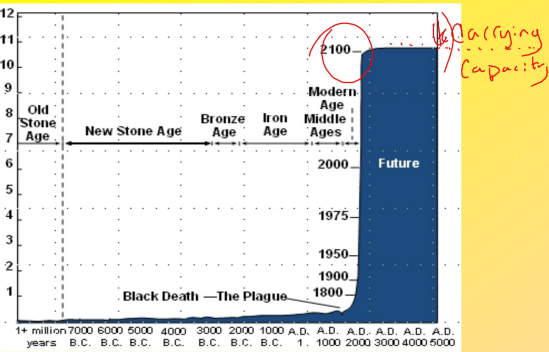
• npr Human population growth

• Human history in numbers



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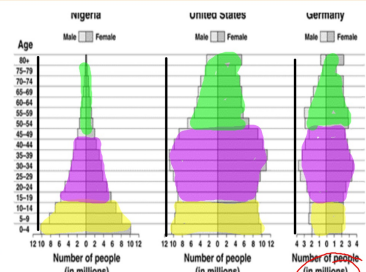
demographer



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Age Structure Diagrams:

Used to show how many people there are and if the population is ↑, ↓, or stable.
if the diagram shows:
- a pyramid shape, then one can expect a rapid increasing in population.
- a straight up and down shape except for the older age groups, the population is stable.
- a top-heavy shape, then a decreasing is forecast for that population.



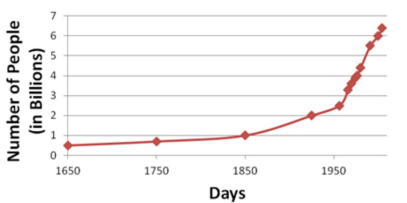
1. In which country will there be a population explosion? N
2. In which country will there be a decrease in population? G
3. In which country is the population relatively stable? US

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Statistics on Human Population

Year A.D.	Number of People (in billions)
1650	50
1750	70
1850	1.0
1925	2.0
1956	2.5
1966	3.3
1970	3.6
1974	3.9
1976	4.0
1980	4.4
1991	5.5
2000	6.0
2004	6.4

Human Population Growth



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Statistics on Human Population

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1650	50
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1970	3.6
1974	3.9
1976	4.0
1980	4.4
1991	5.5
2000	6.0
2004	6.4

Instructions for creating your graph.

Place time on the horizontal axis. Values should range from 1650 to 2020.
Place number of people on the vertical axis. Values should range from 0 to 10 billion.
Make sure that you have the correct labels for the X and Y access and a title for your graph.

Analysis

1. Based on your graph, in what year will the population reach 8 billion? _____
2. Based on your graph, how many years will it take for the population of 2004 to double? _____

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Earth's Carrying Capacity

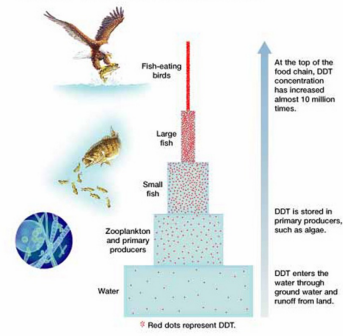
Analysis

1. What factors contributed to the world's overall population growth in the last 150 years.
2. Why does a population not level off during the same year it reaches zero population growth?
3. If the carrying capacity of the earth was 9 billion people, when would this number be reached (according to your graph)?
4. What will happen when the human population exceeds the earth's carrying capacity?
5. What changes do you believe the human population needs to make to ensure we don't reach carrying capacity?

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Figure 6 Biological magnification of DDT

Because DDT accumulates in fatty tissue, DDT concentrations (in parts per million, ppm) increase as this chemical moves up the food chain.



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