Biology and Environmental Science

Looking at parts of words
- Bio means “life”
- -ology means “study of”
- -ologist means “studier of”
- What does Biology mean?
- What other words have “bio” in it?

Zoology
- When you go to a zoo…what are you going to see?
- Why call it a zoo?
- What is a zoologist?
  - Studier of animals

Botany
- What do you think botany is the study of?
- What things are found in a botanical garden?
- What does a botanist do?
What is Ecology?

- Ecology is the study of how living things interact with each other and their environment.

- What is an ecologist?

Other Biology Categories

- Entomology
  - Study of insects
- Ichthyology
  - Study of fish
- Ornithology
  - Study of birds
- Mammology
  - Study of mammals
- Herpetology
  - Study of reptiles

Living and non-living things

- Biotic - living thing
  - What does “Bio” mean?
- Abiotic – Non living thing
  - What does the “A” mean?
- What are examples of biotic and abiotic things

Biotic Factors

- The term biotic means living or has lived before

- What are some examples of biotic factors?
  - Dog, Snake, Fish, Flower, Tree, Dead leaf

- List 5 other biotic factors in your notebook
**Abiotic Factors**

- Abiotic Factors are things that *aren’t* living or have *never lived*.

- Examples
  - Sand, dirt, rocks

- List 5 in your notes

**Organization of Living Things**

- Organism
- Population
- Community
- Ecosystem

**Organism**

- An organism is 1 biotic factor
  - It is one individual living thing

- Examples
  - A single lion
  - A single fish
  - A single tree

**Populations**

- Populations are groups of organisms in an area
  - It is a group of the same type of living thing
  - Members of the same species

- Examples
  - A pride of lions
  - A school of fish
  - An army of ants
What are Species
• Species is a basic unit of biological classification
• Species are organisms capable of interbreeding and producing fertile offspring in normal conditions.
  – Fertile offspring means having offspring that in turn can produce offspring of their own

Communities
• A community of a group of different living things together in an area
  – It is groups of populations living together
• Examples
  – Lions and Zebras
  – Butterflies and Flowers

Ecosystems
• Ecosystems are all of the living and non-living things in an area
  – It is the communities and the abiotic factors
• Examples
  – Prairie ecosystems
  – Woodland ecosystems
  – Pond ecosystems

Habitat
• Specific place where organisms live within an ecosystem.
• A habitat provides all the things an organism needs to survive.
• Organisms live in different habitats because they have different requirements for survival.
• What are some of the requirements an organism would need to survive?
Habitat

• What is the habitat for a squirrel?
  – What does the habitat provide for the squirrel?

• What is the habitat for a fish?
  – What does the habitat provide for the fish?

Taxonomic Keys

• A taxonomic key is used by biologists to identify unknown organisms.
• The user is given a set of choices based on characteristics.
• By making the correct choice at each step, the identify of the organism can be found.

Studying Populations

• Population density is the number of individual organisms in a specific area
• If there are 50 flowers in a garden measuring 10 square meters, then the population density is 5 flowers per square meter.
• 50 flowers / 10 meters = 5 flowers/meter
• More things in a smaller space means a higher population density.
What kinds of things can limit a population from increasing infinitely?

- Lack of food
- Lack of water
- Lack of space
- Weather
- Disease

These are called limiting factors
**Studying Populations**

- Population sizes can go up and down over time.
- What are 2 ways a population can increase?
  1. Births
  2. Immigration
     - Members moving into a population

- How can a population size go down?
  1. Death
  2. Emigration
     - Members exiting the population

**World population reached 7 billion in Mar 2012**

- 360,000 births per day
- 151,600 people die each day
- 15,000 births each hour
- 6,516 people die each hour
- 250 births each minute
- 105 people die each minute
- 4 births each second of every day
- Almost 2 people die each second

**Limiting Factors**

- If a population gets too big, certain resources will “limit” more growth.
- Food, water, space are limiting factors
- What are other limiting factors?

**Carrying Capacity**

- An area can only support a certain size of a population
- The maximum amount of individuals an area can support is called its carrying capacity.
## Determining Population Sizes

- **Direct observation**
  - Count each individual
- **Indirect observation**
  - Look at evidence (tracks, droppings, nests, etc.)
- **Sampling**
  - Count individuals in small area and estimate for entire area
- **Mark and recapture**
  - Tag or mark individuals and see how many are recaptured
- Which are used for very large populations?

## Interactions Among Living Things

- 3 main types of interactions are:
  - **Competition**
  - **Predation**
  - **Symbiosis**

### Competition

- Organisms compete with each other for food, water, space.
- How do adaptations allow organisms to compete better?
- Organisms more suited to the environment will have a better chance to survive.

### Predation

- Interaction in which one organism kills and eats another organism is predation
- Predator and prey
  - Predator kills the prey
### Symbiotic Relationships

- Some species have a special relationship with a different species.
- These relationships always benefit at least one of the species.
- **3 Types**
  - Mutualism
  - Commensalism
  - Parasitism

<table>
<thead>
<tr>
<th><strong>Mutualism</strong></th>
<th><strong>Commensalism</strong></th>
<th><strong>Parasitism</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship in which both species benefit.</td>
<td>Relationship in which one species benefits and the other is not changed.</td>
<td>Relationship in which one species benefits while the other is harmed</td>
</tr>
<tr>
<td><img src="image1" alt="Mutualism" /></td>
<td><img src="image2" alt="Commensalism" /></td>
<td><img src="image3" alt="Parasitism" /></td>
</tr>
</tbody>
</table>

- Parasites benefit, host is harmed.
Niche

- An organism's particular role, or how it makes its living is called its **niche**.
- A niche includes the type of food the organism eats, how it obtains food, and which other organisms eat it as food.
- Some organisms are intended to be food for others.

Natural Selection

- What is natural selection?
- The changes that make organisms better suited to their environment develop through a process called **natural selection**.
- Organisms that are best suited have a chance to live longer and pass on their traits to offspring.
- What is the overall goal for all living things?

Adaptations

- Every organism has a variety of adaptations that allow it to live successfully.
- What are some examples?