# Biology Packet

May 4th – 8th, 2020

**Coleman, Griffin, Graves, Koonce**

**Complete each daily assignment and send answers in via Remind or email. Refer to the attached Ecology powerpoint for extra help!**

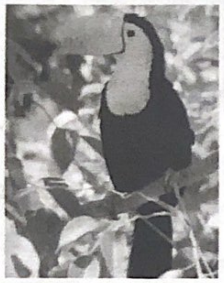
Monday: First, define **adaptation**. List **5** animal or plant adaptations (ex: camouflage, mimicry, migration, body parts, etc). Label each as a physical or behavioral adaptation. Next, define **competition**. List at least **3** ways organisms compete with each other for resources in an ecosystem.

Tuesday: Draw a **food chain** and **food web**. Label each organism as a **producer** or **consumer**.

Wednesday: **Water cycle, Nitrogen cycle, Carbon cycle, Phosphorus cycle** — Draw **2 out of the 4** cycles and label. 10 extra points if you draw out all 4!

Thursday: Symbiotic relationships. Define **mutualism, commensalism, and parasitism**. List examples of each.

Friday: **WRITE** (at least a paragraph) about natural events or human activities that impact the global climate and ecosystems. What are solutions that could address climate change, habitat destruction, and loss of biodiversity?



# Ecology

## WHAT IS ECOLOGY?

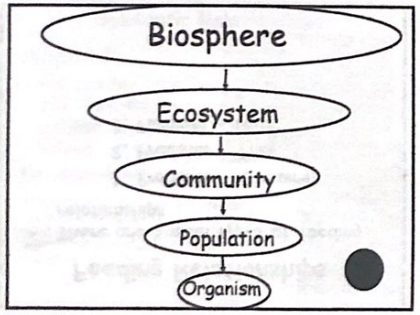
**Ecology- the scientific study of interactions between organisms and their environments, focusing on energy transfer**

**Ecology is a science of relationships**

## WHAT DO YOU MEAN BY ENVIRONMENT?

**The environment is made up of two factors:**

- **Biotic factors- all living organisms inhabiting the Earth**
- **Abiotic factors- nonliving parts of the environment (i.e. temperature, soil, light, moisture, air currents)**




**Organism** - any unicellular or multicellular form exhibiting all of the characteristics of life, an individual.

·The lowest level of organization

## POPULATION

**✓ a group of organisms of one species living in the same place at the same time that interbreed**

**✓Produce fertile offspring**

**✓Compete with each other for resources (food, mates, shelter, etc.)**

**Community - several interacting populations that inhabit a common environment and are interdependent.**

**Ecosystem - populations in a community and the abiotic factors with which they interact (ex. marine, terrestrial)**

**Biosphere - life supporting portions of Earth composed of air, land, fresh water, and salt water.**

·The highest level of organization

## Habitat vs. Niche

Niche - the role a species plays in a community; its total way of life

Habitat- the place in which an organism lives out its life

## Habitat vs. Niche

A niche is determined by the tolerance limitations of an organism, or a limiting factor.

Limiting factor- any biotic or abiotic factor that restricts the existence of organisms in a specific environment.

## Habitat vs. Niche

Examples of limiting factors -

- Amount of water
- Amount of food
- Temperature
- Amount of space
- Availability of mates

## Feeding Relationships

- There are 3 main types of feeding relationships
  1. Producer - Consumer
  2. Predator - Prey
  3. Parasite - Host

## Feeding Relationships

Producer- all autotrophs (plants), they trap energy from the sun

- Bottom of the food chain

## Feeding Relationships

Consumer- all heterotrophs: they ingest food containing the sun's energy

- Herbivores
- Carnivores
- Omnivores
- Decomposers

## Feeding Relationships

CONSUMERS

1. Primary consumers
   - Eat plants
   - Herbivores
- Secondary, tertiary ... consumers
   - Prey animals
   - Carnivores

## Feeding Relationships

Consumer-Carnivores-eat meat

- Predators
  - Hunt prey animals for food.

## Feeding Relationships

Consumer- Carnivores- eat meat

- Scavengers
  - Feed on carrion, dead animals

## Feeding Relationships

Consumer- Omnivores -eat both plants and animals

## Feeding Relationships

Consumer- Decomposers

- Breakdown the complex compounds of dead and decaying plants and animals into simpler molecules that can be absorbed

## Symbiotic Relationships

**Symbiosis- two species living together**

**3 Types of symbiosis:**

1. **Commensalism**
2. **Parasitism**
3. **Mutualism**

## Symbiotic Relationships

**Commensalism-**
**one species benefits and the other is neither harmed nor helped**

**Ex. orchids on a tree**

Epiphytes: A plant, such as a tropical orchid or a bromeliad, that grows on another plant upon which it depends for mechanical support but not for nutrients. Also called *xerophyte, air plant.*

## Symbiotic Relationships

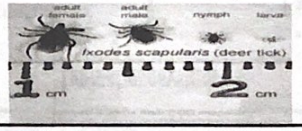
**Commensalism-**
**one species benefits and the other is neither harmed nor helped**

**Ex. polar bears and cyanobacteria**

## Symbiotic Relationships

**Parasitism-**
**one species benefits (parasite) and the other is harmed (host)**

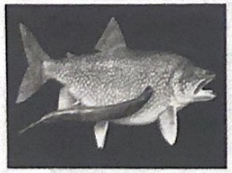
- **Parasite-Host relationship**




## Symbiotic Relationships

**Parasitism- parasite-host**

**Ex. lampreys, leeches, fleas, ticks, tapeworm**



## Symbiotic Relationships

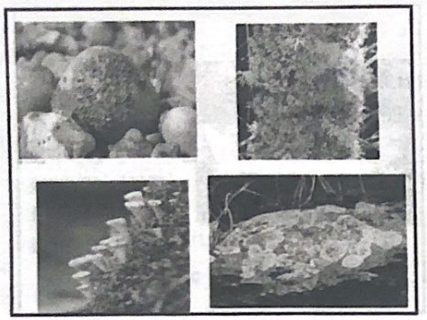
**Mutualism-**
**beneficial to both species**

**Ex. cleaning birds and cleaner shrimp**

## Symbiotic Relationships

**Mutualism-**
**beneficial to both species**

**Ex. lichen**



| Type of relationship | Species harmed | Species benefits | Species neutral |
|---|---|---|---|
| Commensalism | | ○ | ○ |
| Parasitism | ○ | ○ | |
| Mutualism | | ○ ○ | |

○ = 1 species

## Trophic Levels

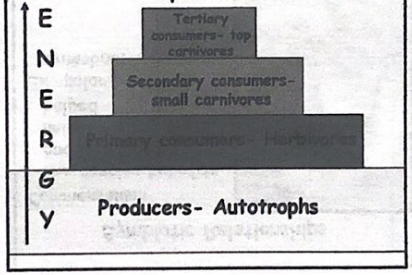
- Each link in a food chain is known as a trophic level.
- Trophic levels represent a feeding step in the transfer of energy and matter in an ecosystem.

## Trophic Levels

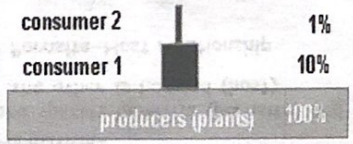
Biomass- the amount of organic matter comprising a group of organisms in a habitat (total mass of organisms).

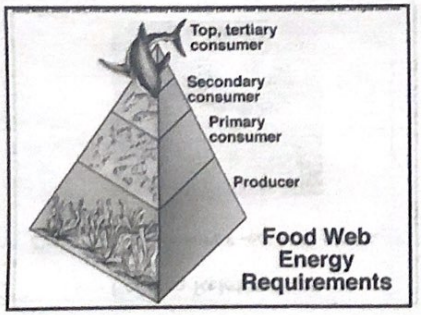
- As you move up a food chain, both available energy and biomass decrease.
- Energy is transferred upwards but is diminished with each transfer.

## Trophic Levels



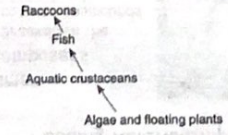

## Typical ecosystem

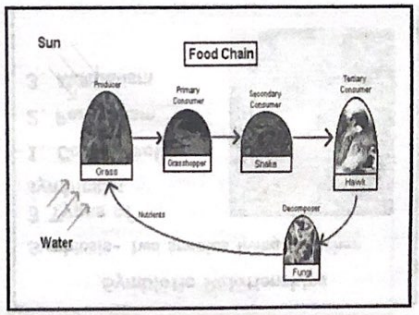



## Trophic Levels

Food chain- simple model that shows how matter and energy move through an ecosystem

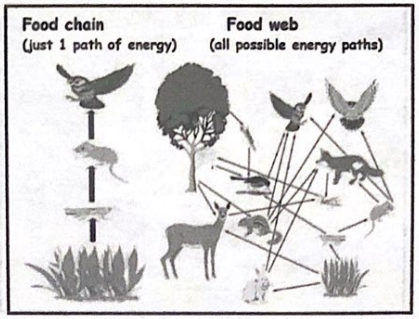


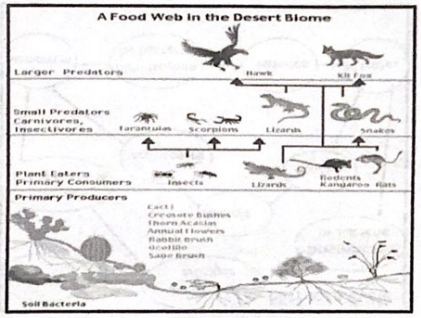



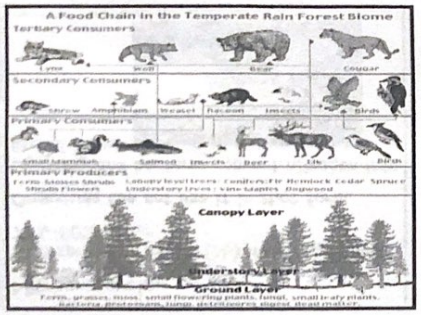
## Trophic Levels

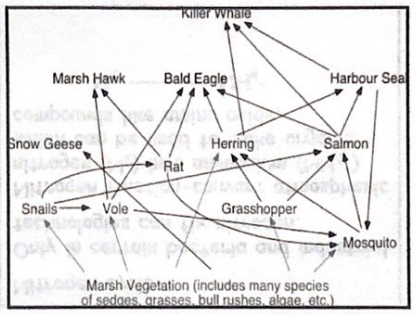
Food web- shows all possible feeding relationships in a community at each trophic level

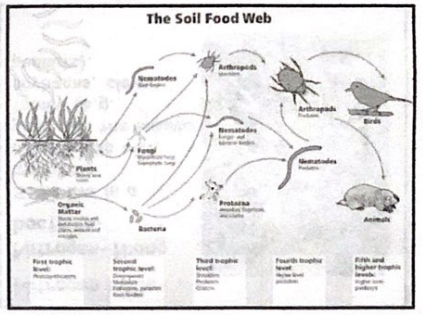
- Represents a network of interconnected food chains




## Toxins in food chains-

While energy decreases as it moves up the food chain, toxins increase in potency.

- This is called biological magnification

Ex: DDT & Bald Eagles

## Nutrient Cycles

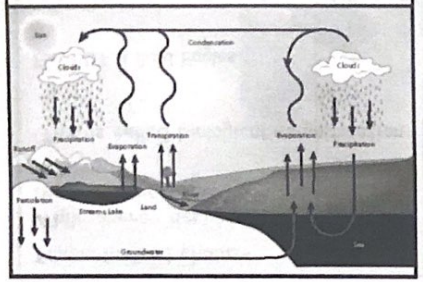
Cycling maintains homeostasis (balance) in the environment.

- 4 cycles to investigate:
  1. Water cycle
  2. Carbon cycle
  3. Nitrogen cycle
  4. Phosphorus Cycle

## Water cycle-

- Evaporation, transpiration, condensation, precipitation

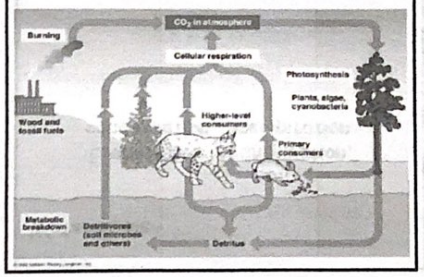
**Water cycle-**




**Carbon cycle-**

·Photosynthesis and respiration cycle carbon and oxygen through the environment.

**Carbon cycle-**




**Nitrogen cycle-**

Atmospheric nitrogen ($N_2$) makes up nearly 78%-80% of air.

Organisms can not use it in that form.

Lightning and bacteria convert nitrogen into usable forms.

**Nitrogen cycle-**

Only in certain bacteria and industrial technologies can fix nitrogen.

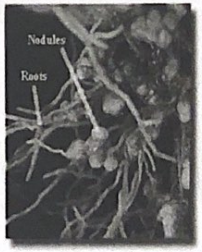
Nitrogen fixation-convert atmospheric nitrogen ($N_2$) into ammonium ($NH_4^+$) which can be used to make organic compounds like amino acids.

$$N_2 \longrightarrow NH_4^+$$

**Nitrogen cycle-**

Nitrogen-fixing bacteria:

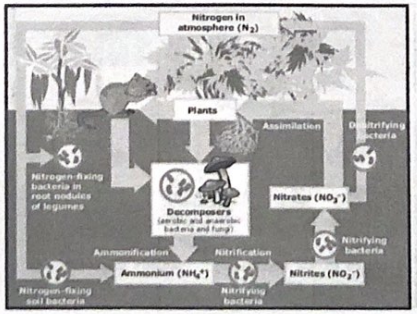
Some live in a symbiotic relationship with plants of the legume family (e.g., soybeans, clover, peanuts).

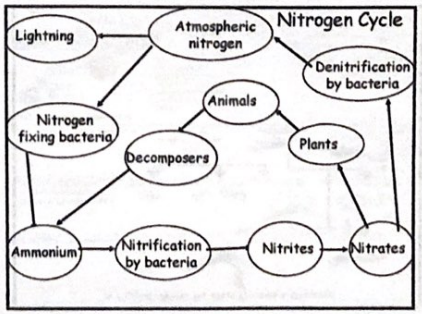



**Nitrogen cycle-**

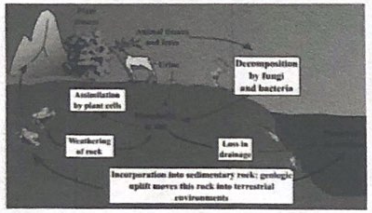
·Some nitrogen-fixing bacteria live free in the soil.

·Nitrogen-fixing cyanobacteria are essential to maintaining the fertility of semi-aquatic environments like rice paddies.



## Phosphorus Cycle




## What is it?

- The phosphorus cycle is the biogeochemical cycle (how phosphorus is in between life and earth) that describes the movement of phosphorus through the lithosphere, hydrosphere, and biosphere.
- The atmosphere doesn't play a significant role in phosphorus because phosphorus compounds are solids during the typical ranges of temperature and pressure found on Earth.

## How It Works

- Rocks start out the Phosphorus Cycle.
- When it rains, phosphates are removed from the rocks and are spread out through both soils and water.
- Plants use up phosphate ions from the soil.
- Phosphate moves from the plants to animals when herbivores eat plants and carnivores eat plants or herbivores.

## How It Works

- Animals release the phosphate into the ground.
- It is then decomposed by bacteria and fungi.
- It then goes through the soil or releases into the water.
- As the rocks are forming they will either join with phosphate or the phosphate will go into the roots of plants and start the cycle over again.