LS.5 Biotic and abiotic factors affect an ecosystem

    a. matter moves through ecosystems via the carbon, water, and nitrogen cycles;

    b. energy flow is represented by food webs and energy pyramids; and

    c. relationships exist among producers, consumers, and decomposers.

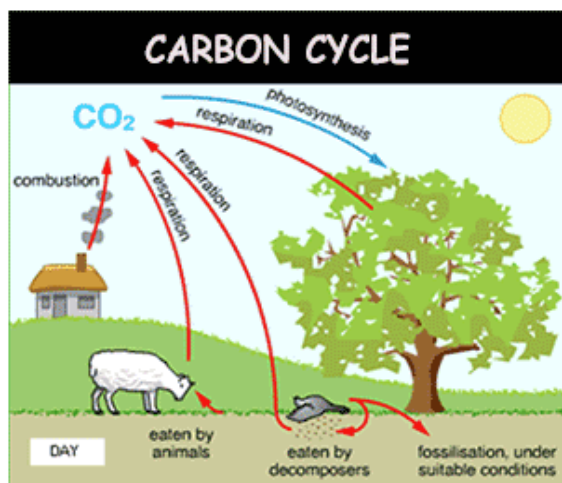## BIOTIC AND ABIOTIC COMPONENTS OF ECOSYSTEMS

- As **matter** and **energy** flow through different organizational levels of living systems, many important **elements and compounds cycle** through the living (biotic) and nonliving (abiotic) components of the environment.
  - This chain of events continuously **repeats**.
  - The cycling of matter ensures its availability for **life processes**.
- **Biotic factors** are all the **living, or once living**, things that directly or indirectly affect an organism and its environment.
  - **Biotic** factors also include the presence of organisms, their **parts**, and **wastes**.
  - In addition, **parasites** and **diseases** are classified as biotic factors.
- **Abiotic factors** are **nonliving** components that determine the types and numbers of organisms that exist in an environment.
  - Some examples include annual **rainfall**, the **pH level** in lakes and ponds, levels of **minerals** in the soil, and the amount of **light** at different depths of the ocean.

Abiotic
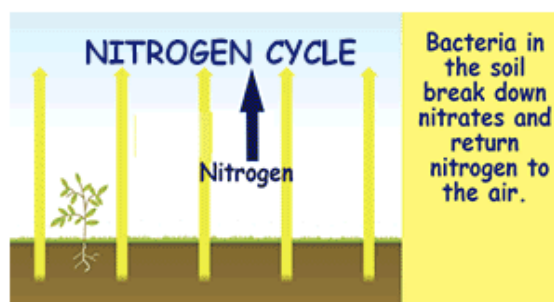components of an ecosystem

CARBON, WATER, AND NITROGEN CYCLES MOVE MATTER THROUGH THE ECOSYSTEM

The carbon, nitrogen, and water cycles serve to transfer matter through all levels of the ecosystem to support life processes.
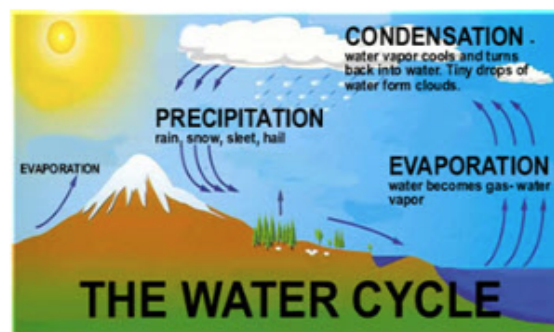
- The processes of the nitrogen cycle include nitrogen fixation, nitrification, assimilation, ammonification, and de-nitrification (You don't have to memorize these names).

NITROGEN CYCLE

Bacteria in the soil break down nitrates and return nitrogen to the air.

Nitrogen

CARBON CYCLE

- The main processes of the carbon cycle include photosynthesis, respiration, combustion, and decomposition.

CONDENSATION - water vapor cools and turns back into water. Tiny drops of water form clouds.

PRECIPITATION rain, snow, sleet, hail

EVAPORATION

EVAPORATION water becomes gas- water vapor

THE WATER CYCLE

- The main processes of the water cycle include precipitation, evaporation, condensation, and transpiration.
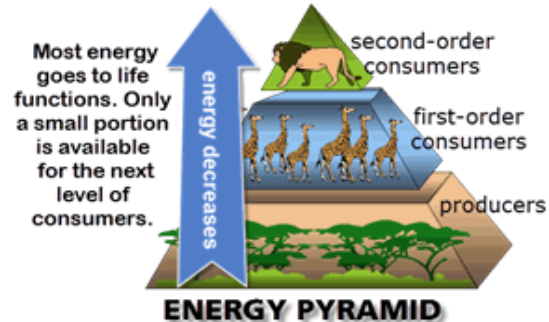
Food Webs and Energy model Energy Flow

- Within natural and designed systems, it is possible to track the flow, cycles, and conservation of matter and energy.
- **Food chains** and **webs** illustrate how **energy is transferred** from producers to different levels of consumers in an ecosystem.
- The amount of energy available **decreases** from producer to **first-order, second-order**, and **third-order** consumers.

FOOD CHAINS
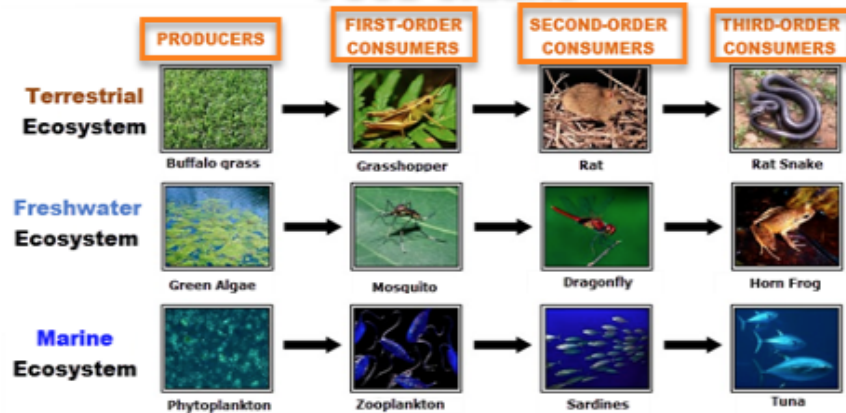
- This concept can be modeled through an **energy pyramid**.
- **No** energy conversion is perfectly **efficient**.
- Each level of the **energy pyramid** has **less energy** to pass on to the next with roughly **one-tenth** of the energy in one level available for the next.
- Energy is given off to the environment as **thermal energy** through **metabolism**.

Most energy goes to life functions. Only a small portion is available for the next level of consumers.

ENERGY PYRAMID

Producers, Consumers, Decomposers

- The life processes of plants and animals are **interdependent** and contribute to the **flow of energy** and **cycles of matter** within an ecosystem.
  - **Producers** are **consumed** (eaten) by **consumers**.
  - When either **producers or consumers die**, they are broken down and consumed by **decomposers**.
    - **Decomposers** return **nutrients** to the environment where they can be used by **producers**.
- **Human actions** can positively and negatively affect the populations of producers, consumers, and decomposers in an ecosystem.

Every food chain starts with a PRODUCER

PRODUCER makes food with PHOTOSYNTHESIS

Decomposers return nutrients to the environment