

Unit 5 Natural Resources

Chapter 13:

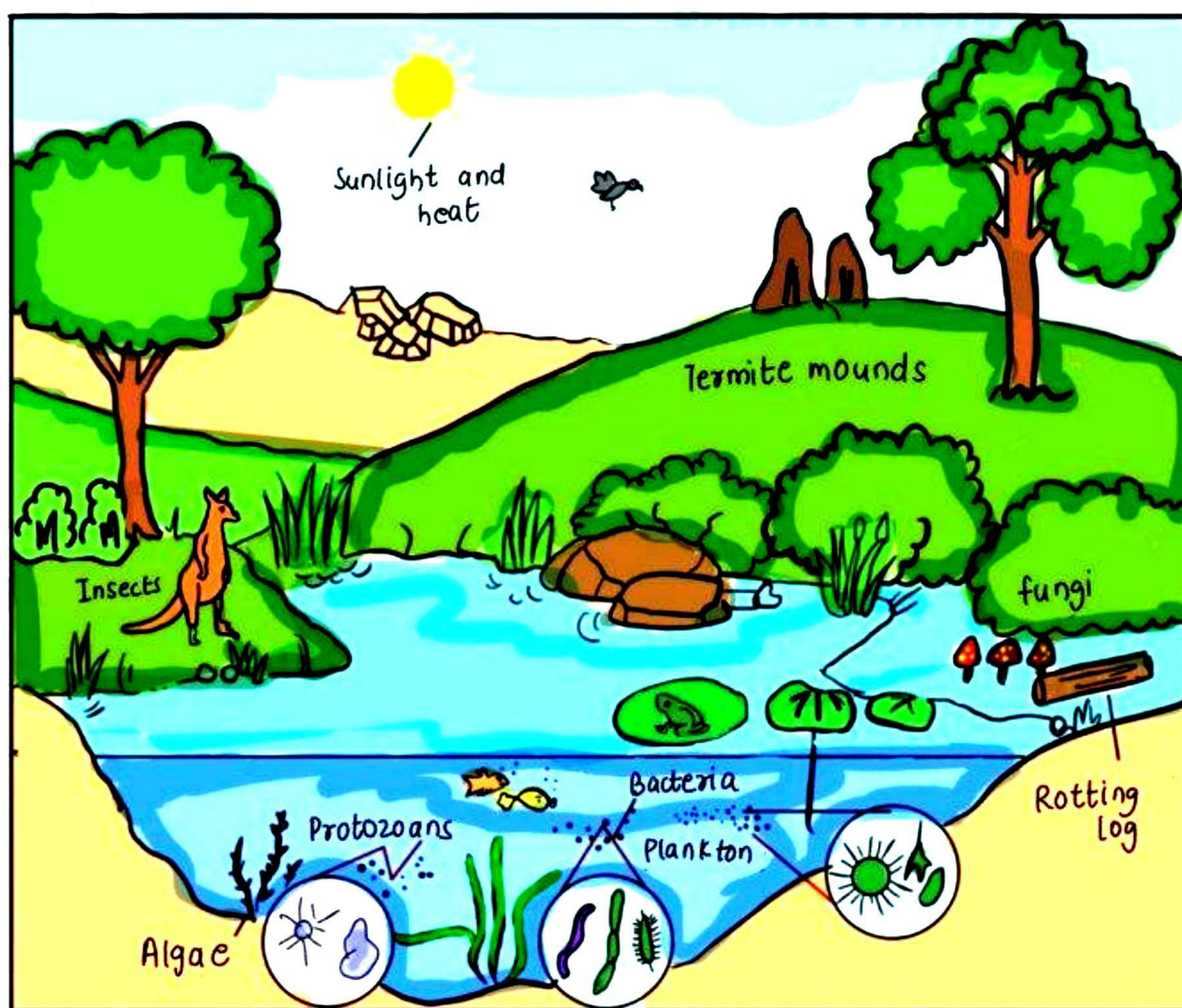
Our Environment

→ Environment

It encompasses the entirety of physical and biological circumstances within which organisms thrive and engage with biotic and abiotic elements.

→ What is Ecosystem?

An ecosystem is a complex system of living and non-living things interacting with each other and their environment. Coined by Botanist **A.G. Tansley** in 1935, it includes both biotic and abiotic elements and maintain equilibrium through their interaction. Humans are essential components and the benefits we gain from ecosystems are known as ecosystem services.



! NOTE - Agro ecosystem represent the largest man-made ecosystems. Example include aquariums, botanical gardens, Parks and field crops.

ECOSYSTEM

Abiotic factors

Biotic factors

Producers

Consumers

Decomposers

Primary Herbivores

Secondary Primary Carnivores

Tertiary Secondary Carnivores

Abiotic - Components refer to the non-living chemical and physical elements of the environment, such as soil, air, water and temperature.

Biotic - Components encompass the living organisms within the environment, including plants, animals, microbes and fungi.

→ Modes of Nutrition

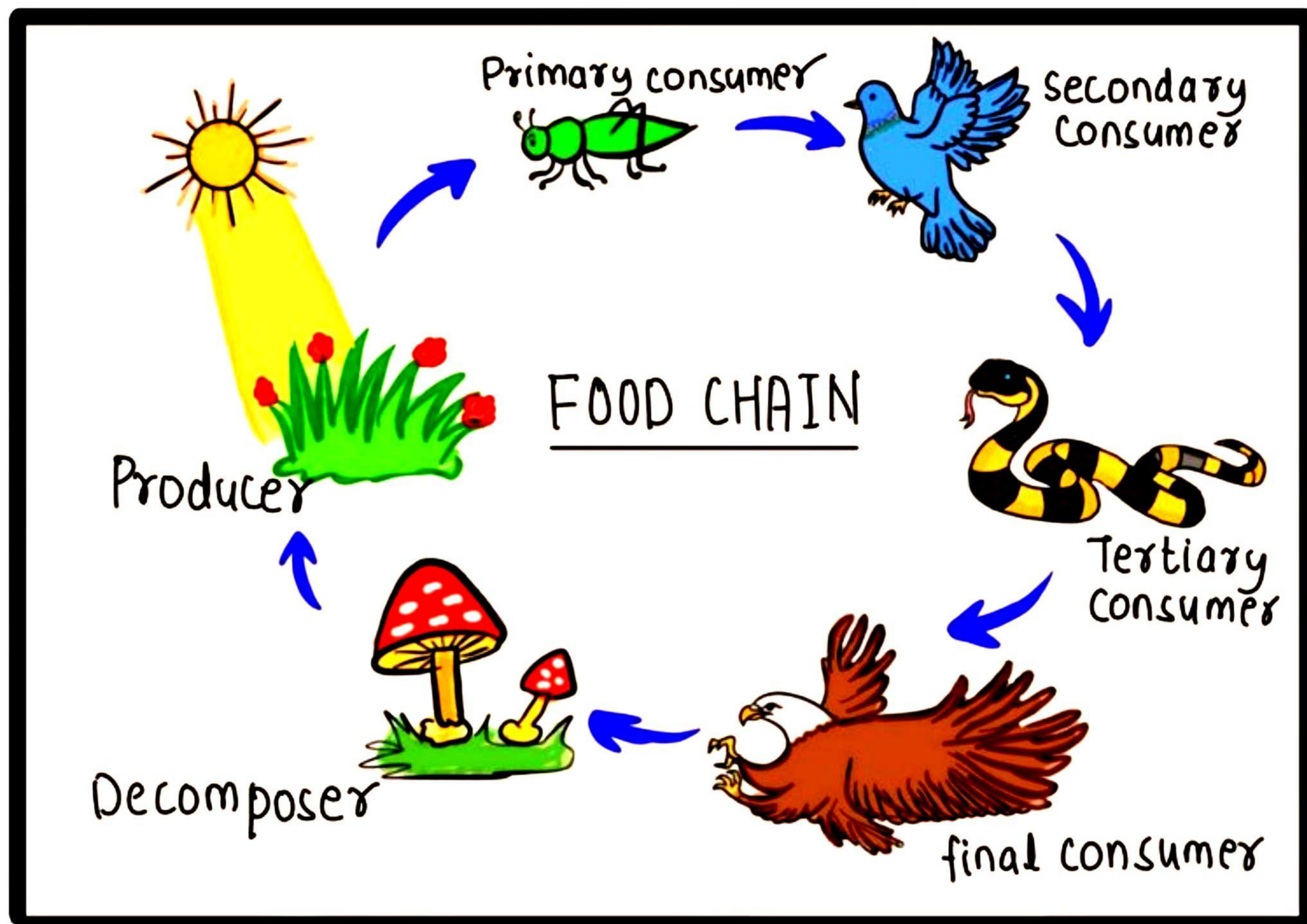
The nutritional approach involves the process of consuming food to support growth, maintain health and repair damaged body parts. Plants utilize raw materials from their surroundings including minerals, carbon dioxide, water and sunlight to generate their own food. There are two modes of nutrition.

Autotrophic Nutrition - Plants are primary producers and exhibit autotrophic nutrition. They use sunlight, carbon dioxide and water to synthesize the sustenance.

Heterotrophic Nutrition - Animals and humans are heterotrophs relying on plants for their foods.

→ Food chain

A food chain is a linear sequence of organisms through which energy is transferred in the form of food, with one organism consuming another for instance: Grass (Producer) → Grasshopper (Herbivore) → Frog (Carnivore) → Snake (Carnivore) → Eagle (Top carnivore).



→ The Significance of food chain lies in several key aspects

- The food chain provides insight into the interconnections among various organisms in an ecosystem, illustrating how they share and interact with food resources. They serve as nature's delivery system, facilitating the movement of energy and resources throughout different components of the ecosystem.
- Acting as energy highways, food chains play a crucial role in transporting essential energy and resources across living parts of ecosystems and even throughout the entire biosphere.
- Food chains serve as the engines of ecosystem or the biosphere, driving the dynamic flow of energy between different organisms, thus sustaining life and maintaining ecological balance.
- However, when harmful substances like pesticides and weed killers enter food chains, they pose increasing risks particularly to top-level creatures, including humans. Understanding and managing these chemicals within ecosystems become imperative to mitigate their adverse effects, underscoring the importance of environmental stewardship.

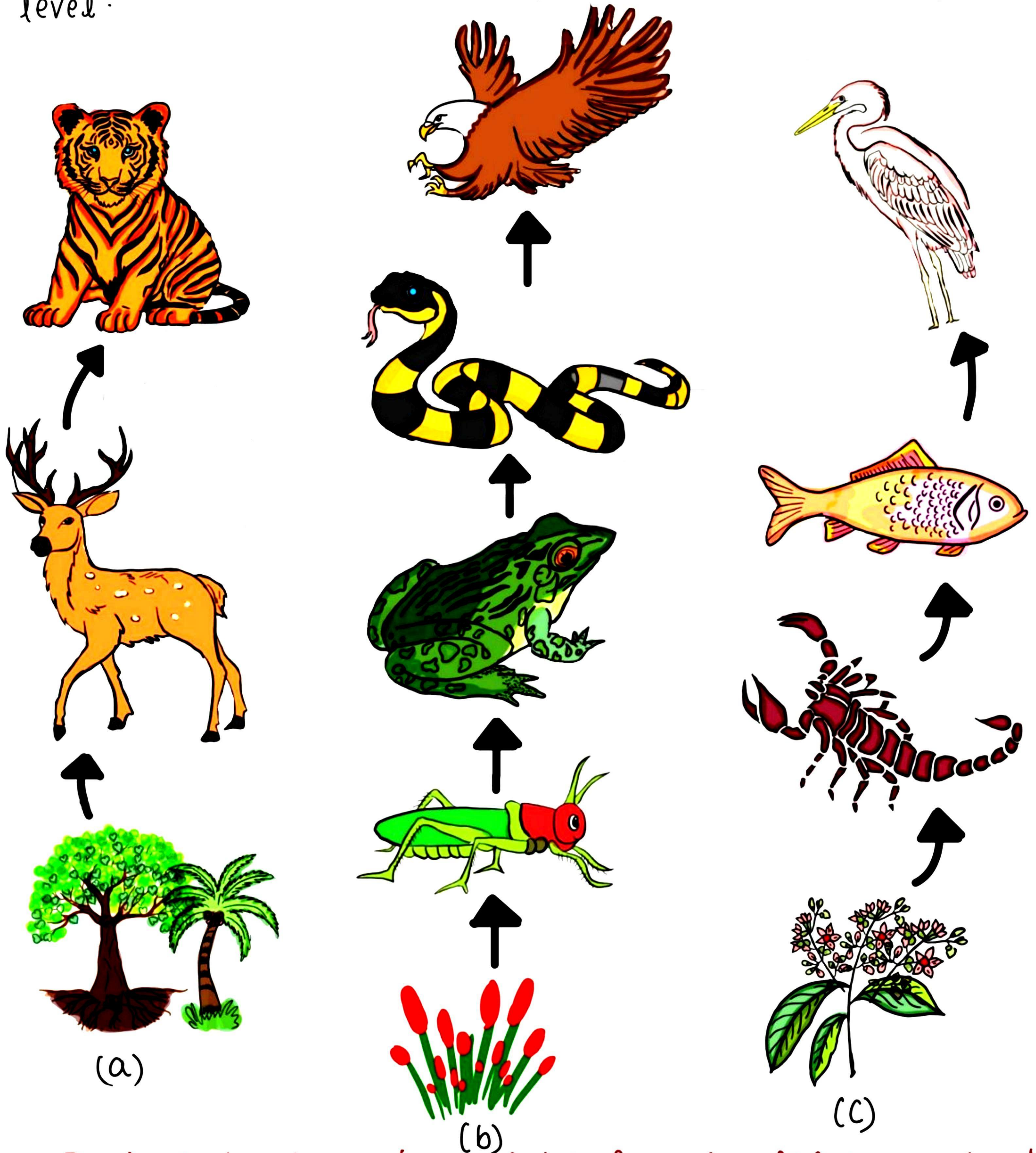
→ Law of Conservation of Energy

The Law of Conservation of Energy states that energy cannot be created or destroyed; instead, it undergoes

transformation from one form to another. within biological system. energy is transferred from one organism to another as it moves across trophic levelson.

→ Food Web

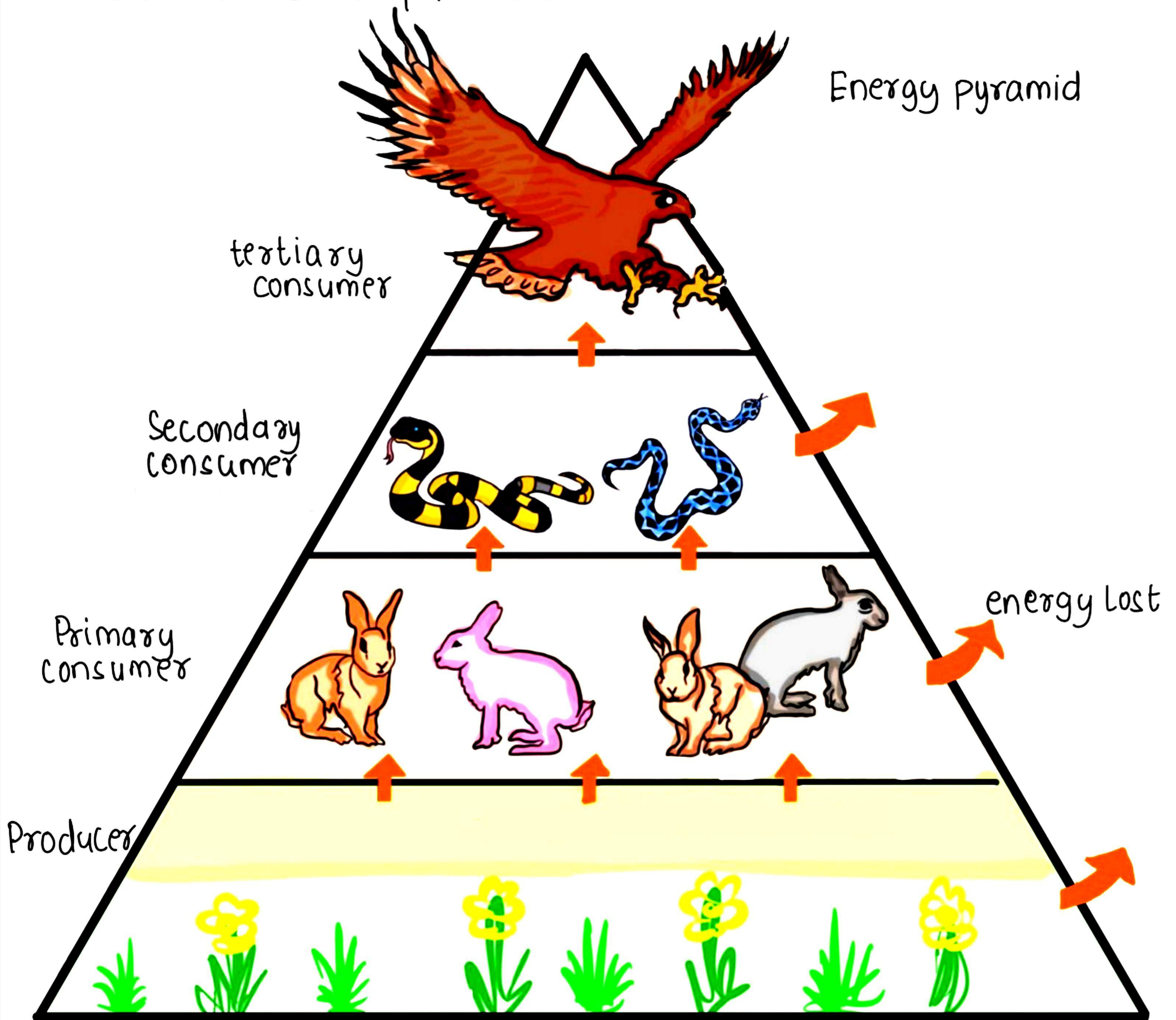
food web is a network of various food chains which are interconnected at a various trophic levels. Since an organism can occupy position in more than one food chain, in a food web, it occupies more than one trophic level.



Food chain in nature, (a) in forest, (b) in grassland and (c) in a pond

→ Trophic levels

Trophic levels are the various steps in food chain where transfer of food or energy takes place. Producers are in the first trophic level. Herbivores are second trophic level, carnivores or secondary consumers are third trophic level and large carnivores or tertiary consumers are the fourth trophic level.



→ Pyramid of Trophic levels

The pyramid of trophic levels is a visual depiction illustrating the flow of energy through ecosystems. It typically begins with producers and encompasses three main types :-

1. **Pyramid of Numbers** - This type displays the number of organisms present at each trophic levels. It can be either upright or inverted.

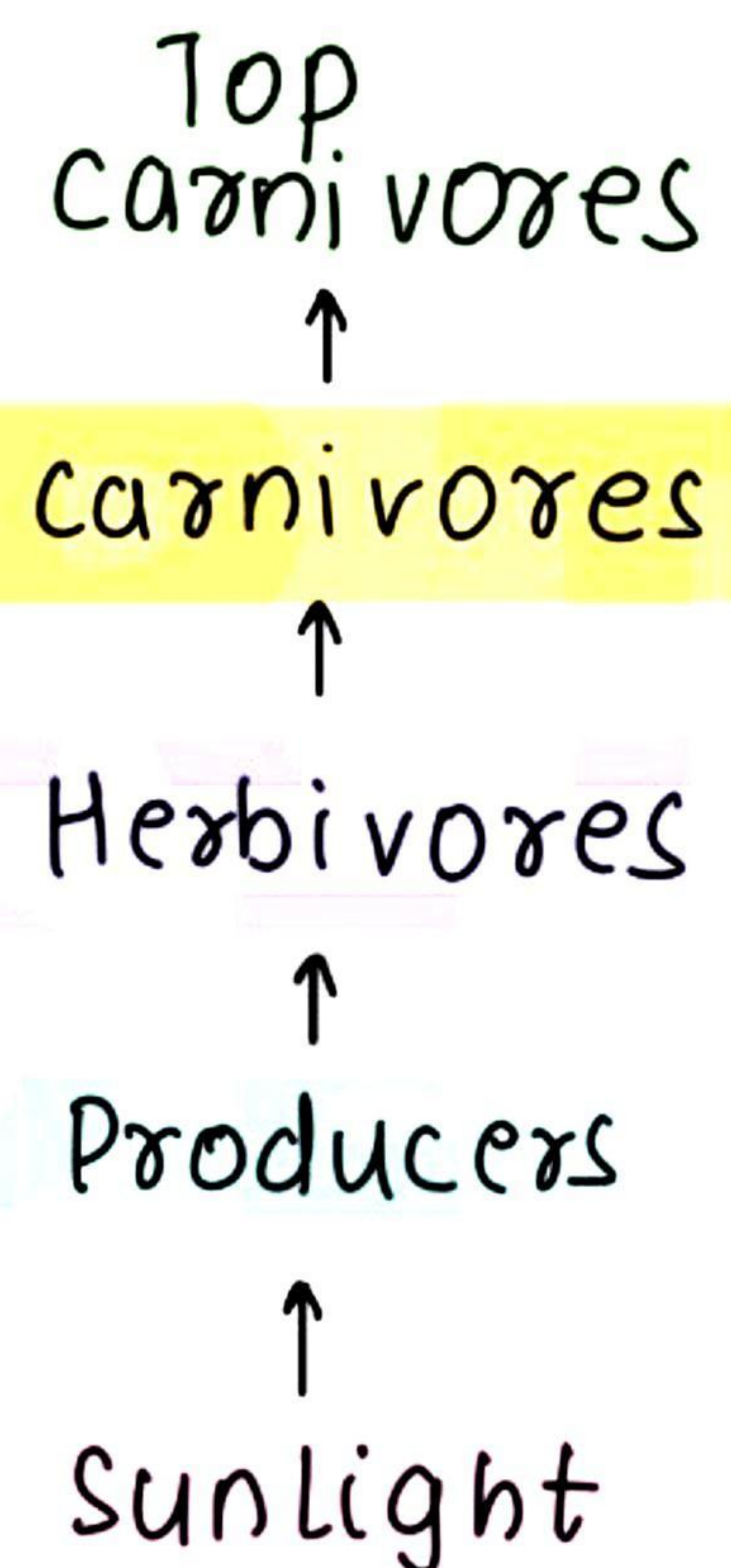
2. **Pyramid of Biomass** - This representation showcases the biomass of each trophic level, which may also be either upright or inverted.
3. **Pyramid of Energy** - Unlike the other types, this pyramid is always upright as it illustrates the flow of energy from one trophic level to the next.

→ Energy Flow

Energy accumulates initially with primary producers and then flows through the food chain to various trophic level. This process is known as energy flow, is characterized by its unidirectional nature, with no recycling or return to previous levels. As energy is transferred from one trophic level to another, there is always some loss of energy.

The flow of energy in an Ecosystem

The energy in a food chain only moves in one direction. It goes from the plants (the autotrophs) to the plant-eating animals (the herbivores) and does not go back to the Sun.



📌 Energy flow Across Trophic levels

- Energy flows unidirectionally in food chains starting with green plants converting sunlight into food energy.
- The 10 percent law states that only about 10% of energy is passed on to the next trophic level, with 90% used by the current level for life process.
- Most food chains consists of 3 to 4 levels due to energy loss at each step.
- Biological magnification occurs when harmful chemicals become more concentration as they move up the food chain, posing risks to organisms including humans.
- Ozone (O₃) shields the Earth's surface from harmful ultra-violet radiation crucial for protecting life of Earth.

Depletion of the Ozone layers - The Ozone layer is depleted due to the use of chemicals such as aerosols and spray propellants, notably chlorofluorocarbons. This depletion can lead to skin cancer in

humans and animals and cause significant harm to plant life.

Biological Magnification - This occurs when harmful, non-biodegradable chemicals like pesticides accumulate in organisms as they progress up the food chain, resulting in an increase in their concentration.

→ How do Our Activities Affect the Environment

Human activities have profoundly shaped our environment, influencing every aspect of life on earth. Over nearly two million years of evolution, humans have left an indelible mark on the planet's resources and ecosystems. From our earliest ancestors to the present day, our journey has encompassed advancements in social behaviour and significant strides in science, technology and medicine. Continuously striving for better solutions, we aim to address current challenges and elevate society as a whole toward higher standards of living.



→ Air Pollution

The introduction of pollutants, organic molecules or other hazardous substances into the Earth's atmosphere.

- Natural sources include forest fires, dust storms and volcanic activity
- Man-made sources encompass power plants, residential areas, industries, oil refineries and transportation.

→ Garbage Management

Encompasses all activities and measures necessary to handle waste from its creation to its ultimate disposal. Ensure adherence to environment regulations and practices with through monitoring and regulation

- Waste Segregation
- Collection
- Transportation
- Treatment
- Processing and recycling
- Disposal

