

# Chapter: Our Environment Ecosystem

Presented by

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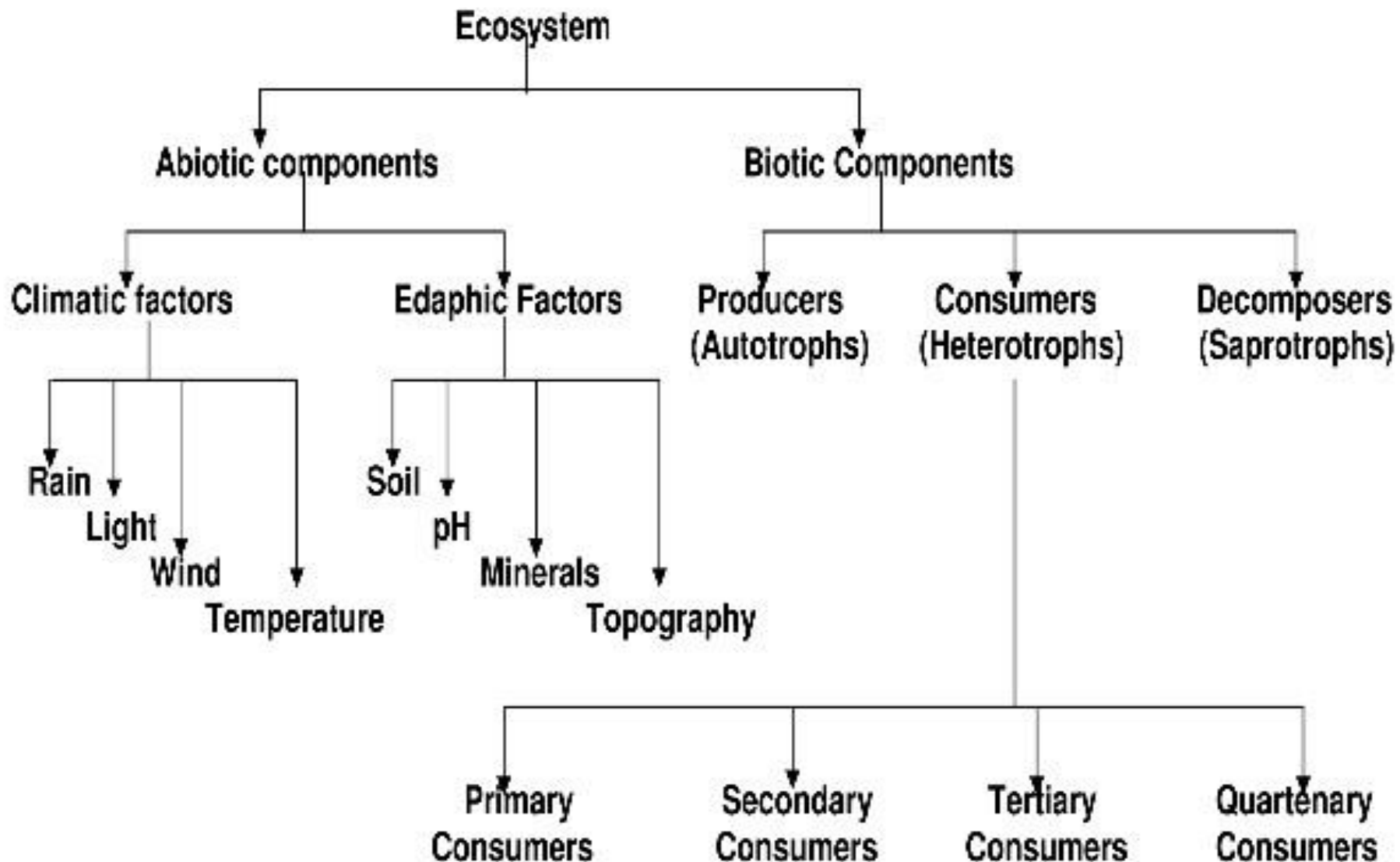
# What is ecosystem?

- The term **ecosystem** was coined by the British ecologist **A. G. TANSLEY** in 1935. He used it to define a unit that covers all organisms of a given area as well as their relationship to the inorganic environment.
- An *ecosystem* is a geographic area where plants, animals, and other organisms, as well as weather and landscape, work together to form a bubble of life. *Ecosystems* exhibit interactions between biotic or living parts and abiotic factors or non-living parts.

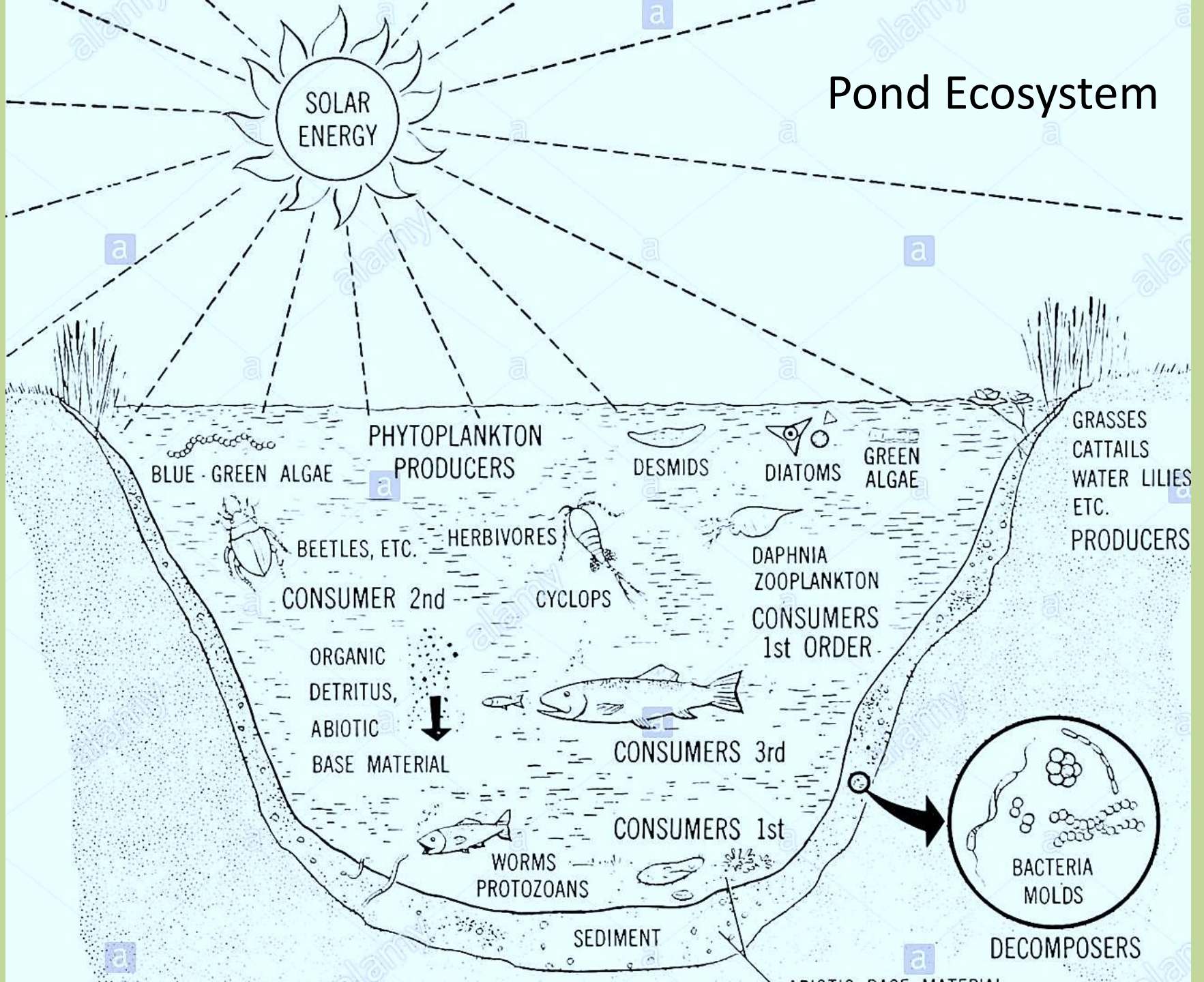
# Examples of ecosystem

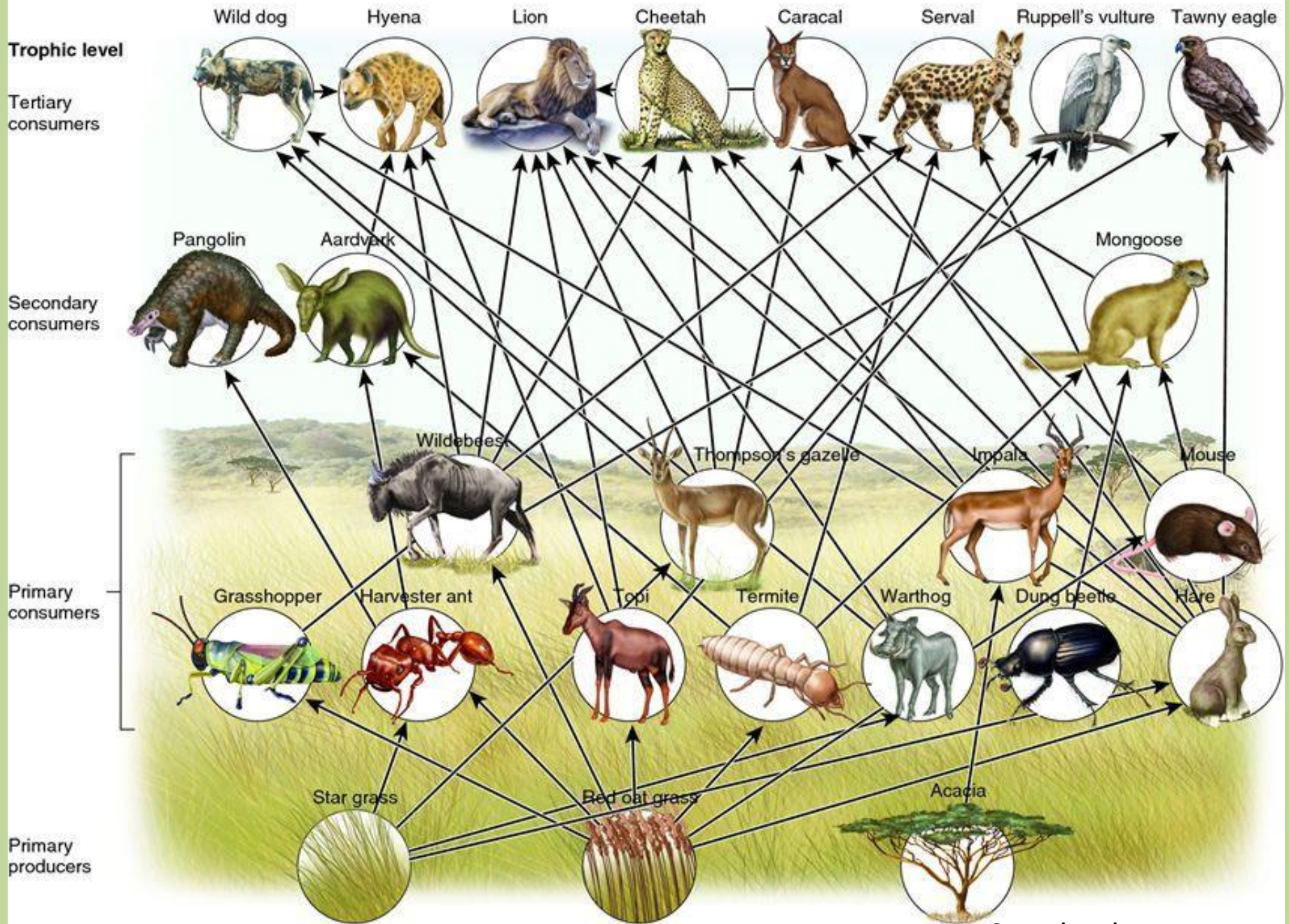
- Ecosystem examples are limitless. An ecosystem does not have to cover a large region. They exist in small **ponds**, inside human homes, and even in the human gut. Alternatively, ecosystems can cover huge areas of the planet.
- Types of Ecosystem
  - Terrestrial Ecosystems: **Forest Ecosystem**, Desert Ecosystem, **Grassland ecosystem**, Tundra ecosystem
  - Aquatic Ecosystem: **Marine ecosystem**, **freshwater ecosystem**, estuarine ecosystem.
  - Micro-biomes: Any anatomical system contains microbiota – mutualistic, commensalistic, pathogenic or **parasitic** bacteria, fungi, archaea and viruses.

# Components of Ecosystem



# Pond Ecosystem





Grassland Ecosystem

# Food Chain

- A **food chain** is a linear sequence of organisms through which nutrients and energy pass as one organism eats another. In a *food chain*, each organism occupies a different trophic level.
- the **trophic level** is the position that an organism occupies in a food chain - what it eats, and what eats it. Primary producers make up the first trophic level.

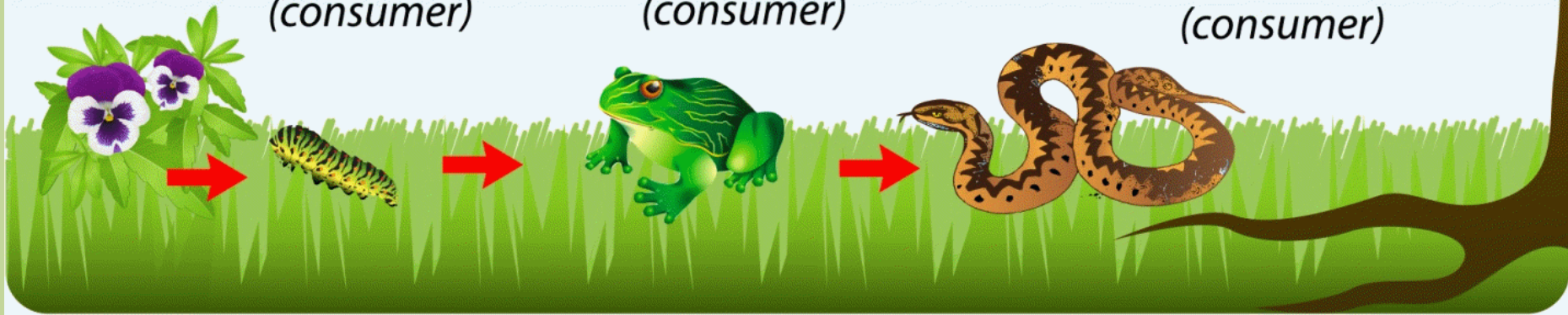
**Flower**  
(producer)

**Caterpillar**  
(consumer)

**Frog**  
(consumer)

**Snake**  
(consumer)

**Owl**  
(consumer)

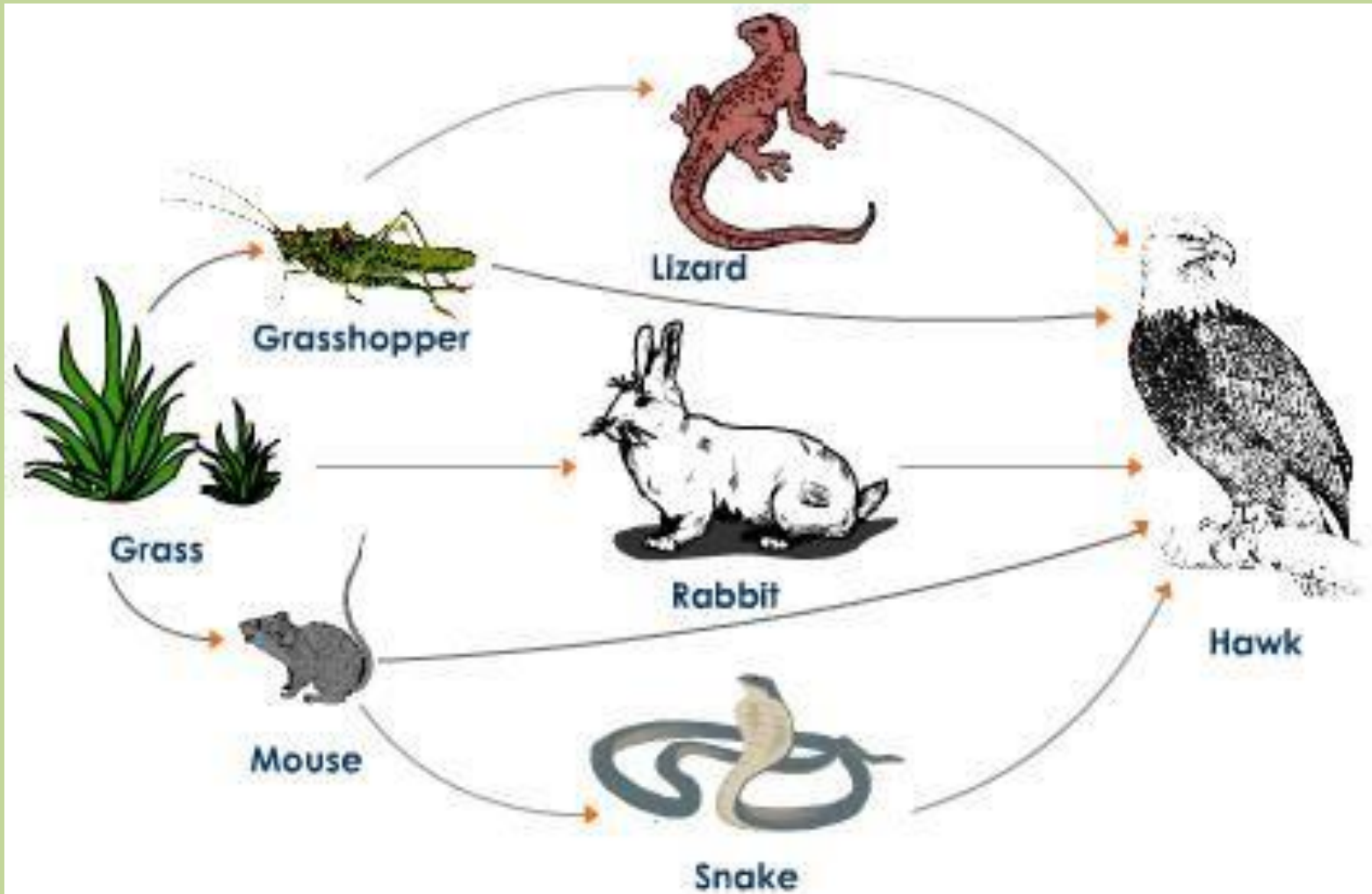


# Food Web

- *Food web* is a connection of multiple *food chains*.
- A food web is the natural interconnection of food chains and a graphical representation of what-eats-what in an ecological community.

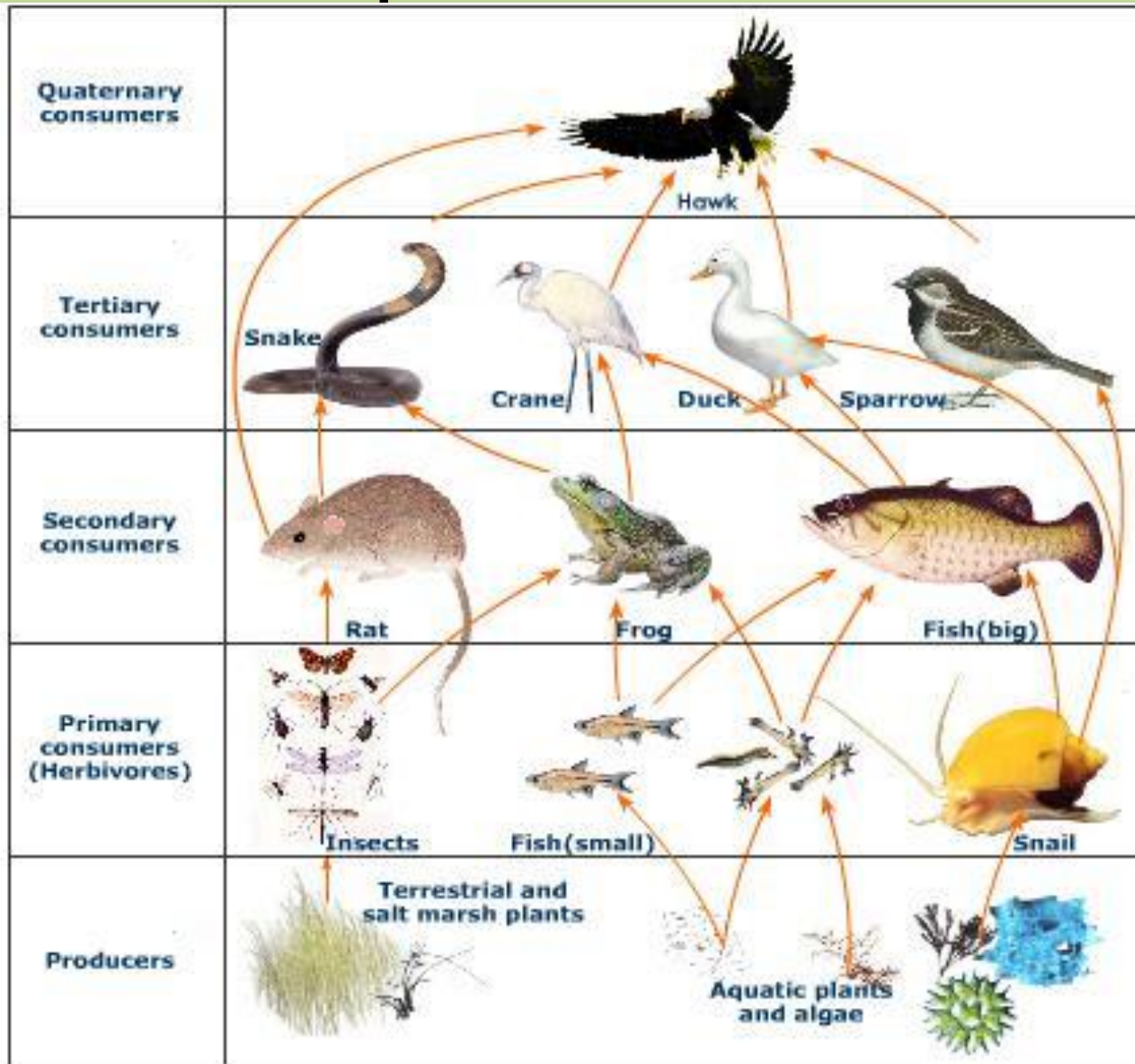


# Examples of food web



A Food Web in a Grassland Ecosystem With Five Possible Food Chains

# Examples of food web

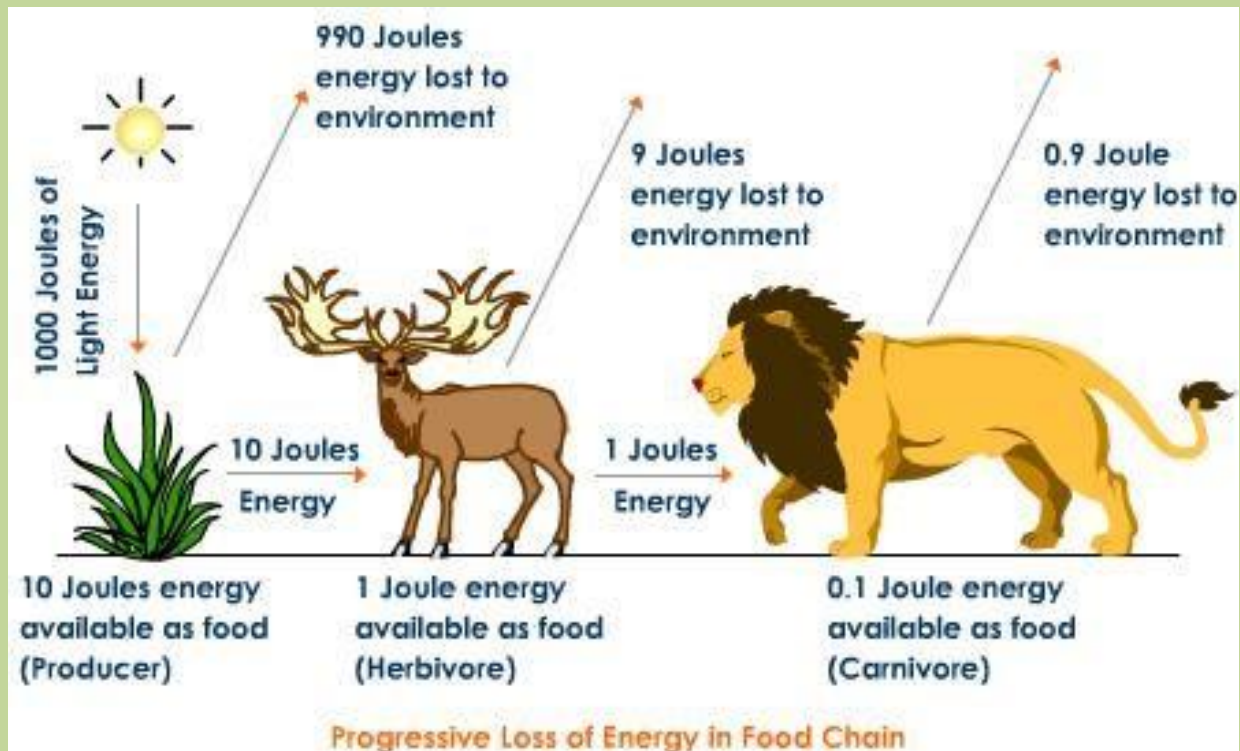


# Energy flow in ecosystem

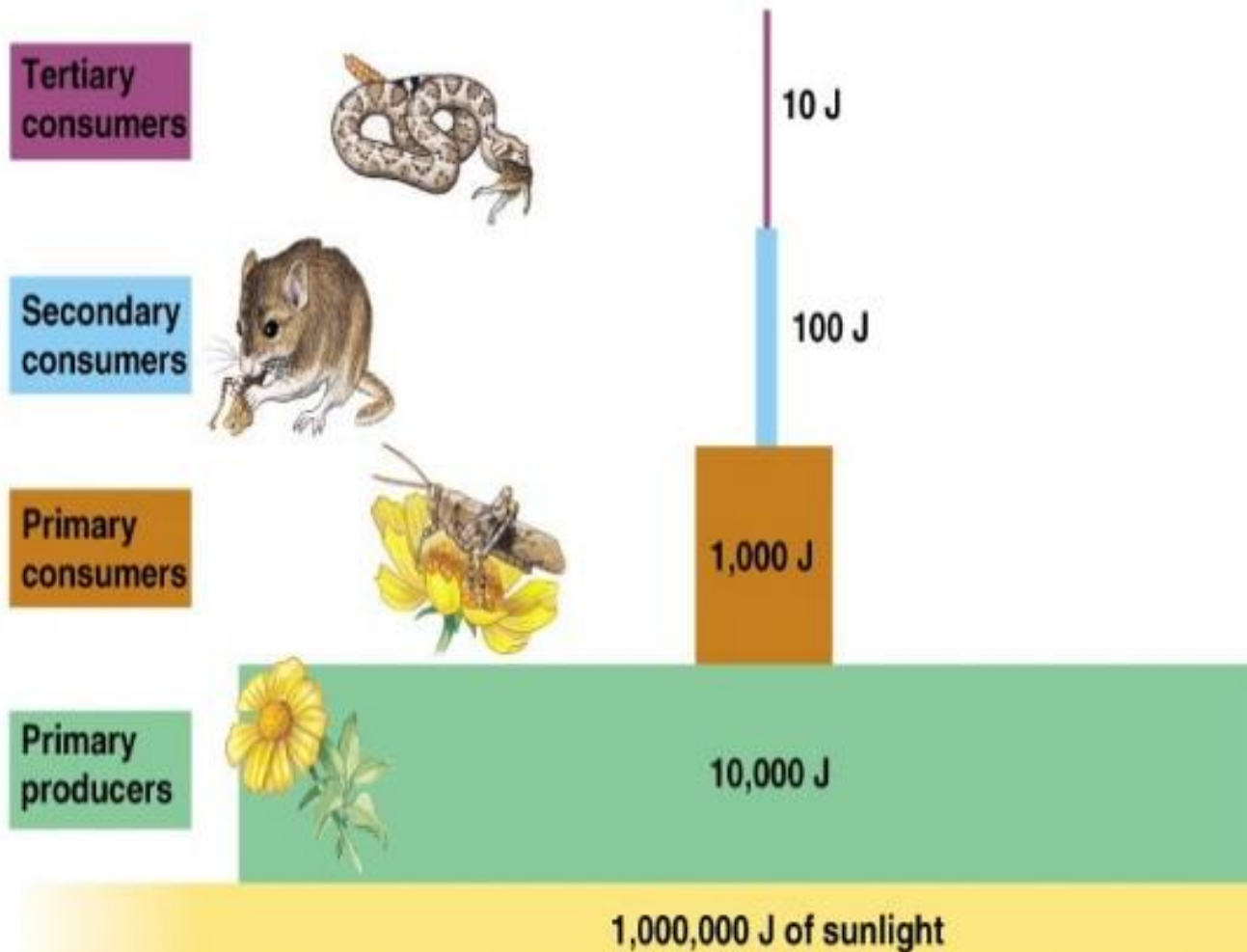
- The green plants in a terrestrial ecosystem capture about 1% of the energy of sunlight that falls on their leaves and convert it into food energy.
- When green plants are eaten by primary consumers, a great deal of energy is lost as heat to the environment, some amount goes into digestion and in doing work and the rest goes towards growth and reproduction. An average of 10% of the food eaten is turned into its own body and made available for the next level of consumers.
- Therefore, 10% can be taken as the average value for the amount of organic matter that is present at each step and reaches the next level of consumers.

# Energy flow in ecosystem

- Lindeman's 10% law
- The **ten percent law** of transfer of energy from one trophic level to the next can be attributed to Raymond **Lindeman** (1942), it is also called as Lindeman's trophic efficiency rule.

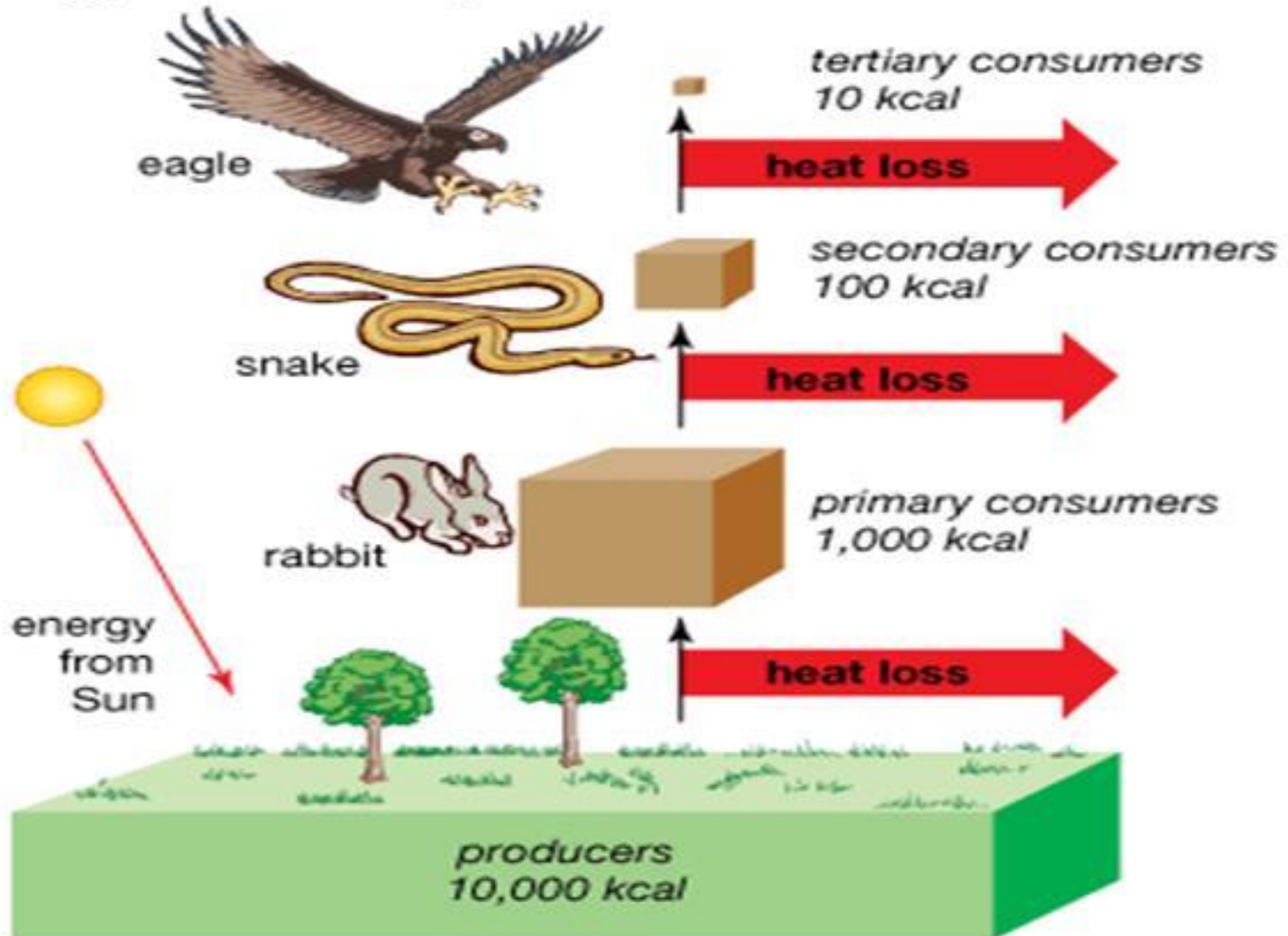


# Examples



# Examples

## Energy flow and trophic levels



# Energy flow in ecosystem

- Since so little energy is available for the next level of consumers, food chains generally consist of only three or four steps. The loss of energy at each step is so great that very little usable energy remains after four trophic levels.
- There are generally a greater number of individuals at the lower trophic levels of an ecosystem, the greatest number is of the producers.
- The length and complexity of food chains vary greatly.

# Aspects associated with energy flow

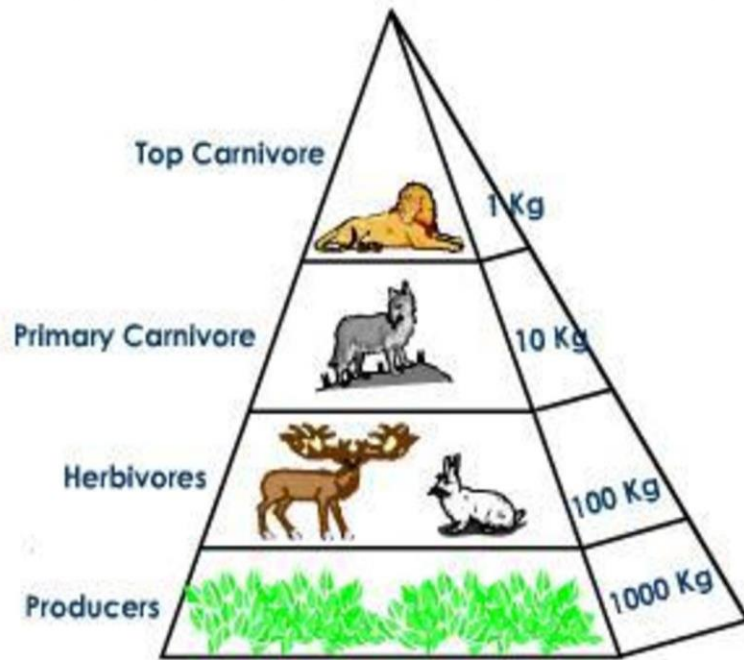
- Firstly, the flow of energy is **unidirectional**. The energy that is captured by the autotrophs does not revert back to the solar input and the energy which passes to the herbivores does not come back to autotrophs. As it moves progressively through the various trophic levels it is no longer available to the previous level.
- Another interesting aspect of food chain is how unknowingly some harmful chemicals enter our bodies through the food chain. **Biomagnification** is the process of accumulation of harmful non-biodegradable chemicals (like pesticides) progressively at each trophic level. As human beings occupy the top level in any food chain, the maximum concentration of these chemicals get accumulated in our bodies.



# Ecological Pyramids

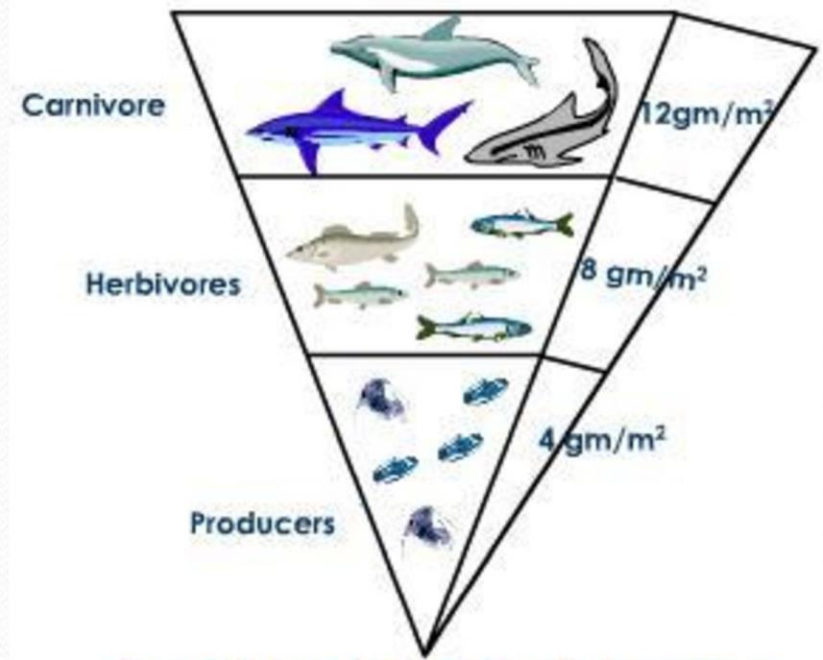
- An **ecological pyramid** is a graphical representation of the relationship between different organisms in an **ecosystem**. Each of the bars that make up the **pyramid** represents a different trophic level, and their order, which is based on who eats whom, represents the flow of energy.

# Pyramids of Biomass cont.



Upright Pyramid of biomass in a Terrestrial Ecosystem

Upright



Inverted Pyramid in an Aquatic Ecosystem

Inverted

# Pyramid of Number

Upright pyramid

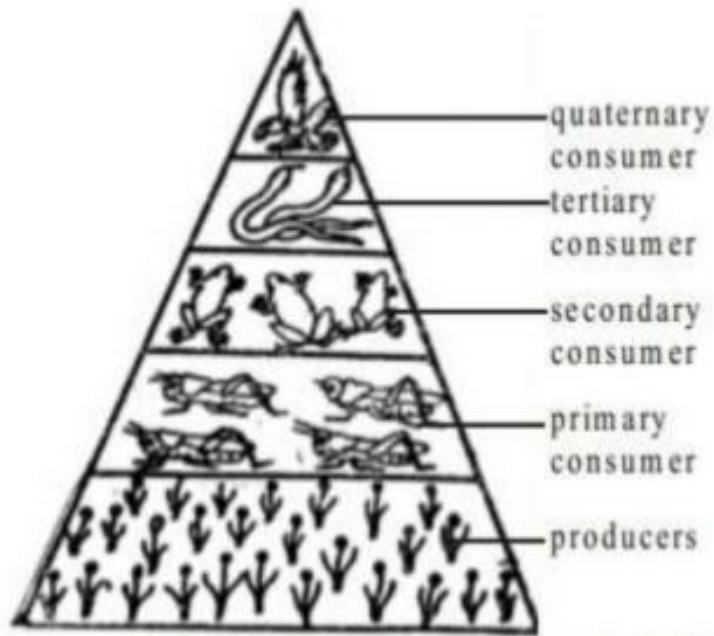
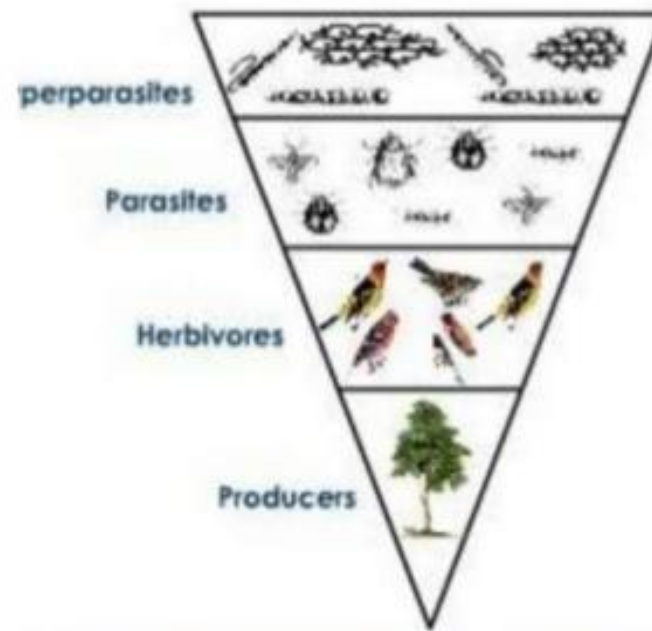


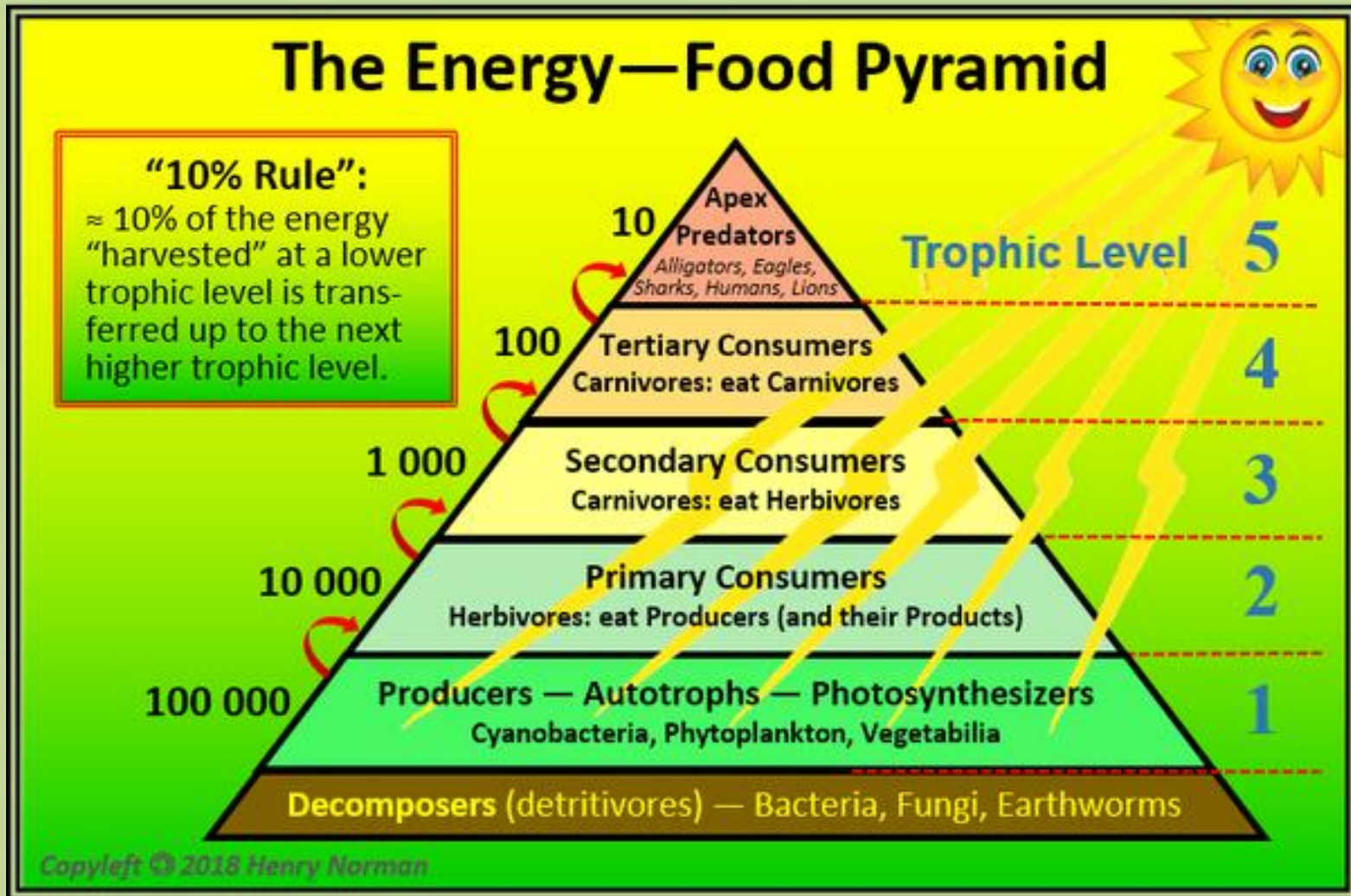
Fig. Pyramid of numbers in a grassland

Inverted pyramid



Inverted pyramid of number

# Pyramid of energy



- Remember- producer captures on only 1% of solar radiation