Ecosystem

Presented by-

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Terminologies

- Ecology= *oikos* (household or home) + *logos* (study of) (Greek words, coined by the German biologist Ernst Haeckel in 1869).
- Habitat- the environment in which a particular organism lives.
- Ecology - the science that deals with the study of organisms in their natural habitat interacting with their surroundings (other living organisms and physical components).
- Ecosystem - a group of living species interacting with one another and with their non-living environment. (Term coined by the Oxford ecologist Arthur Tansley in 1935)

Ecosystem

- **Definition -** "a unit that includes all the organisms, *i.e.*, the community in a given area interacting with the physical environment so that a flow of energy leads to clearly defined trophic structure, biotic diversity and material cycles, i.e., exchange of materials between living and non-living, within the system". - Eugene Odum
- Functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment.
- The structural and functional system of communities and their environment.

Structure of an ecosystem

- Components of an ecosystem = abiotic (non-living) + biotic (living)
- Abiotic components- Physical (air, water, sunlight, temperature, pressure, soil) + Chemical [inorganic (macro & micro elements, e.g. C, H, O, N, Ca, etc. from biogeochemical cycles) + organic (proteins, carbohydrates, lipids, amino acids etc. synthesized by flora and fauna)]
- Biotic components- producers, consumers and decomposers

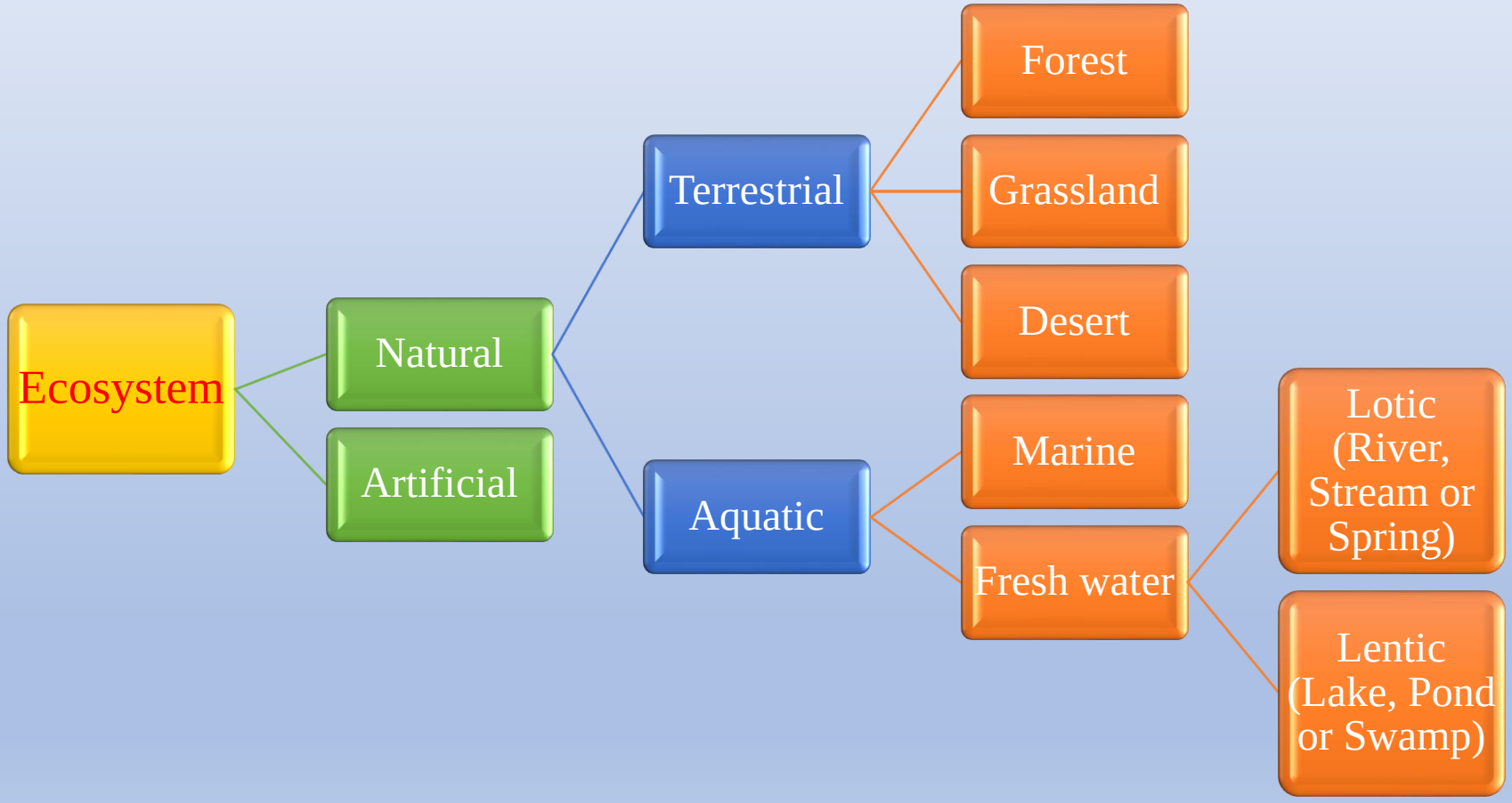
Function of an ecosystem

- Ecosystem invariably performs in a systematic way under natural conditions. It converts the sun's radiant energy and passes it to biotic components.
- The biotic components exchange between themselves and abiotic components the energy, nutrition and water for life processes.
- The main functions of an ecosystem are

  i) Biological functions- cycling of nutrients in the ecosystem

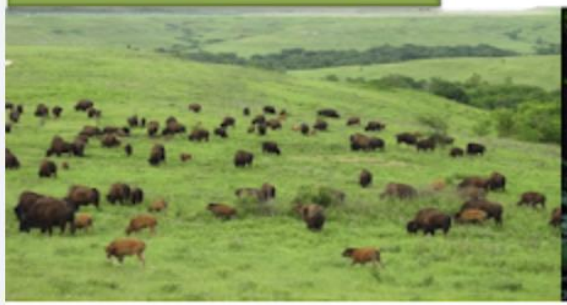
  ii) Physical functions- energy flow in the ecosystem

Types of ecosystem



Types of ecosystem

I: Natural: Terrestrial



Grassland

Forest

Desert

Natural: Aquatic

a) Marine: Oceans

b) Freshwater: Lakes

II: Artificial or Manmade

Aquarium

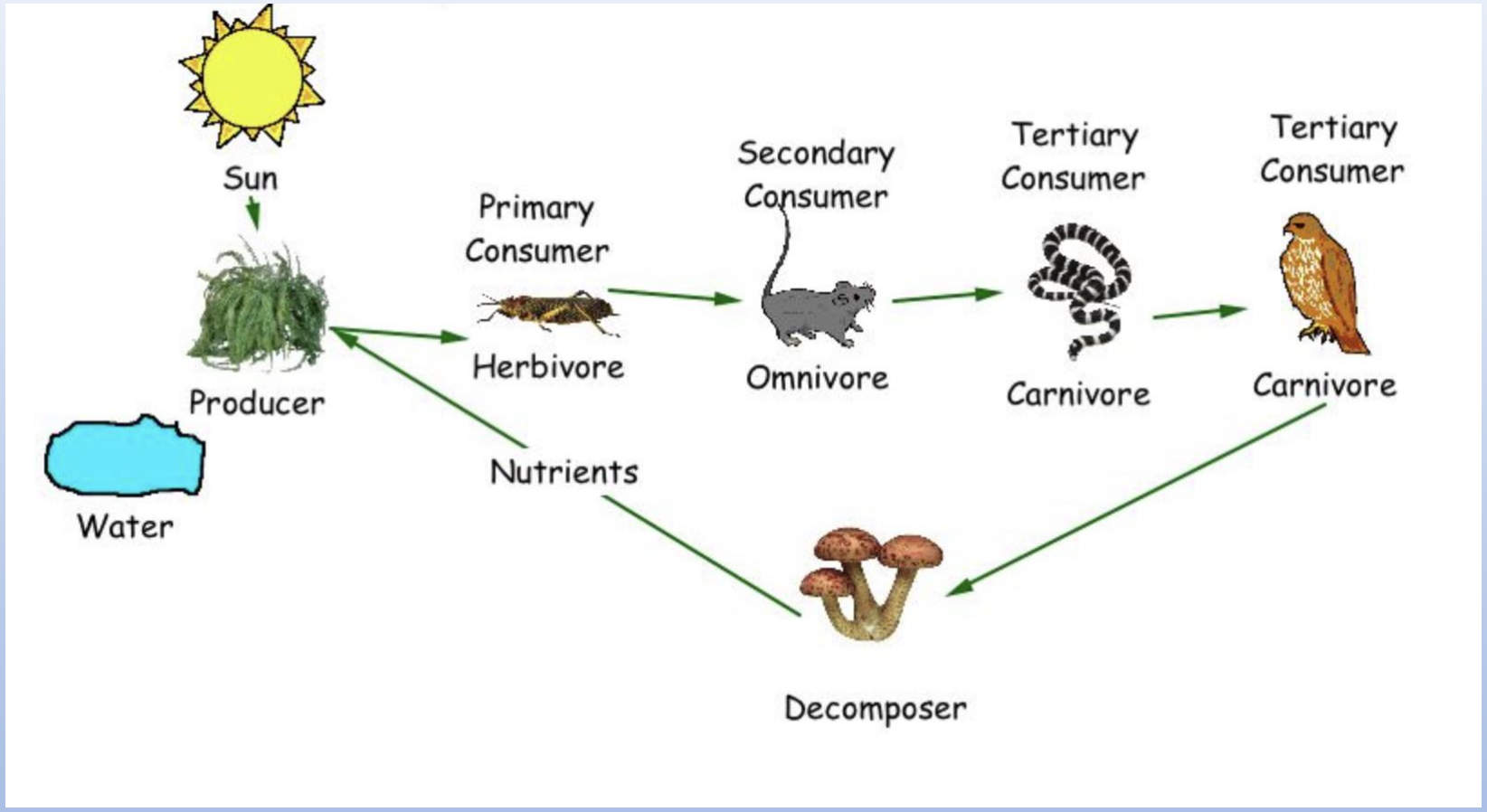
Crop field

Producers, Consumers and Decomposers

- **Producers-** Organisms which produce their own food by using energy from the sun (by photosynthesis), a.k.a. Autotrophs, e.g. plants
- **Consumers-** Organisms which don‘t make their own food, but get it from eating plants or other animals, a.k.a. Heterotrophs
- Primary consumers- Herbivores (plant eaters)
- Secondary consumers- primary carnivores (eat herbivores)
- Tertiary consumers- secondary carnivores (eat primary carnivores)
- **Decomposers-** Organisms which feed on dead organisms and decompose into simpler compounds

Food Chain

- A **food chain** shows how each living thing gets its food.
- It is the sequence of interlinked organisms involving repeated eating and being eaten, resulting in the flow of nutrients and energy.
- A food chain always starts with plant life and ends with an animal.
- Decomposers are generally located at the bottom of the ecosystem
- Each step, level or link of a food chain is called a trophic level
- Example- Grass→ insect→ frog → snake → eagle in a grassland ecosystem.

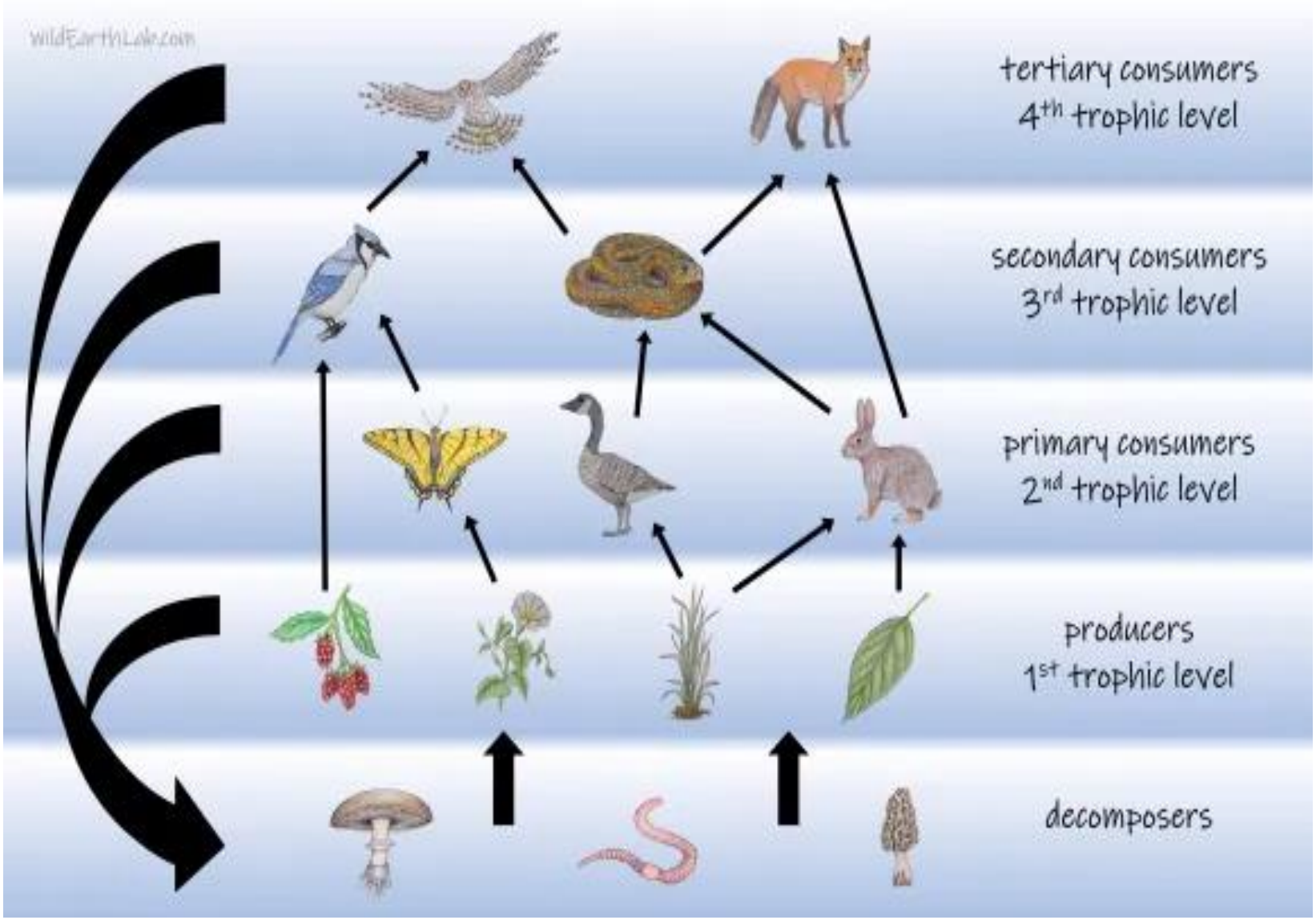

Sun
Producer
Water
Primary Consumer
Herbivore
Secondary Consumer
Omnivore
Tertiary Consumer
Carnivore
Tertiary Consumer
Carnivore
Nutrients
Decomposer

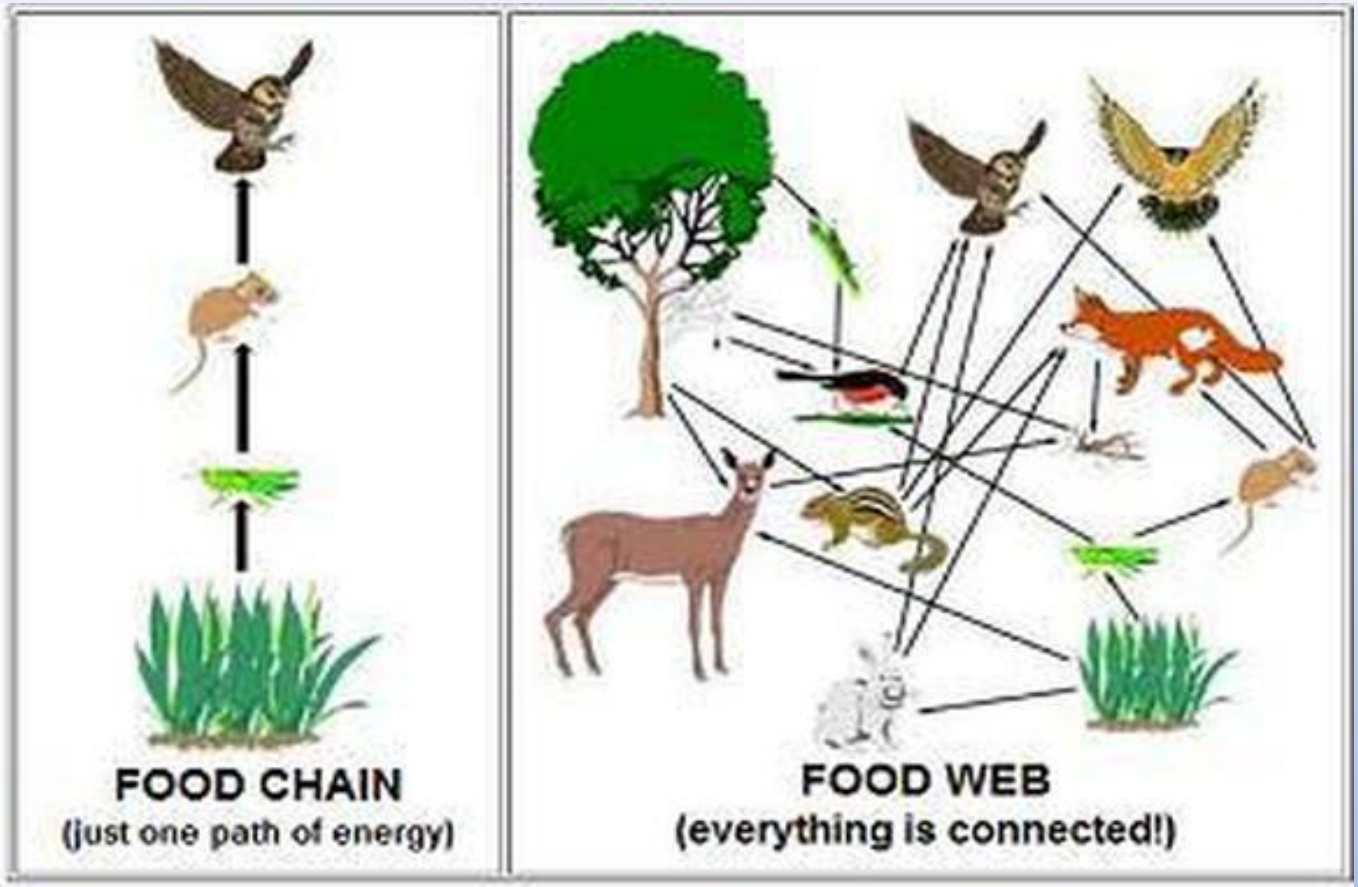
Types of Food Chain

1. **Grazing Food Chain –**
   - Starts with green plants and ends in carnivores
   - Most of the food chains in all the ecosystem are GFC.
2. **Detritus Food Chain –**
   - Starts with dead organic matter consumed by detrivores and decomposers
   - Partially decomposed organic matter and even decomposers are consumed by detrivores

Food Web

- Most animals are part of more than one food chain and eat more than one kind of food in order to meet their food and energy requirements.
- The interconnected food chains operating in an ecosystem which establish a network of relationships between various species form a **food web**.
- This interdependence of the populations within a food chain helps to maintain the balance of plant and animal populations within a community.
- A more complex food web= more stable ecosystem


WildEarthLab.com
tertiary consumers
4th trophic level
secondary consumers
3rd trophic level
primary consumers
2nd trophic level
producers
1st trophic level
decomposers



In the food chain, if one species gets affected, then species in all trophic levels are also affected. Whereas, in the food web, if one species gets affected, other species don’t get affected.

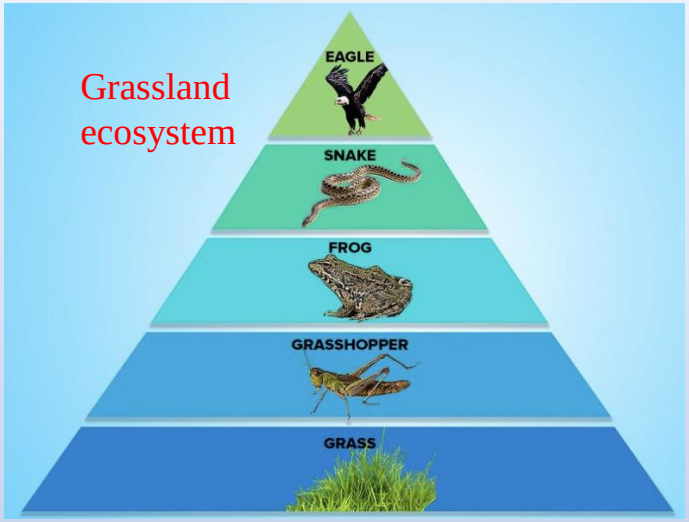
Ecological Pyramid

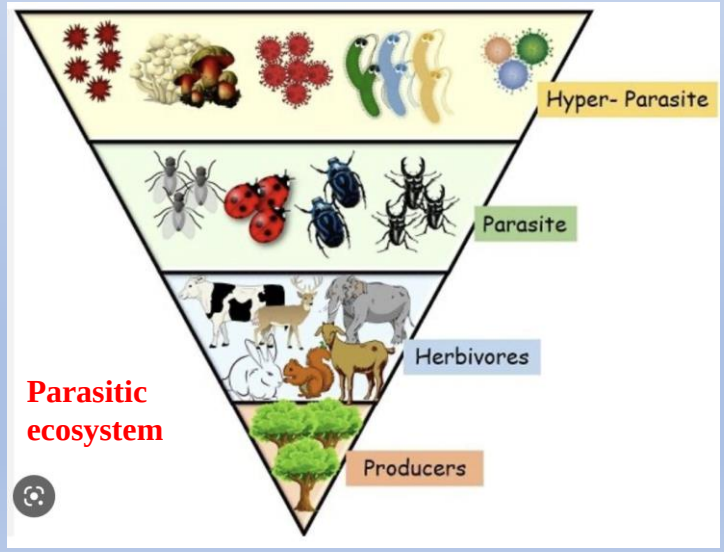
- The graphical presentation of structure and function of trophic levels of an ecosystem.
- The first or producer level constitutes the base of the pyramid and the successive levels, the tiers making the apex.
- Types-

1. Pyramid of numbers refers to number of individual organisms at each level.
2. Pyramid of biomass refers to total dry weight of total amount of living matter.
3. Pyramid of energy shows the rate of energy flow at successive energy level.

Pyramid of Number

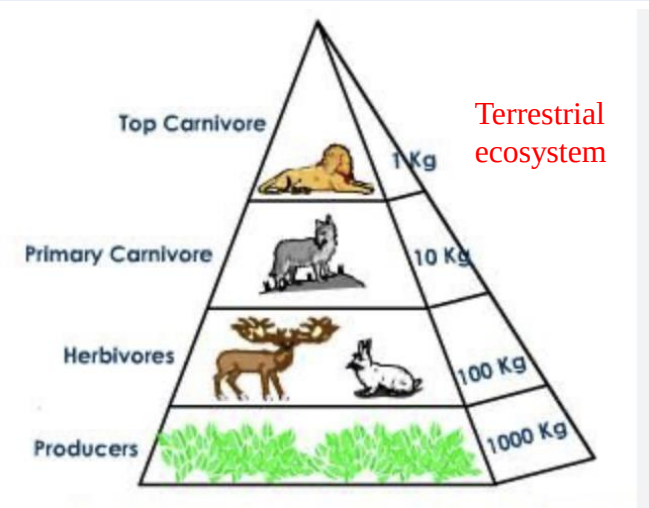
- Relationship between producers, herbivores and carnivores at successive trophic levels in terms of their numbers.
- Generally upright except in the parasitic food chain, where it is inverted

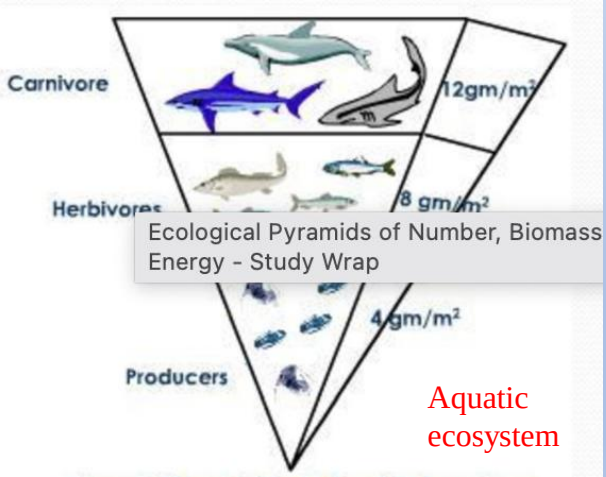




Pyramid of Biomass

- Each level takes into account the amount of biomass (living weight) produced by each trophic level.
- Generally upright except for aquatic ecosystems, where large numbers of zooplanktons depend on a relatively smaller number of phytoplanktons (inverted).



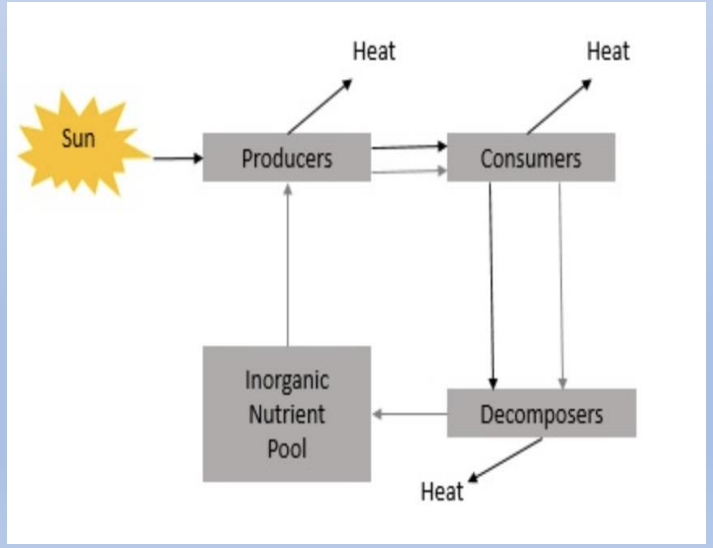


Pyramid of Energy

- It is a picture of the rates of passage of food mass through food chains. So its shape is always upright.
- There is always a gradual decrease in the energy content at successive trophic levels (10% Law- Raymond Lindeman)

Energy Flow in an Ecosystem

- The cycle of energy is based on the flow of energy through different trophic levels in an ecosystem. (Calorific flow)
- The primary source of energy is solar energy.
- The energy flow takes place via the food chain and food web.
- **Process of energy flow in the ecosystem-**
- Plants absorb sunlight and transform it into chemical energy in the process of photosynthesis.
- This chemical energy is stored in the plants and is passed on to the primary consumers in the food chain when the herbivores consume the plants, followed by the secondary consumers. Thus, the energy flow is unidirectional in nature.



- This energy flow is based on two different laws of thermodynamics:
- The first law of thermodynamics, states that energy can neither be created nor destroyed, it can only change from one form to another.
- The second law of thermodynamics, states that as energy is transferred more and more of it is wasted.
- Moreover, in a food chain, the energy flow follows the 10 percent law. According to this law, only 10 percent of energy is transferred from one trophic level to the other; rest is lost into the atmosphere.

Thank You