

# What is an Ecosystem? Structure and Function of Ecosystem , Energy Flow in an Ecosystem: Food Chains, Food web and Ecological Succession

# What is an Ecosystem?

- ▶ The term 'eco' refers to a part of the world and 'system' refers to the co-ordinating units. An ecosystem is a community of organisms and their physical environment interacting together. Environment involves both living organisms and the non-living physical conditions. These two are inseparable but inter-related. The living and physical components are linked together through nutrient cycles and energy flows.

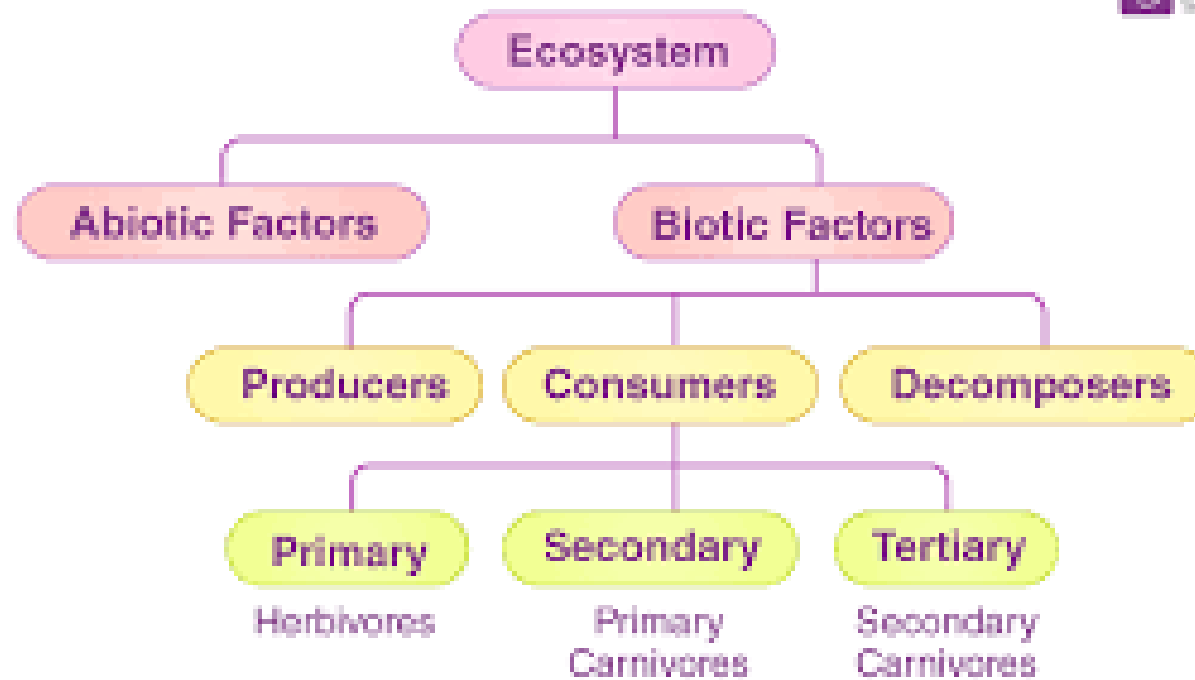
An ecosystem includes all the living things (plants, animals and organisms) in a given area, interacting with each other, and with their non-living environments (weather, earth, sun, soil, climate, atmosphere). In an ecosystem, each organism has its own niche or role to play.

- ▶ Sir Arthur George Tansley (1871 –1955) was an English botanist who introduced the concept of the ecosystem into biology



# STRUCTURE OF ECOSYSTEM

- ▶ The structure of an ecosystem is characterised by the organisation of both biotic and abiotic components. This includes the distribution of energy in our environment. It also includes the climatic conditions prevailing in that particular environment.
- ▶ The structure of an ecosystem can be split into two main components, namely:
  - Biotic Components
  - Abiotic Components
- ▶ The biotic and abiotic components are interrelated in an ecosystem. It is an open system where the energy and components can flow throughout the boundaries



# Structure of Ecosystem

- ▶ **Biotic Components:** Biotic components refer to all life in an ecosystem. Based on nutrition, biotic components can be categorised into autotrophs, heterotrophs and saprotrophs (or decomposers).
- ▶ • Producers include all autotrophs such as plants. They are called autotrophs as they can produce food through the process of photosynthesis. Consequently, all other organisms higher up on the food chain rely on producers for food.
- ▶ • Consumers or heterotrophs are organisms that depend on other organisms for food. Consumers are further classified into primary consumers, secondary consumers and tertiary consumers.
- ▶ • Primary consumers are always herbivores that they rely on producers for food. • Secondary consumers depend on primary consumers for energy. They can either be a carnivore or an omnivore.

- ▶ • Tertiary consumers are organisms that depend on secondary consumers for food. Tertiary consumers can also be an omnivore.
- ▶ • Quaternary consumers are present in some food chains. These organisms prey on tertiary consumers for energy. Furthermore, they are usually at the top of a food chain as they have no natural predators.
- ▶ • Decomposers include saprophytes such as fungi and bacteria. They directly thrive on the dead and decaying organic matter. Decomposers are essential for the ecosystem as they help in recycling nutrients to be reused by plants.
- ▶ **Abiotic components** are the non-living component of an ecosystem. It includes air, water, soil, minerals, sunlight, temperature, nutrients, wind, altitude, turbidity, etc.

# Functions Of Ecosystem

- ▶ The functions of the ecosystem are as follows:
- ▶ 1. It regulates the essential ecological processes, supports life systems and renders stability.
- ▶ 2. It is also responsible for the cycling of nutrients between biotic and abiotic components.
- ▶ 3. It maintains a balance among the various trophic levels in the ecosystem.
- ▶ 4. It cycles the minerals through the biosphere.
- ▶ 5. The abiotic components help in the synthesis of organic components that involves the exchange of energy.

# Energy Flow in an Ecosystem: Food Chains, Food web and Ecological Succession

## ► 1. Food Chain:

- Food Chain The sun is the ultimate source of energy on earth. It provides the energy required for all plant life. The plants utilise this energy for the process of photosynthesis, which is used to synthesise their food. During this biological process, light energy is converted into chemical energy and is passed on through successive levels. The flow of energy from a producer, to a consumer and eventually, to an apex predator or a detritivore is called the food chain.



- Dead and decaying matter, along with organic debris, is broken down into its constituents by scavengers. The reducers then absorb these constituents. After gaining the energy, the reducers liberate molecules to the environment, which can be utilised again by the producers.



## ► A classic example of a food chain in an ecosystem

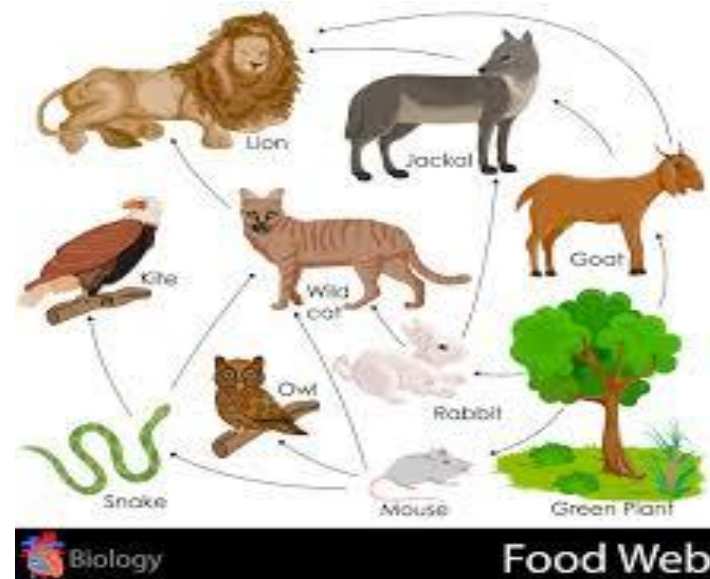
- The food chain is an ideal representation of flow of energy in the ecosystem.
- In food chain, the plants or producers are consumed by only the primary consumers, primary consumers are fed by only the secondary consumers and so on.
- The producers that are capable to produce their own food are called autotrophs.
  - Any food chain consists of three main tropic levels, viz., producers, consumers and decomposers.
- The energy efficiency of each tropic level is very low. Hence, shorter the food chain greater will be the accessibility of food.
- The typical food chain in a ground ecosystem proceeds as grass  
mouse————-> snake ———-> hawk.
- Food webs are more complex and are interrelated at different tropic levels.
- Organisms have more than one choice for food and hence can survive better
  - Hawks don't restrict their food to snakes, snakes eat animals other than mice, and mice eat grass as well as grasshoppers, and so on.
- A more realistic illustration of feeding habits in an ecosystem is called a food web.

## ► Food web

- Charles Elton presented the food web concept in year 1927, which he termed as food cycle.
- Charles Elton described the concept of food web as
  - The carnivore animals prey on the herbivores.
  - These herbivores obtain the energy from sunlight.
  - The later carnivores may also be preyed upon by other carnivores.
  - Until a reach where an animal has no enemies it forms a terminus on this food cycle.
- There are chains of animals that are related together by food, and all are dependent on plants in the long run.
  - This is termed as a food chain and all the food chains in a community is known as the food web.
  - A food web is a graphical depiction of feeding connections among species of an ecological community

- Food web includes food chains of a particular ecosystem.
- The food web is an illustration of various techniques of feeding that links the ecosystem.
  - The food web also explains the energy flow through species of a community as a result of their feeding relationships.
  - All the food chains are interconnected and overlapping within an ecosystem and they constitute a food web.
  - In natural environment or an ecosystem, the relationships between the food chains are interrelated.
  - These relationships are very complex, as one organism may be a part of multiple food chains.
- Hence, a web like structure is formed in place of a linear food chain.
  - The web like structure is formed with the interlinked food chain and such matrix that is interconnected is known as a food web.
  - Food webs are an inseparable part of an ecosystem; these food webs permit an organism to obtain food from more than one type of organism of the lower trophic level

# FOOD WEB



## ► Ecological Succession:

- Ecological Succession is a process through which ecosystems tend to change over a period of time. Succession can be related to seasonal environmental changes, which create alterations in the community of plants and animals living in the ecosystem. Other successional events may take much longer time periods of time, extending to several decades.
- When stripped of its original vegetation by fire, flood, or glaciation, an area of bare ground does not remain devoid of plants and animals. Beginning with plants, area is rapidly colonized by a variety of both plant and animal species that subsequently modify one or more environmental factors. This modification of the environment may in turn allow additional species to become established. The transitional series of communities which develop in a given area are called sere or seral stages, while the final stable and mature community is called the climax. The development of the community by the action of vegetation on the environment leading to the establishment of new species is termed succession. Succession is the universal process of directional change in vegetation during ecological time. It can be recognized by the progressive change in the species composition of the community. Retrogression in community development does not occur unless succession is disturbed or halted by fire, grazing, scraping or erosion.

Thank You...

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