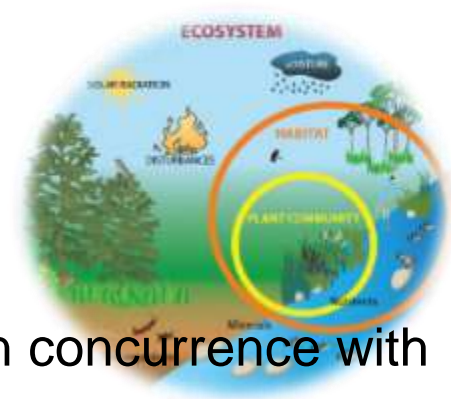




Ecosystems

Prof. D. R. Borhade

Introduction :



- An ecosystem is defined as a community of life forms in concurrence with non-living components, interacting with each other.”
- The ecosystem is the structural and functional unit of ecology where the living organisms interact with each other and the surrounding environment.
- In other words, an ecosystem is a chain of interaction between organisms and their environment.
- The term “Ecosystem” was first coined by A.G.Tansley, an English botanist, in 1935.

Types of Ecosystem

➤ An ecosystem can be as small as an oasis in a desert, or as big as an ocean, spanning thousands of miles.

➤ There are two types of ecosystem:

1) Terrestrial Ecosystem

2) Aquatic Ecosystem

1) Terrestrial Ecosystems :

➤ Terrestrial ecosystems are exclusively land-based ecosystems. There are different types of terrestrial ecosystems distributed around various geological zones.

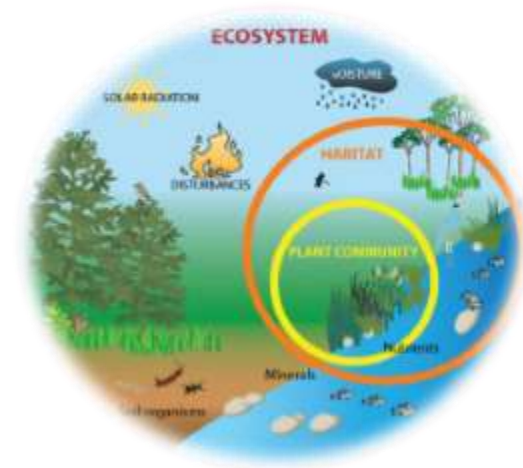
➤ They are as follows:

a) Forest Ecosystems

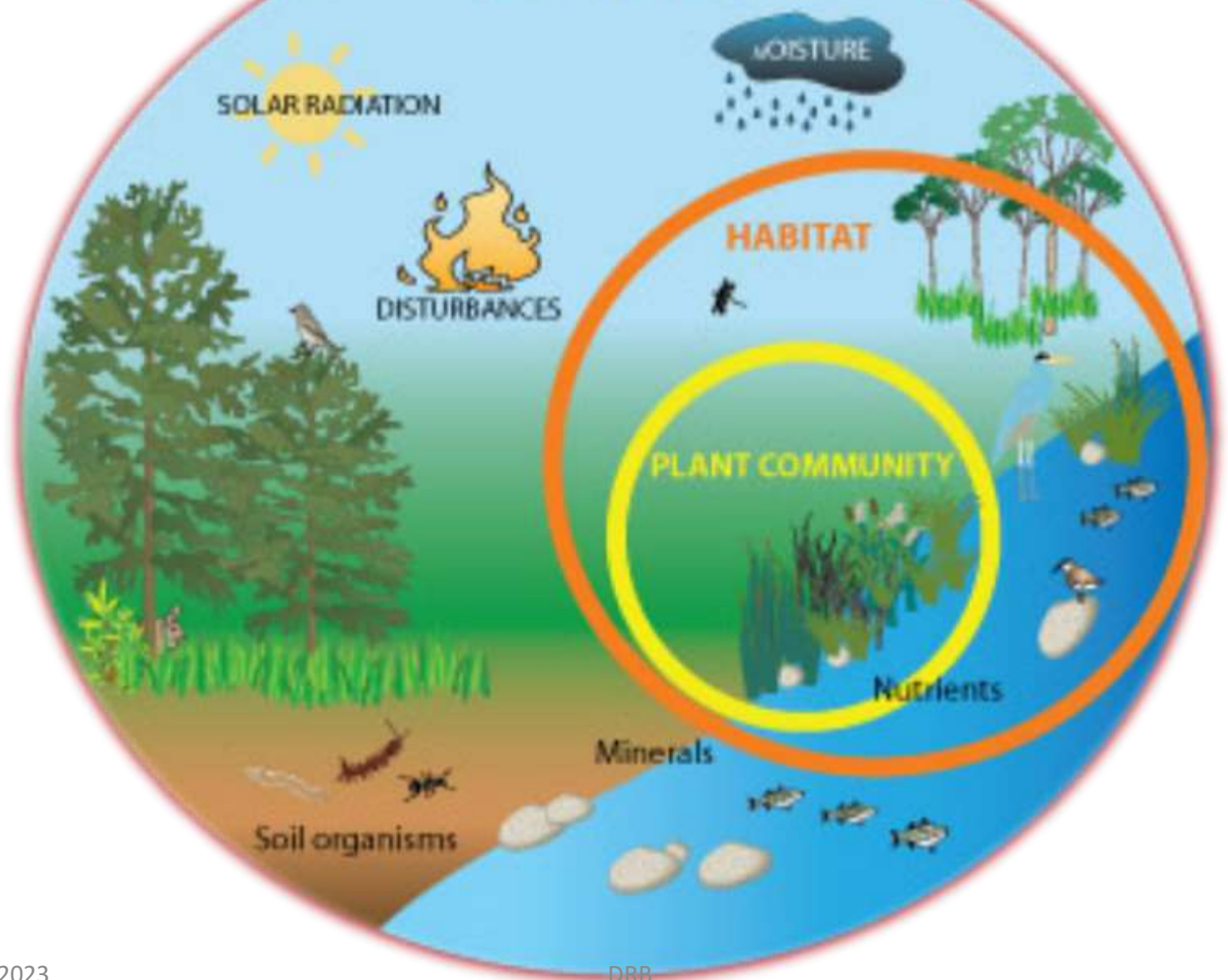
b) Grassland Ecosystems

c) Tundra Ecosystems

d) Desert Ecosystem



ECOSYSTEM



a)Forest Ecosystem

➤A forest ecosystem consists of several plants, animals and microorganisms that live in coordination with the abiotic factors of the environment. Forests help in maintaining the temperature of the earth and are the major carbon sink

b)Grassland Ecosystem

➤In a grassland ecosystem, the vegetation is dominated by grasses and herbs. Temperate grasslands, savanna grasslands are some of the examples of grassland ecosystems.

c)Tundra Ecosystem

➤Tundra ecosystems are devoid of trees and are found in cold climates or where rainfall is scarce. These are covered with snow for most of the year. The ecosystem in the Arctic or mountain tops is tundra type.

d)Desert Ecosystem

➤Deserts are found throughout the world. These are regions with very little rainfall. The days are hot and the nights are cold.

2)Aquatic Ecosystem

Aquatic ecosystem are ecosystems present in a body of water.

These can be further divided into two types, namely:

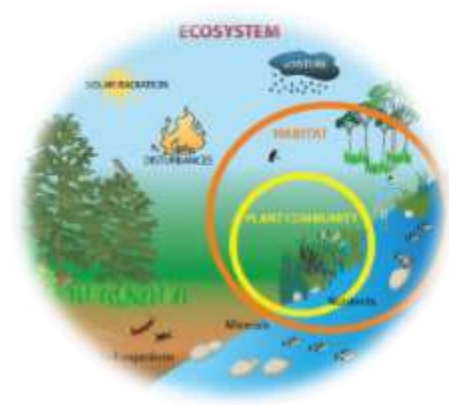
- a)Freshwater Ecosystem
- b)Marine Ecosystem

a)Freshwater Ecosystem

The freshwater ecosystem is an aquatic ecosystem that includes lakes, ponds, rivers, streams and wetlands. These have no salt content in contrast with the marine ecosystem.

b)Marine Ecosystem

The marine ecosystem includes seas and oceans. These have a more substantial salt content and greater biodiversity in comparison to the freshwater ecosystem.



Structure of the Ecosystem

- The structure of an ecosystem is characterized by the organization 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.

Ecosystem

Abiotic Factors

Biotic Factors

Producers

Consumers

Decomposers

Primary
(Herbivores)

Secondary
(Pri. Carnivores)

Tertiary
(Sec. Carnivores)

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.

• *Continued*

• **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

- 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:

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

Terrestrial Ecosystem : -

Forest Ecosystem :

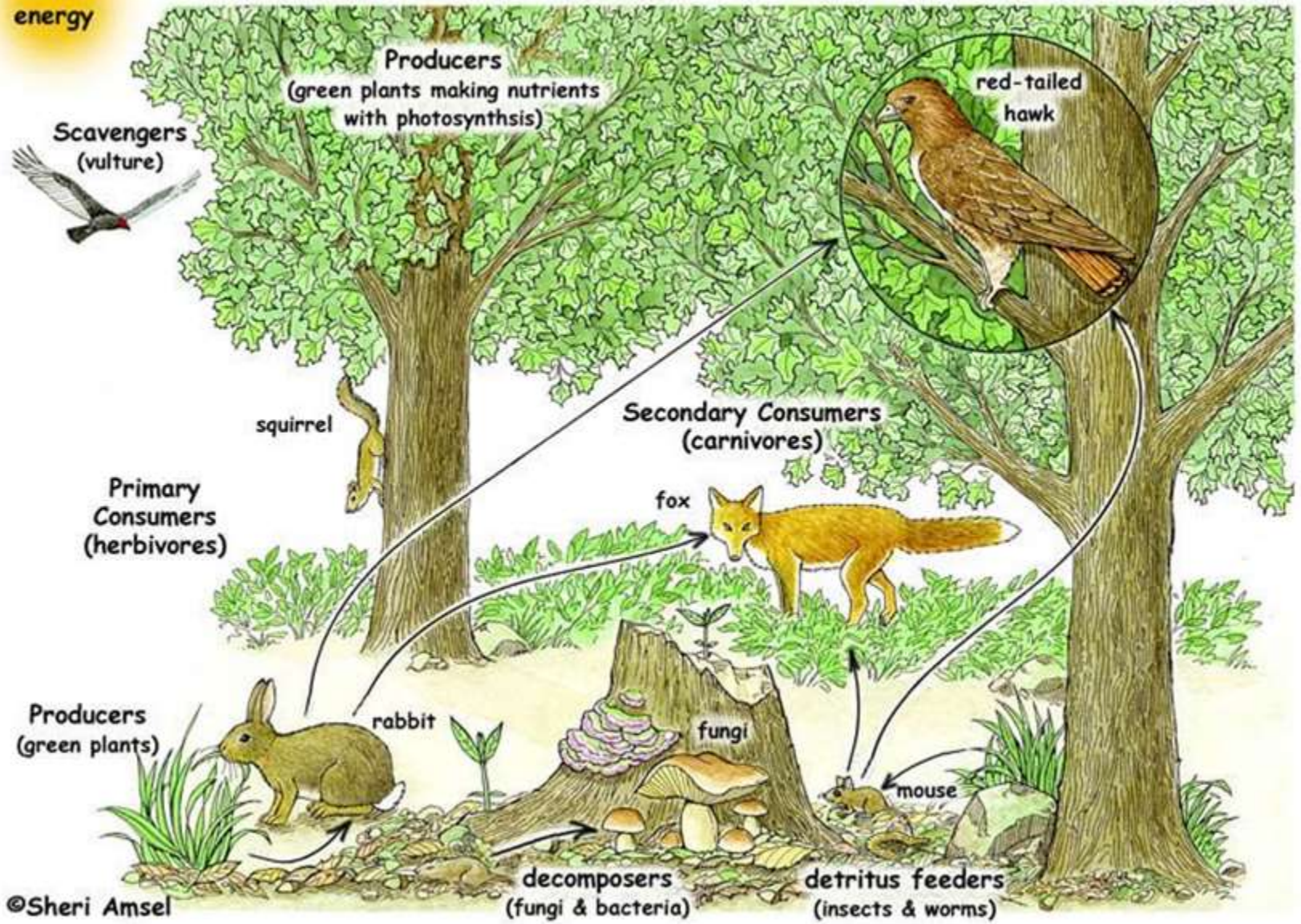
- Study of interdependent relations of flora and fauna in a forest is termed as Forest Ecosystem.
- In such ecosystems, the entire interaction happens naturally between all abiotic and biotic components.
- The ecological potential of any species depends on their habitat requirements like temperature, climate, frugality, their lifespan and, reproducing capacity.

Types of Forest Ecosystem

- a) Temperate Forest Ecosystem
- b) The Tropical Rainforest Ecosystem
- c) Boreal or Taiga Forests

Forest Ecosystem

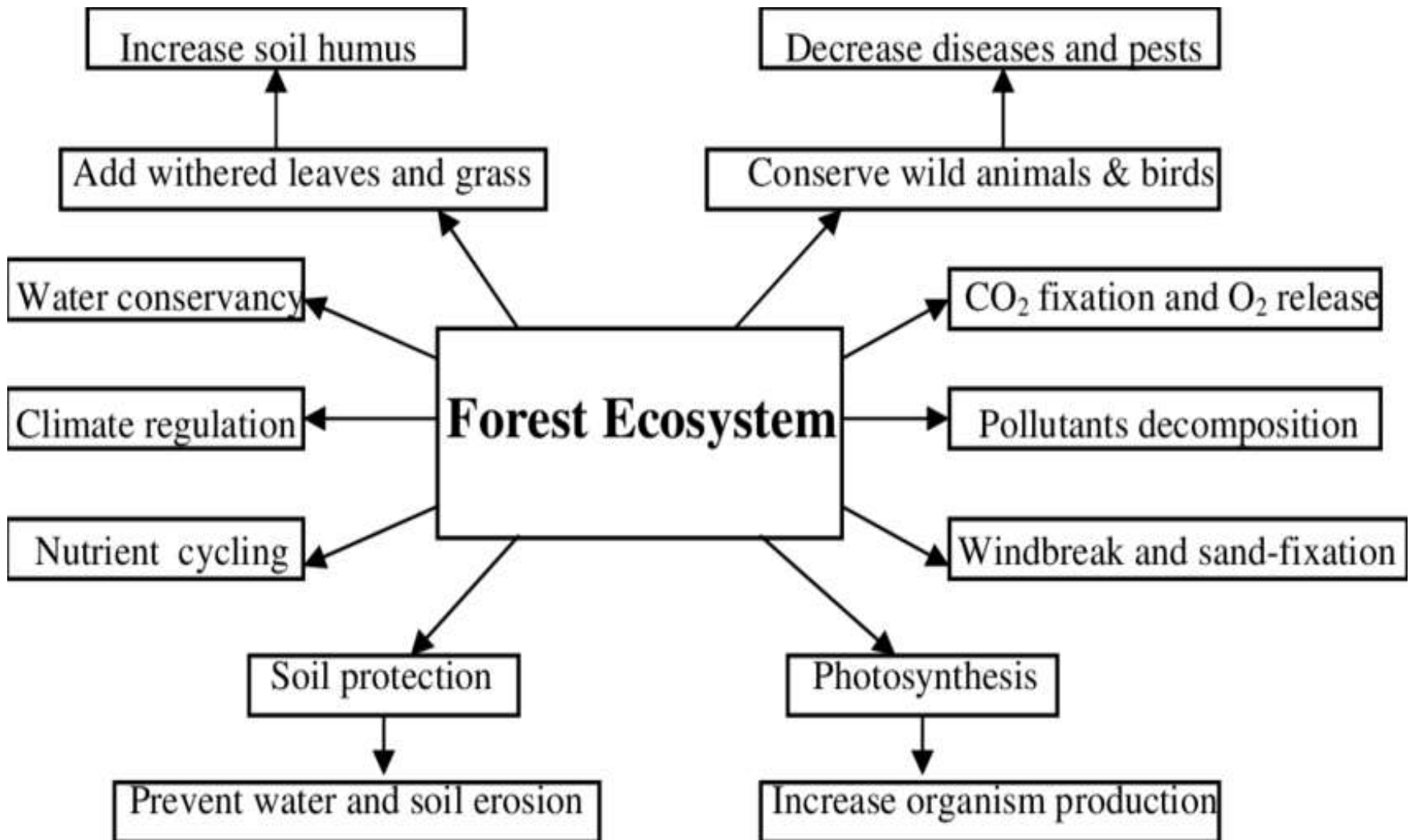
solar energy



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- There are **Producers** who prepare food for the entire forest ecosystem.
- Trees and plants are thus called the primary producers.
- **Consumers** are the one who cannot produce their own food and thus depend on producers for their food and energy sources.
- Organisms that only eat plants are referred to as primary consumers.
- For example, herbivores such as deer and rabbits are primary consumers.
- Secondary consumers feed on herbivores and are called as Carnivores.
- Omnivores are the consumers that feed both on plant and animals.
- Organisms like worms, microbes, fungi, ants, and other bugs are called **Decomposers** as they break down the plant and animal wastes into small particles which ultimately blends with the environment.
- Human beings are omnivores as they feed on both flora and fauna and thus are a part of this forest ecosystem.

Functions of Forest Ecosystem



Grassland Ecosystem

Grassland Ecosystem is an area where the vegetation is dominated by grasses and other herbaceous (non-woody) plants.

It is also called transitional landscape because grassland ecosystems are dominated by the grass with few or no trees in the area where there is not enough for a forest and too much of a forest.

Components of Grassland Ecosystem

The components of the Grassland Ecosystem are discussed below:

- 1. Abiotic Components:** These are non-living thing components consist of carbon, hydrogen, sulphur, nitrogen and phosphorous etc.
- 2. Biotic Components:** These are living components and its sub-components are discussed below-
 - (I) Producers:** The primary producers of food are the grasses such as **Aristida, Cynodon, Digitaria, Desmodium, Setaria** etc. If herbs and shrubs are present, they also contribute to the primary production of food.

(II) Consumers: The consumers in a grassland ecosystem are of three levels.

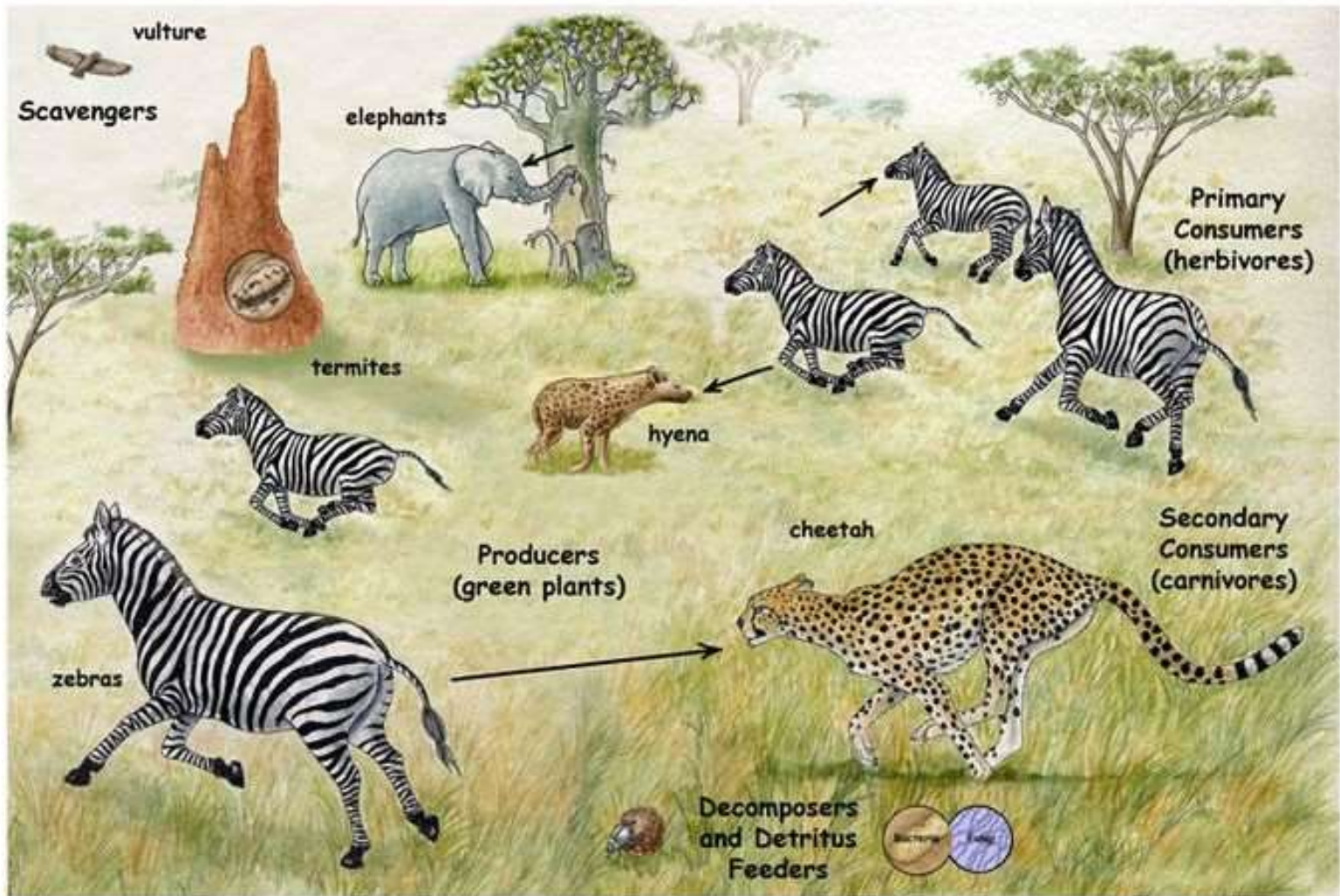
(a) Primary consumers: These feed directly from the grasses (grazing) and include herbivores such as **Cows, Buffaloes, Goats, Rabbits, Mouse** etc. and also **insects, termites, centipede, millipedes** etc.

(b) Secondary consumers: These consumers are the carnivorous animals such as snakes, lizard, jackal, foxes, frogs etc. which feed on the primary consumers.

(c) Tertiary consumers: Hawk, Eagles and vultures constitute the tertiary consumer in the grassland ecosystem which preys upon the secondary and primary consumer.

(III) Decomposers: The organic matter of the grassland is decomposed by the microbes like actinomycetes, fungi (Mucor, Aspergillus, Rhizopus, Penicillium, and Cladosporium), aerobic and anaerobic soil bacteria etc. They release the minerals back into the soil thus making the soil fertile.

Grassland Ecosystem



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Desert Ecosystem :

(A) Abiotic Component:

The abiotic component includes the nutrients present in the soil and the aerial environment. The characteristic feature of the abiotic component is lack of organic matter in the soil and scarcity of water

(B) Biotic Component:

(a) Producer

The producers are mainly shrubs or bushes, some grasses and a few trees. there are many species of plants that survive in the desert.

Most of them are succulents, which mean they store water.

Others have seeds that lay dormant until a rain awakens them.

these plants find a way to get water and protect themselves from the heat.

The most famous desert plant is the cactus

(b) Consumers:

These include animals such as insects and reptiles.

some rodents, birds and some mammalian vertebrates are also found.

Reptiles can withstand the extreme temperatures because they can control their body temperatures very easily.

two categories: snakes and lizards.

mammals like foxes and jackals, kangaroo rat, camels.

(c) Decomposers:

Due to poor vegetation the amount of dead organic matter is very less.

As a result the decomposers are very few.

The common decomposers are some bacteria and fungi, most of which are thermophile.

Desert Ecosystem

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Aquatic Ecosystem :-

Freshwater ecosystem :-

- They cover only a small portion of earth nearly 0.8 per cent.
- Freshwater involves lakes, ponds, rivers and streams, wetlands, swamp, bog and temporary pools.
- Freshwater habitats are classified into lotic and lentic habitats.
- Water bodies such as lakes, ponds, pools, bogs, and other reservoirs are standing water and known as lentic habitats & lotic habitats represent flowing water bodies such as rivers, streams.

- **Lotic Ecosystems :-**

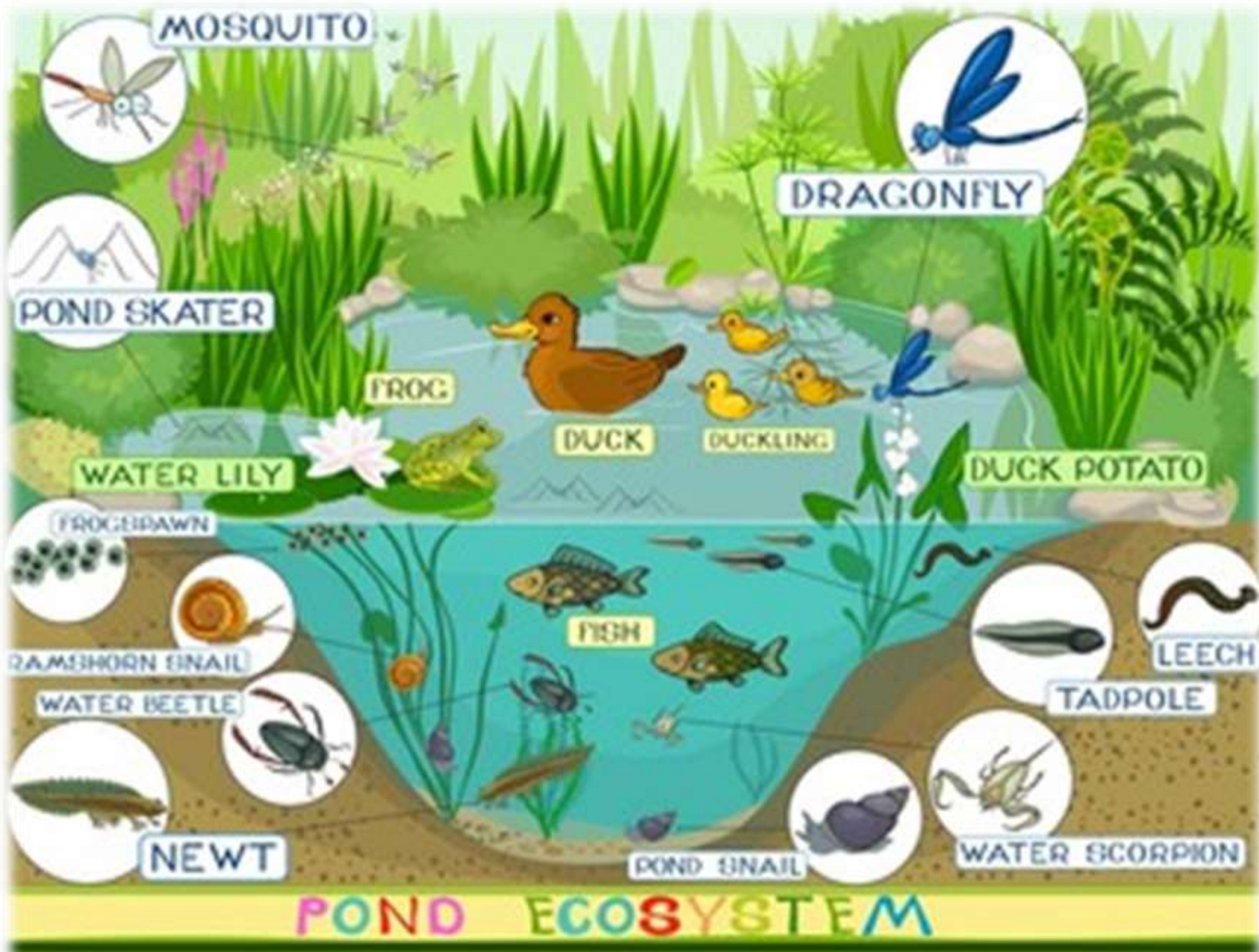
- They mainly refer to **the rapidly flowing waters** that move in a unidirectional way including the rivers and streams.
- These environments harbor numerous species of insects such as beetles, mayflies, stoneflies and several species of fishes including trout, eel, minnow, etc.
- Apart from these aquatic species, these ecosystems also include various mammals such as beavers, river dolphins and otters.

- **Lentic Ecosystems :-**

- They include all **standing water habitats**.
- examples : Lakes and ponds
- lentic - stationary or relatively still water.
- These ecosystems are home to algae, crabs, shrimps, amphibians such as frogs and salamanders, for both rooted and floating-leaved plants and reptiles including alligators and other water snakes are also found here.

- **Wetlands :-**

- Wetlands are **marshy areas** and are sometimes covered in water which has a wide diversity of plants and animals.
- Examples: Swamps, marshes, bogs, black spruce and water lilies are some in the plant species found in the wetlands.
- The animal life of this ecosystem consists of dragonflies and damselflies, birds such as Green Heron and fishes such as Northern Pike.



Marine ecosystems :

- It defined as the interaction of plants, animals, and the marine environment.
- Marine means, the sea or ocean.
- The term encompasses the salty waters of the Earth, and is also known simply as a salt water ecosystem.
- As over 70% of Earth's surface is covered in water, and 97% of that water is salt water, marine ecosystems are the largest types of ecosystems on the planet.
- Shallow and deepest part of sea shows different ecosystem.
- Algae and sea weed are the producers.
- Zooplanktons, invertebrates & vertebrates are the consumers.

