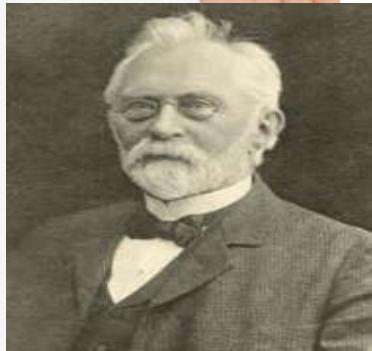
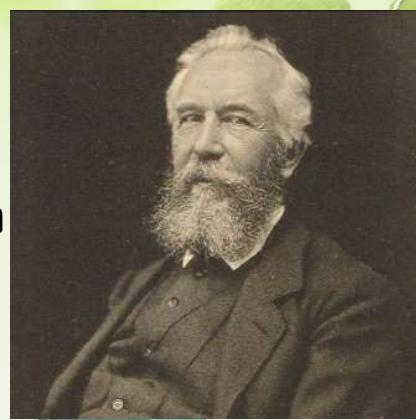


- The meaning of the word ecology was given by German Biologist Haeckel in 1869.
- The word ecology is derived from Greek words 'Oikos' meaning house, habitat or place of living and 'Logos' meaning to study.
- After that.... Danish botanist, Eugenius Warming elaborated the idea of Ecology.



## **Definition**

Ecology is the study of interactions among organism or group of organisms with their environment. The environment consists of both biotic components (living organisms) and abiotic components (non - living organisms).

# Ecology is study of interactions between

**Non-living components in the environment...**

Light

Water

Wind

Nutrients in soil

Heat

Solar radiation

Atmosphere, etc.

**AND...**

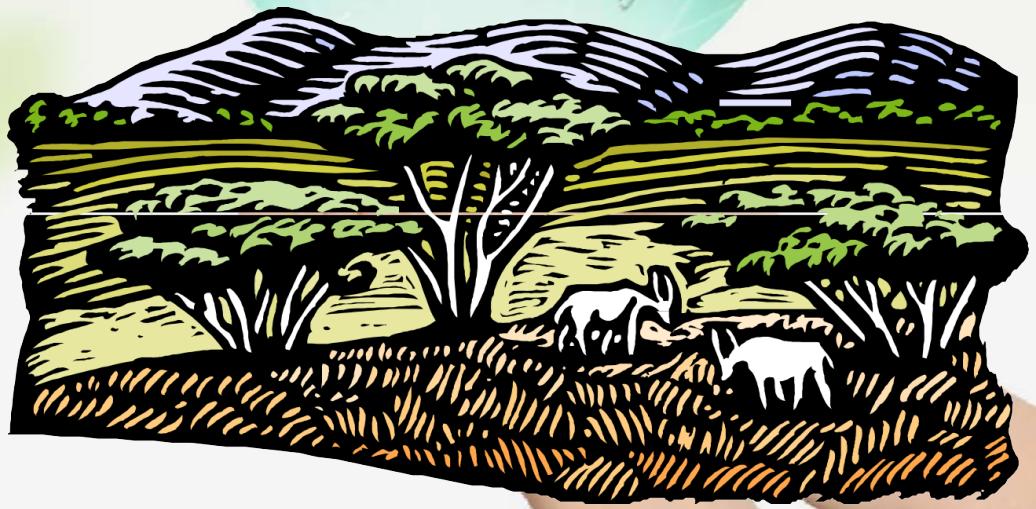


**Living organisms...**

**Plants**

**Animals**

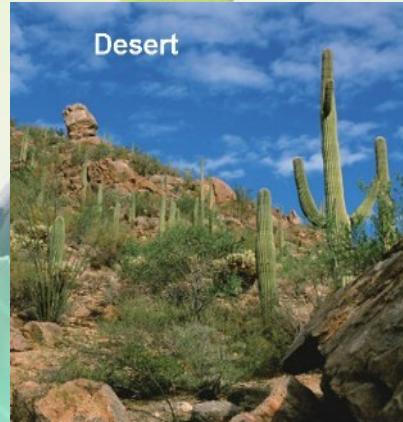
**Microorganisms in soil, etc.**



# Ecosystem

The term Ecosystem was first proposed by A.G. Tansley in 1935.

An ecosystem consists of the biological community that occurs in some locale, and the physical and chemical factors that make up its non-living environment. There are many examples of ecosystems - a pond, a desert, a forest, an estuary, an ocean.



Ecosystem is the basic functional unit of Ecology.

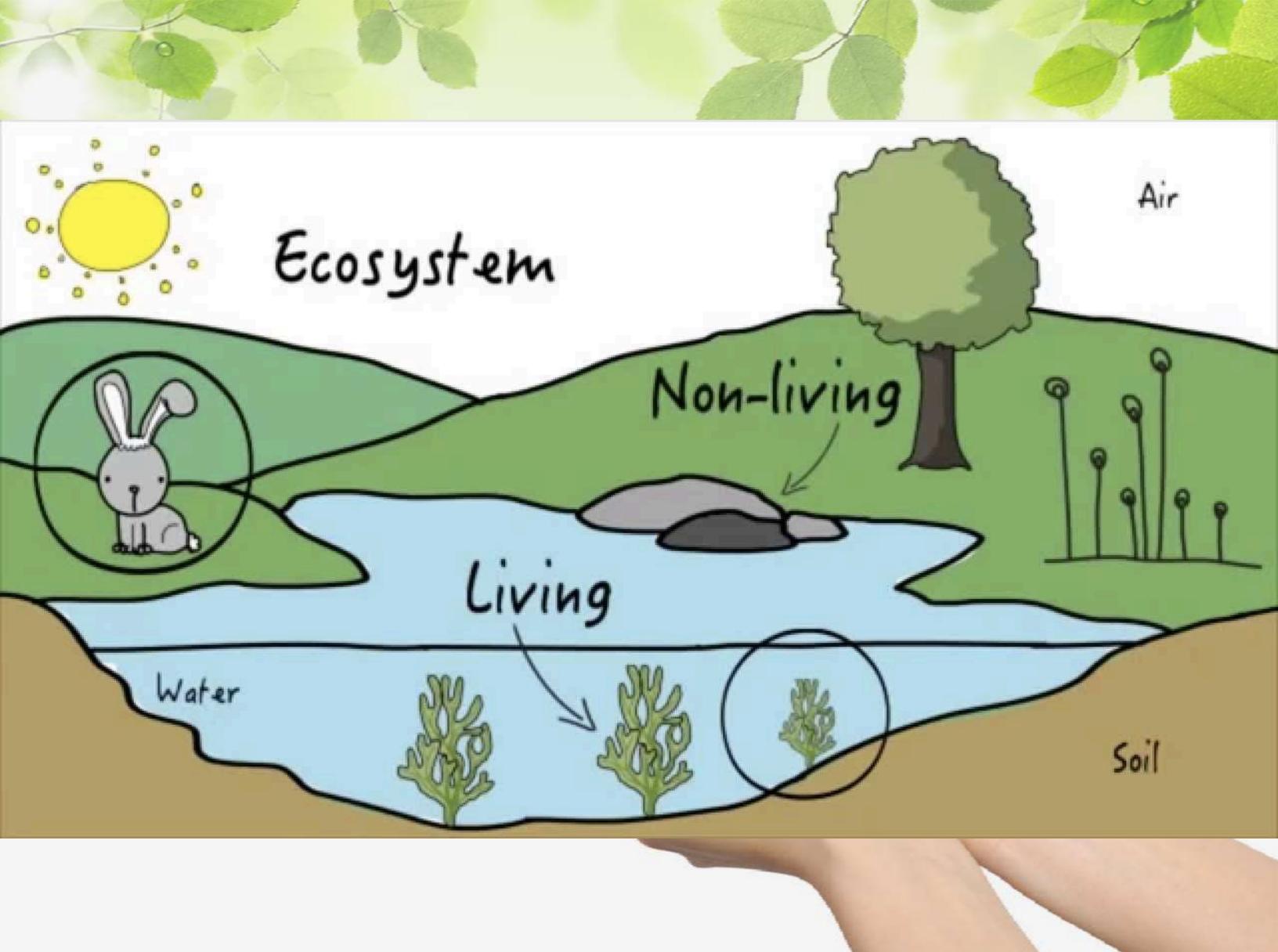
## Definition

A group of organisms interacting among themselves and with environment is known as ecosystem. Thus an ecosystem is a community of different species interacting with one another and with their non living environment exchanging energy and matter.

Ecology is the study of ecosystems.

## Example

Animals cannot synthesis their food directly but depend on the plants either directly or indirectly.



## **STRUCTURE OF AN ECOSYSTEM**

**The term structure refers to the various components of an ecosystem.**

**An ecosystem has two major components**

- **Biotic (living) components**
- **Abiotic (non living) components**

**The living organisms (or) living members in an ecosystem collectively called biotic components (or) biotic community.**

**Ex: Plants, Animals, Microorganisms**



## Classification biotic components

The members of biotic components of an ecosystem are grouped in to three based on how they get food.

- Producer (Plants)
- Consumer (Animals)
- Decomposers (Micro-organisms)

## 1. Producers (Autotrophs)

Producers synthesise their food themselves through photosynthesis

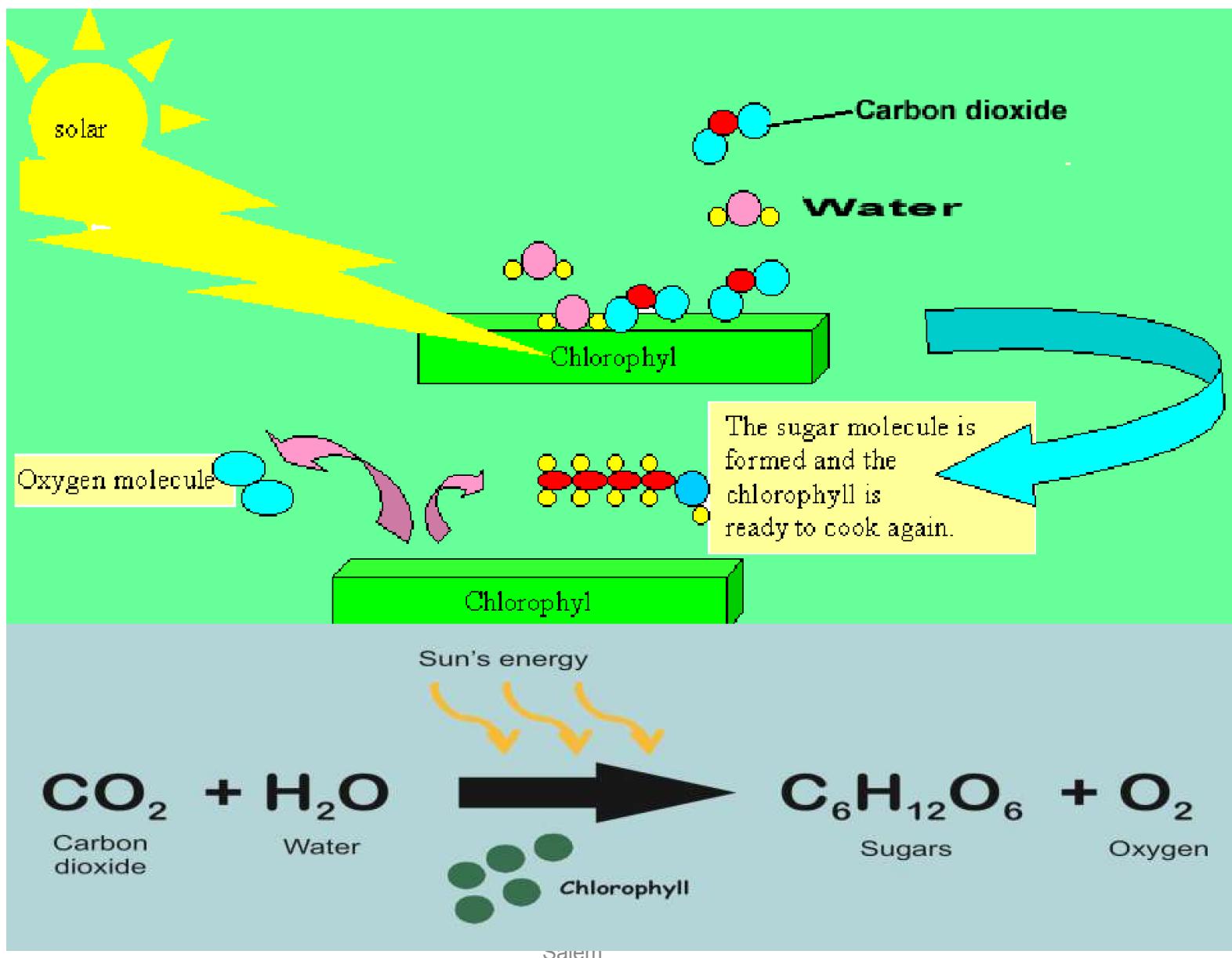
Ex: All green plants, trees.

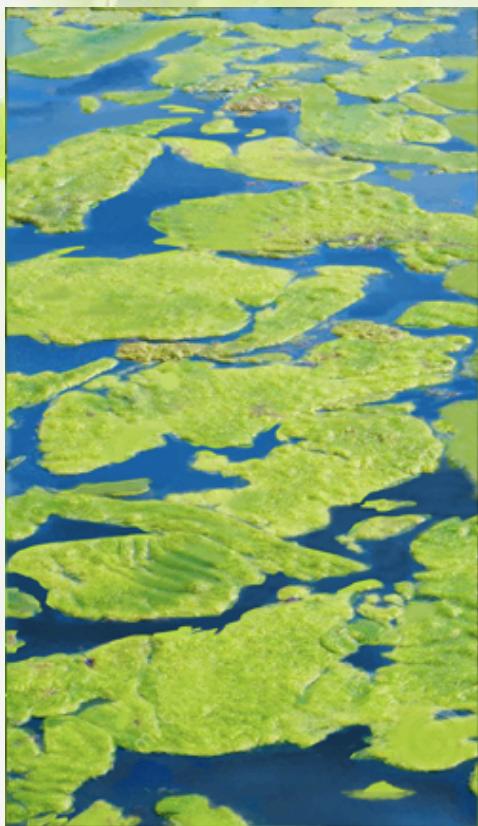
### Photosynthesis

The green pigment called chlorophyll, present in the leaves of plants, converts  $\text{CO}_2$  and  $\text{H}_2\text{O}$  in the presence of sunlight into carbohydrates.



This process is called photosynthesis





Algae



Grass



Trees

2. Consumers also called as Heterotrophs:

Classification of consumers

Consumers are further classified as

(i) Primary consumers or Herbivores or Plant eaters:

Primary consumers are also called herbivores, they directly depend on the plants for their food. So they are called plant eaters.

Examples : Insects, rat, goat, deer, cow etc.

## (ii) Secondary consumers (primary carnivores) (Meat eaters):

Secondary consumers are primary carnivores, they feed on primary consumers. They directly depend on the herbivores for their food.

Ex: Frog, cat, snakes, small birds, etc.,

## (iii) Tertiary consumers (Secondary carnivores) (Meat-eaters)

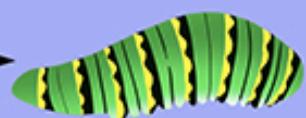
Tertiary consumers are secondary carnivores, they feed on secondary consumers. They depend on the primary carnivores for their food.

Ex: Hawk, Eagle, Tiger, Lion, etc.

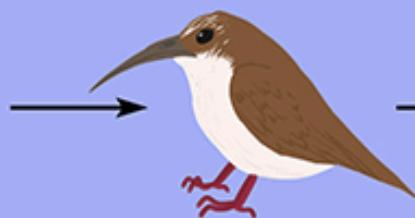
OAK TREE LEAVES



CATERPILLAR



TREECREEPER  
(SMALL BIRD)



HAWK



PRODUCER

PRIMARY  
CONSUMER

SECONDARY  
CONSUMER

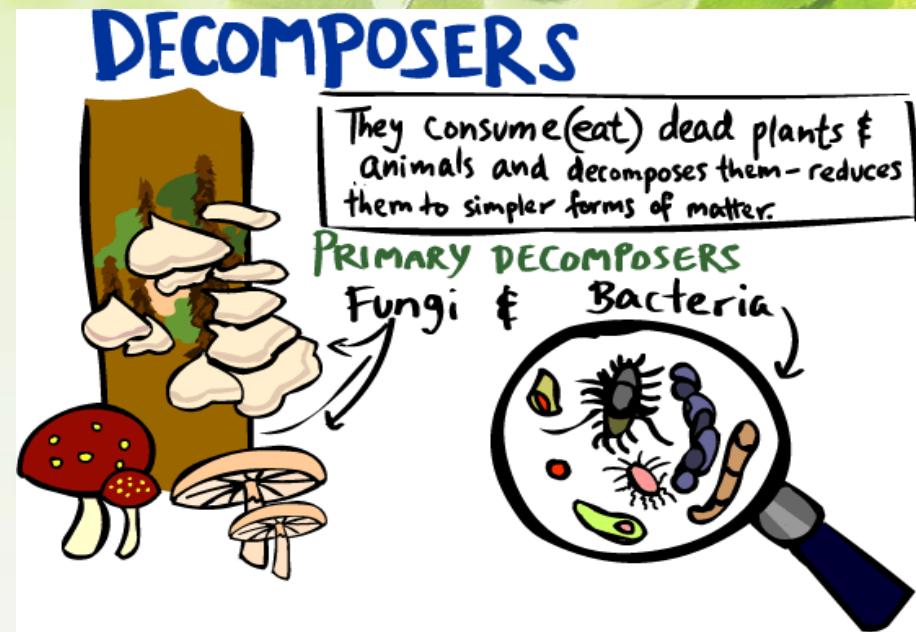
TERTIALY  
CONSUMER



**Omnivore:** Organisms that feed both on plants and animals. Ex: Human, rat, birds.

**Detritivore:** They feed on dead organisms, wastes of living beings and partially decomposed matter. Ex: Termites, earthworm, ants etc.

### 3. Decomposers



Decomposers attack the dead bodies of producers and consumers, and decompose them into simpler compounds. During the decomposition inorganic nutrients are released.

The inorganic nutrients together with other organic substances are then utilised by the producers for the synthesis of their own food.

## **Abiotic (non-living) components**

The non-living components (physical and chemical) of ecosystem collectively form a community called abiotic components (or) abiotic community.

Ex: Climate, soil, water, air, energy etc.,

**1. Physical components:** Include the energy, climate, nutrients and living space that the biological community needs. They are useful for the growth and maintenance of its member.

Ex: Air, water, soil, sunlight, etc.,

**2. Chemical Components:** They are the sources of essential nutrients.

- Organic substances : Protein, lipids, carbohydrates, etc.,
- Inorganic substances: All micro (Al, Co, Zu, Cu) and macro elements (C,H, O, P, N, P, K) and few other elements.



# TYPES OF ECOSYSTEM

**Natural ecosystem:** These operate themselves under natural conditions. Based on habitat types, it can be further classified into three types.

**Terrestrial ecosystem:** This ecosystem is related to land.

Ex: Grassland ecosystem, forest ecosystem, desert ecosystem, etc.,

**Aquatic ecosystem:** This ecosystem is related to water. It is further sub classified into two types based on salt content.

- Fresh water ecosystem

- (a) Running water ecosystems. Ex: Rivers, Streams...
- (b) Standing water ecosystems Ex: Pond, lake...

- Marine ecosystem Ex: Seas and sea shores...

**3. Man - made (or) Artificial ecosystems:** Artificial ecosystem is operated (or) maintained by man himself.

Ex: Croplands, gardens...

## **FUNCTION OF AN ECOSYSTEM**

The function of an ecosystem is to allow flow of energy and cycling of nutrients.

Functions of an ecosystem are of three types.

- **Primary function:** The primary function of all ecosystem is manufacture of starch (photosynthesis).
- **Secondary function:** The secondary function of all ecosystem is distribution energy in the form of food to all consumers.
- **Tertiary Function:** All living systems die at a particular stage. These dead systems are decomposed to initiate third function of ecosystems namely “cycling”.

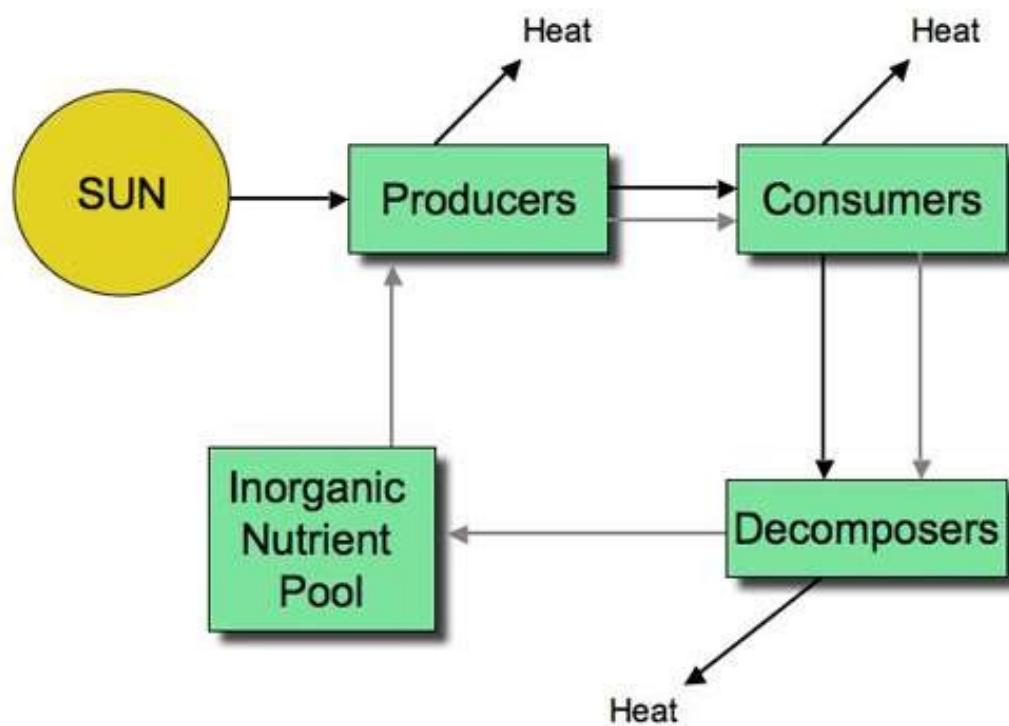
The functioning of an ecosystems may be understood by studying the following terms.

- Energy and material flow.
- Food chains
- Food webs
- Food pyramids



## ENERGY FLOW IN THE ECOSYSTEMS

- Energy is the most essential requirement for all living organisms.
- Solar energy is the only source to our planet earth.
- Solar energy is transformed to chemical energy in photosynthesis by the plants (Primary producers).
- Some amount of chemical energy is used by the plants for their growth and the remaining is transferred to consumers by the process of eating.
- Thus the energy enters the ecosystems through photosynthesis and passes through the different trophic levels or feeding levels.



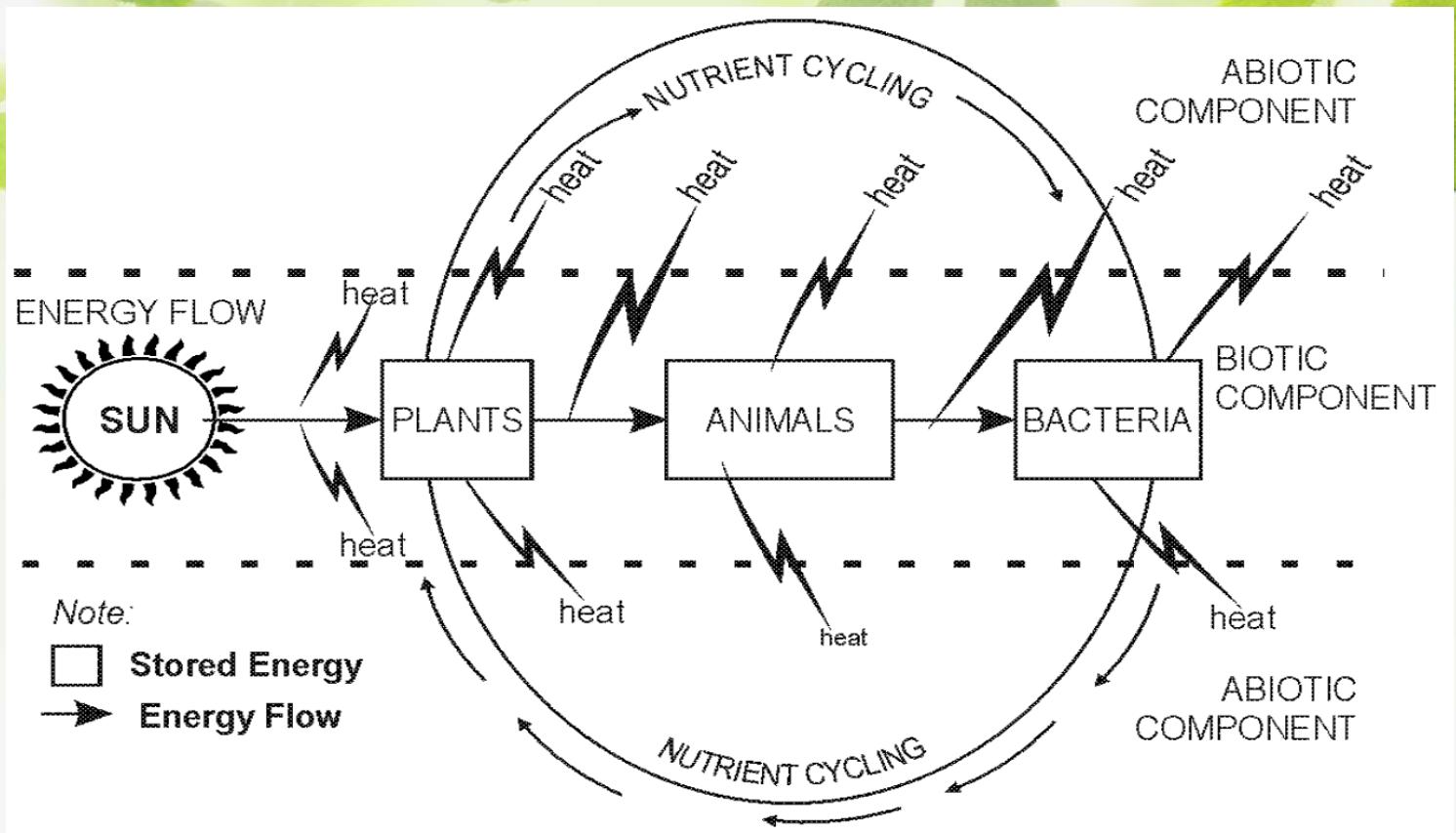
The flow of energy in an ecosystem follows the laws of thermodynamics.

I law of thermodynamics – “Energy neither can be created nor destroyed, but it can be converted from one form to other”.

Energy for an ecosystem comes from the sun. It is absorbed by plants, it is converted into chemical energy. This chemical energy utilised by consumers transform into heat.

II law of thermodynamics – “Whenever energy is transformed, there is a loss of energy through the release of heat”.

Energy is transferred between tropic levels in the form of heat as it moves from one tropic level to another tropic level. The loss of energy takes place through respiration, work, running, hunting etc.,



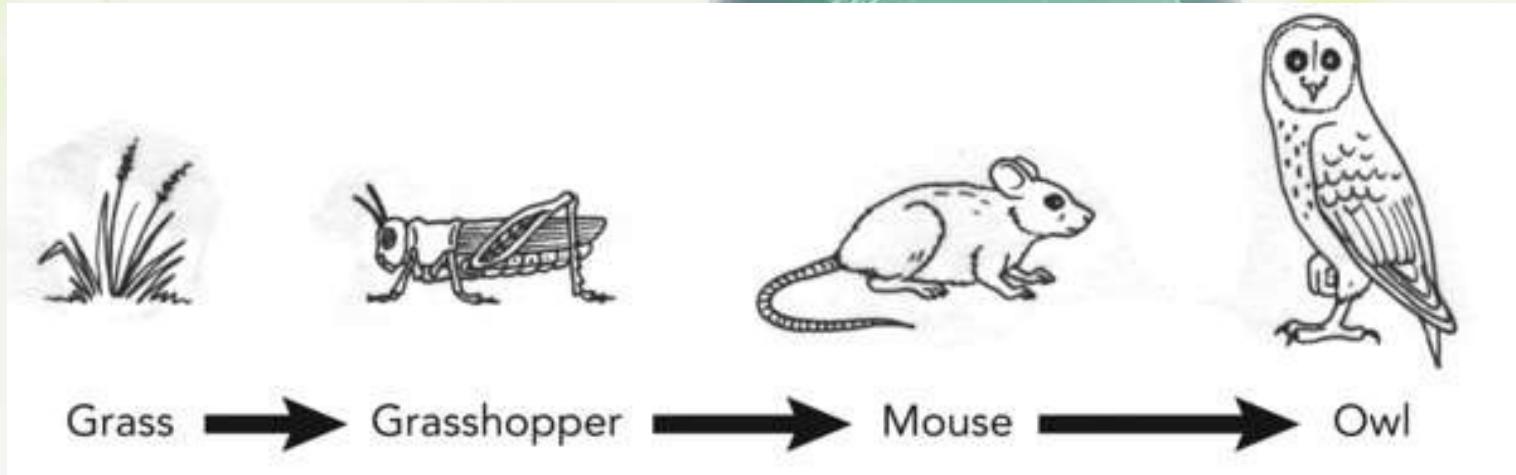
**Flow of energy and nutrient cycling from abiotic to biotic and vice versa.**

# FOOD CHAINS

## Definition

“There sequence of eating and being eaten in an ecosystem is known as food chain” (or) “Transfer of food energy from the plants through a series of organisms is known as food chain”

- A food chain always starts with plant life and ends with animal. When the organisms die, they are all decomposed by microorganism (bacteria and fungi) into nutrients that can again be used by the plants.
- At each and every level, nearly 80-90% of the potential energy gets lost as heat.

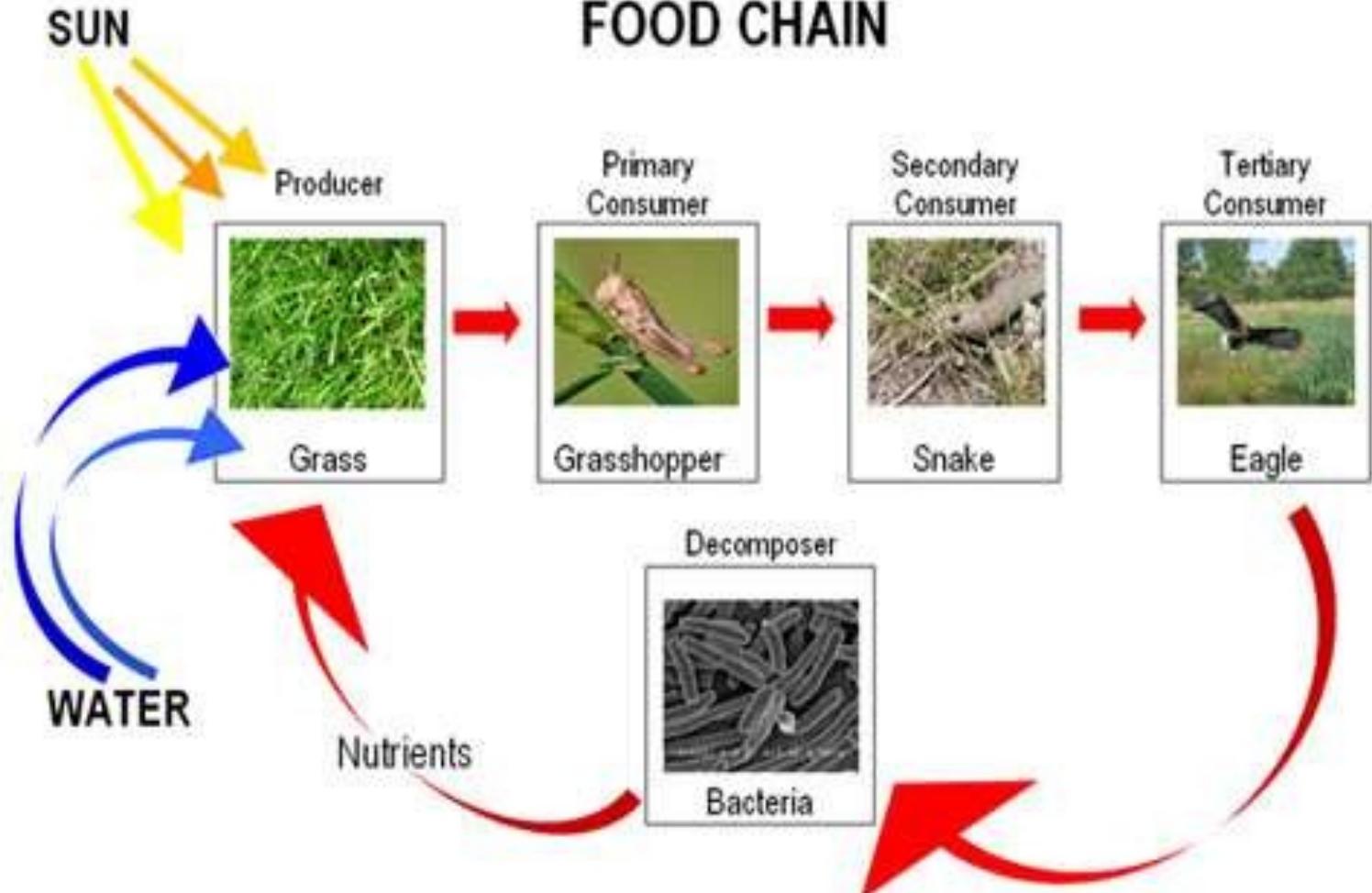


## Tropic Levels (T1,T2, T3, T4, T5) (or) Feeding levels

The various steps through which food energy passes in an ecosystem is called as tropic levels. The tropic levels are arranged in the following way,

- The green plants or producers represent first tropic level T1,
- The herbivores or primary consumers represent second tropic level T2.
- The carnivores or secondary consumers represent third tropic level T3.
- The tertiary consumers are fourth tropic level T4.
- Finally decomposers represent last tropic level T5.

# FOOD CHAIN



Food chains are classified into two main types

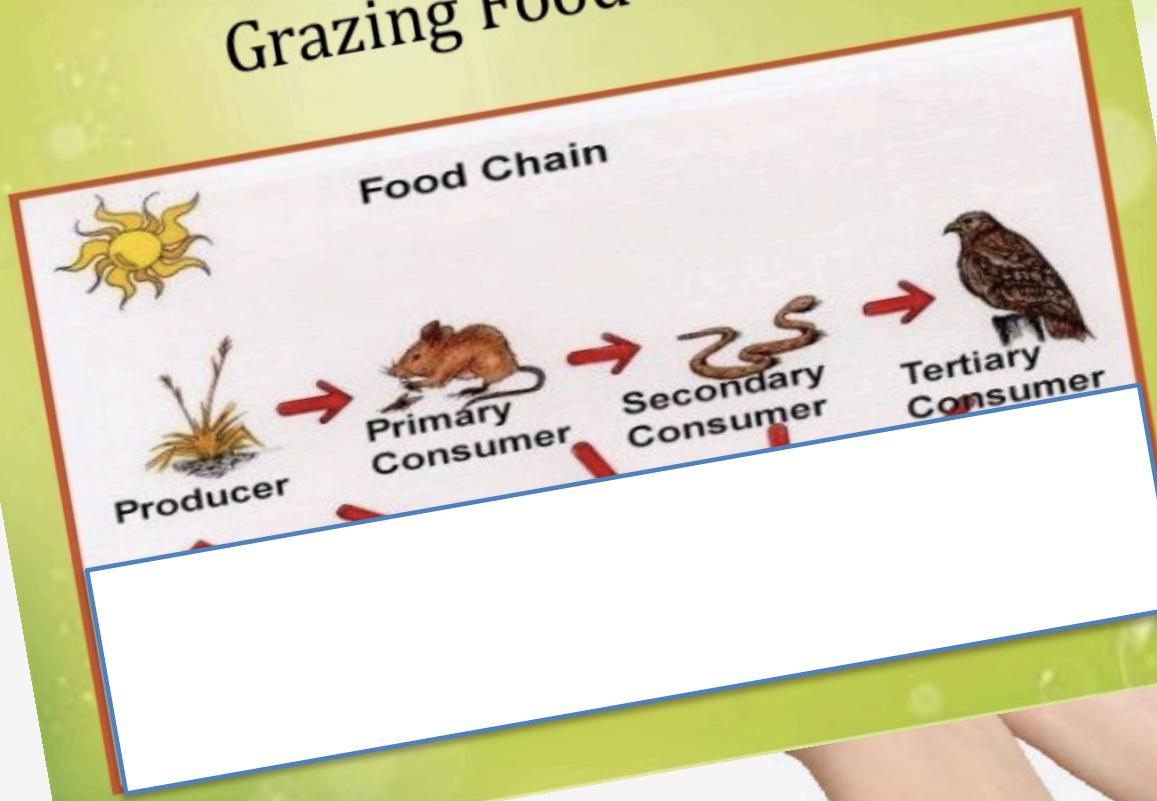
Grazing food chain

Detritus food chain

- Grazing food chain: Found in Grassland ecosystems and pond ecosystems. Grazing food chain starts with green plants (primary producers) and goes to decomposer food chain or detritus food chain through herbivores and carnivores.
- Detritus food chain: Found in Grassland ecosystems and forest ecosystems. Detritus food chain starts with dead organic matter (plants and animals) and goes to decomposer food chain through herbivores and carnivores.

The following diagram shows that grazing food chain and detritus food chain are interconnected to each other but are not isolated.

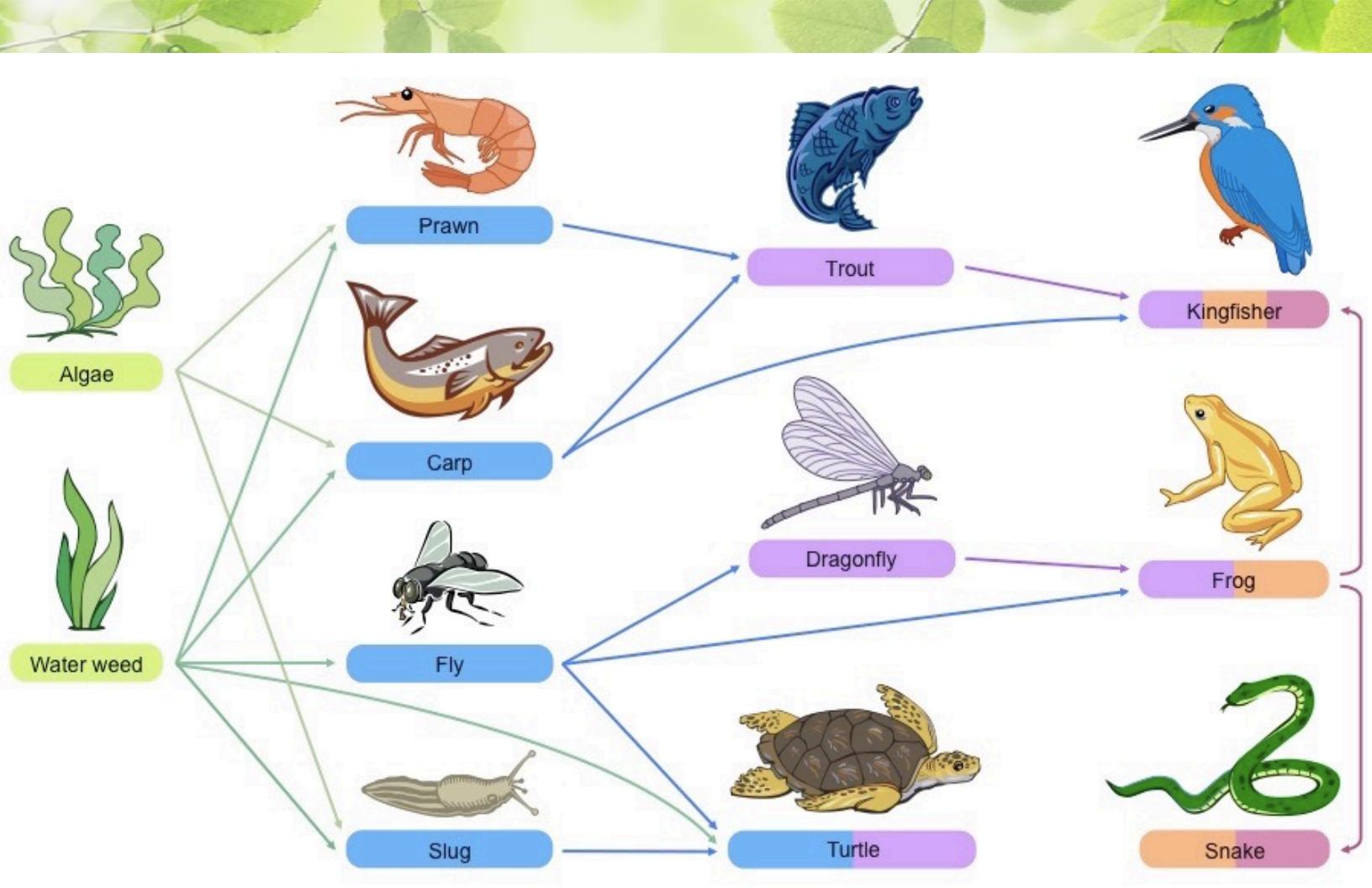
## Grazing Food Chain



## **FOOD WEB**

- The interlocking pattern of various food chains in an ecosystem is known as food web.
- In a food web many food chains are interconnected, where different types of organisms are connected at different trophic levels, so that there are a number of opportunities of eating and being eaten at each trophic level.
- Grass may be eaten by insects, rats, deer's, etc., these may be eaten by carnivores (snake, fox, tiger). Thus there is a interlocking of various food chains called food webs

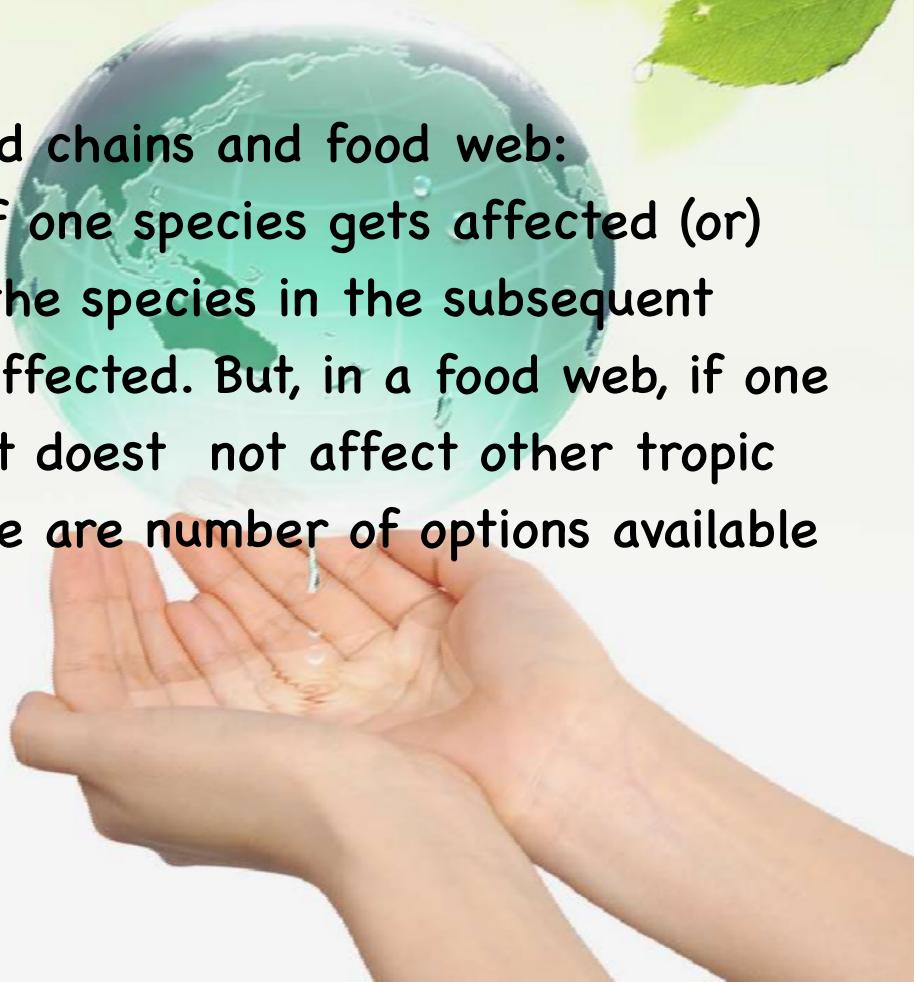


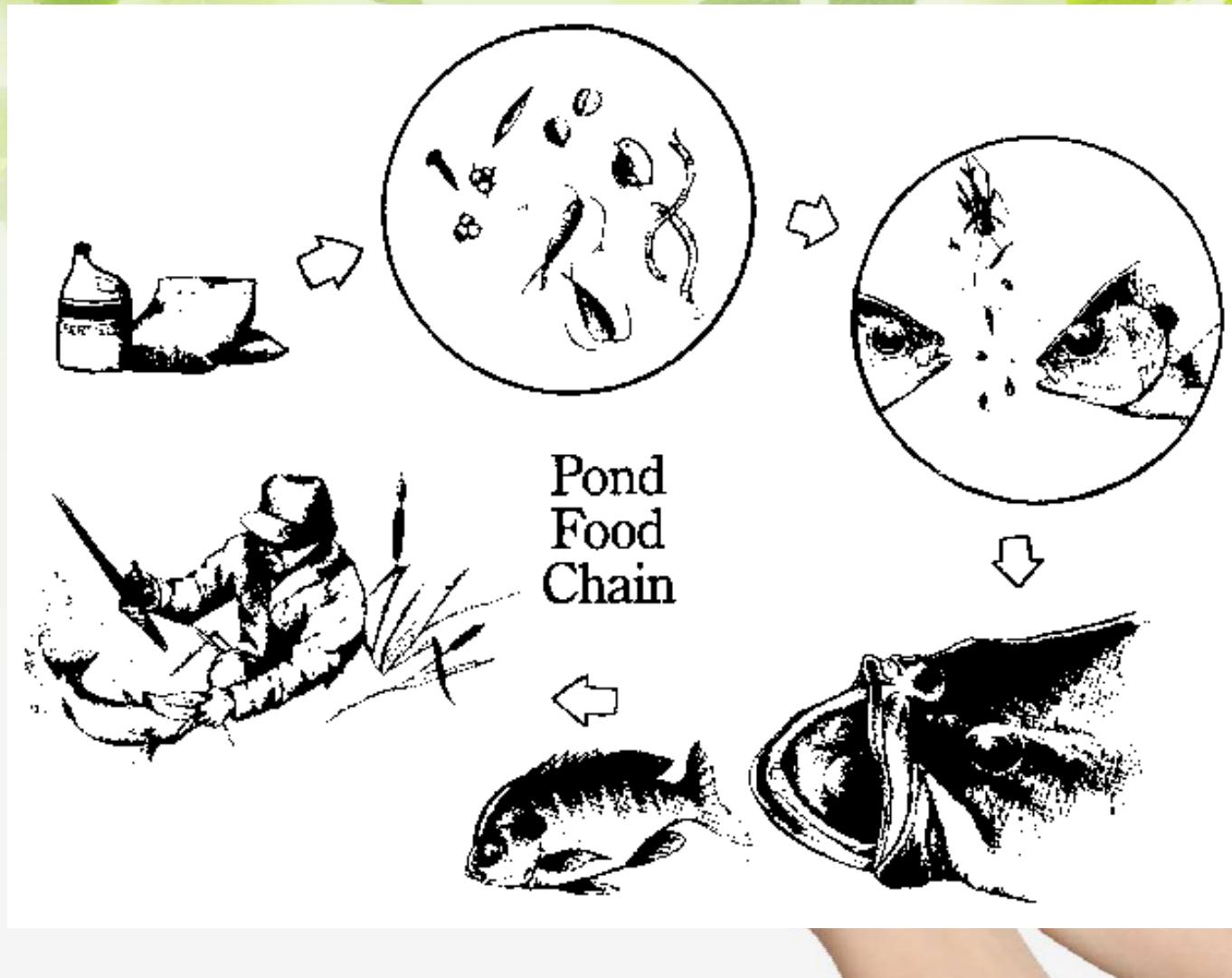


**Trophic Level:** 1 (Producers)    2 (1<sup>o</sup> Consumers)    3 (2<sup>o</sup> Consumers)    4 (3<sup>o</sup> Consumers)    5 (4<sup>o</sup> Consumers)

Difference between food chains and food web:

In a linear food chain if one species gets affected (or) becomes extinct, then the species in the subsequent tropic levels are also affected. But, in a food web, if one species gets affected, it does not affect other tropic levels so seriously. There are number of options available at each tropic level.





## Significance of food chains and food webs

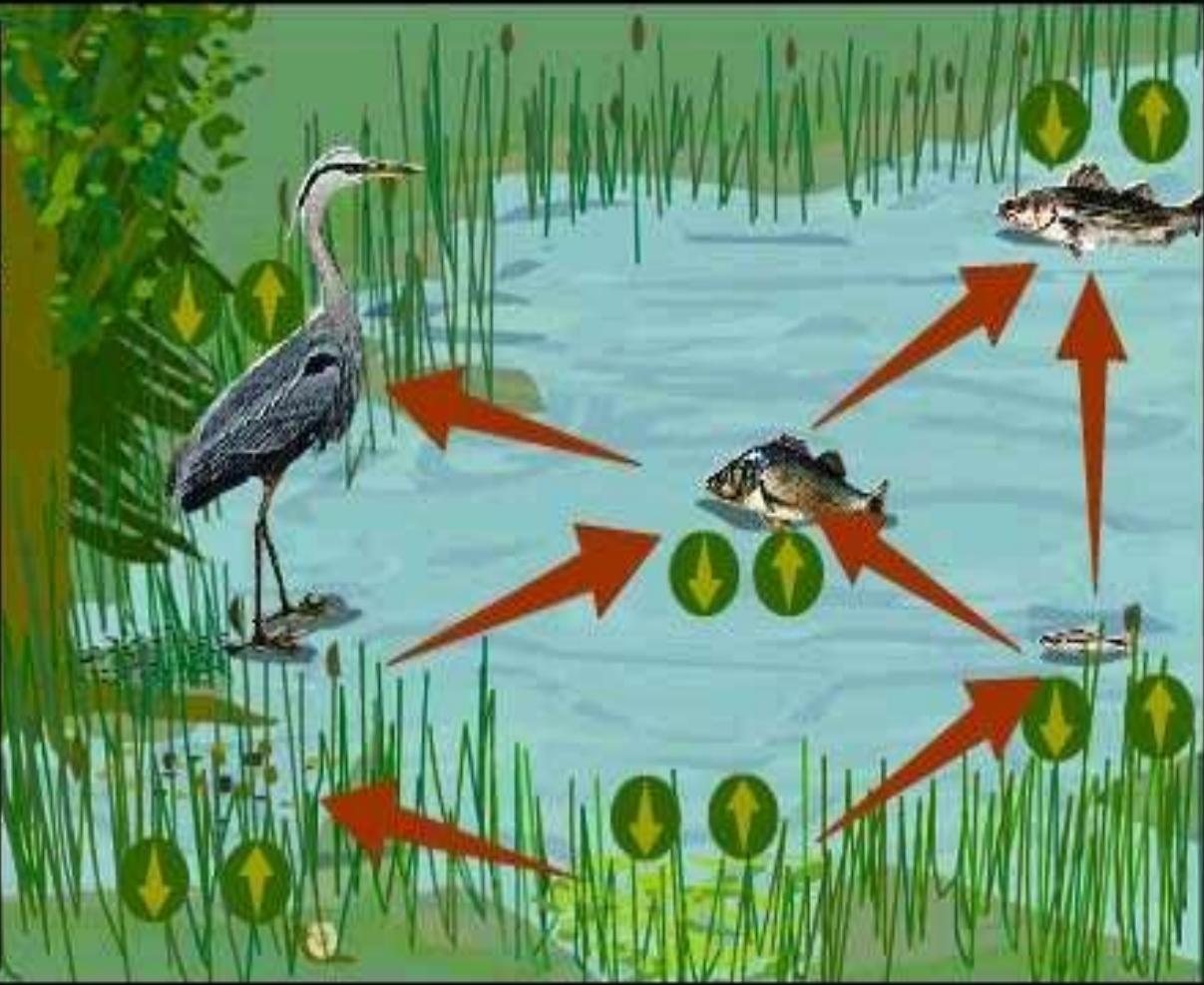
- Food chains and food webs play a very important role in the ecosystem. Energy flow and nutrient cycling takes place through them.
- They maintain and regulate the population size of different tropic levels, and thus help in maintaining ecological balance.
- They have the property of bio-magnification. The non - biodegradable materials keep on passing from one tropic level to another. At each successive tropic level, the concentration keep on increasing. This process is known as bio-magnification.

## Food Web of a Pond

What happens when one animal population in a food web increases or decreases?

The impact of the population change ripples through the trophic levels, eventually affecting all species in this food web.

Trace the ripple effects from a change in one species and see!



## ECOLOGICAL PYRAMIDS

- "Graphical representation of structure and function of tropic levels of an ecosystem, starting with producers at the bottom and successive tropic levels forming the apex is known as an ecological pyramid."
- In food chain starting from the producers to the consumers, there is a regular decrease in the biomass and number of the organisms.
- Since energy is lost as heat in each tropic levels, it becomes progressively smaller near the top.

## **Types of Ecological pyramids**

- **Pyramid of numbers.**
- **Pyramid of energy.**
- **Pyramid of biomass.**



# Pyramid of Numbers

A pyramid of numbers can be used to show the **number** of organisms at **each stage** of a food chain.

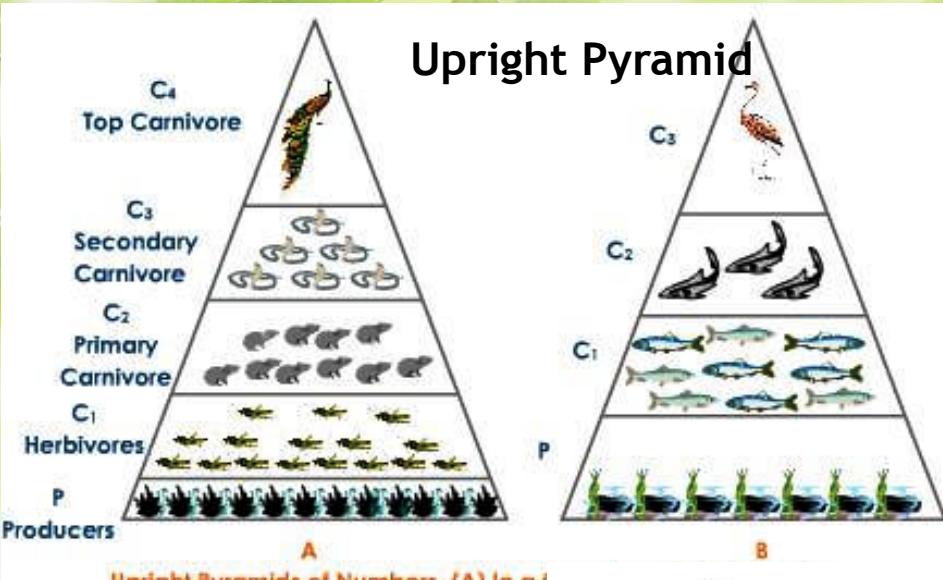


It represents the number of individual organisms present in each tropic levels.

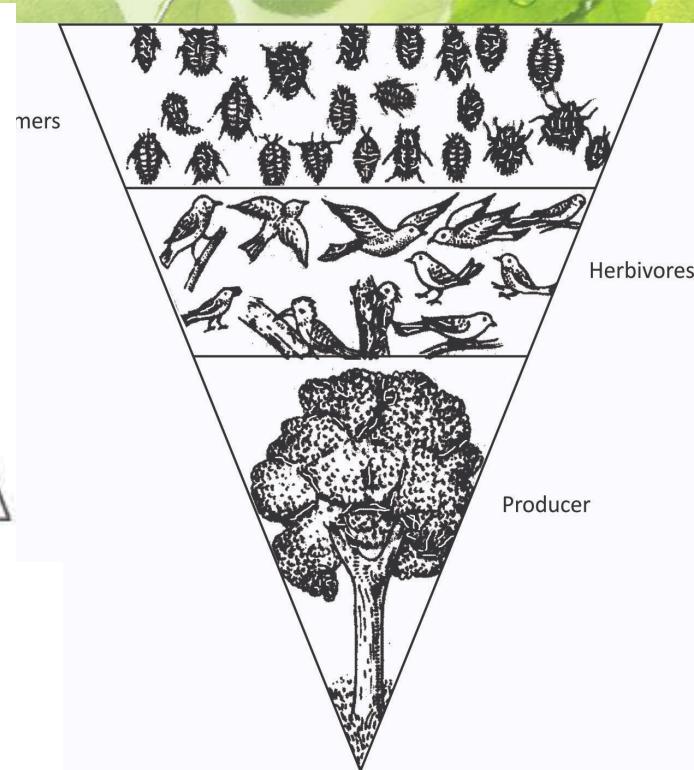
Ex: A grassland Ecosystem

- The producers in the grasslands are grasses, which are in size and large in numbers. So the producers occupy lower tropic level (1St tropic level).
- The primary consumers (herbivores) are rats, the 2nd tropic level. Since the number of rats are lower Compared to the grasses, the size is small.
- The secondary consumers (carnivores) are snakes, which occupy the 3rd tropic level. Since the number of snakes are lower when compared to the rats.
- The tertiary consumers (carnivores) are eagles, which the next tropic level. The number and size of the last level is till smaller.

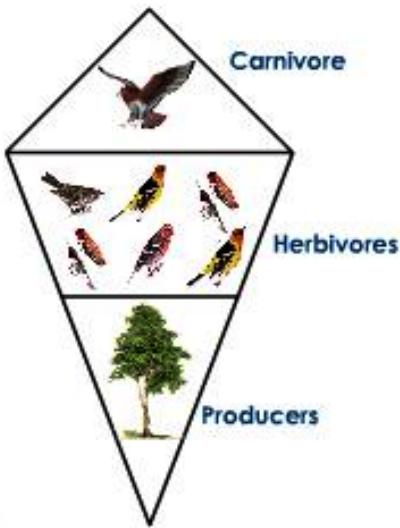
## Upright Pyramid



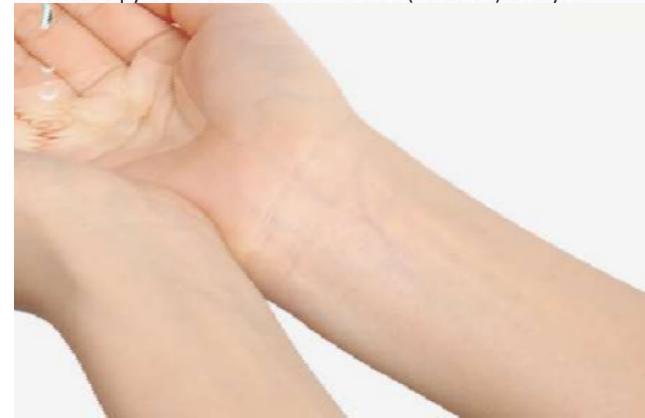
Upright Pyramids of Numbers. (A) In a terrestrial ecosystem; (B) in a aquatic ecosystem.



: Inverted pyramid of numbers in a tree (Parasitic) ecosystem

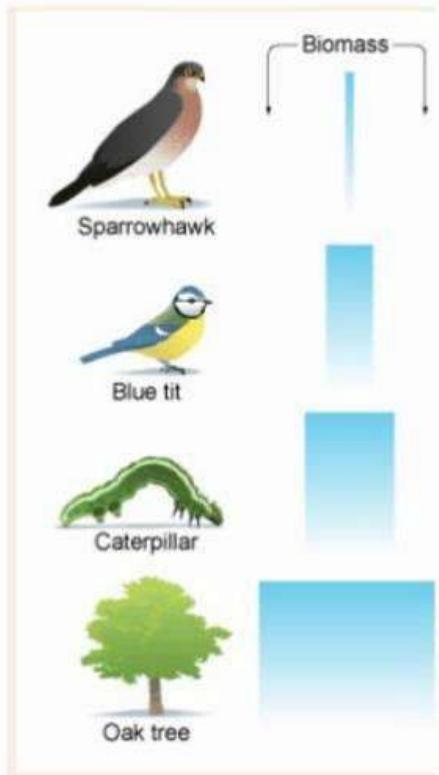


Partly Upright  
Pyramid of Number



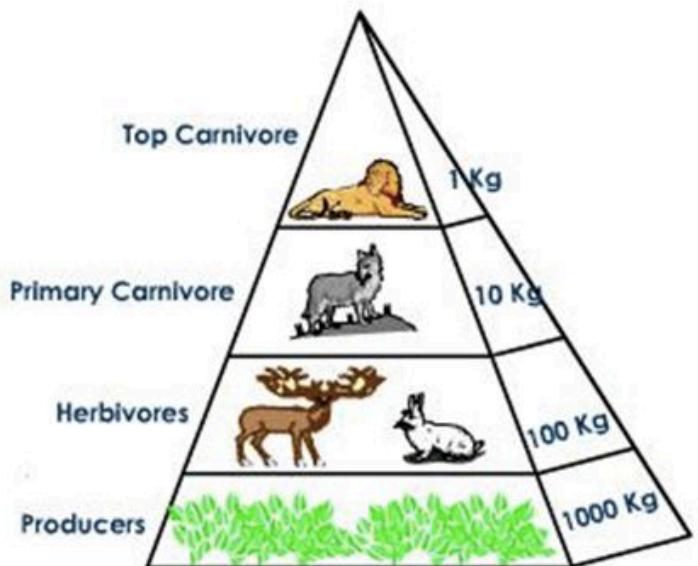
# Pyramids of biomass

(mass of tissue of living organism)

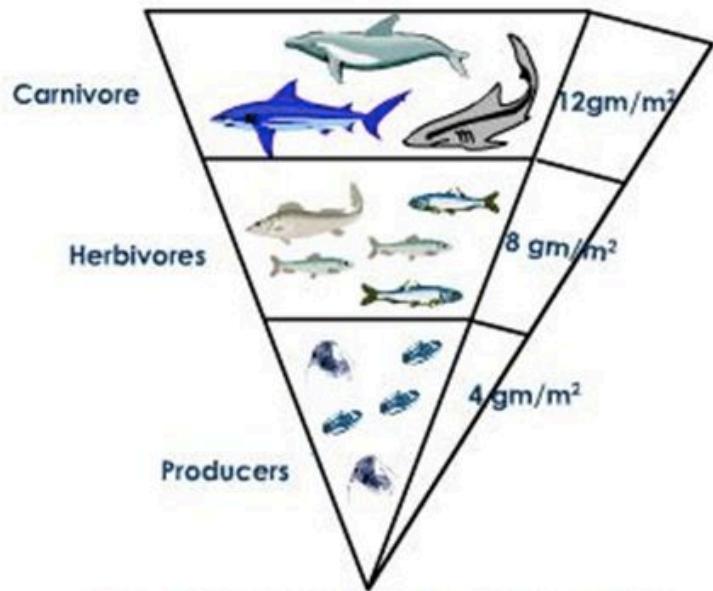


A pyramid of biomass is a graphical representation of biomass present in a unit area of various trophic levels. It shows the relationship between biomass and trophic level quantifying the biomass available in each trophic level.

# Pyramid of biomass - *upright or inverted*



Upright Pyramid of biomass in a Terrestrial Ecosystem



Inverted Pyramid in an Aquatic Ecosystem

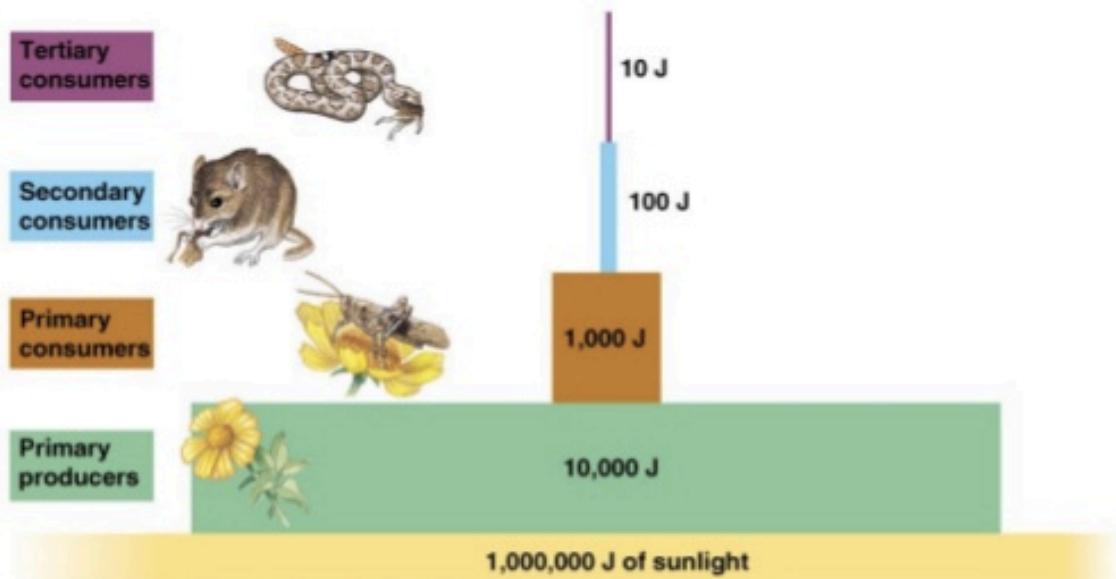
## Pyramid of Biomass

- It represents the total amount of biomass (mass or weight of biological material or organism) present in each trophic levels.  
Ex: A forest ecosystem
- The above figure shows that there is a decrease in the biomass from the lower trophic level to the higher trophic level. This is because the trees (producers) are maximum in the forest, which contribute a huge biomass. The next trophic levels are herbivores (rabbit, deer) and carnivores (snakes, fox). Top of the trophic level contains few tertiary consumers (lion, tiger), the biomass of which is very low.

## Pyramid of Energy

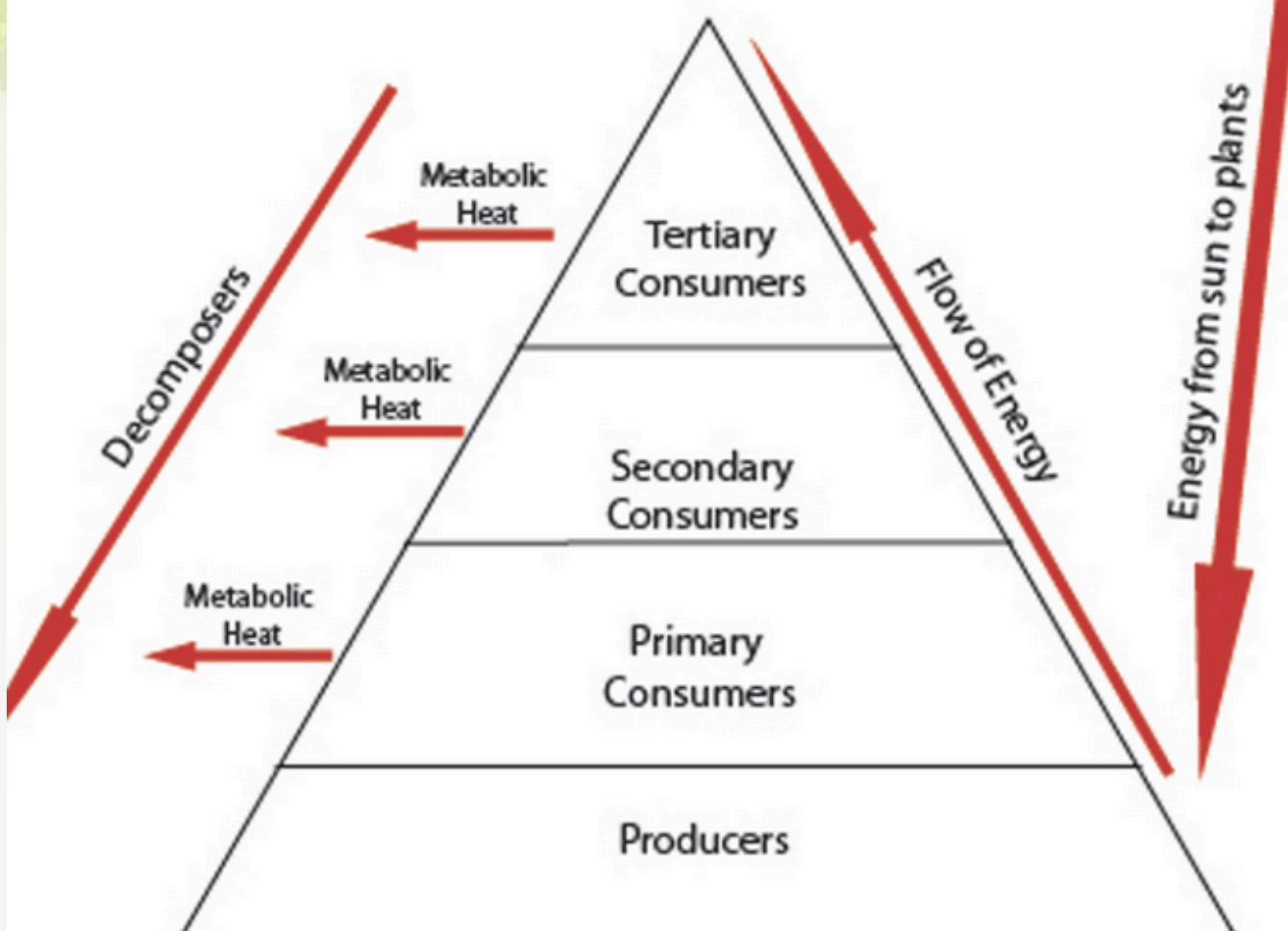
- This pyramid indicates not only the amount of energy flow at each level, but more importantly, the actual role the various organisms play in the transfer of energy.
- An energy pyramid illustrates how much energy is needed as it flows upwards to support the next trophic level.
- Always there is a huge loss of energy.

# Trophic Levels



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Notice that only 10% is moved to the next level.  
Where does the rest go?



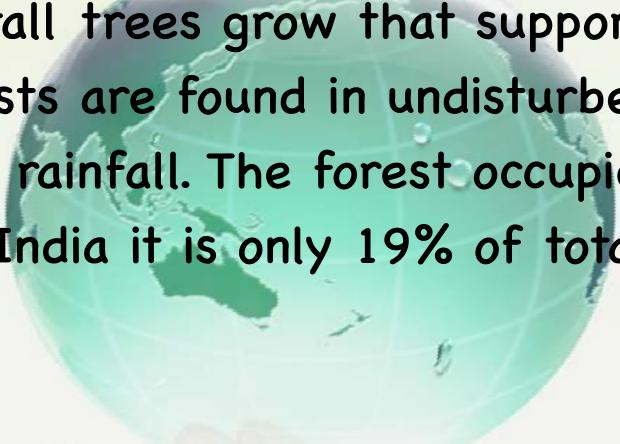
# FOREST ECOSYSTEM

A forest is an area with a high density of trees. A forest ecosystem is one in which tall trees grow that support many animals and birds. The forests are found in undisturbed areas receiving moderate to high rainfall. The forest occupies nearly 31% of the world's land in India it is only 19% of total land area.

## Types of forest ecosystem

Based upon the climate conditions, forests are classified into

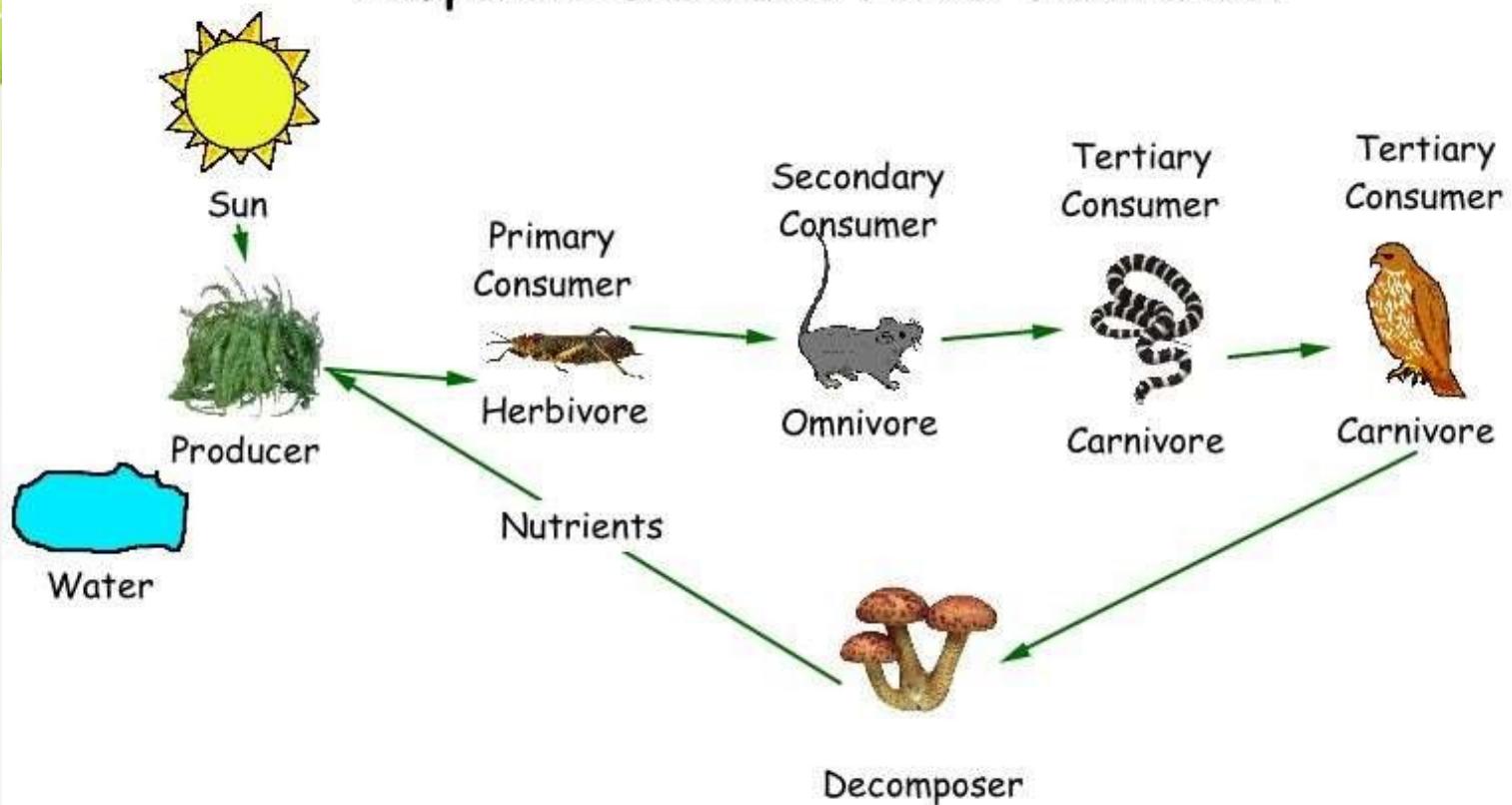
- Tropical Rain forests.
- Tropical deciduous forests.
- Tropical scrub forests.
- Temperate rain forests.
- Temperate deciduous forests.



## Characteristics of forest ecosystems

- Forests are characterised by warm temperature and adequate rainfall, which make the generation of number of ponds, lakes etc.,
- The forest maintains climate and rainfall.
- The forest support many wild animals and protect biodiversity.
- The soil is rich in organic matter and nutrients which support the growth of trees.
- Since penetration of light is so poor, the conversion of organic matter into nutrients is very fast.

## Temperate Deciduous Forest Food Chain



# **Structure and Function of forest ecosystem**

## **I. Abiotic components**

The abiotic components include basic inorganic & organic compounds present in the soil & atmosphere. In addition minerals, the occurrence of litter is characteristic features of majority of forests.

## **II. Biotic components**

1. Producers: In a forest, the producers are mainly trees produce food by photosynthesis. Apart from trees, climbers, epiphytes, shrubs and ground vegetation. Dominant species of trees in forest are Dalbergia, Tectona grandis, Lichens, Fern, Pine, Cedar.

## 2. Consumers

**Primary consumers (herbivores):** They directly depend on the plants for their food.

Ex: Ants, flies, insects, mice, deer, squirrels. Larger animals such as Elephants, Deer, Giraffe etc.

**Secondary consumers (primary carnivores):** They directly depend on the herbivores for their food.

Ex: Lizards, snakes, birds, fox.

**Tertiary consumers :** They depend on the primary carnivores for their food.

Ex: Animals like tiger, lion, etc.,

## 3. Decomposers

They decompose the dead plant and animal matter.

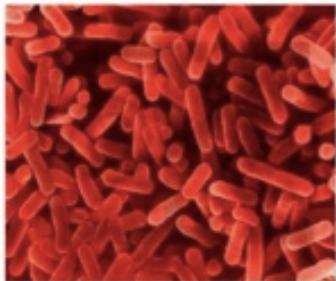
Ex: Bacteria and fungi.



**Producers: Different tree species**



**Consumers in a Forest Ecosystem**



**Decomposers in a Forest ecosystem**

It provides numerous environmental services like;

- Ø Nutrient cycling,
- Ø Maintaining biodiversity
- Ø Providing wildlife habitat
- Ø Affecting rainfall patterns
- Ø Regulating stream flow
- Ø Storing water
- Ø Reducing flooding
- Ø Preventing soil erosion
- Ø Reclaiming degraded land & many more....

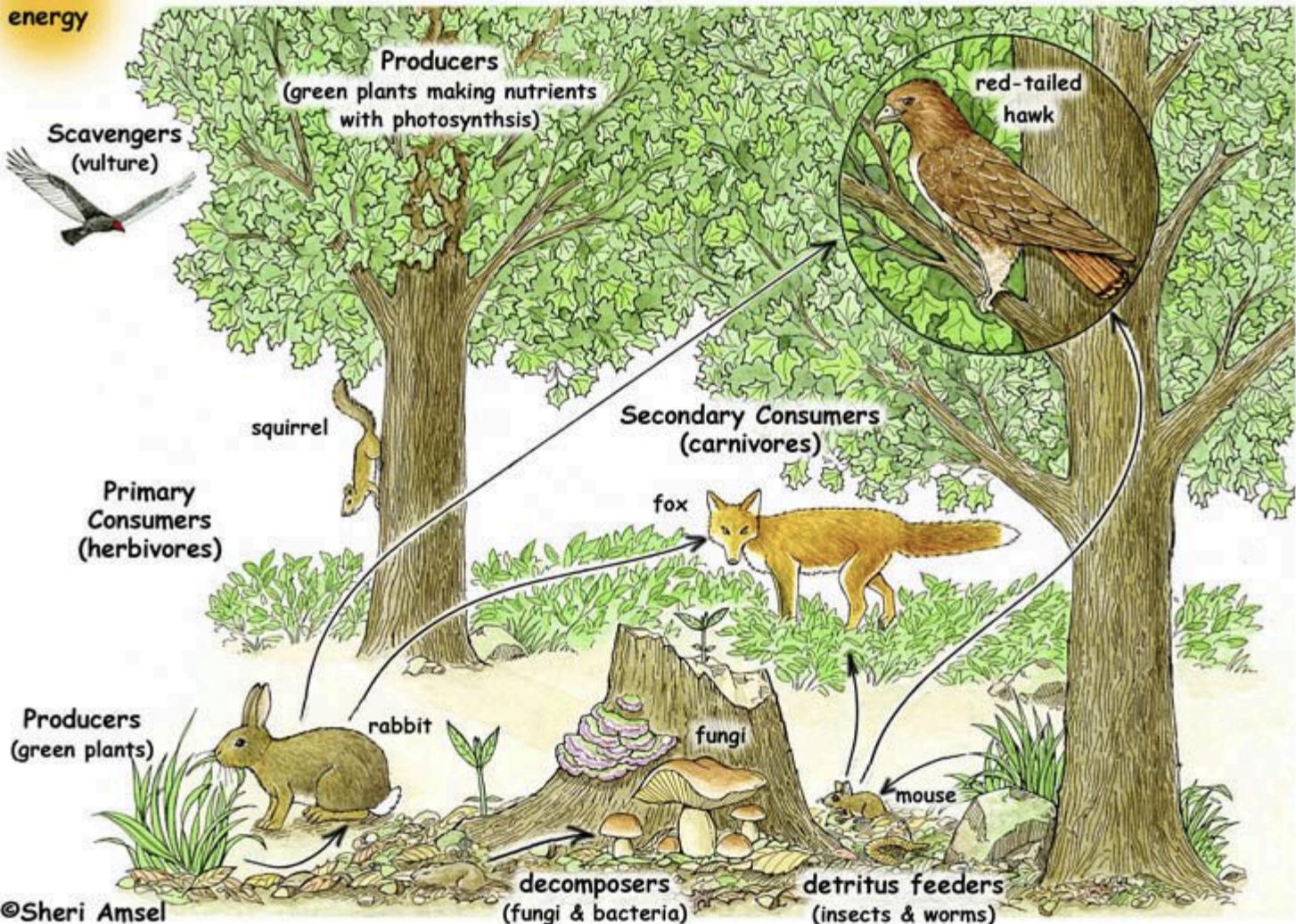


Apart from environmental values, forest ecosystems have some traditional values as well.

- Ø Fire Wood & Timber.
- Ø Fruits.
- Ø Gums.
- Ø Herbs & drugs.



solar  
energy



©Sheri Amsel

## **GRASSLAND ECOSYSTEM**

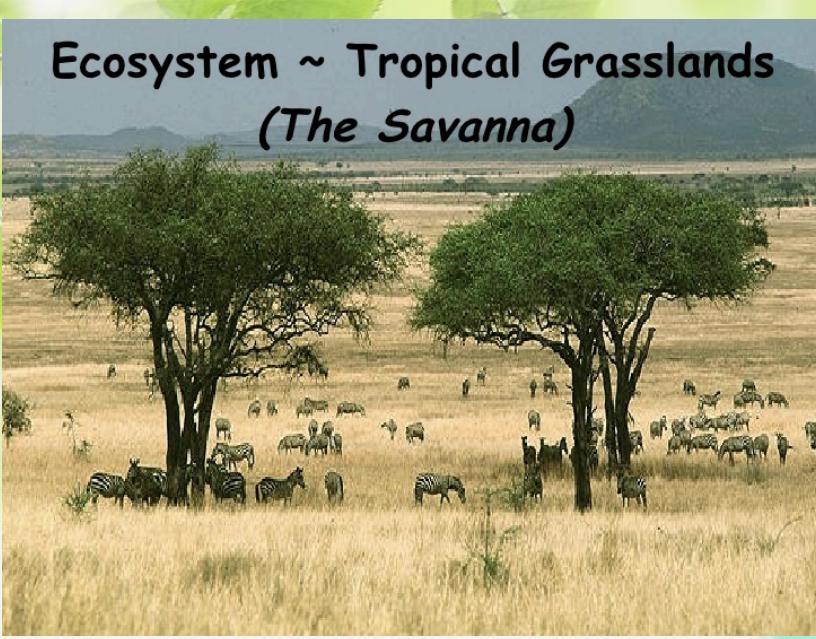
Grassland occupies about 20% of earth's surface. In addition to grass some trees and shrubs are/also present in grasslands. Limited grazing helps to improve the net primary production of the grasslands. But, overgrazing leads degradation of these grasslands resulting in desertification.

### **Types of grassland ecosystem**

Depending upon the climate conditions grassland are classified into three types

- Tropical grasslands
- Temperate grasslands
- Polar grasslands

# Ecosystem ~ Tropical Grasslands *(The Savanna)*



## Features of different types of grassland

### Tropical grasslands

They are found near the borders of tropical rain forests. Characterised by high temperature and moderate rainfall (40 to 100 cm). It is also known as Savanna type. Tall grasses with scattered shrubs and stunted trees and animals like zebras, giraffes, antelopes, etc., are observed here.

### Temperate grasslands

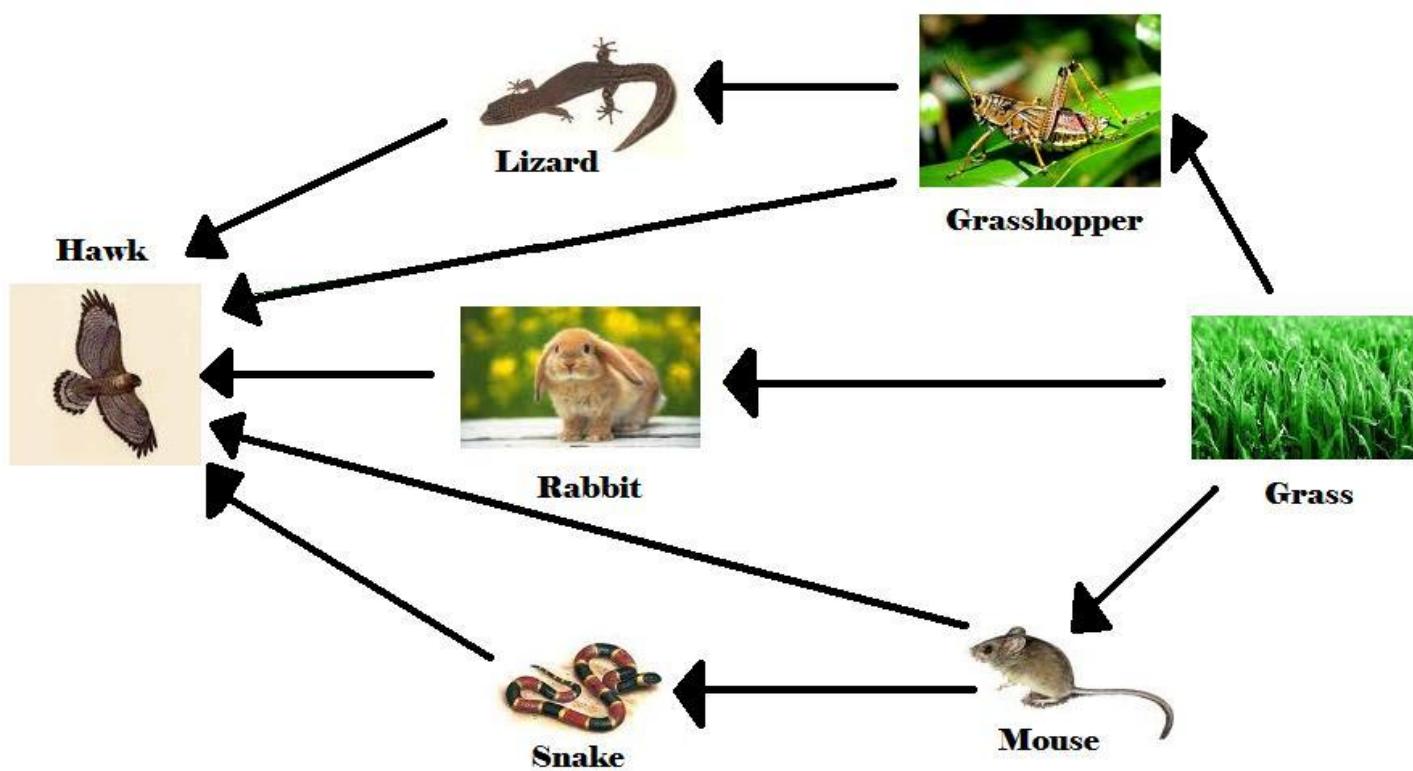
They are usually found in the centres of continents, highly sloped hills. They are characterised by very cold winters and hot summers: Intense grazing and summer fires, do not support shrubs or trees to grow.

## Polar grasslands

They are found in arctic polar regions. They are characterised by severe cold and strong winds along with ice and snow. In summers several small annual plants grow. There are animals like arctic wolf, weasel, arctic fox, etc.,

## Characteristics of Grassland Ecosystems

- Grassland ecosystem is a plain land occupied by grasses.
- Soil is very rich in nutrients and organic matter.
- Since it has tall grass, it is ideal place for grazing animals.
- It is characterised by low or uneven rainfall.



# **Structure and function of the grassland Ecosystems**

**Abiotic components:** Nutrients, H, O, N, P, S, etc.,

These abiotic components are supplied by CO<sub>2</sub>, H<sub>2</sub>O, C, Nitrate, phosphates and sulphates.

## **Biotic Components**

**Producers:** They produce food.

Ex: Grasses, Herbs and shrubs.

**Consumers:**

**Primary consumers (herbivores) :**They depend on grasses for their food Ex: Insects, cows, buffaloes, deer, sheep, etc.,

**Secondary consumers (carnivores) :**They feed on herbivores.

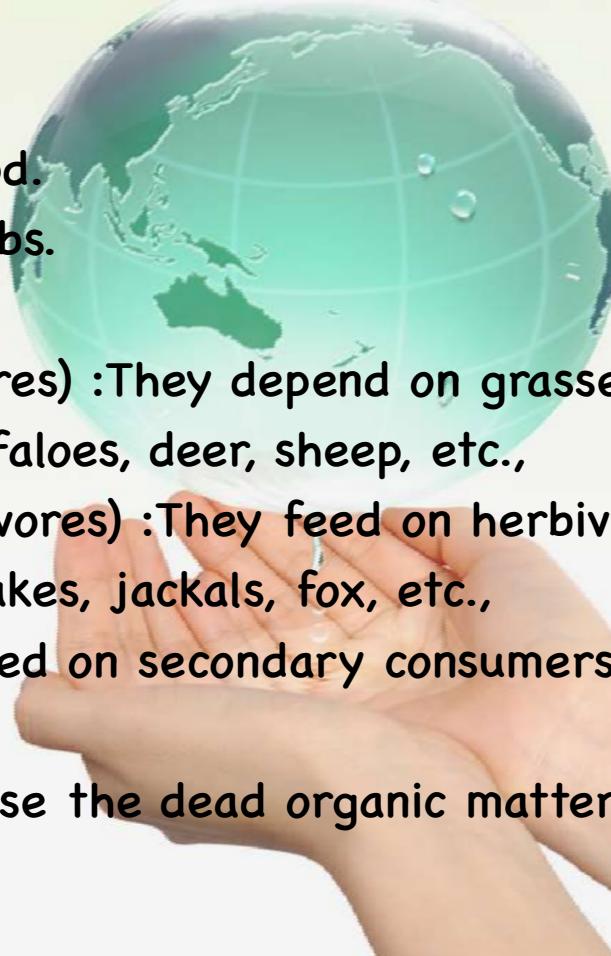
Examples: Lizards, birds, Snakes, jackals, fox, etc.,

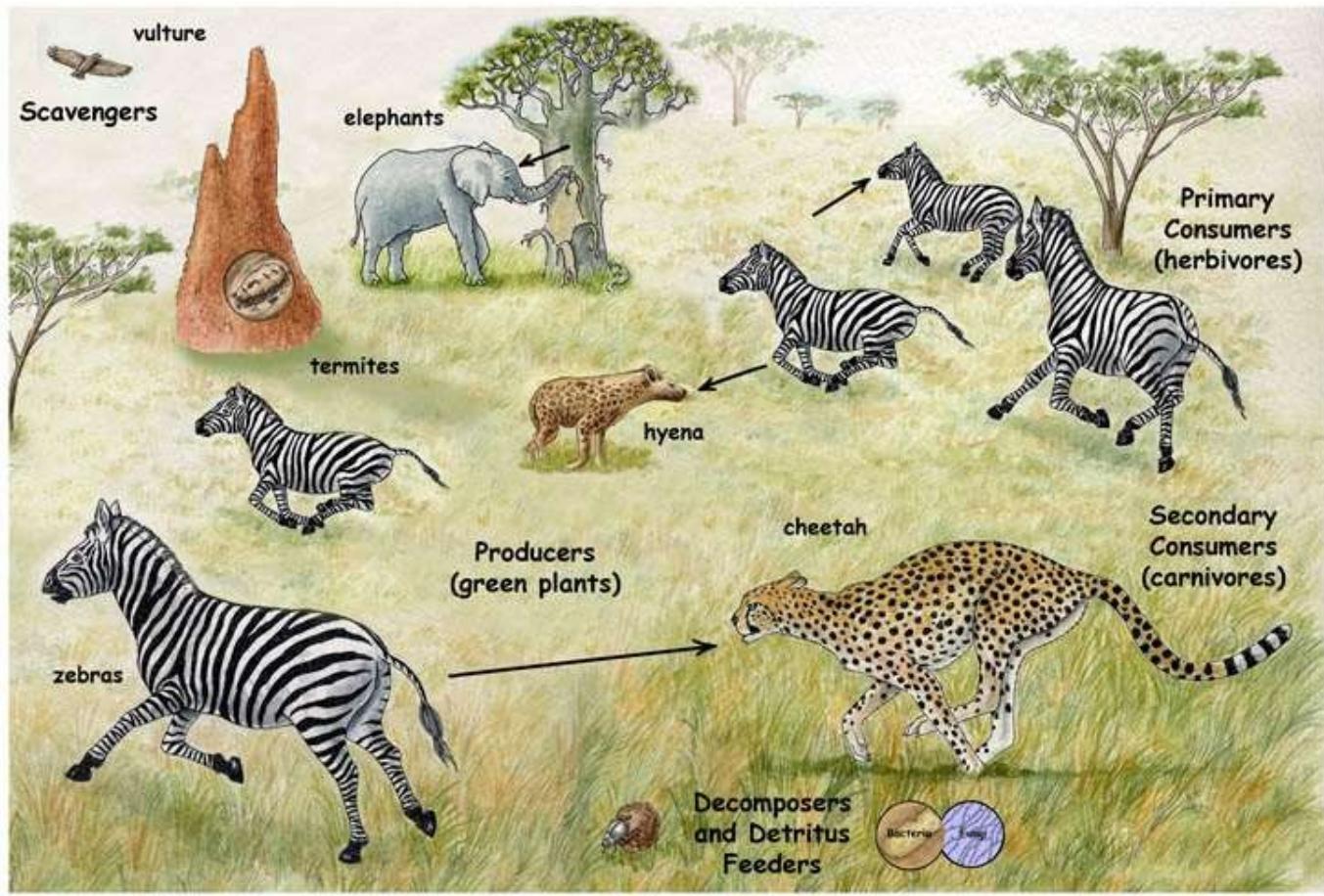
**Tertiary consumers:** They feed on secondary consumers

Ex: Hawks, eagle, etc.,

**Decomposers :**They decompose the dead organic matter

Ex: Fungi and bacteria.





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## **Importance:**

- Grasslands are of vital importance for raising livestock for human consumption and for milk and other dairy products
- Grasslands provided home to many different animals that were hunted and domesticated
- They are used as grazing area for cattle
- They Maintain Biodiversity
- Protects restored habitat for many plants and animals including pheasant, ducks, songbirds and endangered species

# DESERT ECOSYSTEMS

## Introduction

Desert occupies about 14% of our world's land area. It is characterised by less than 25 cm rainfall. The atmosphere is dry and hence it is a poor insulator .

## Types of desert ecosystems

Based on the climatic conditions, deserts are classified into three types.

- Tropical deserts.
- Temperate deserts.
- Cold deserts.





## Features of different types of deserts

**Tropical desert** is an environment of extremes, it is the driest and hottest place on earth. Rainfall is sporadic and in some years no measurable precipitation falls at all.

- Africa: Sahara desert.
- Rajasthan: Thar desert.

**Temperate desert** is a barren area of land where little precipitation occurs (less than 10%), characterised by very hot summer and very Winter time. Ex: Atacama, Mojave.

**Cold deserts** have hot summers but extremely cold winters. These are found in high, flat areas, called plateaus. Ex: Gobi desert, Ladakh.

## Characteristics of Desert ecosystem

The desert air is dry and the climate is hot. Annual rainfall is less than 25 cm. The soil is very poor in nutrients and organic matter, Vegetation is poor.

## Structure and functions of the desert ecosystems

### I. Abiotic Components

Intense solar radiation, lashing winds, and little moisture i.e. less than 10 inches (25 cm) of rainfall. The nutrient cycling is also very low. The characteristic feature of the abiotic component is lack of organic matter in the soil and scarcity of water.

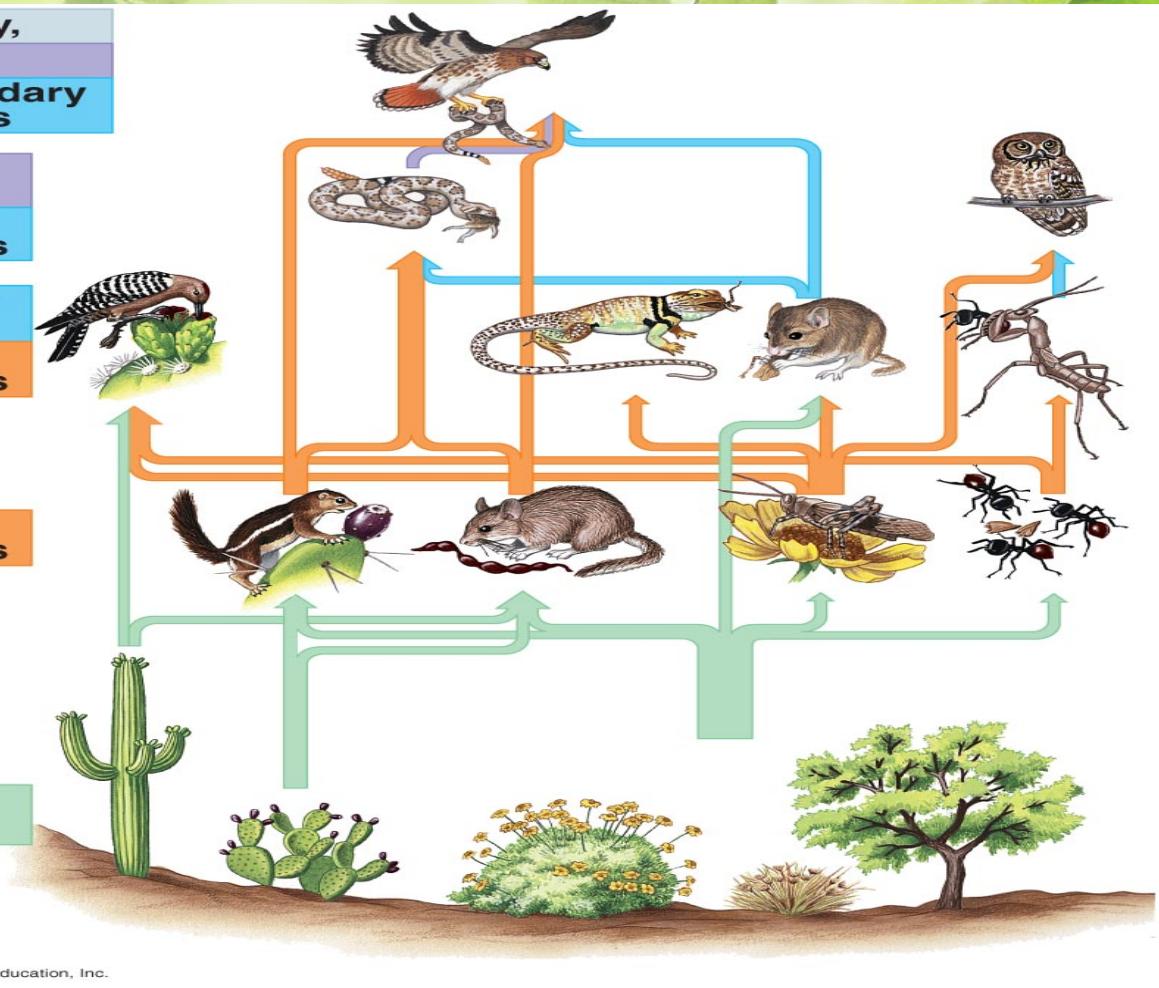
**Quaternary,  
tertiary,  
and secondary  
consumers**

**Tertiary  
and  
secondary  
consumers**

**Secondary  
and  
primary  
consumers**

**Primary  
consumers**

**Producers  
(plants)**



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## Desert Ecosystem

## II. Biotic Components

Producers: In deserts mostly Succulent (e.g., cacti) plants are found available. They have water inside them to stay alive, waxy coating to prevent intense heat, thorn on the outside to protect them from being eaten.

Ex: Succulents, Shrubs, bushes, some grasses and few trees.

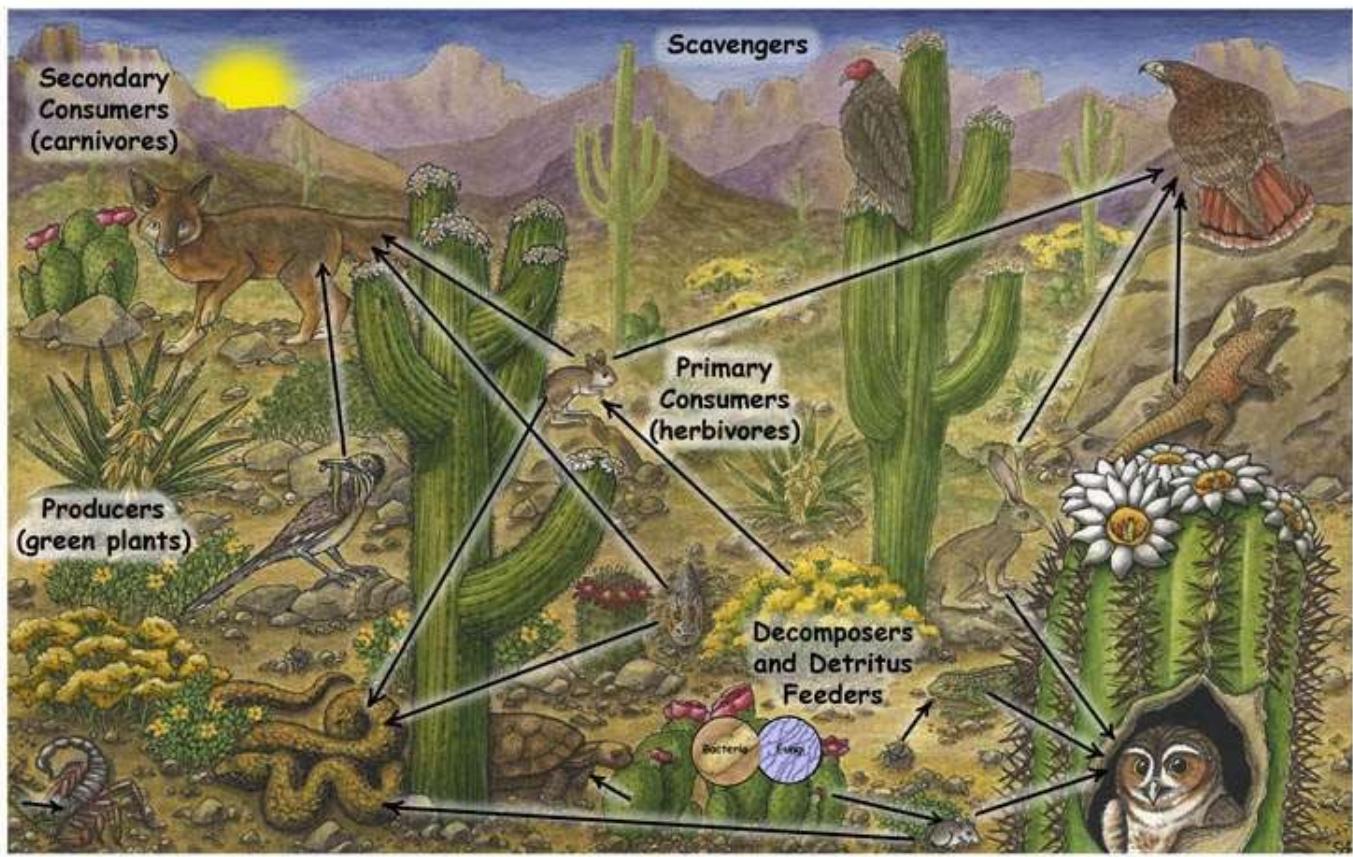
Consumers: These animals dig holes in the ground to live in. They come out at night to find food. Most of the animals can extract water from the seeds they eat.

Ex: Locust, scorpions, snakes, camel, elk etc.

Decomposers: Desert has poor vegetation with a very low amount of dead organic mater. They are decomposed by few fungi and bacteria.

Ex: Fungi and bacteria

# Desert Food Web



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# AQUATIC ECOSYSTEMS

The aquatic ecosystem deals with water bodies. The major types of organisms found in aquatic environments are determined by the water's salinity.

## Types of aquatic life zone

Aquatic life zones are divided into two types.

### 1. Fresh water life zones

Eg. Ponds, streams, lakes, rivers.

### 2. Salt water life zones

Eg. Oceans, estuaries.

# FRESH WATER ECOSYSTEM POND ECOSYSTEMS

## Introduction

A pond is a fresh water aquatic ecosystems, where water is stagnant. It receives enough water during rainy season. It contains several types of algae, aquatic plants, insects, fishes and birds.

## Characteristics of pond

- Pond is temporary, only seasonal.
- It is a stagnant fresh water body.
- Ponds get polluted easily due to limited amount of water.
- Pond ecosystems are lentic ecosystems – i.e. they involve stagnant or standing water.

# Structure and functions of pond ecosystems

## Abiotic components

Ex: Temperature, light, water and organic and inorganic compounds

## Biotic Components

- Producers

These include green photosynthetic organism. They are of two types.

- Phytoplankton: These are microscopic marine plants, which freely float on the surface of water.

Ex: Floating plants like Nostoc, Anabena, Consmarium.

- Microphytes are microscopic algae

Ex: Floating plants and submerged plants like hydrilla, Jussiaea, wolfia, demna.

## Consumers

Primary consumers (Zooplanktons): These are microscopic animals which freely float on the surface of water.

Zooplanktons are found along with phytoplankton. They feed on plants (phytoplankton).

Ex: Protozoa, very small fish, ciliates, flagellates and protozoans.

Secondary consumers (Carnivores): They feed on zooplankton

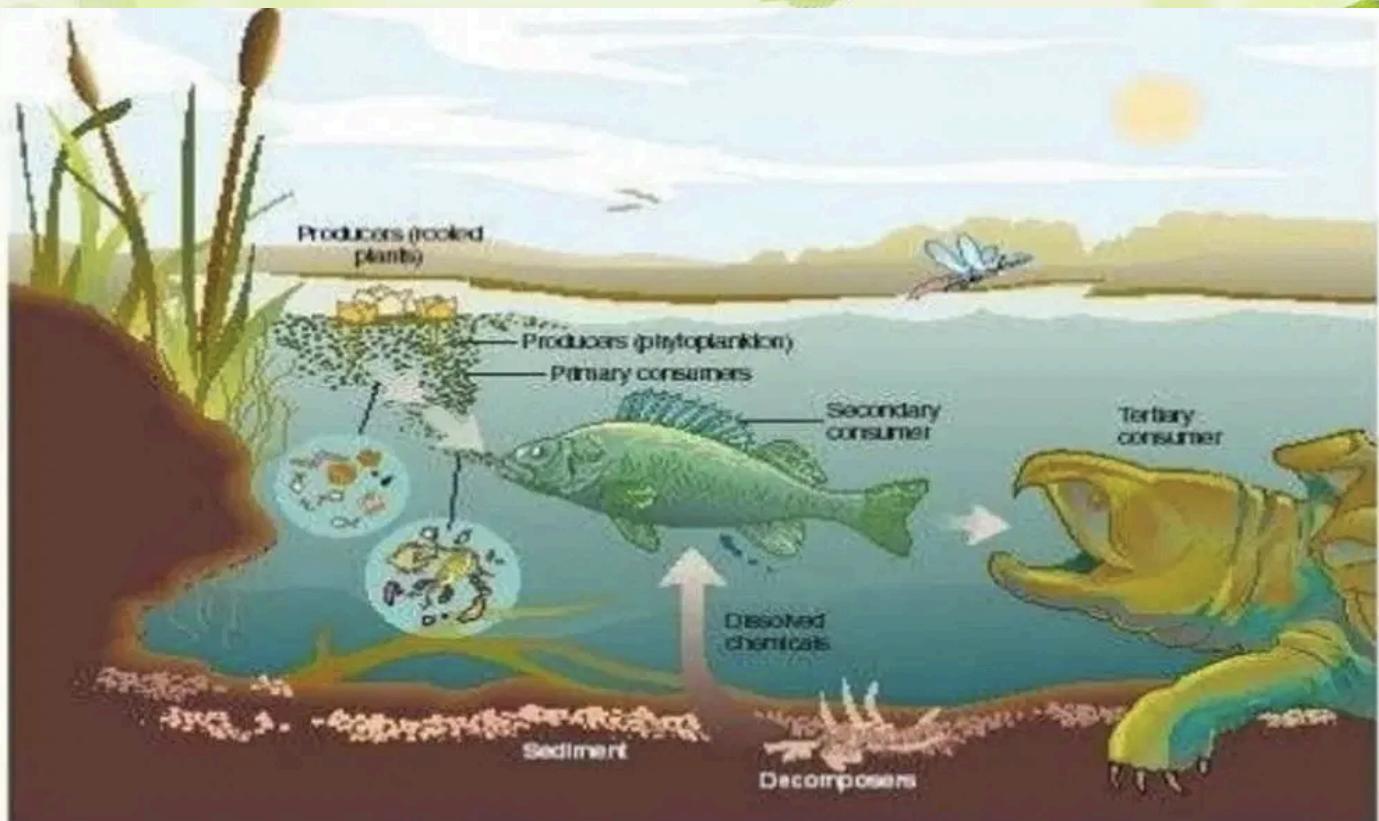
Ex: Insects like water beetles and small fish.

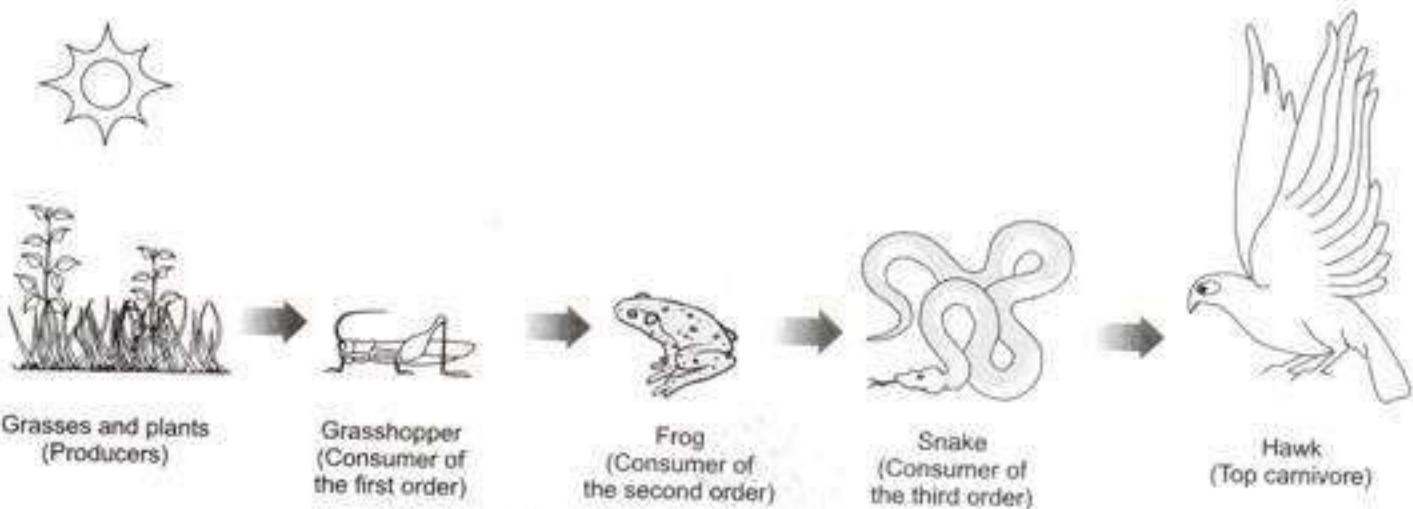
Tertiary consumers :They feed on smaller fish

Ex: Large fish like game fish.

Decomposers: They decompose the dead plant and animal matter and their nutrients are released and reused by the green plants.

Ex: Fungi, bacteria and flagellates





**Fig. 8.3** A food chain in a grassland ecosystem

In a freshwater aquatic ecosystem like a pond, the organisms in the food chain include algae, small animals, insects and their larvae, small fish, big fish and a fish-eating bird or animal (Figure 8.4).



## Importance of pond ecosystems.

1. Biodiversity: Pond ecosystems are very important habitats for so many different types of fish, birds, plants and crustaceans as well as insects such as dragonflies, damsel flies and pond skaters.
2. Ubiquity: Pond ecosystems can be found on every continent on the planet.
3. Abundance: Pond ecosystems are very abundant. Not only can they be found almost everywhere, they can be found plentifully.
4. Source of hydration: A watering hole in a prairie or desert many species of animals will come to pond. Humans can also use these ecosystems as a source of water.
5. Beauty: Pond ecosystems are very beautiful as well.

## LAKE ECOSYSTEM

Lakes are large natural shallow water bodies. Lakes are used for various purposes. Lakes are supplied with water from rainfall, melting snow and streams.

### Types of lakes

Some important types of lake are

Oligotrophic lakes : They have low nutrient concentrations

Eutrophic lakes : They are overnourished by nutrients like N and P

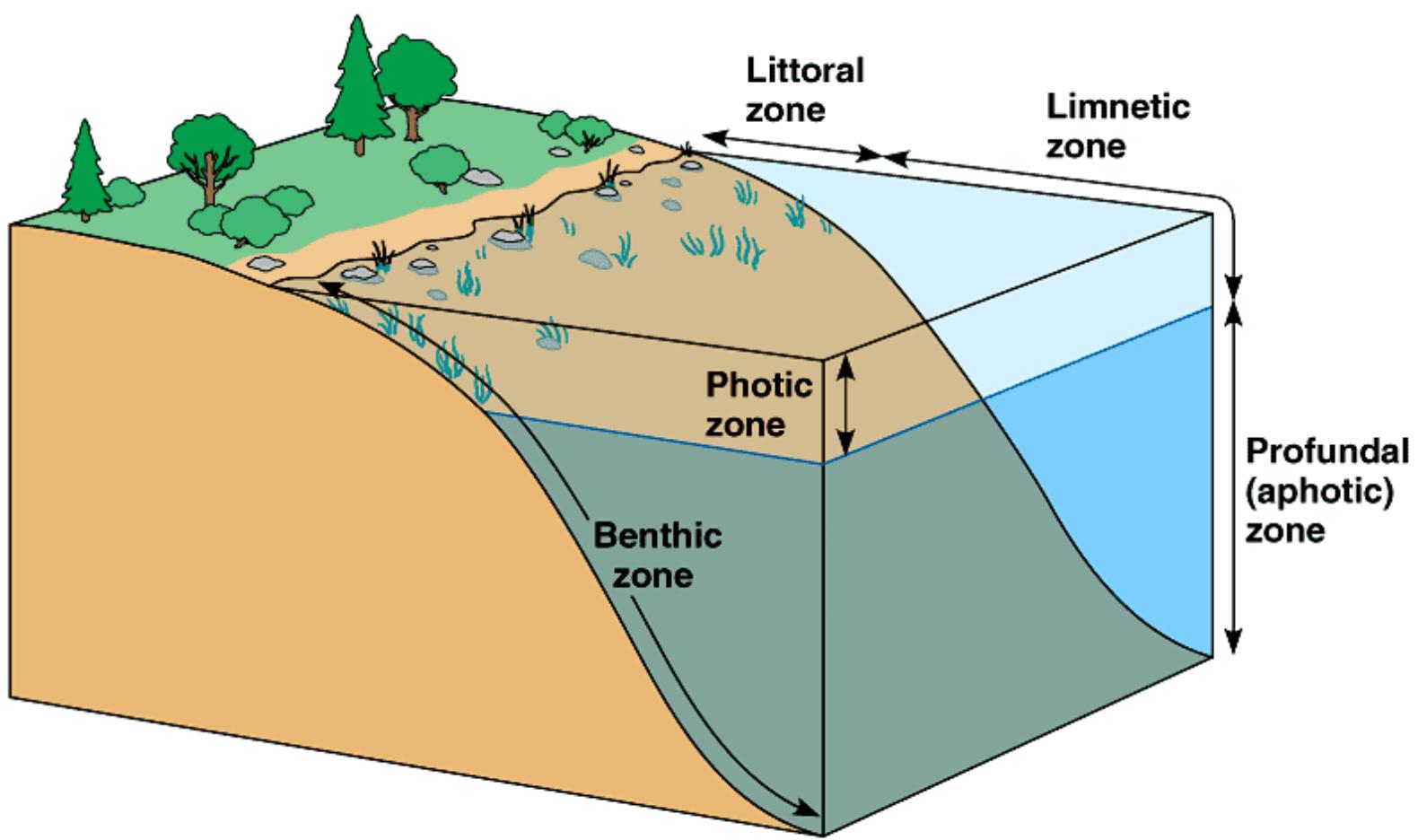
Dystrophic lakes : They have low pH, high humic and content and brown waters.

Volcanic lakes : They receive water from magma after volcanic eruption.

## Zones of Lake

Depending upon their depth and distance from the shore, like consists of four distinct zones.

- Littoral zones: It is the top layer of the Lake. It has a shallow water.
- Limnetic zone: Next to the littoral zone is limnetic zone, where effect penetration of solar light takes place.
- Profundal zone: The deep open water, where it is too dark.
- Benthic zone: This zone is found, at the bottom of the lake.



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## Characteristics of lake ecosystem

- Lake is a shallow fresh water body;
- It is a permanent water body with large Water resources.
- It helps in irrigation and drinking.

## Structure and function of lake ecosystem

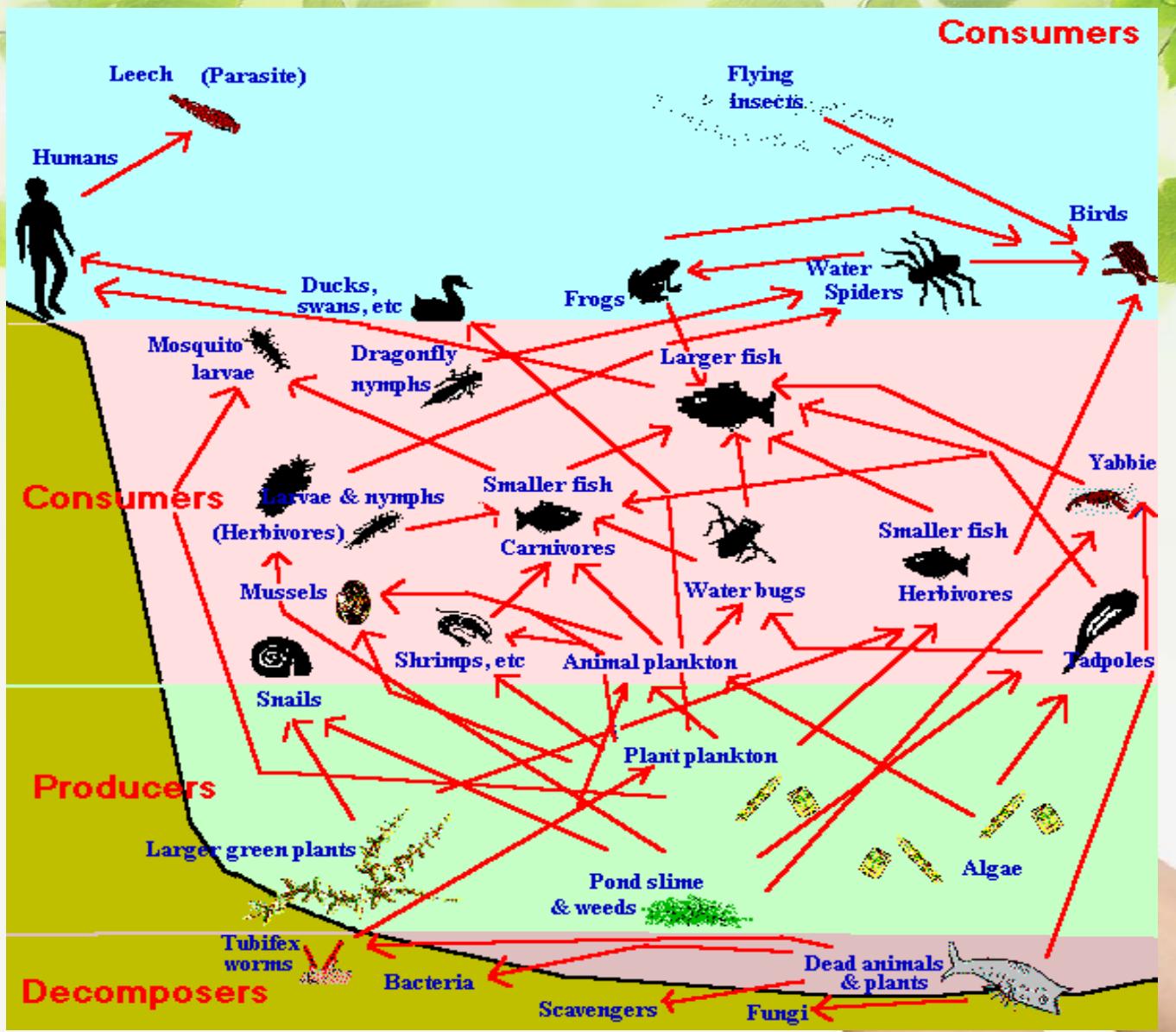
### I. Abiotic components

Temperature, light, proteins and lipids, O<sub>2</sub>, CO<sub>2</sub>

### II. Biotic Consumers

Producers: They are green plants, may. be submerged, free floating ad amphibious plants.

Examples: Phytoplanktons, algae and flagellates.



## 2. Consumers

**Primary Consumers (Zooplanktons):** They feed on phytoplankton

Ex: Ciliates, protozoans, etc.

**Secondary consumers (carnivores) :** They feed on zooplankton. Ex Insects and small fishes.

**Tertiary consumers:** They feed on smaller fish

Ex: Large fishes like game fish.

**Decomposers:** They decompose the dead plants ad animals Ex: Bacteria, fungi and actinomycetes.

## RIVER (or) STREAM ECOSYSTEM

### Introduction

The running water of a stream or a river is usually well oxygenated, because it absorb's oxygen from the air. The number of animals are low in river or stream.

### Characteristics of River or Stream.

It is a fresh water, and free flowing water systems.

Due to mixing of water, dissolved oxygen content is. more.

River deposits large amount of nutrients.

# Structure and function of River or Stream Ecosystem

## Abiotic components

Examples : River, Light, Temperature, Chemistry, Substrate

## Biotic Components

Producers: Phytoplankton, algae, water grasses, aquatic masses other amphibious plants.

## Consumers

1. Primary consumers: They feed on phytoplankton.

Ex : Water insects, snails, fishes:

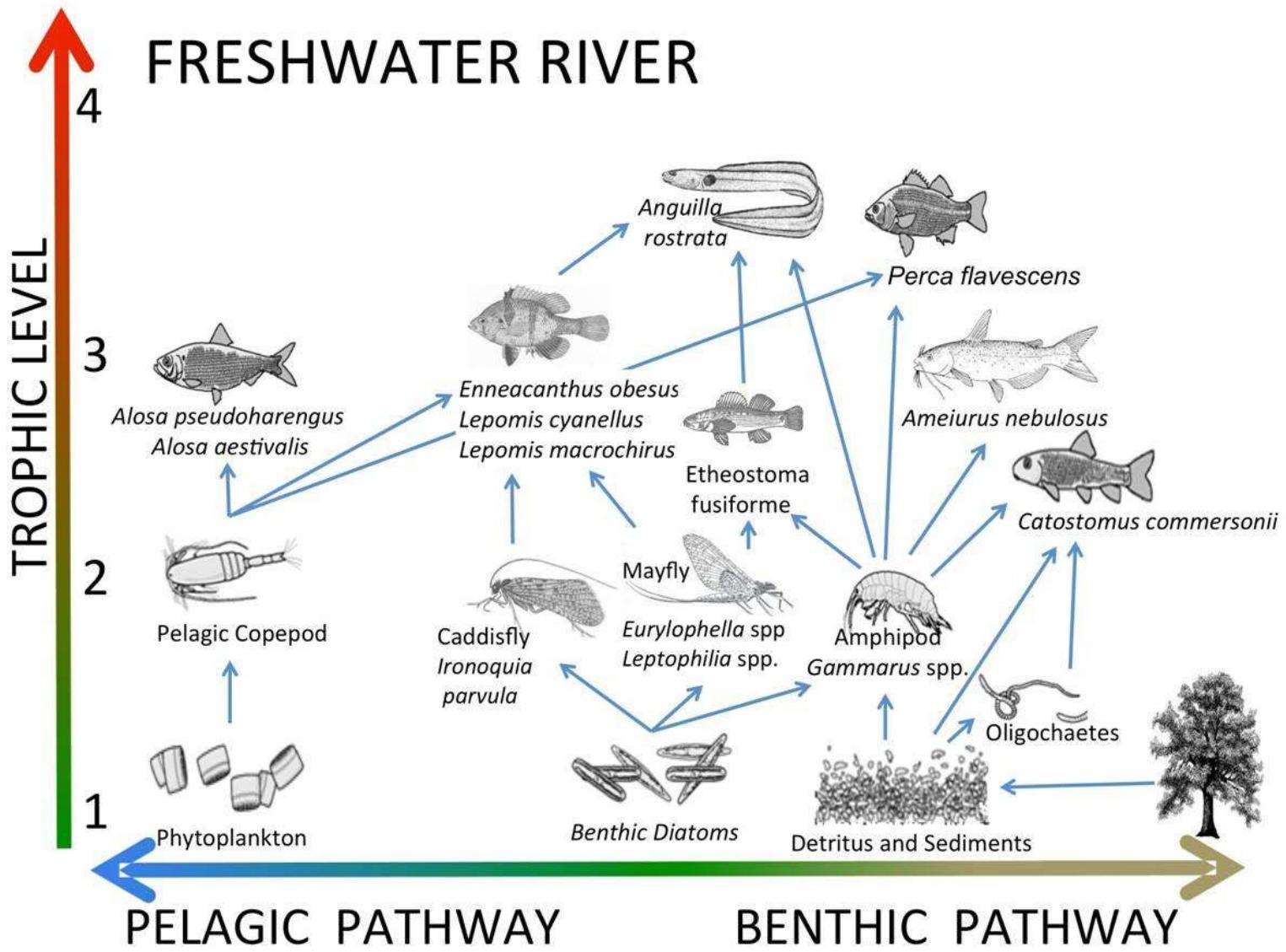
2. Secondary consumers: They feed on primary consumers

Ex: Birds

Decomposers: They decomposes the dead animals and plants. Ex :Bacteria and fungi.



# FRESHWATER RIVER



# SALT WATER ECOSYSTEMS. OCEAN (MARINE) ECOSYSTEMS

## Introduction

Oceans cover more than two thirds of the earth's surface. Ocean environment is characterised by its high concentration of salts and minerals. It supplies huge variety of products and drugs. It also provides us iron, magnesium, iron, natural gas.

## Zones of Oceans

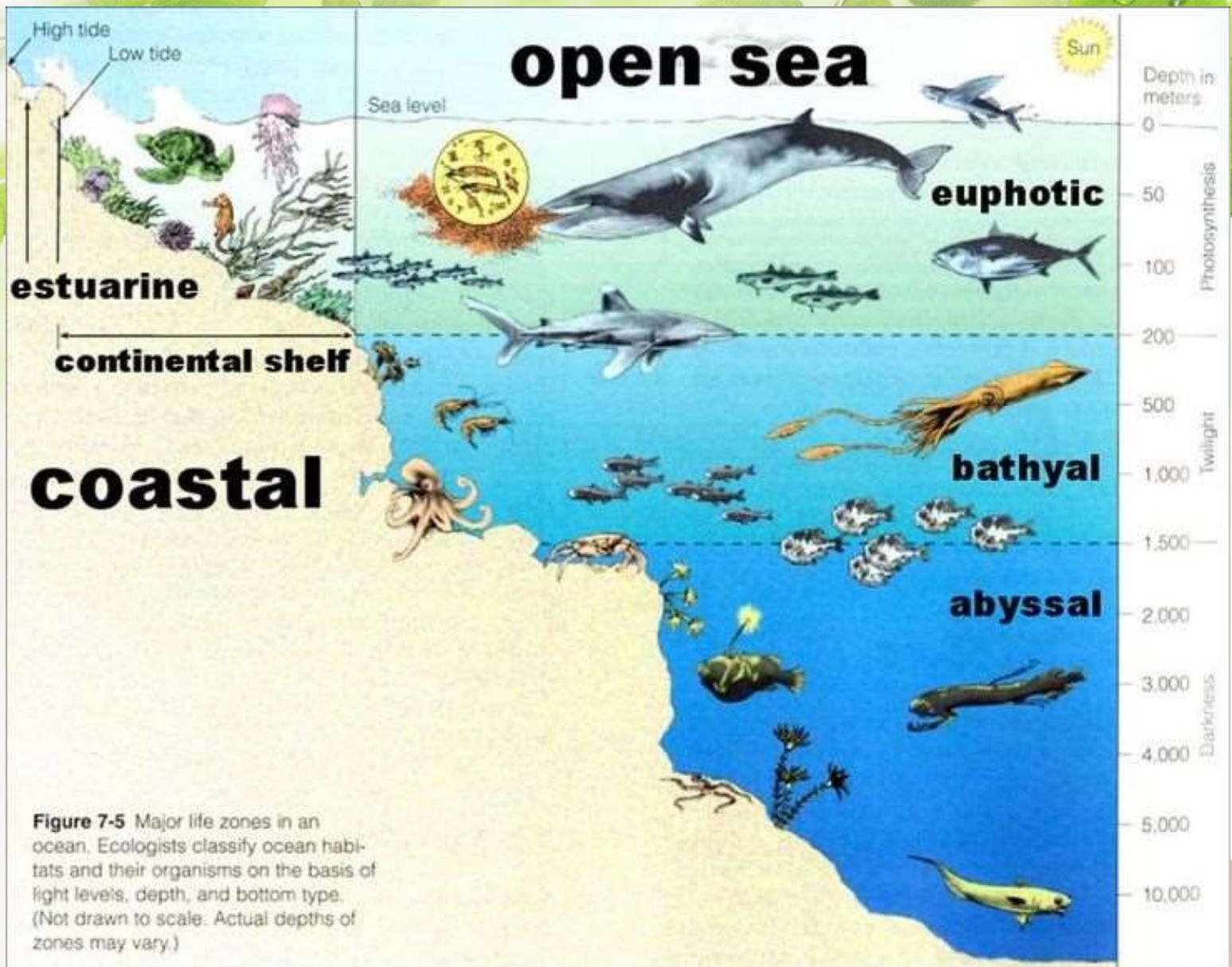
The oceans have two major life zones.

**Coastal zone:** It is relatively warm, nutrient rich shallow water. It has high primary productivity because of high nutrients and sunlight.

**Open sea:** It is the deeper part of the ocean. It is vertically divided into three regions.

- **Euphotic zone:** It receives abundant light and shows high photosynthetic activity.
- **Bathyal zone:** It receives dim light and is usually geologically active.
- **Abyssal zone:** It is the dark zone and is very deep (2000 to metres).

# open sea



**Figure 7-5** Major life zones in an ocean. Ecologists classify ocean habitats and their organisms on the basis of light levels, depth, and bottom type. (Not drawn to scale. Actual depths of zones may vary.)

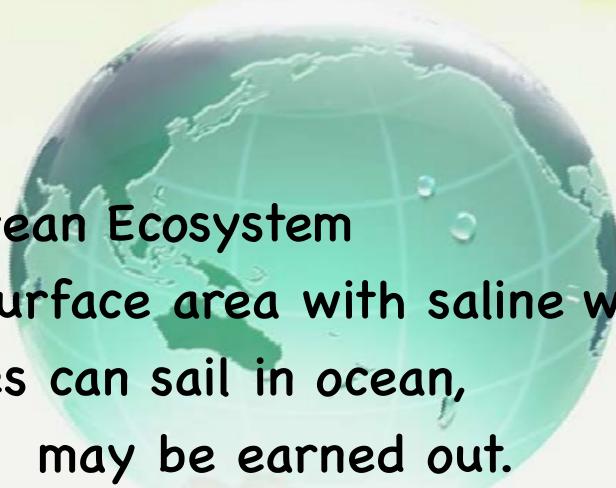
## Characteristics of Ocean Ecosystem

It occupies a large surface area with saline water.

Since ship, submarines can sail in ocean,  
commercial activities may be earned out.

It is rich in biodiversity.

It moderates the- temperature



# Structure and function Ecosystems

Abiotic components Examples

Temperature, light, NaCl, K, Ca, and Mg Salts  
alkalinity

Biotic components

1. Producers :

Phytoplanktons (diatoms, unicellular algae, etc., ) and marine plants (sea weeds, chlorophycela, phaeophyceae).



## 2. Consumers

These are heterotrophic macro consumers. They depend on producers for their nutrition.

Primary consumers (herbivores) :They feed on producers

Ex: Crustaceans, molluscs, fish

Secondary consumers (carnivores) : They feed on herbivores

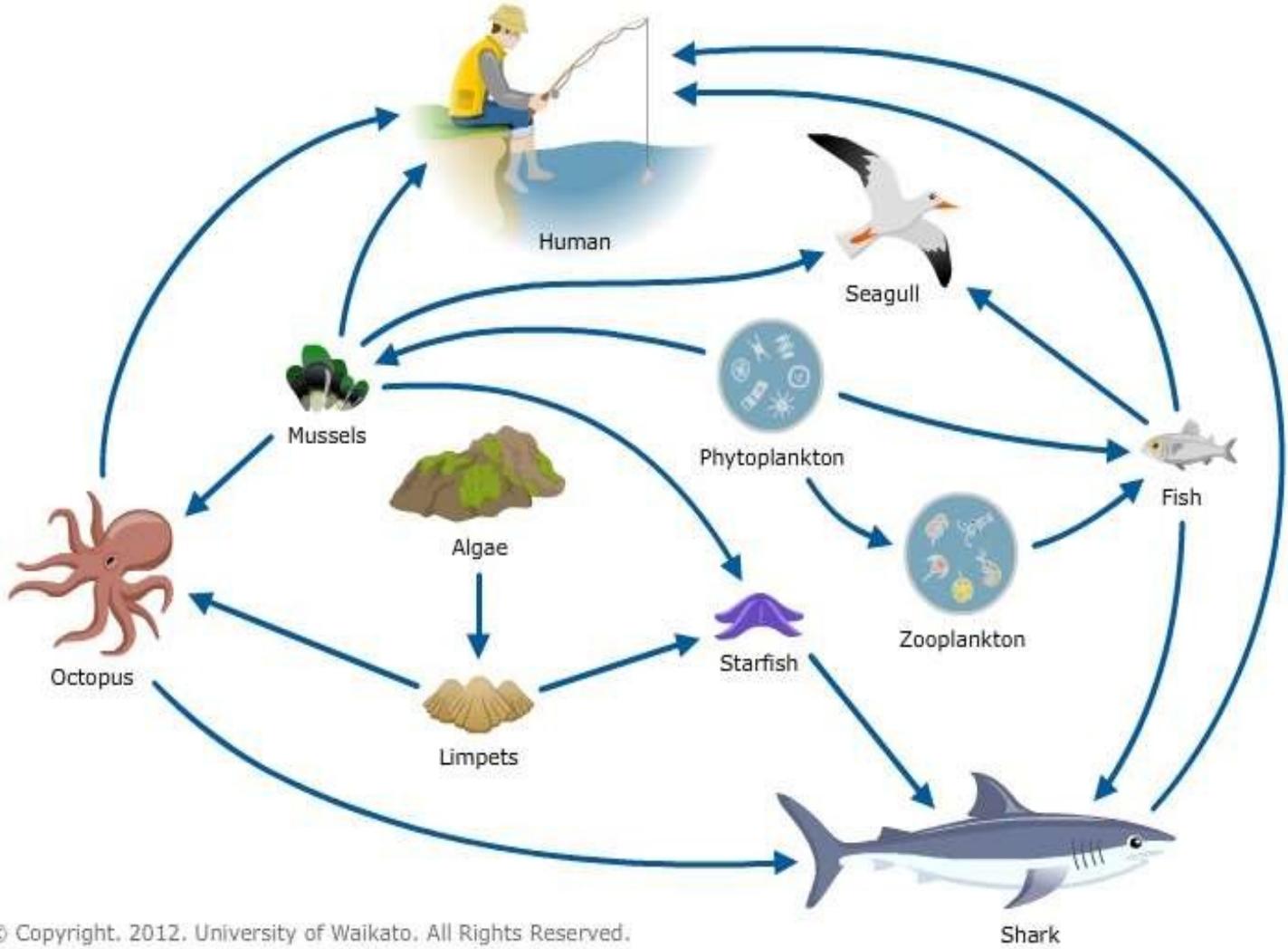
Ex: Herring, mackerel, etc.,

Tertiary Consumers: They are the top consumers. They feed on small

Ex: Cod, Haddock, -etc.,

3. Decomposers: They decompose the dead organic matter.

Ex: Bacteria and some fungi.



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# ESTUARINE ECOSYSTEM

## Introduction

An estuary is a partially enclosed coastal area at the' mouth of a river, where sea water mixes with freshwater. It is strongly affected by tidal action. Estuaries are generally : abundant of nutrients. Estuaries are useful to human beings due to their high food potential. It is essential to protect the estuaries from pollution.

## Characteristics of Estuarine ecosystem

- Estuaries are transition zones, which are strongly affected by tides of the sea.
- Water characteristics are periodically changed.
- The living organism in estuarine ecosystems have wide tolerance.
- Salinity remains highest during the summer and lowest during the winter.

# **Structure and function of Estuarine Ecosystem**

## **Abiotic Components**

**Examples :Temperature, pH, sodium and potassium salts and various nutrients.**

## **Biotic Components**

### **Producers**

**Examples :Marsh grasses, seaweeds , sea-grasses and phytoplankton.**

### **Consumers**

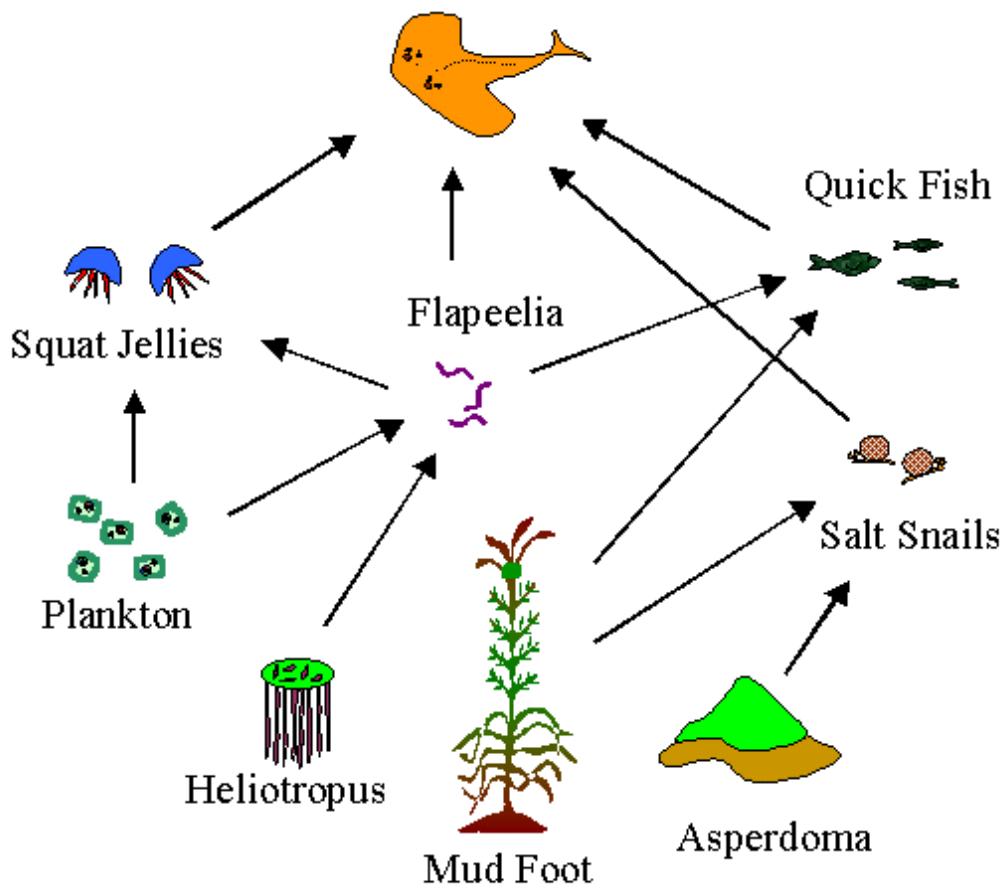
**Examples :Oysters, crabs, seabirds, small fishes**

### **Decomposers**

**Examples :Bacterias, fungi and actenomycetous.**



## Sand Wedge



Salem

