

Terrestrial eco system

This eco system related to land.

EXAMPLES

Grassland ecosystem, Forest eco system,
desert eco system.

Aquatic ecosystem

This is related to water.

I. Fresh water eco system

a. Running water eco system

Examples

Rivers, streams

b. Standing water eco system

Examples

Pond, lake.

II. Marine Ecosystem

Seas and sea shores

Structure (or) Components of eco system

It explains the relation between abiotic and biotic components.

Two major components are

I)Biotic

II) Abiotic

Abiotic (or) Non living components

The non living components of the environment are called abiotic component.

Examples.

Soil, Water, Climate, Air, Energy and Nutrients

1. Physical component

They are useful for growth and maintenance of biotic.

Examples : Air, water, sunlight and energy

2. Chemical component

They are essential sources of nutrients.

Examples : (i) Organic substances such as Protein, Carbohydrates, lipids...
(ii) Inorganic substances such as all micro and macro elements.

- **Micro elements:** Al, Cu, Zn, Co.

- **Macro elements:** C, H, O, P, N, P, K

Biotic components

The living organisms in eco system are called biotic components.

Examples

Plants, Animals and micro organisms.

Classifications of biotic components

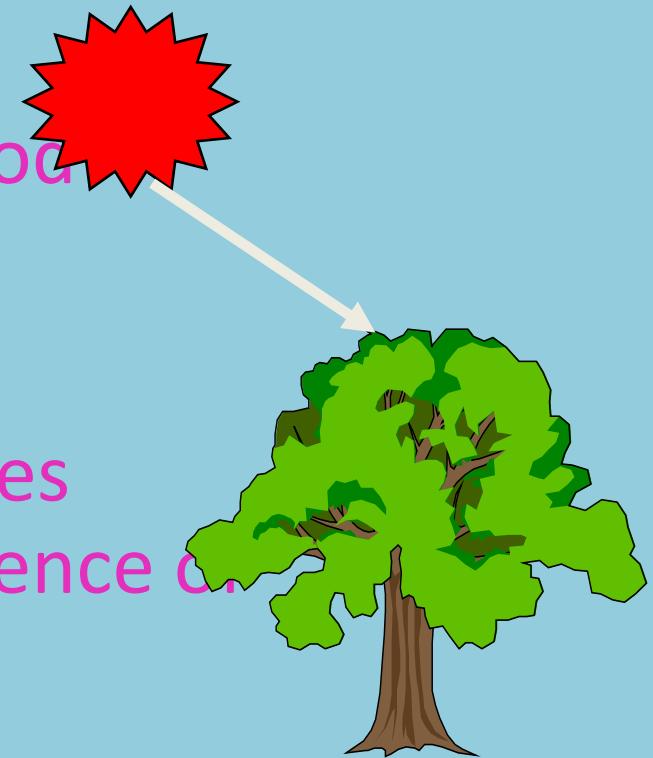
1. Producers(Plants)
2. Consumers(Animals)
3. Decomposers(Microorganisms)

1. Producers(Autotrophs)

Plants and trees prepare their food through photosynthesis.

Photosynthesis

The green pigments in plant leaves convert CO_2 and H_2O in the presence of sunlight into carbohydrates.



Sun light



This process is called photosynthesis.

PHOTOSYNTHESIS CHART

SUNLIGHT

CARBON DIOXIDE

WATER

MINERALS

OXYGEN

PLANT SUGARS

Carbon dioxide enters the leaves through stomata (tiny holes) in the leaves.

2. Consumers (Heterotrophs)

Plant eating species

Insects, rabbit, goat, deer, cow.,

Animals eating species

Fish, lions, tigers

Types of consumers

- a. Primary consumers
- b. Secondary consumers
- c. Tertiary consumers

a. Primary consumers

They are called Herbivores.

They are plant eaters.

Examples : Insect, rat, goat...

b. Secondary consumers

They are primary carnivores

They are herbivores eaters.

Examples: Frog, cat, snakes, foxes...

c. Tertiary consumers

They are secondary carnivores.

They are primary carnivores eaters.

Examples: Tiger, lions

Producer Herbivores Primary carnivores

GRASS-----→RAT-----→CAT----- →TIGER

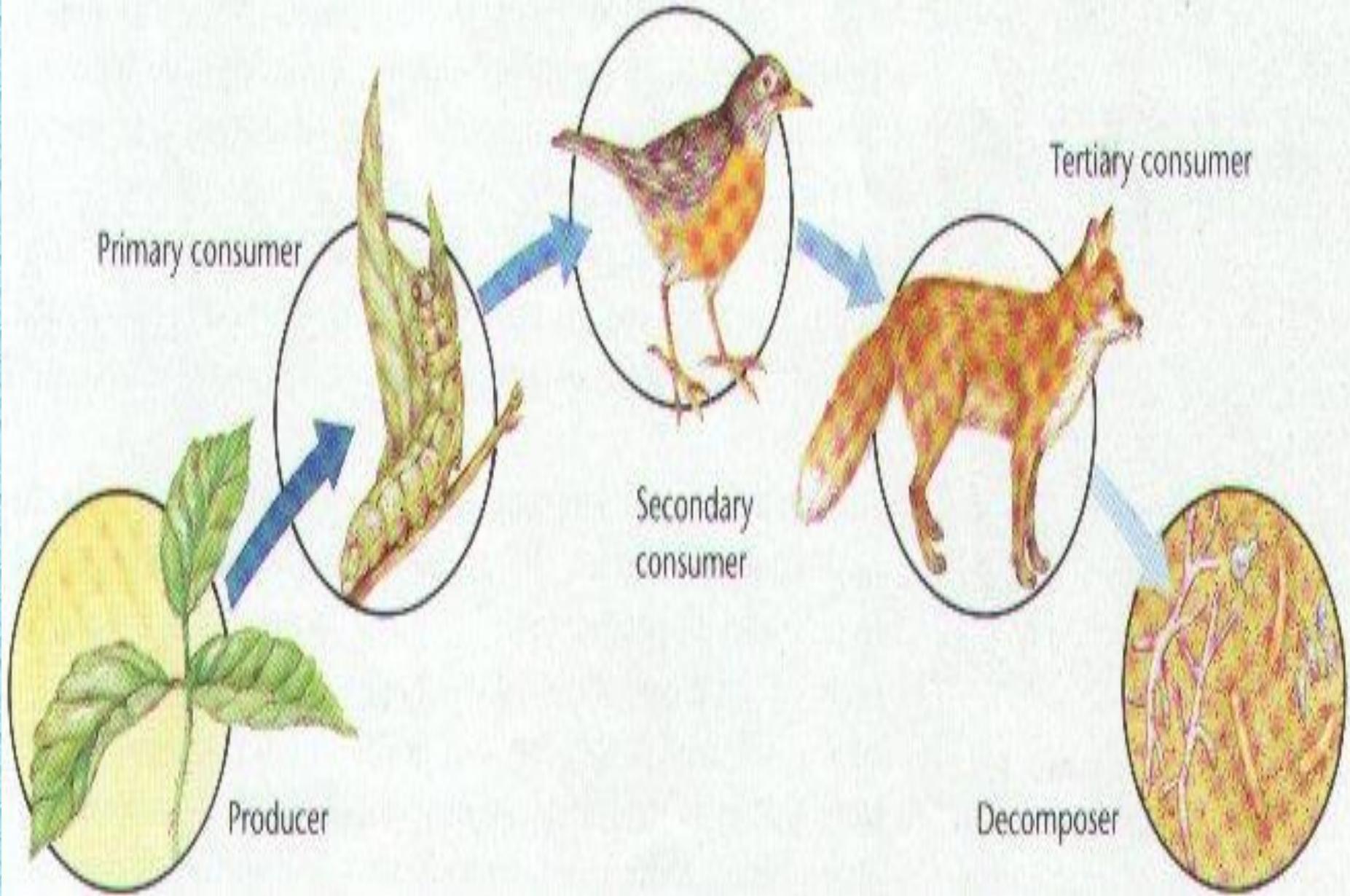
Secondary carnivores

3. Decomposers

Micro organisms like bacteria and fungi.

Decomposers attack the dead bodies of producers and consumers.

- It converts dead organic matter into simpler as well as inorganic compounds. These inorganic compounds together with organic substances are utilized by the producers for the synthesis of their own food.



Function of an ecosystem

Types of function

Primary function

Photosynthesis: Manufacturing of starch

Secondary function

Distributing of energy in the form of food

Tertiary function

The dead systems are decomposed and initiating the cycling.

Food chains

Transfer of food energy from plants through a series of organisms is referred to as food chain.

A food chain starts with plants and ends with animals.

Herbivores

Animals that eat only plants are called herbivores.

Carnivores

Animals that eat other animals are called carnivores.

Food Chain in a grass land

Plants ----→
Producer

Rats---→
prim consu

Snakes -----→Eagles
seccconsumers

Terconsumers

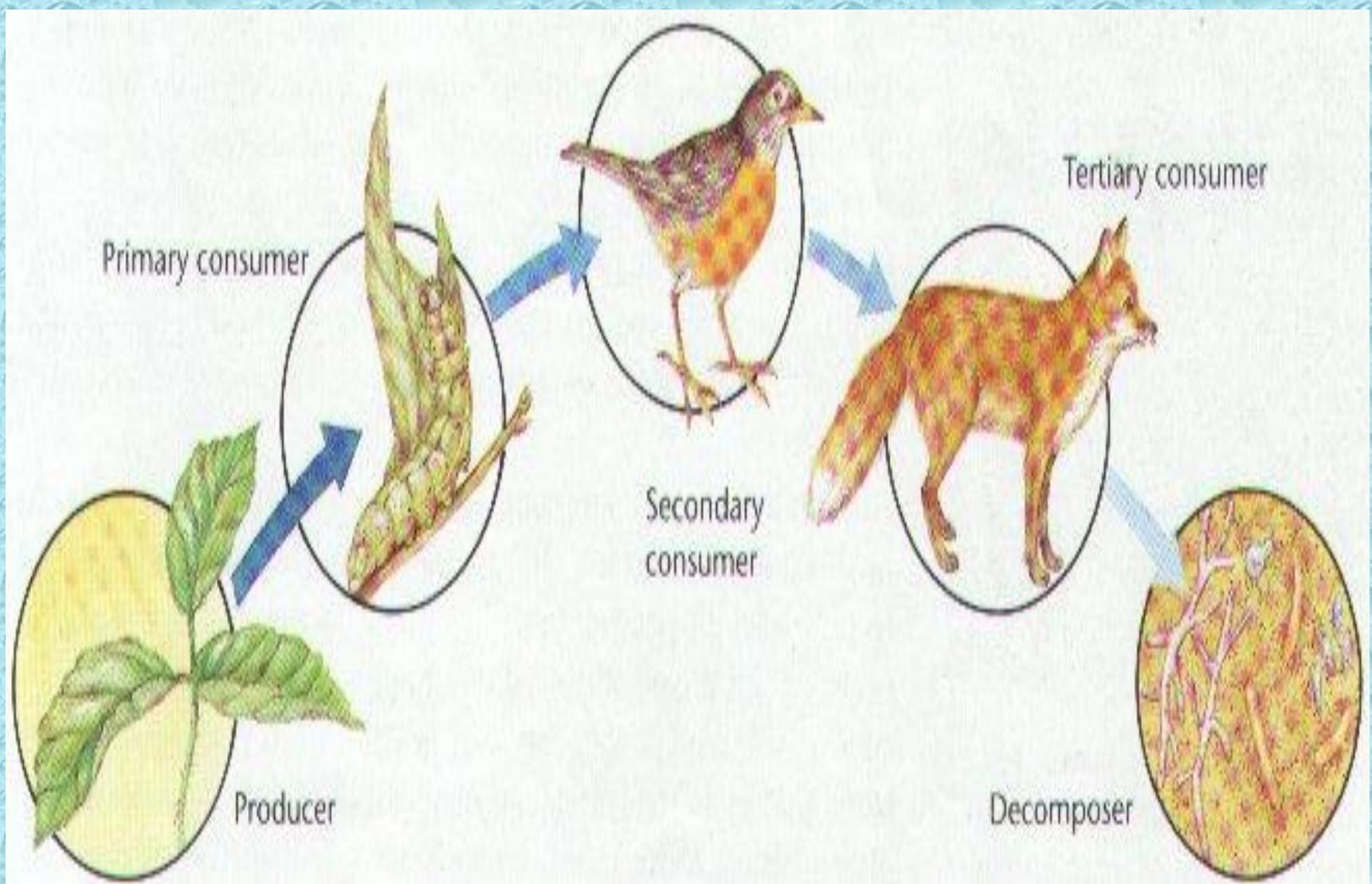
Food Chain in a pond

Phytoplankton---→Zooplankton-----→small fish-----→large fish -----→ man
Producer primary secondary secondary Tertiary
Consumer Consumer consumer consumer

Food chain in Forest

Plants-----→Deer-----→Tigers OR Lions
Producer primary Consumer secondary consumer

Example of a Food Chain



Tropic levels (or) feeding levels

The various steps through which food energy passes in an eco system is called tropic levels.

T1-----→T2-----→ T3 -----→ T4 -----→T5

- T1** Green plants are first tropic level
- T2** Primary consumers are second tropic level
- T3** Secondary consumers are third tropic level
- T4** Tertiary Consumers are fourth tropic level.
- T5** Decomposers represent fifth tropic level.

Types of Food chain

1. Grazing food chain
2. Detritus food chain

1. Grazing food chain

It is found in grass land and pond eco system

1. Starts with green plants
2. Goes to herbivores and carnivores
3. Finally goes to decomposers

2. Detritus food chain

Found in grassland and forest eco system

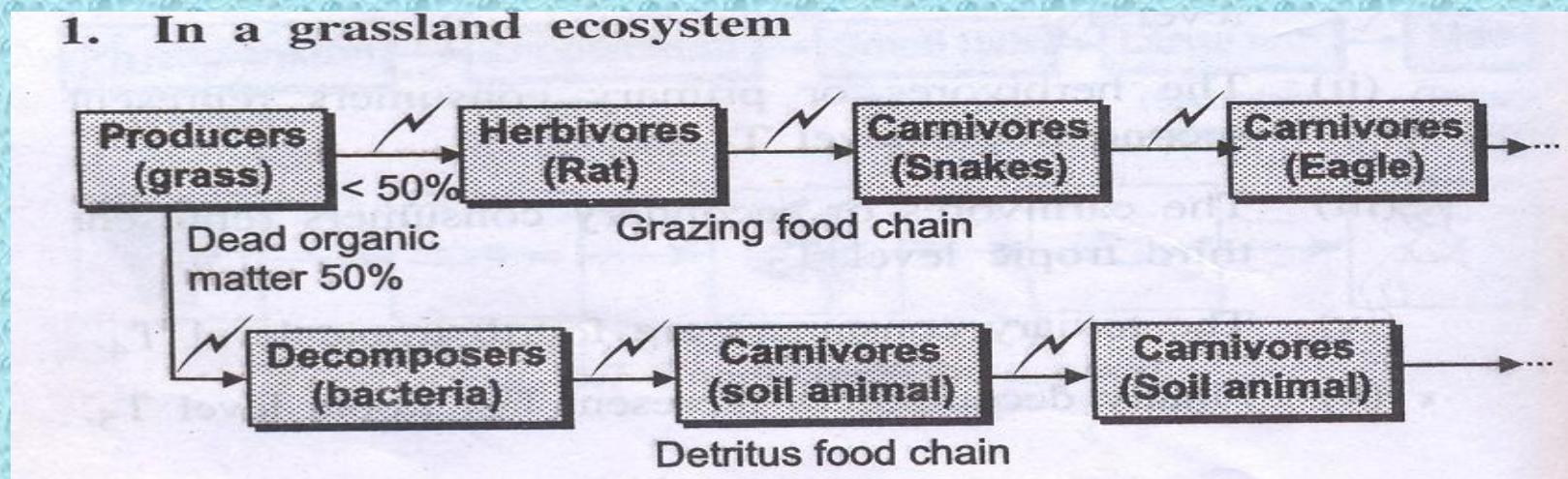
1. Starts with dead organic matter
2. Goes to herbivores and carnivores
3. Finally goes to decomposers

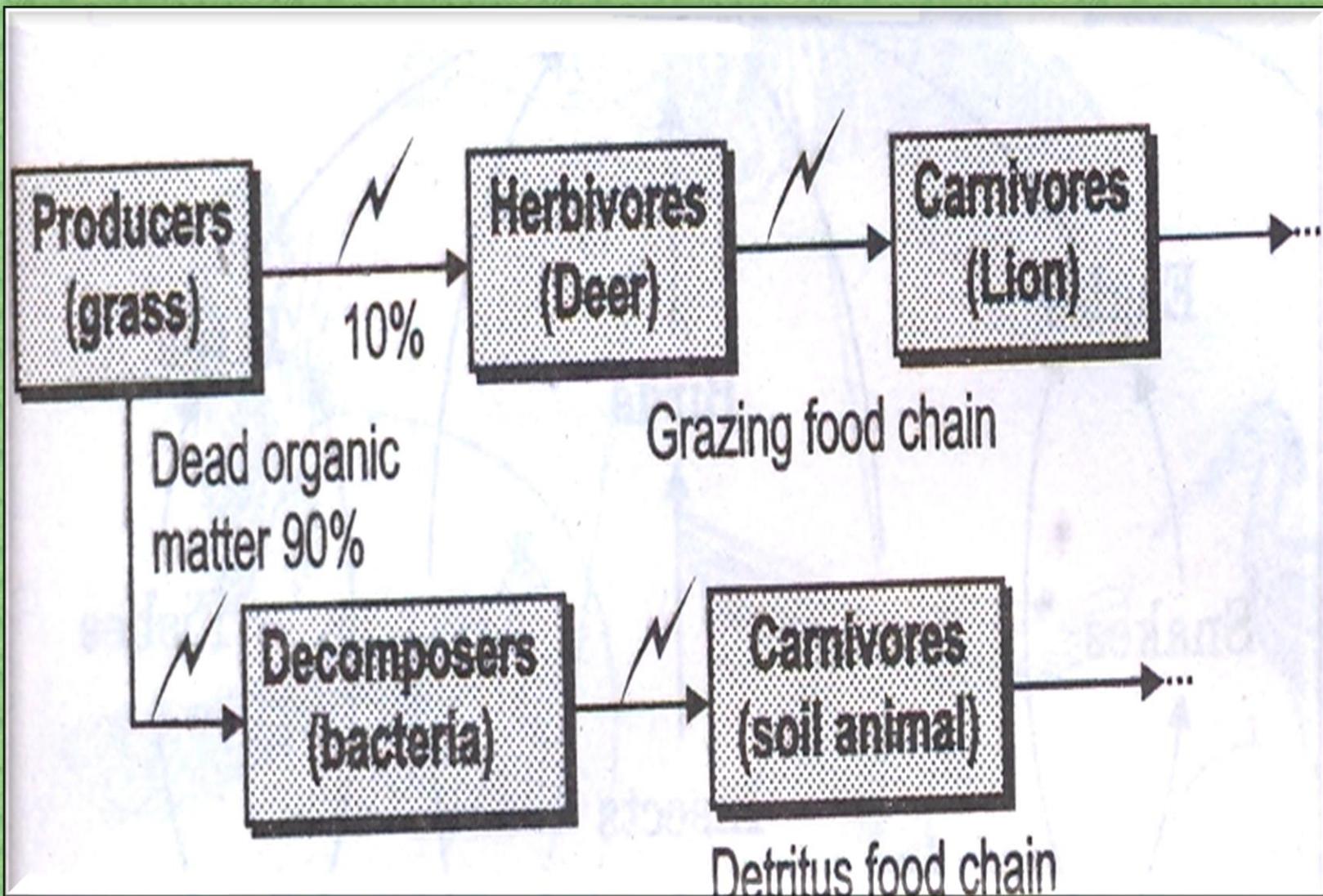
Flow diagram

In a grassland eco system

It gets energy from plant.

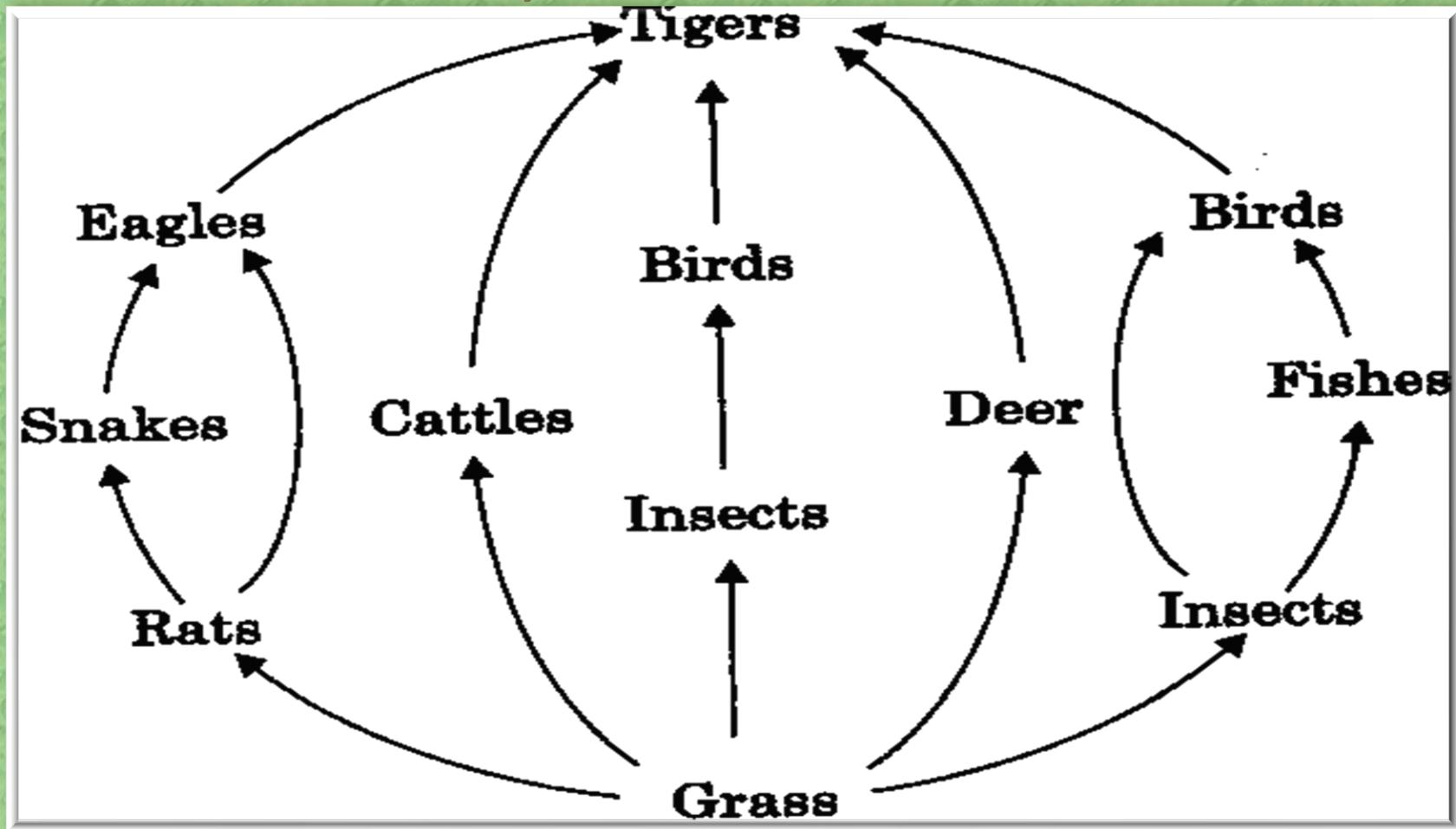
1. In a grassland ecosystem



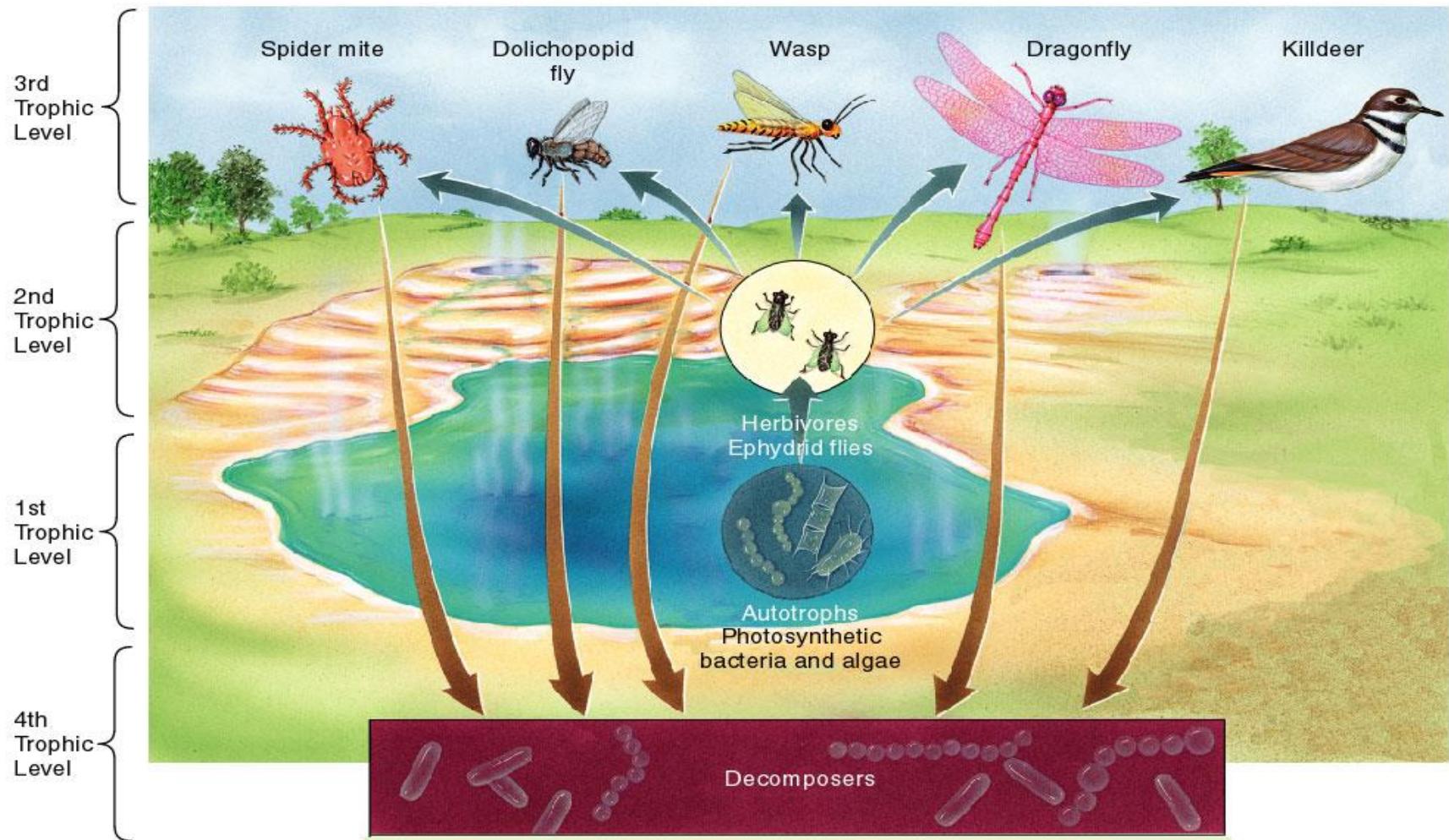


Food web

The interlocking pattern of various food chains in an ecosystem.



Food web of a hot spring



Difference between food chain food web

In a food chain if one species get affected, then subsequent tropic levels are also affected.

But in a food web if one species get affected, then subsequent tropic levels are not affected.

Significations of food chain and food web.

1. Energy flow and Nutrient cycle takes place through food chain and food web.
2. It helps in maintaining the ecological balance.
3. It regulates the population size of tropic level.

4. Bio magnification

The non bio degradable materials keep on passing from one tropic level to another.

At each tropic level the concentration keep on increasing

Biomagnification of DDT-An Illustration

1. DDT sprayed for pest control
2. Its concentration increases through food chain.
3. From plants to animals, birds, fish and human beings.
4. It damages the shells of egg and cells of human beings.

Energy flow and thermodynamics

It follows two laws of thermodynamics

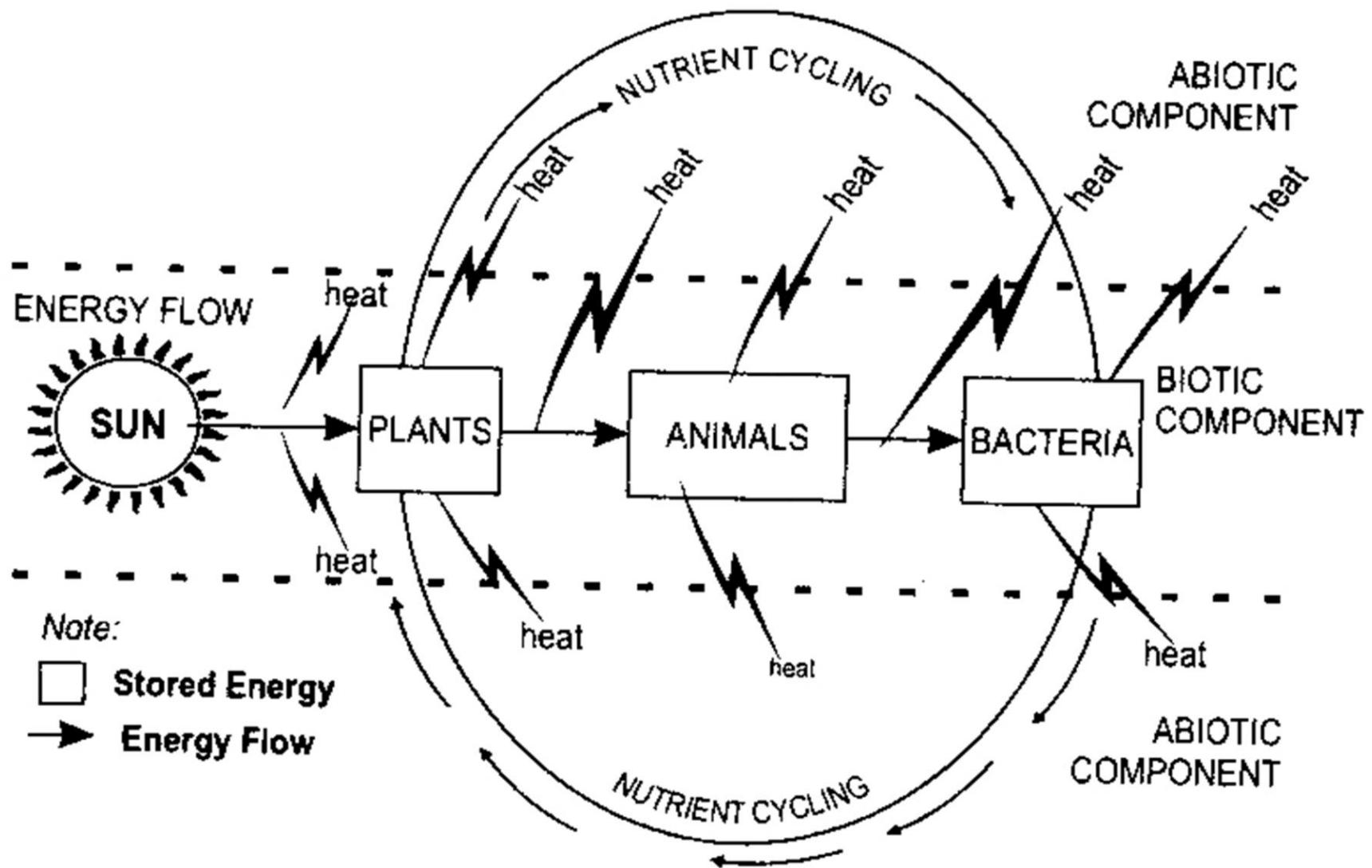
1st law of Thermodynamics

Energy can neither be created nor destroyed, but it can be converted from one form to another.

2nd law of Thermodynamics

Whenever the energy is transformed, there is a loss of energy through the release of heat.

Relationship between structure and function



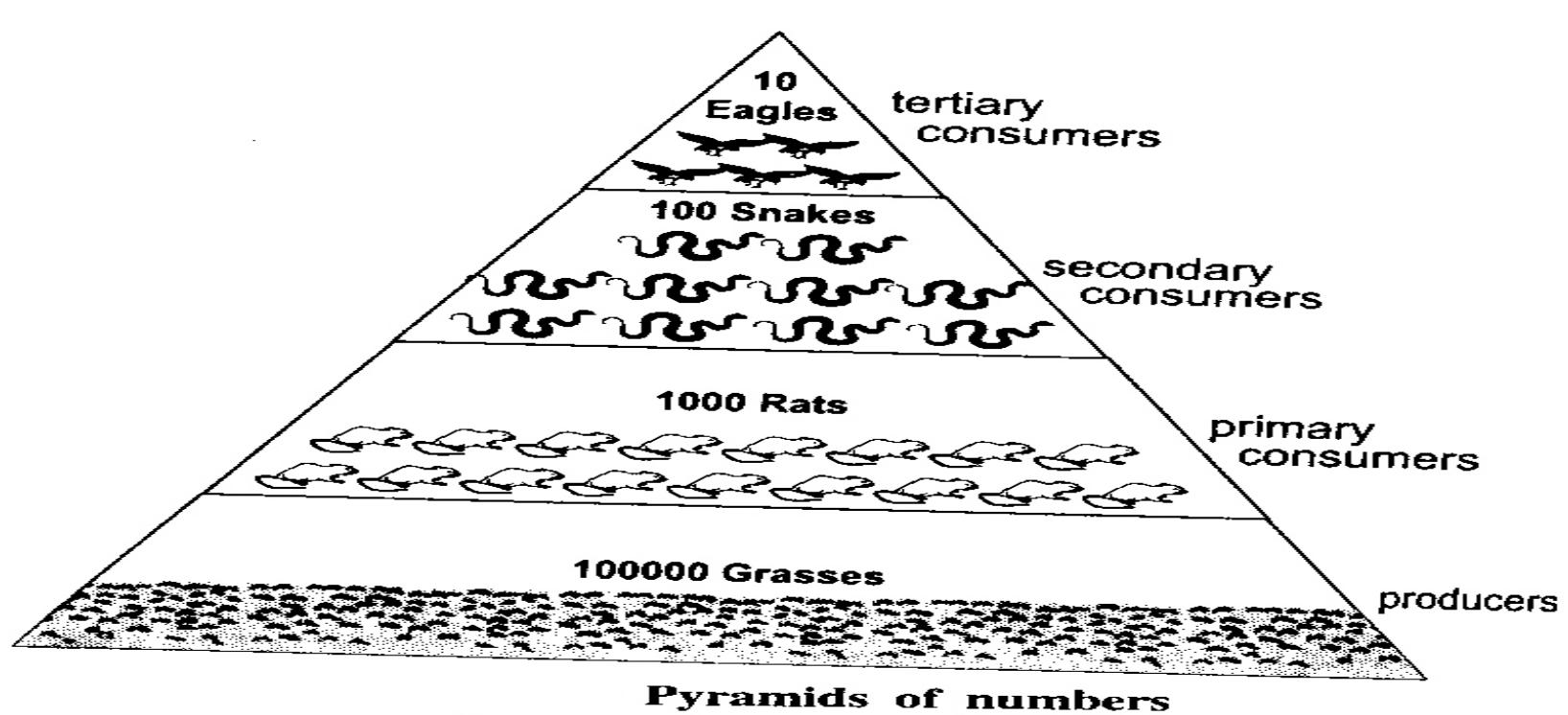
Ecological pyramids

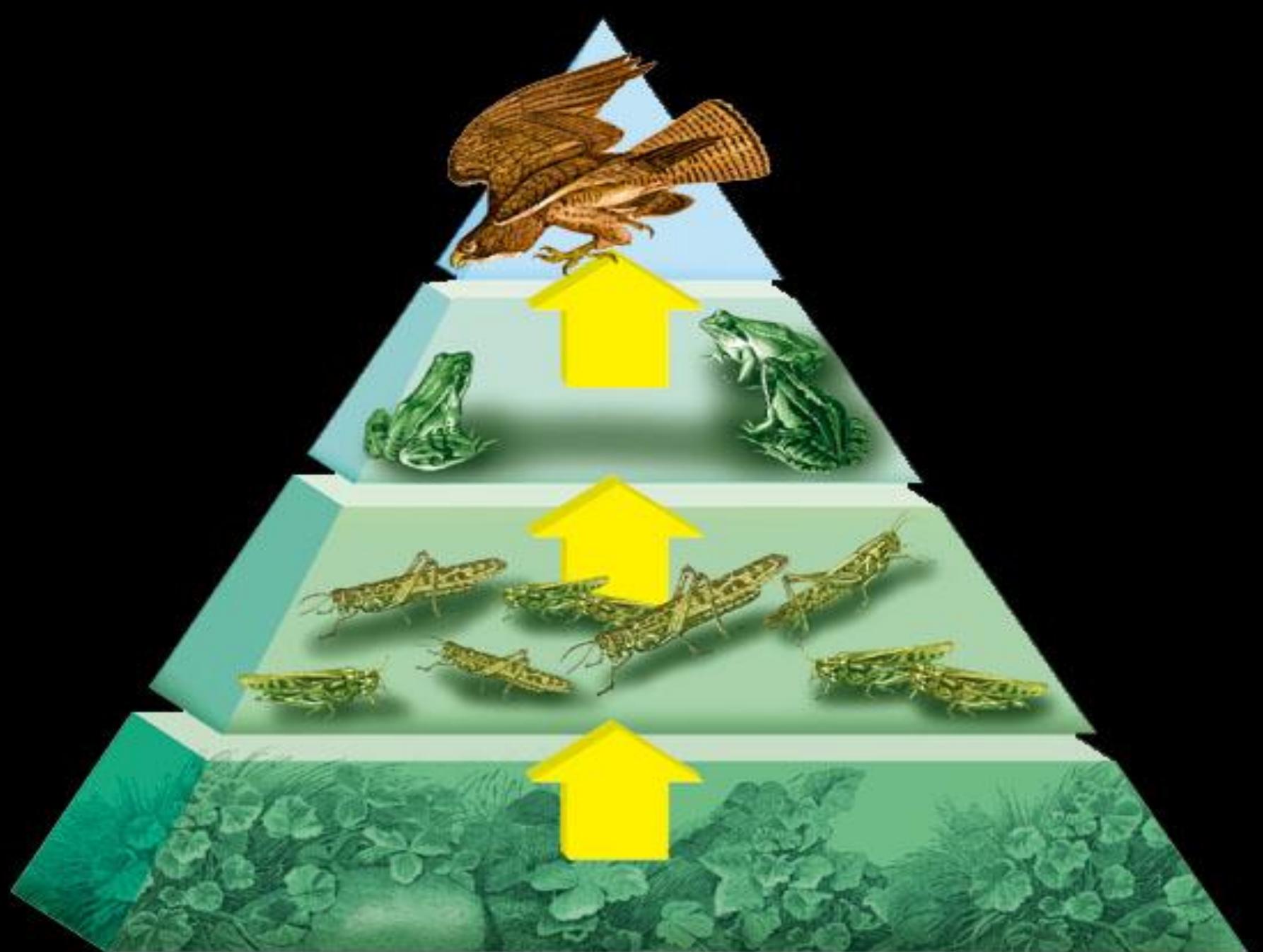
Graphical representation of structure and function of trophic levels of an eco system is called Ecological pyramid.

It is triangular in shape.

Bottom starts with producer.

The apex end with tertiary consumers.





Types of ecological pyramids.

1. Pyramid of numbers.
2. Pyramid of energy.
3. Pyramid of biomass.

1. Pyramid of numbers.

It represents the number of organisms present in the each tropic level.

Examples : Grass land ecosystem.

Level1.Here the producers are grass-size is small and number is high.

Level2.The primary consumers are rat- size and number is small.

Level3.The secondary consumers are snakes - size and number is smaller.

Level4.The tertiary consumers are eagles- size and number is smallest.

2. Pyramid of energy.

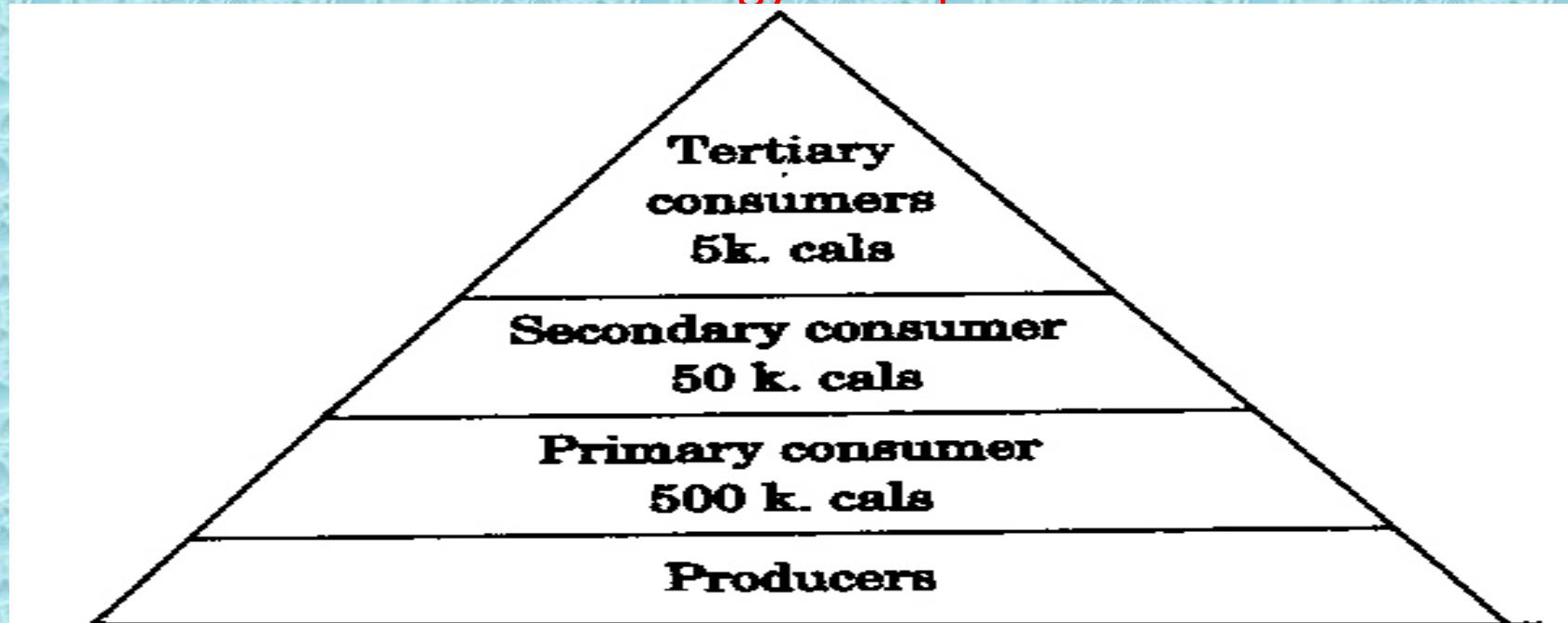
It represents the amount of energy present in the each tropic level.

In each level loss of energy in the form of heat.

In each level 90% of energy loss takes place.

There fore only 10% of transferred to next level.

Therefore decrease in energy from producer to consumer.

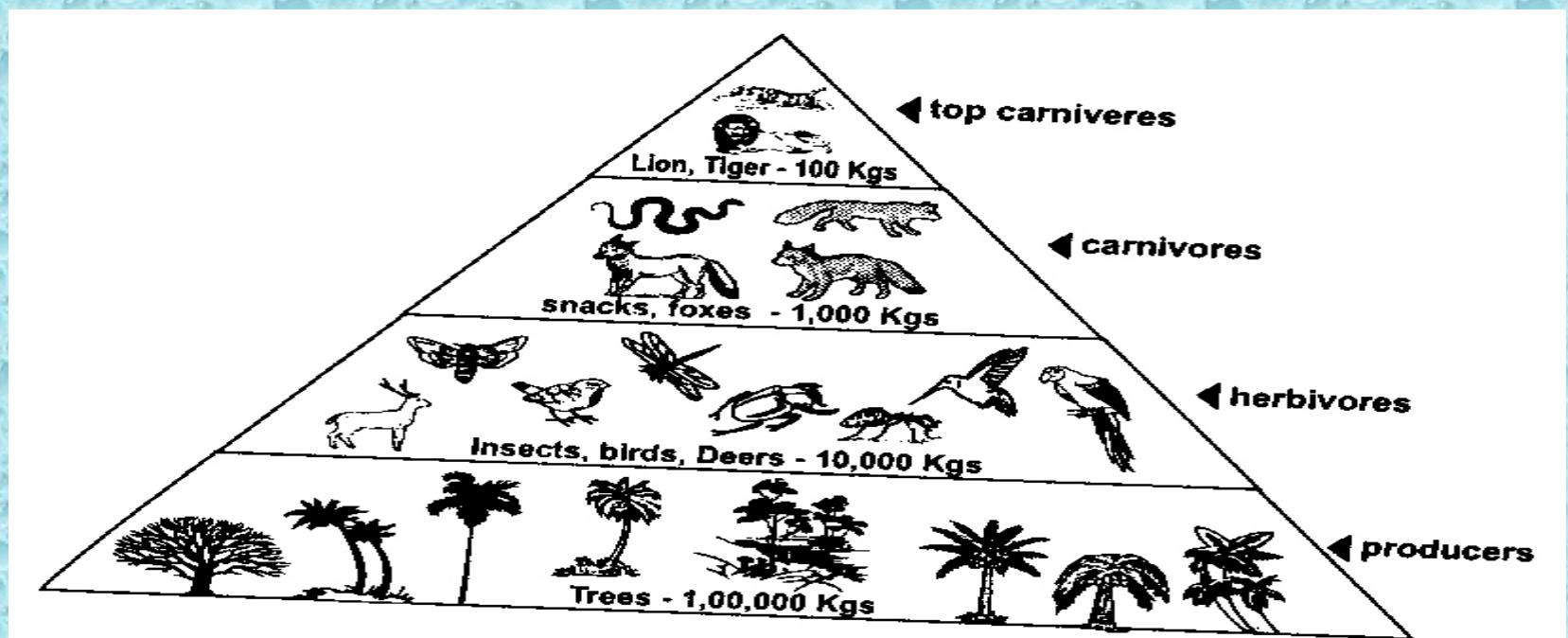


Pyramid of biomass.

It represents the total amount of bio mass present in each tropic level.

Example: Forest eco system.

Decrease in the bio mass from lower tropic level to the higher tropic level.



Forest Ecosystem

1. Tall and dense trees support animals, birds and tribal people.
2. They are receiving high rain fall.
3. Forests covers 40% of world land.

Types of forest eco system

1. Tropical rain forests.
2. Tropical deciduous forests.
3. Tropical scrub forests.
4. Temperate rain forests.
5. Temperate deciduous forests.

Features of different types of forests.

Tropical rain forests.

Found near equator.

High temperature.

Trees like Teak, Sandal

Animals like Lion, Tiger and Monkeys



Tropical deciduous forests

Found little away from equator.

Warm climate.

Rain in monsoon only.

Trees like maple, oak, hickory.

Animals like deer, fox.



Tropical scrub forests.

They are in dry climate.

Trees like shrubs & small deciduous trees

Animals like Deer, Fox,...



Temperate rain forests.

Found in temperature area with adequate rainfall.

Coniferous forests

Trees like pines, redwood.

Animals like squirrels, fox, cats, bear...



Temperate deciduous forests.

Found in area with moderate temperature.

Trees like oak, hickory

Animals like deer, fox, and bear.



Characteristics of forest eco system.

It is characterized by warm temperature and adequate rainfall.

The forests maintain the climate and rainfall.

Habitat for wild animals.

It protects biodiversity.

The soil in the forest is rich in nutrients, support the growth of trees.

Light is poor inside the forest, therefore conversion of organic matter into nutrient is very fast.

Structure and function of forest eco system.

1. Abiotic component

E.g. Temperature, light, rainfall, minerals.

Inorganic and organic substances found in the soil.

2. Biotic components

a. Producers

Trees, shrubs and plants

The plants absorb sunlight and produce food through photosynthesis.

b. Consumers

Primary consumers (Herbivores)

Ants, flies, insects, mice, deer, squirrels

They directly depend on the plants for food.

Secondary consumers (Primary carnivores)

Snakes, birds, fox.

They directly depend on the herbivores for their food.

Tertiary consumers

Tiger, lion

They depend on the primary carnivores for their food.

Decomposers

Bacteria and fungi

They decompose the dead plants and animals matter.

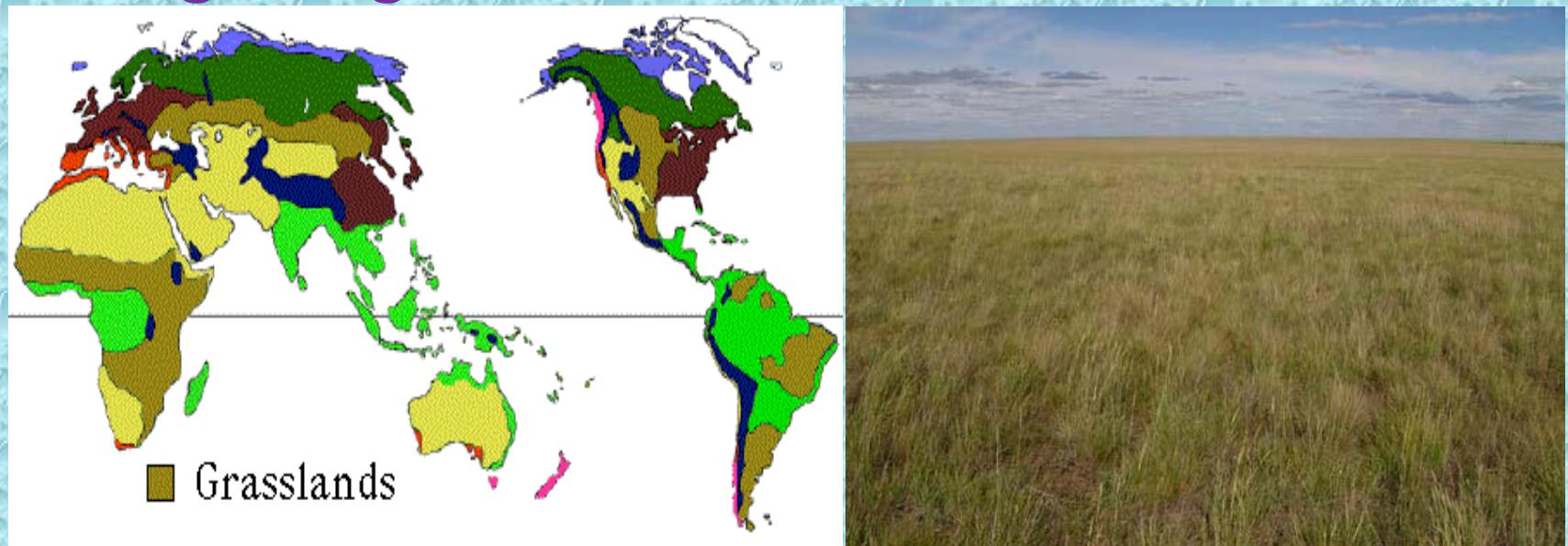
Decomposition rate is high in tropical forest and low in temperate forest.

Grass land ecosystem

Grass land occupies 20% of earth's surface.

Some trees shrubs are also present in the grass land ecosystem.

Over grazing leads to desertification



Grasslands can be found on all continents except Antarctica.

Types of grass land ecosystem

- 1.Tropical grasslands**
- 2. Temperate grass land.**
- 3.Polar grasslands**

1. Tropical grasslands

Found near tropical rain forests.

High temperature

It is also known as savanna.

Tall grass with tall shrubs .

Animals like Zebras, giraffes, antelopes.



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2. Temperate grass land.

Found in centers of continent.

Found in slopes of hills.

Very cold winter and hot summers.

Shrubs and trees are not growing in this climate.

3. Polar grasslands

Found in artic polar region.

cold and strong winds with ice and snow.

In summer several small annual plants grow.

Animals like arctic wolf and arctic fox.

Characteristics of grassland eco system.

1. Plain land occupied by grasses.
2. Soil is very rich in nutrients and organic matters.
3. It is ideal place for grazing animals.
4. It is characterized by uneven rain fall.

Structure and function of grassland ecosystem.

Abiotic component

Nutrients, C, H, O, N, P, S.

These abiotic components are supplied by CO_2 , H_2O , Nitrates, Phosphates and Sulphates.

Biotic components

a. Producers

Grasses,shrubs

They produce food through photosynthesis.

b . Consumers

Primary consumers (Herbivores)

Cows, buffaloes, deer, sheep

They directly depend on the grasses for food.

Secondary consumers (Primary carnivores)

Snakes, lizards, birds, jackals, fox

They directly depend on the herbivores for their food.

Tertiary consumers

Hawks, eagle

They depend on the primary carnivores for their food.

C .Decomposers

Bacteria and fungi

They decompose the dead plants and animals matter.

Desert eco system

Desert occupies 35% of world land.

The atmosphere is very dry.

Types of desert eco system

1. Tropical deserts
2. Temperate deserts
3. Cold desert.

Tropical deserts

Found in Africa Sahara desert

Rajasthan Thar

They have wind blown sand



2. Temperate deserts

Found in south California: Majave

They have very hot summer and winter

3. Cold desert.

They are found in China: Gobi desert

They have very warm summer and cold winter.

Characteristics of Desert ecosystem

1. Climate is hot and air is dry.
2. Annual rainfall is less than 25 cm.
3. The soil is very poor in nutrients and organic matters.
4. Vegetation is poor.

Structure and functions of desert eco system.

1. Abiotic components

Example : Temperature, rainfall, sunlight, water.

Temperature is high

Rain fall is very low.

Nutrient is very low in this soil.

2.Biotic components

Producers

Eg:Shrubs, bushes, some grasses & few trees.

Some plants are found.

They have water inside them to alive.

They have waxy layer on the outside to protect them from hot.

Consumers

Eg : Snake, mice, camels, reptiles.

These animals dig holes in ground to live.

They come out at night time to find food.

Animals extract water from the seeds.

Decomposers

Eg : Fungi, bacteria

Desert has poor vegetation

It has very low amount of nutrients.

They are decomposed by fungi and bacteria.



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AQUATIC ECOSYSTEM



It deals with water bodies.

Types of aquatic life zone.

1. Fresh water life zones.

Example

Ponds, streams , river, lakes

2. Salt water life zones.

Example

Oceans, estuaries.

1. Fresh water ecosystem

Pond ecosystem

- i) Here water is stagnant.
- ii) It receives water from rain
- iii) It contains algae,
aquatic plant , insects , fishes
and birds.

Characteristics of pond

- i) Pond is temporary
- ii) Only in season
- iii) It is a stagnant fresh water body.
- iv) Easily they are polluted.

Structure and function of pond ecosystem

Abiotic components

Example : Temperature, water, light, organic and inorganic compounds.

Biotic components

1. Producers

Green photosynthetic organism

They are two types

a. Phytoplankton

Microscopic aquatic plants

They are floating on the surface of water.

Examples : Algae , Pandorina, anabaena, cosmarium.

b.Microphytes

Example : Hydrila , jussiaea, wolfia, demna

2.Consumers

A. Primary consumers (Zooplanktons)

Microscopic animals freely float on the surface water.

Examples : Protozoa, small fish, ciliates, flagellates and protozoan

They feed on phytoplankton

B . Secondary consumers (Carnivores)

Example : Water beetles and small fish

They feed on zooplankton

C.Tertiary consumers

Examples : Game fish

They feed on smaller fish.

3. Decomposers

Examples : Fungi, bacteria and flagellates.

They decompose the dead plants and animals.

LAKE ECOSYSTEM

A scenic view of a lake surrounded by forested hills under a clear blue sky. The foreground shows the dark green foliage and trunks of coniferous trees. In the middle ground, a large, deep blue lake stretches towards distant, hazy mountains. Several small, green-covered islands are scattered across the water. The sky is a vibrant, clear blue with no visible clouds.

Types of lakes

1. Oligotrophic lakes

Low nutrient concentrations

2. Eutrophic lakes

Over nourished by N and P.

3. Dystrophic lakes

Low pH, High Fumic acid and brown water

4. Volcanic lakes

Get water from volcanic eruption

5. Meromictic lakes

Rich in salt

6. Artificial lakes

They are created due to construction of dams

Zones of lakes

1. Littoral zones

Top layer of the lake

It has shallow water.

2. Limnetic zone

Next to littoral

Effective penetration of solar light takes place

3. Profundal zone

Deep open water

Dark in colour

4. Benthic zone

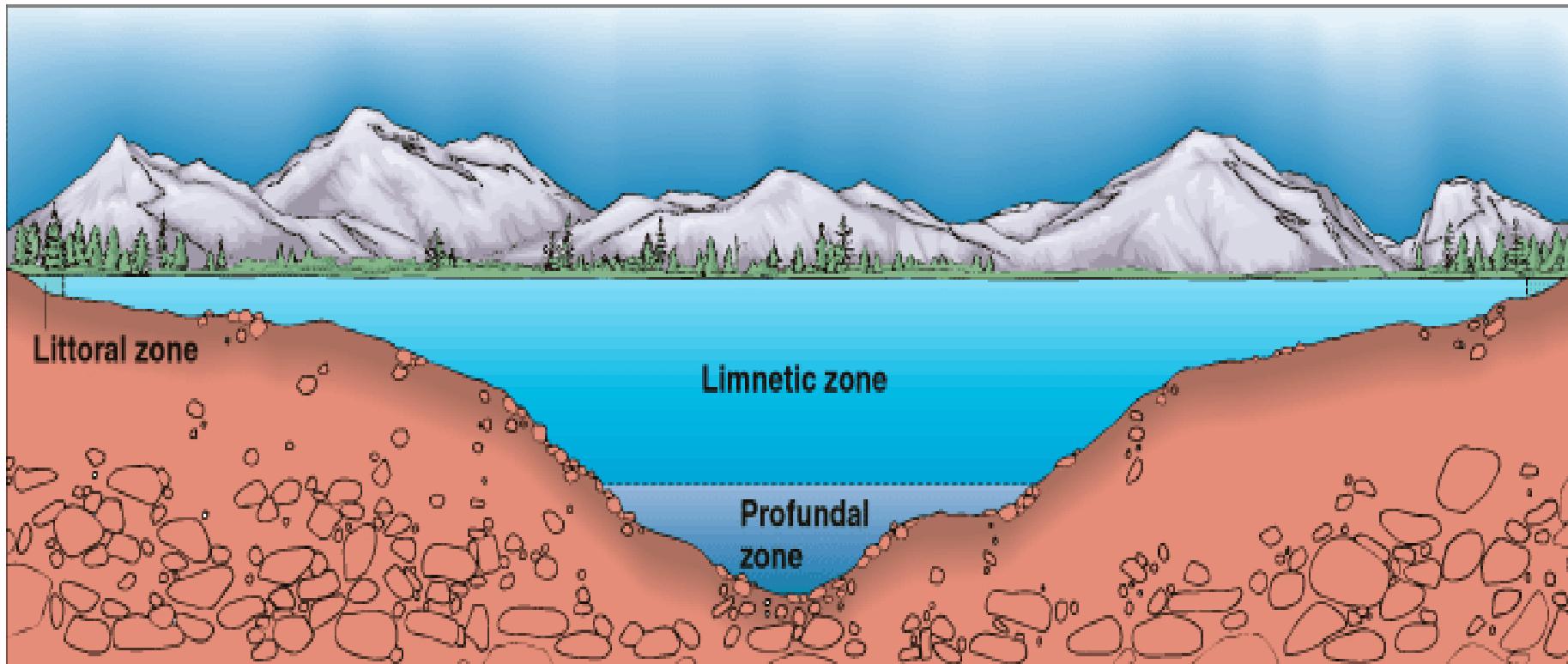
Bottom of the lake

Characteristic of Lake Ecosystem

1. Lake is shallow fresh water body

2. It is permanent water body with large water.

3. It helps irrigation and drink.



Structure and function of Lake Ecosystem

1. Abiotic components

Example : Temperature, light, energy, protein, lipids, turbidity, O₂ and CO₂

2. Biotic components

a. Producers

They are green plants, free floating plant and amphibious plants.

Example : Phytoplankton, algae, flagellate

b. Consumers

A . Primary consumers (Zooplanktons)

Example : Ciliates, Protozoan

They feed on phytoplankton

B . Secondary consumers (carnivores)

Example : Insects and small fishes
They feed on zooplankton

C . Tertiary consumers

Example : Game fish
They feed on smaller fishes

c . Decomposers

Example : Bacteria, fungi and ctnomycetes.
They decompose the dead plants and animals.

River or stream ecosystem

River waters are well oxygenated.

It absorbs oxygen from air

The number of animals is low in river.

Characteristics of River or stream eco system

1. It is fresh water.
2. Free flow of water takes place.
3. Dissolved oxygen content is more.
4. Its deposits have more nutrients.

Structure and function

1. Abiotic component

Examples : Temperature, light, pH, nutrients, organic and inorganic compounds.

2. Biotic components

a . Producers

Phytoplankton, algae, water grasses, aquatic masses, and other plants.

b . Consumers

A. Primary consumers

Example : Water, insects, snails, fishes

They feed on phytoplankton

2. Secondary consumers

Example

Birds and mammals

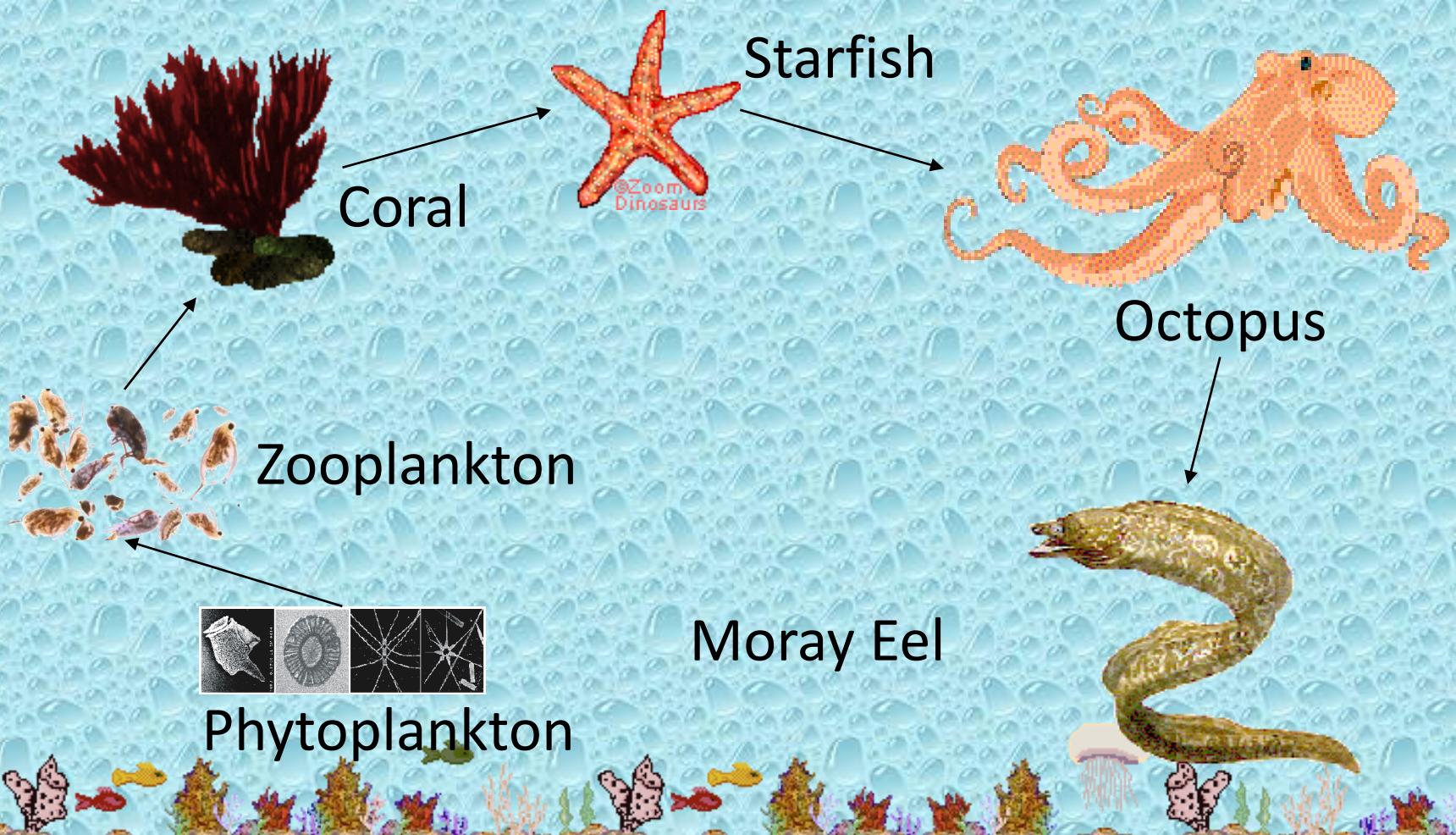
They feed on primary consumers.

c. Decomposers

They decomposes dead animals and plants

Example

Bacteria and fungi.



Ocean Ecosystem

It covers more 75% of earth

It has high concentration of salt.

It provides sea food.

It provides Iron, magnesium, phosphorous and natural gases.

Zones of Ocean

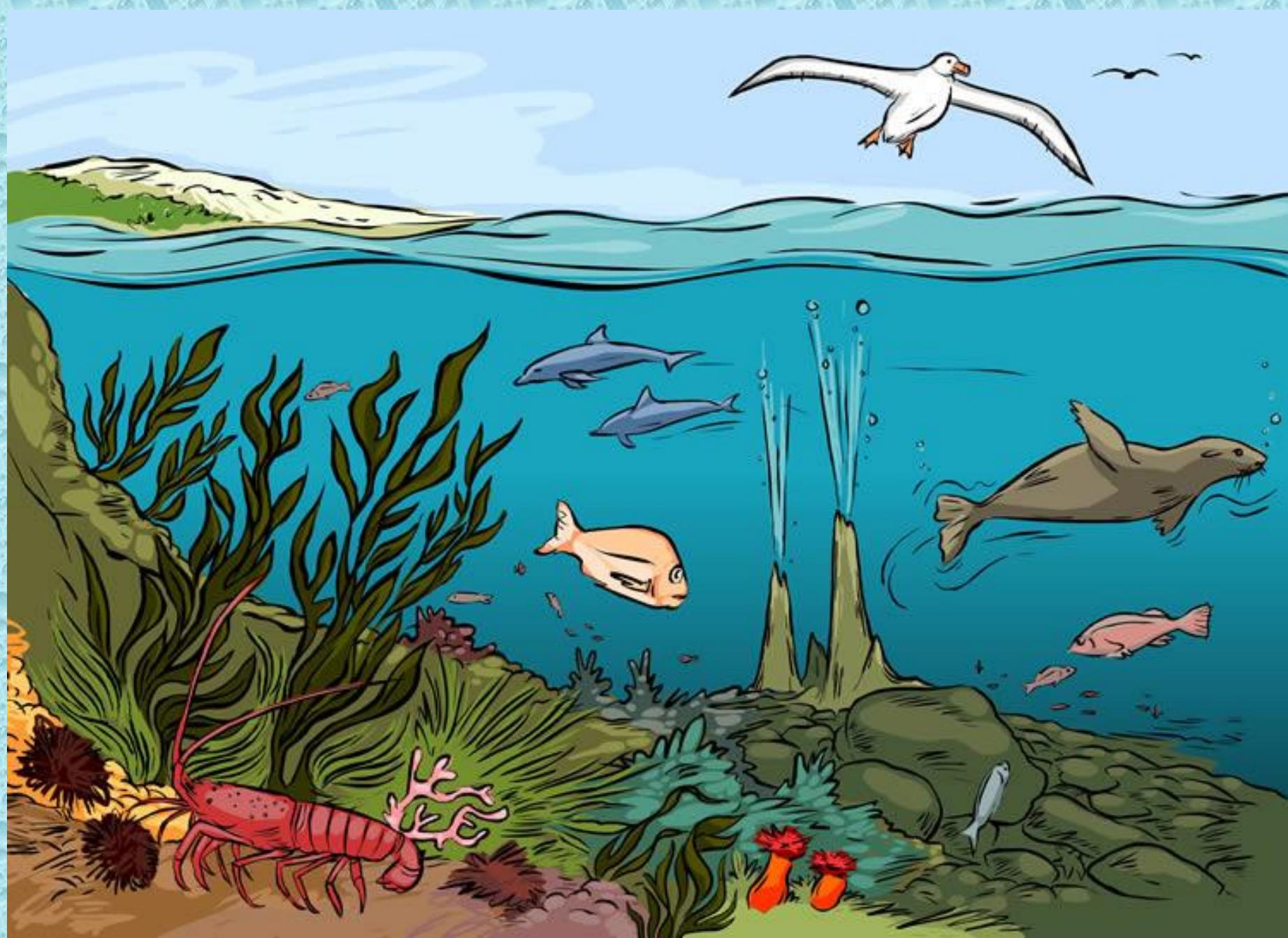
1. Coastal zone

It is warm.

Nutrient rich.

High primary productivity

High sun light.



2. Open sea

It is deeper part of ocean.

It is divided in to three regions

I .Euphotic zone

It receives abundant light

It shows high photosynthetic activity.

ii. Bathyal zone

It receives dim light

It is geological active.

iii.Abyssal zone

It is the dark zone

It is very deep.

Characteristics of ocean eco system

It occupies large surface area with salt water.

Ship and sub marine transport takes place for commercial purpose.

It is rich in bio diversity.

It alters the temperature on the earth.

Structure and function of ocean eco system

1. Abiotic component

Examples : Temperature, light, NaCl, K, Ca, and Mg salts alkalinity.

2. Biotic components

a. Producers

Phytoplankton and marine plants

b . Consumers

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

I. Primary consumers (Herbivores)

Examples : Crustaceans, molluscs, fish.

They feed on producers.

ii. Secondary consumers (Carnivores)

Examples : Herring sahd, mackerel,...

They feed on herbivores.

iii. Tertiary consumers

Examples : Cod, Haddock,...

They are the top consumers

They feed on small fishes.

c . Decomposers

They decompose dead animals and plants

Example : Bacteria and fungi.

Estuarine Ecosystem

- It is partially enclosed coastal area.
- It is at mouth of river and sea junction.
- It is affected by tidal action.
- It has more nutrients.
- It has high food potential.

Characteristics

1. It is a transition zone
2. It is affected tidal action.
3. Water characters are periodically
4. Salinity is very high in summer and lower in winter.
5. The living organisms have wide tolerance.

ADAYAR RIVER



- **The Adyar River**
- Originating from the Chembarambakkam Lake (Thiruvallur district), is one of the rivers which passes through Chennai, South India, and joins the Bay of Bengal. The Adyar River contributes to the estuarine ecosystem of Chennai. Two rivers meander through Chennai, the Cooum (or Koovam) in the central region and the Adyar in the southern region

- The Adyar, which is much less polluted than the Cooum, is de-silted and cleaned periodically by the state government. A protected estuary of the Adyar the natural habitat of several species of bird and animal farms.

Structure and function of estuarine ecosystem.

Abiotic components

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

Biotic components

i. Producers

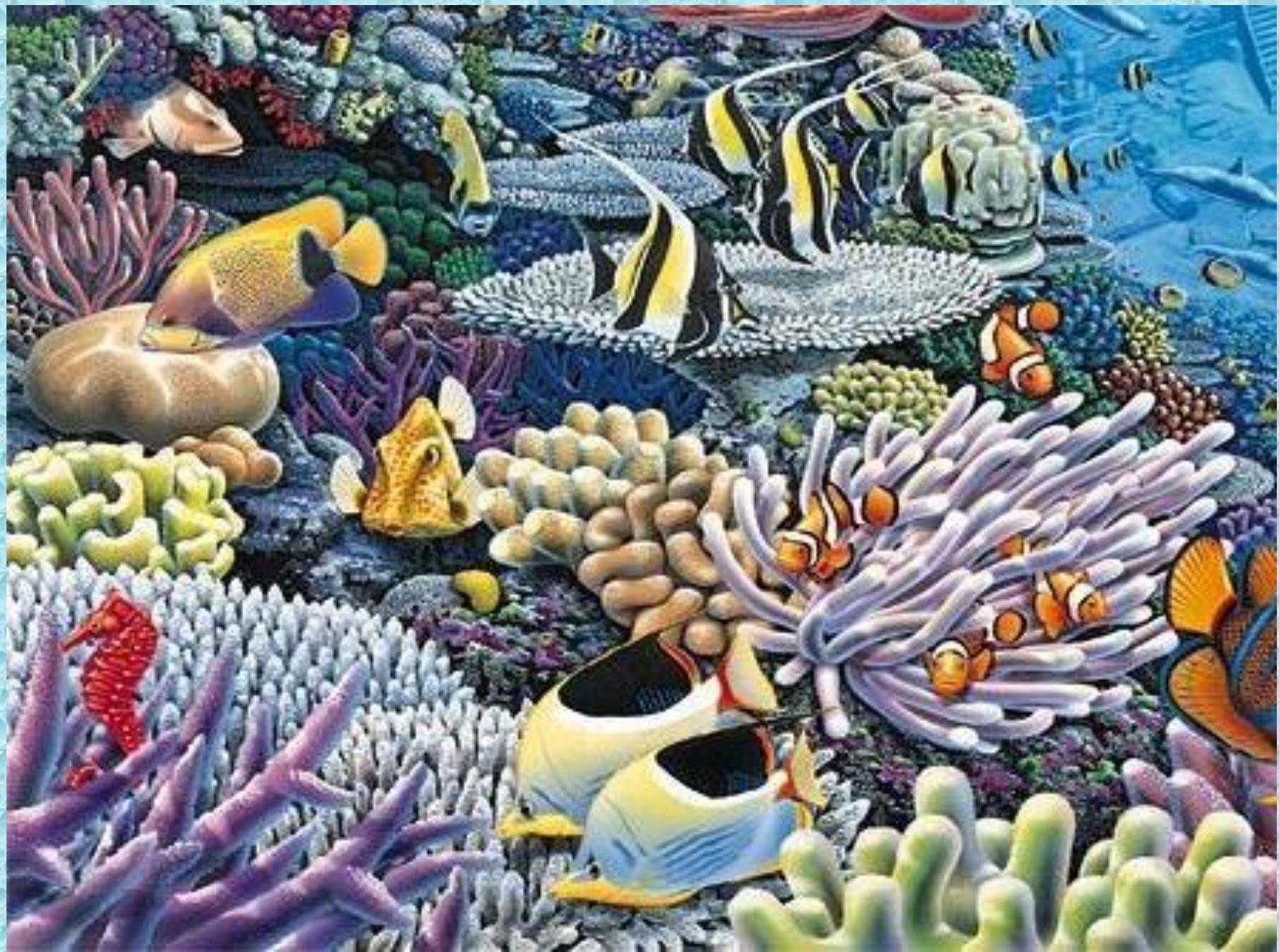
Examples : Marsh grasses, sea weeds, sea grasses, and phytoplankton

ii. Consumers

Examples : Oysters, crabs, seabirds, small fishes.

iii. Decomposers

Examples : Bacterias, fungi and actenomycetous

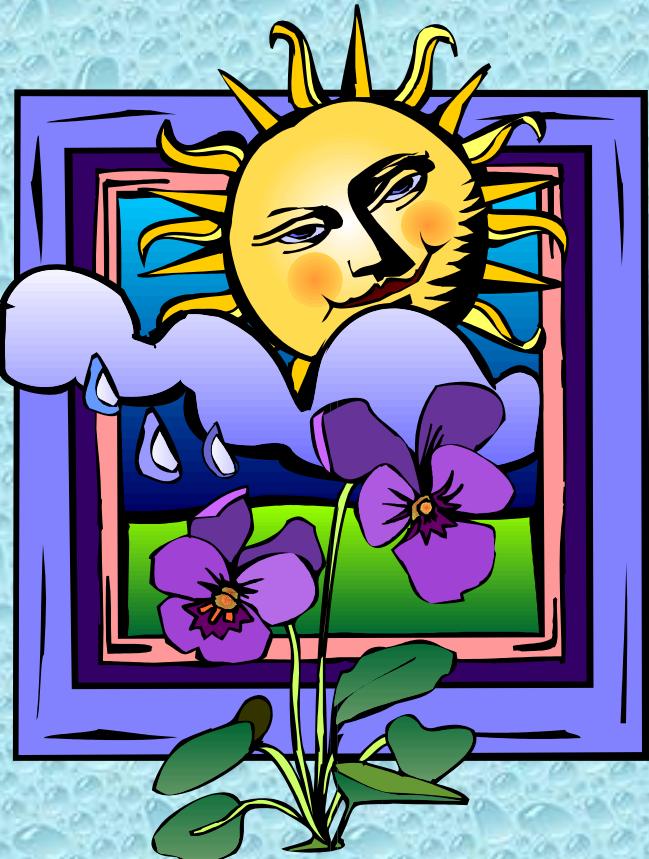


Ecological succession

1. The progressive replacement of one community by another.
2. The process is continued till the development of stable community.
3. Whole process takes in a particular area.

ECOLOGICAL SUCCESSION

- Ecosystems tend to change with time until a stable system is formed.
- The stable system that will form depends on climatic limitations.



Ecological Succession

- The progressive replacement of one community by another until a stable stage is reached is called ecological succession.

Types of ecological succession

1. Primary succession

The gradual establishment of biotic communities on a life less ground.

A. Hydrarch or Hydrosere

Establishment starts in watery area like pond, lake.

B. Xerarch or Xerosere

Establishment starts in dry area like desert and rock

2. Secondary succession

The establishments of biotic community in an area already contain some community.

2.7.1 Stages of ecological succession

- 1. Pioneer community:** The first group of organism, which establish their community in the area is called ‘Pioneer’ community.
- 2. Seres (or) Seral stage:** The various developmental stages of a community is called ‘seres’.

Community

It is the group of plants or animals living in an area.

Primary Succession

- **Primary succession** occurs where there was no previous community, such as on bare rock or sand.
- Primary succession begins with **pioneer** organisms.



Pioneer Organisms

- Pioneer organisms can tolerate extreme conditions: hot and cold; dry and wet.
- Moss, dune grass, and lichens are pioneer organisms.



Lichens

- Lichens are algae and fungus growing together in a mutualistic relationship. Algae make the food; fungus anchor and capture water.



Pioneer organisms

- Soil is produced over hundreds of years by pioneer organisms.
- These organisms break apart rock, add humus as they die and decompose, and hold water
- This allows other organisms to grow there.



Secondary Succession

- The community begins again where the former community was disrupted.
- Soil is already present.



Process of ecological succession

- 1. Nudation- development of bare area
- 2. Invasion – Migration and Establishment- pioneer community
- 3. Competition- for water, food
- 4. Reaction- the living organisms take water and nutrient and grow and modify the environment
- 5. Stabilization- Climax community

2.7.3 Process of Ecological Succession

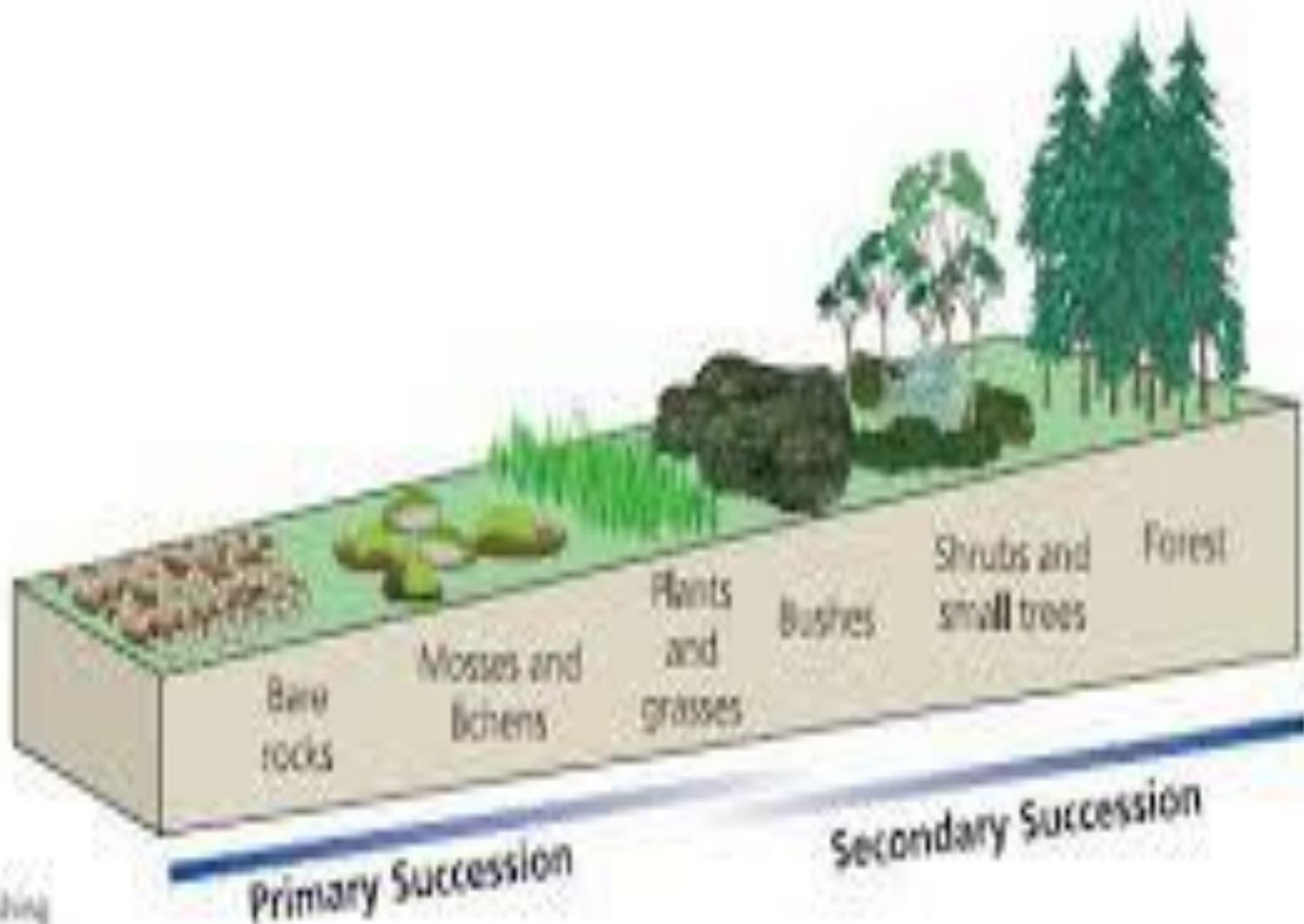
The process of ecological succession can be explained in the following steps.

- 1. Nudation:** It is the development of a bare area without any life form.
- 2. Invasion:** It is the establishment of one or more species on a bare area through migration followed by establishment.
 - (a) Migration:** Migration of seeds is brought about by wind, water or birds.
 - (b) Establishment:** The seeds then germinate and grow on the land and establishes their **pioneer communities**.

3. **Competition:** As the number of individual species grows, there is a competition with the same species and between different species for space, water and nutrients.
4. **Reaction:** The living organisms, take water, nutrients and grow and modify the environment is known as reaction. This modification becomes unsuitable for the existing species and favour some new species, which replace the existing species. This leads to **seral communities**.
5. **Stabilizations:** It leads to stable community, which is in equilibrium with the environment.

- Exposed rocks → Lichen Mosses → Grasses
→ Pine tree

Ecological Succession





Primary succession on a terrestrial site.



Climax Community

- The climax community will be part of the BIOME of that area.
- Our climax community-
oak/hickory forest-is part of the temperate deciduous forest biome





What do you think biodiversity means?

Bio diversity

What does “Bio” mean?

Bio = *Life*

Biodiversity

What does “Diversity” mean?

Diversity = Variety

BIO DIVERSITY

Bio diversity means variety of life on the earth surface

There are 20 million species in earth

These species differ from each other is called bio diversity.

Definition

The variety and variability among all groups of living organisms and the eco system in which they occur.

Significance of biodiversity

1. It is very important for human life.
2. We get food, medicine and industrial products from plants, micro organisms and animals.
3. It is also important for agriculture, forestry and fisheries.
4. Loss of biodiversity brings economic and social costs.

Loss of bio diversity

1. The farmers prefer Hybrid seeds; as a result, many plant species become extinct.
2. For the manufacturing of drugs and medicines many wild plants are destroyed.
3. Every year the tropical forests are destroyed for medicines.

Classifications or levels of biodiversity

Genetic diversity

Species diversity

Community or eco system diversity.

1. Genetic diversity

A species with different genetic characteristics is known as sub species (or) genera.

Genetic diversity is the diversity within species.

Examples

There are 1000 varieties of rice but all are belong to the species orisa Sattaiva.

They show variation in size, colour, shape and nutrient content.

2. Teak wood varieties

There is different variety of teak wood.

Indian teak, Burma teak, Malaysian teak.

1. Genetic Diversity : Diversity within the species EX: Rice variety

Chihuahuas, beagles, and rottweilers are all dogs—but they're not the same because their genes are different.



Chihuahua



Beagle



Rottweilers

Diversity of species

For example, monkeys, dragonflies, and meadow beauties are all different species.



Saki Monkey



Golden Skimmer



Meadow Beauty

Species diversity

Species

1. A discrete group of organisms of same kind is known as species.
2. **Diversity between the differed species is called species diversity.**
3. The sum of varieties of all living organisms at the species level.
4. Plants, animals and micro organisms are biotic; they are interacting with each other and with abiotic component.

Example : Plants species

Apple, mango, grapes, wheat, rice...

Animal species

Lion, Tiger, Elephant, deer...



Community or eco system diversity

It is a set of biotic component; they are interacting with each other and with abiotic component.

The diversity at habitat level is called as ecosystem diversity.

Example : River ecosystem

It explains the interaction between living organism and physical environment.

Value of bio diversity

1. Bio diversity is must for stability of biosphere.
 2. Bio diversity is must for proper functioning of biosphere.
 3. Bio diversity is vital for healthy biosphere.
- Biosphere is the life supporting system and it is combination of different organisms.

Classification of Value of bio diversity

Consumptive use value

This is direct use value

Here the bio diversity products are harvested directly.

Here the bio diversity products are consumed directly.

Example : Food, drug, fuel.

Classification of Value of bio diversity

a. Food

- i) Many plants are eaten by human beings.
- ii) 80-90% of crops are from the tropical wild plants.
- iii) Few animals are also consumed as food.

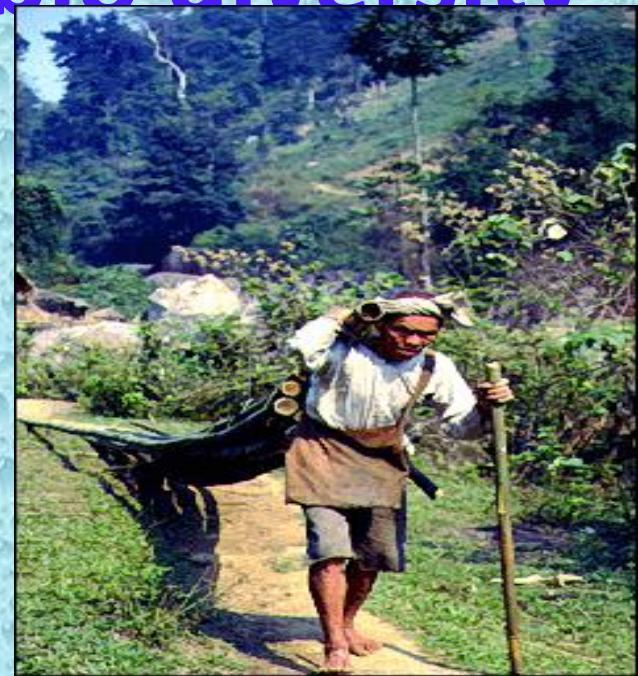
Example

Ceropegia bulbosa: in central India

Codonopsis: in Himalayan region

Cicer microphyllum; in Kashmir

Spiders, wild herbivores are consumed by tribal people.



b. Drugs

- 70% of medicines are extracted from plant leaves
- 20000 species of plants are used in unani, sidha and ayurveda systems.

Examples

1. Germany uses 2500 plant species for homeopathy treatment.
2. India use 3000 plant species for homeopathy unani, sidha and ayurveda treatment.
3. About 85% of human beings use plants for primary health treatment.
4. About 30 medicines prepared from neem tree.
5. Parts of peepal tree used to prepare medicine for fever, cough, stomach and skin diseases.

c. Fuel

1. Wood is used as fuel by tribal peoples and villagers.
2. Coal, petroleum and natural gas are products of bio diversity.



- **2. Productive use value**
- i. products derived from animals and plants
- ii. These products have some commercial value.
- iii. They are marketed and sold.
- This value is called productive use value.

Animal product	animal
Silk	Silk-Worm
Wool	Sheep
Musk	Musk deer
Tusk	Elephant
Leather	All animal
Food	Fish and animals

Plants product	Plant industry
Wood	Paper and pulp industry
Cotton	Textile industry
Fruits, vegetables	Food industry
Leather	Leather industry
Ivory	Ivory industry
pearl	Pearls industry



Social value

1. These values are associated with the social life, religion of people.
2. The way in which the bio resources are used to the society.

Example

Holy plants

Tulsi, peepal, lotus

The leaves, plants and fruits of these plants are used in worship.

Holy animals

Cow, snake, bull, peacock, rat, etc.,

Ethical value or Existence value

A species may or may not be used but its existence in nature gives pleasure is called ethical value

Biodiversity has great religious and cultural basis value in India.

Many of plants and animals, rivers and mountains are worshiped as god.

Aesthetic value

The most important aesthetic value is eco-tourism.

To keep the beautiful nature, protect the beautiful animals and plants.

Example

The sweet voice of birds, pleasant colour of flowers and leaves. colour of Peacock.



Option values

Any species may be proved to be a valuable species after some day is called Option value

Presently unknown and need to be known bio diversities are also called option value.

Example

The bio technology field searching a species for causing the diseases of cancer and AIDS.

Global bio diversity

There are 20 million species are in the world.

1.5 million Species were found and given scientific name.

Tropical deforestation is reducing the biodiversity by 0.5% every year.

Terrestrial biodiversity or biomass or biome

It is the largest ecological unit.

It is named in different ways.

Example : Tropical rain forest, savannas, desert, tundra.

Tropical rain forests

These are largest store house of bio diversity on earth.

About 50-75% of Global biodiversity lies in this tropical forest.

It has million of species of plants, animals, birds, mammals and amphibians

a. Medicinal plants

25% of world drugs obtained from tropical rain forest.

Example

3000 plants are cancer fighting species.

About 2000 species are found in tropical rain forest.

b. flowering plants

Nearly 1, 30,000 flower species are found.

We know only 1-3%.

Protection of tropical rain forest

Protection of tropical rain forest is essential.

To save medicinal important species.

Example

Silent valley in Kerala

To protect tropical rain forest, silent valley Hydro electric power project was abandoned

2. Temperate forest

It has less bio diversity

It has 1,70,000 flowering plants

30,000 vertebrates

2,50,000 other group of species.

Marine diversity

It is higher than terrestrial biodiversity.

It is less known

Estuaries, coastal and oceans are in this bio diversity

Out of 35 existing phyla 34 are in this bio diversity.

Bio diversity at national level (India)

India is the second largest nation containing 5% of worlds' biodiversity and 2% of earth's surface.

Rank of India in bio diversity

10th rank among the plant rich countries

11th rank among the endemic species of higher vertebrates.

6th rank among the agricultural crops.

India is the mega diversity nation because it is rich in flora and fauna.

There is a high demand for Indian species in abroad.

Medicinal value

More than 2000 medicinal plants are in India to cure many diseases.

Example : Tulsi and neem.

Turmeric in India is an anti carcinogen.

Commercial value

Indian sandal wood

Indian tobacco

Mushrooms

Ornamental plants and more than 100 species of micro organisms

In Indian soil are more valuable in foreign countries.

Number of plant and animal species in India

Flowering plants-20000

Insects-67000

Fishes-1460

Birds-1200

Reptiles-420

Mammals-340

Domestic plants and animals-170

Bio diversity at local level OR measurement of bio diversity

There are four types

1. Point richness

Number of species that can be found at single point in a given space.

2. Alpha richness or alpha diversity

Number of species that can be found in a small homogeneous area.

It is strongly correlated with physical variables.

3.Beta richness or Beta diversity

It means that number of species increases when we change the habitat.

4.Gama richness or Gama diversity

It means that number of species increases when it across large land scape.

Bio diversity at Tamilnadu

- The distribution of plants and animals in the various districts of Tamilnadu
- Dense forest in Salem districts.
- Western Ghats have 1500 species of plants, 50 species of mammals and 90 reptiles.
- Birds of several species are coming to Vedanthangal from far places.
- The elephant sanctuaries at anaimalai.
- The tiger sanctuaries at mundanthurai.

Mega diversity

- There are 170 countries in the world
- Among them 12 countries have 70% of bio diversity
- Mega diversity regions
- Australia, Brazil, China, Colombia, Ecuador, USA
- India, Indonesia, Madagasgar, Mexico, Peru, Congo.
- These 12 countries are called mega diversity region.

India as mega diversity nation

It has 89,450 animal species (7.31%)

It has 47,000 plant species (10.8%)

The loss of bio diversity is 33%.

Plants	Number	animals	Number
Fungi	23000	Mollusca	5042
Bacteria	850	Lower groups	9979
Algae	2500	Arthropods	57525
Bryophytes	2564	Amphibian	2546
Gymnosperms	64	Birds	1228
Pteridophytes	1022	Reptiles	428
Angiosperms	15000	mammals	372

Endemic species

The species which are confined to a particular area is called endemic species.

In India about 33% of flowering plants, 36% Of reptiles, 53 % of fresh water fishes, 60% amphibians and 10 % mammalians are present.

Origin of plant diversity

5000 flowering plants and 166 crop plants species are found in India.

Origin of marine diversity

More than 340 coral species and sea plants are found in India.



RED data book

- According to this book 44 plant species are endangered.
- 3% animal species are endangered.
- 153 species are exposed to damage.
- India is in the 2nd rank in terms of threatened mammals and
- 6th rank with the most threatened birds.
- **Hot –spots of bio diversity**
- Geographic areas which possess the high endemic species are called hot-spots

Buergers' Tree Kangaroo

Dendrolagus goodfellowi buergersi



Continent: Australasia

Range: Western Sepik Province,
Papua New Guinea

Habitat: Rain forests

Threats: Hunted for food, habitat
destruction

For information on our conservation projects,
visit our web site: www.conbio.org

Not
Threatened Vulnerable Endangered Critically
Endangered Listed in
the IUCN

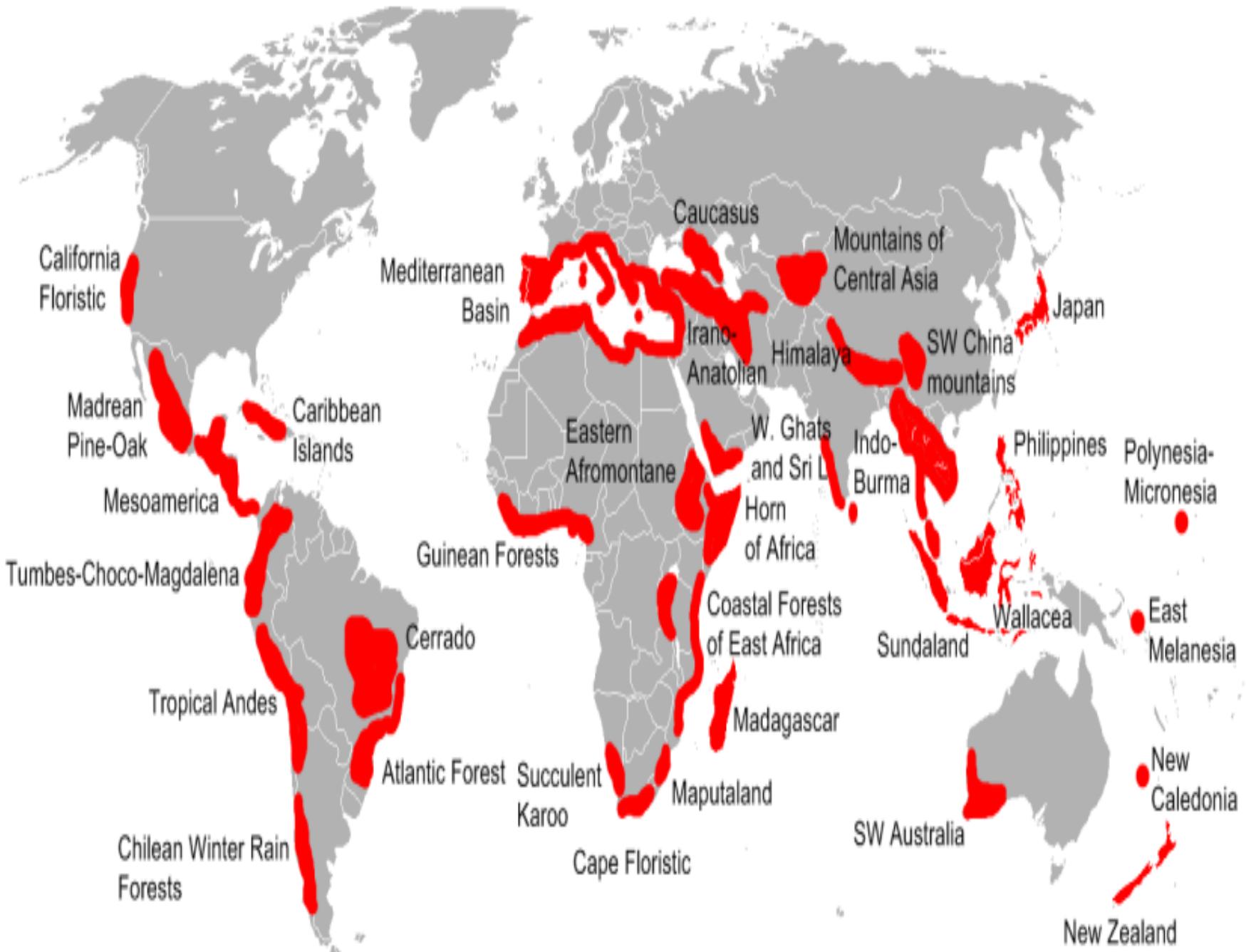
IUCN Status

Criteria for recognizing hotspots

- 1. Richness of the endemic species.
- 2. Significant percentage of specialized species.
- 3. The site is under threat
- 4. It should contain potentially useful plants.

Reason for rich biodiversity in the tropics

- 1. The tropics have a more stable climate.
- 2. Warm temperature and high humidity.
- 3. There is an opportunity for many species to co-exists.
- 4. There is no single species domination
- 5. Rate of out crossing to be higher in tropics.



Area of Hot spot

- It covers Less than 2% of world area.
- There are 50000 endemic species in world.
- It must contain at least 0.5 % of endemic species.
- About 405 terrestrial plants and 25% of vertebrate are endemic species found in hot spots
- These are area of high diversity.
- These area threatened by many human activities.

Hot spots of bio diversity in India

1. Eastern Himalayas -Indo-Burma region
2. Western Ghats - TN,Kerala, Karnataka, Maharashtra

Eastern Himalayas

- 1. These area in Nepal, Bhutan, northern India.
- 2. There are 35000 plant species.
- 3.30 % are endemic plants.
- 4. There are 63% Mammals.
- 5.60% of Indian birds from Himalaya

Portrayals of political boundaries are
for reference only and are NOT
in support of ANY position.



Western Ghats

- 1. This area comprises Tamil Nadu, Maharashtra, Karnataka and Kerala.
- 2. 1500 endemic species are here.
- 3. Dicotyledonous plants available here.
- 4. 62% amphibians and 50% lizards are here.
- 5. Only 6.8% forests are available.



Threats to biodiversity

1. Wastes generated by human population.
2. Industrialization

Cause for loss of biodiversity

(OR)

Various threats to Indian biodiversity

Habitat loss

1. The loss of populations of inter breeding organisms
2. Habitat loss threatened a wide range of animals and plants.

Factor affecting habitat loss

Deforestation

The forests and grass lands are home for thousands of species, which integrate due to loss of their natural habitat.

Forests and grass lands are destroyed for developmental projects.

Raw material

For the production of hybrid seed wild plants are raw materials. Therefore so many plants are destroyed.

Production of drugs

Many medicinal plants are destroyed for drugs production leads to diversity loss.

Illegal trade

Illegal trade on wild life reduces the biodiversity leads to the habitat loss.

Developmental activities

Construction of dams, roads and hydro power projects leads to the loss of habitat.

Poaching of wild life

It means over harvesting of wild life

It means killing of wild life.

Commercial hunting leads to loss of bio diversity

1. Subsistence poaching

Killing animals to provide food for their survival.

2. Commercial poaching

Hunting and killing the animals to sell their products.

Factors influencing poaching

1. Human population.

Increased human population causes wild life loss and their habitat loss.

2. Commercial activities

Wild life products are highly profit, therefore poachers smuggle it to other countries.

Wild life products

Furs, horns, tusks, live specimens, herbal products.



Wealth of wild life

The developing countries in Asia, Latin America, and Africa have richest source of bio diversity.

Importers of wild life

The rich country in Europe and North America, Japan, Taiwan, hongkong are the major importer of wild products

Examples

Male gorilla

In Rwanda, It is hunted for its body parts, head and hands

Blue morpho butterfly

In Brazil, it is hunted for attractive trays

Snowy large egret.

In U.S. ,It is hunted for its white plumes.

Blupper

It is used to prepare lamp oil.





Man –wild life conflicts

When wild life brings damages to human, man-wild life conflicts start.

It is very difficult to compromise village peoples and animals.

Example for man wild life conflicts

1. In sambalpur Orissa 195 humans were killed in the last 5 years by elephants. The villagers killed 98 elephants.
2. In Mysore elephants damaged cotton and sugar cane crops.
Therefore the peoples lilled several elephants.
3. In Kathmandu tiger killed 16 peoples and one child was killed in the national zoo.
4. In Poway, Mumbai two men were killed by leopard.
5. In sanjay Gandhi national park Mumbai 16 peoples were killed by leopards.

Factors influencing man – wild life conflicts

1. Shrinking of forest covers.
2. Human encroachment in the forest area.
3. Injured animals have tendency to attack human.
4. To search food and shortage of food inside the forest, animals move to human's area.
5. Electric wire around lands injured elephant, start violence
6. Compensation given by the GOVT is not enough, therefore farmers revenge to kill animals.



Remedial measures

1. Adequate crop compensation and cattle compensation scheme must be started.
2. Solar powered fencing with electric shock will prevent animals to enter in to the field area.
3. Cropping system should be changed near the forest area.
4. Sufficient food and water should be available in side forest area
5. Developmental and constructional work in the forest area should be stopped

Endangered and Endemic species of India

Types of species

Extinct species

No longer found in the world

Endangered or threatened species

Unless it is protected or conserved its number has been reduced.

Vulnerable species

Its population facing continuous decline due to deforestation and exploitation.

Rare Species

It is localized in the restricted area.

Endangered species in India

In India 450 endangered plant species

100 mammals and 150 birds are endangered

India's bio diversity is threatened due to destruction of habitats.

- Number of threatened species in India

Threatened species	Number
Plants	250
Birds	70
Mammals	86
Reptiles	25
Amphibians	3
Fishes	3
Molluscs	2
Insects	50

- **Important Endangered species**

1	Reptiles	Tortoise, green sea turtle, python
2	Birds	Peacock,pelican,Indian bustard
3	Mammals	Indian wolf, red fox, sloth bear,tiger,Indian lion, golden cat, desert cat
4	primates	Capped monkey , golden monkey
5	Plants	Sandal wood tree and medicinal plants

Factors affecting endangered species

1. Pollution

Air, water, soil are polluted by human wastes

2. over – Exploitation

Over –exploitation of natural resources and poaching of wild animals affect the endangered species.

3. Climate change

Accumulation of green house gases brought climate change. It affects the living organisms.

Remedial measures

International treaties on endangered species(ITES)

It conducted “convention on international trade in endangered species1975” this treaty is now signed by 160 countries.

This treaty restrict the commercial trade of 900 specimens

This treaty restricts the commercial trade of 2900 international species.



- Endemic species in India

Group	Number of species
Pteridophytes	200
Angiosperm	4950
Land	878
Fresh water	89
Insect	16214
Amphibia	110
Reptilia	214
Aves	69
Nannakua	38

Ditrichum cornubicum (Cornish Path Moss)

UK endemic, known from 1 locality, Endangered World
RDB species



Factors affecting Endemic species

1. Habitat loss
2. Fragmentation
3. Draining and filling of wet lands
4. Pollution

Example

Frog eggs are sensitive to pesticides.

Over hunting of frog eggs in Asia and France

CONSERVATION OF BIO DIVERSITY

It is important tool for sustainable development

It is commercial, medical, genetic, aesthetic and ecological important.

Factors affecting bio diversity

1. Construction of dams in forest area.
2. Release of industrial wastes.
3. Using pesticides, insecticides in crop fields.
4. Urbanization
5. Poaching of wild animals
6. over exploitation of natural resources.
7. Habitat loss.
8. Oil spills affect marine
9. Discharge of effluents in to marine.
10. The Climatic factors brings global warming, Acid rain, Ozone depletion

- **Advantages of bio diversity conservation**
- Recreation and tourism
- Drugs ,food and raw materials obtained
- It preserves genetic diversity of plants and animals.
- Sustainable life supported
- Conservation of ecological diversity

Strategy of biodiversity conservation

Two types

In-situ conservation

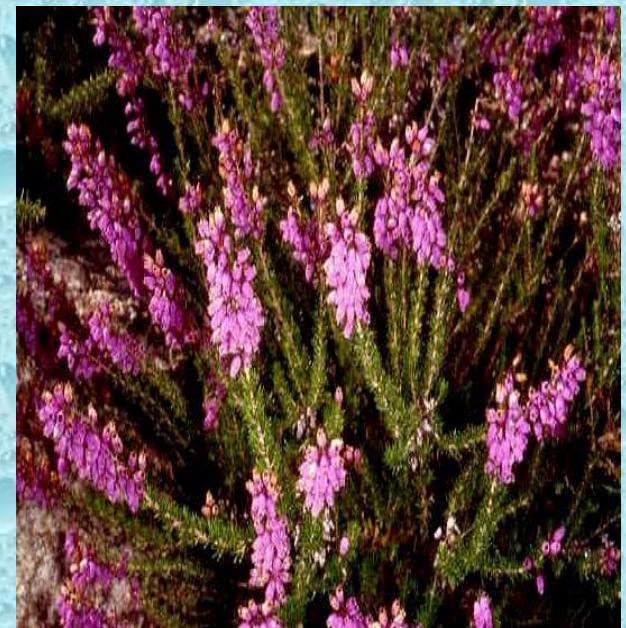
Ex-situ conservation

1. In-situ conservation

- Protection of plant and animal species within its natural habitats. These habitats are called protected area

Important in-situ conservation

- Biosphere
- National parks
- Gene sanctuary
- Wild life sanctuary
- **Methods of in-situ conservation**
- **Around 4% of land area used for in-situ conservation**



- **1. Biosphere reserves**
- It covers 5000 sq.km.

Name of bio sphere	state
Nanda devi	U.P
Nokrek	Meghalaya
Manas	Assam
Sunderbans	West Bengal
Gulf ofmannar	Tamil Nadu
Nilgiri	Karnataka,Kerala,Tamil Nadu
Great Nicobars and Similipal	Orissa

Role of bio sphere

- It gives long term survival of evolving eco system
- It protects endangered species
- It serves as site of recreation and tourism
- Useful for educational and research purpose
- Changes in land use are not allowed

National park

It is an area dedicated for the conservation of wild life.



- It covering an area of about 100 to 500 sq.kms

- **Important national parks in India**

Name of national park	State	Important wild life
Kaziranga	Assam	One horned rhino
Gir	Gujarat	Indian lion
Bandipur	Karnataka	Elephant
Dachigam	J&K	Hangul
Corbett	U.P	Tiger
Kanha	M.P	Tiger
Periyar	Kerala	Tiger ,elephant
Dudwa	U.P	Tiger
Sariska	Rajasthan	Tiger
Ranthambore	Rajasthan	Tiger

Role of national park

1. Tourism
2. Develop the wild life



Wild life sanctuaries

An area reserved for conservation of animals only

At present there are 492 sanctuaries in India.



• Important wild life sanctuaries in India

Name of the sanctuary	State	Major wild life
Hazaribagh	Bihar	Tiger, leopard
Ghana Birds	Rajasthan	300 species of birds
Sultanpur birds	Haryana	Migratory birds
Abohar wild life	Punjab	Black buck
Nal sarovar birds	Gujarat	Water birds
Mudumala wild life	Tamil Nadu	Tiger, elephants, leopards
Vedanthangal bird	Tamil Nadu	Water birds
Wild ass	Gujarat	Wolf, wild ass



Role of wild life sanctuaries

1. It protects animal only
2. It allows harvesting of timber
3. It does not affect the animals adversely

Gene sanctuary

It is a plants conserved area

Examples

In north India two gene sanctuary are found

1. One for citrus (Lemon)
2. One for pitcher plant (An insect eating plant)

Other projects for conservation of animal

1. Gir lion project
2. Crocodile breeding project
3. Project elephant

Advantages of in-situ conservation

- It is very cheap and convenient method
- The species gets adjusted to natural resources

Disvantages

- Large surface area required
- Maintenance of habitats are not proper



Ex-situ conservation

It is the conservation of plant and animal species out side the natural habitats.

Role of Ex-situ conservation

1. Maintains and breeding of Endangered species under controlled condition.
2. Identifies more risk species



HAWAIIEN GOOSE



Important Ex-situ conservation

- Botanical gardens
- Seed banks
- Microbial culture collections
- Tissue and cell culture
- Zoological gardens

Methods of Ex-situ conservation

1. National bureau of plant genetic resources

- It is located in New Delhi
- It uses cryo preservation techniques
- Here agricultural and horticultural crops

Peer David's deer was a native species of China



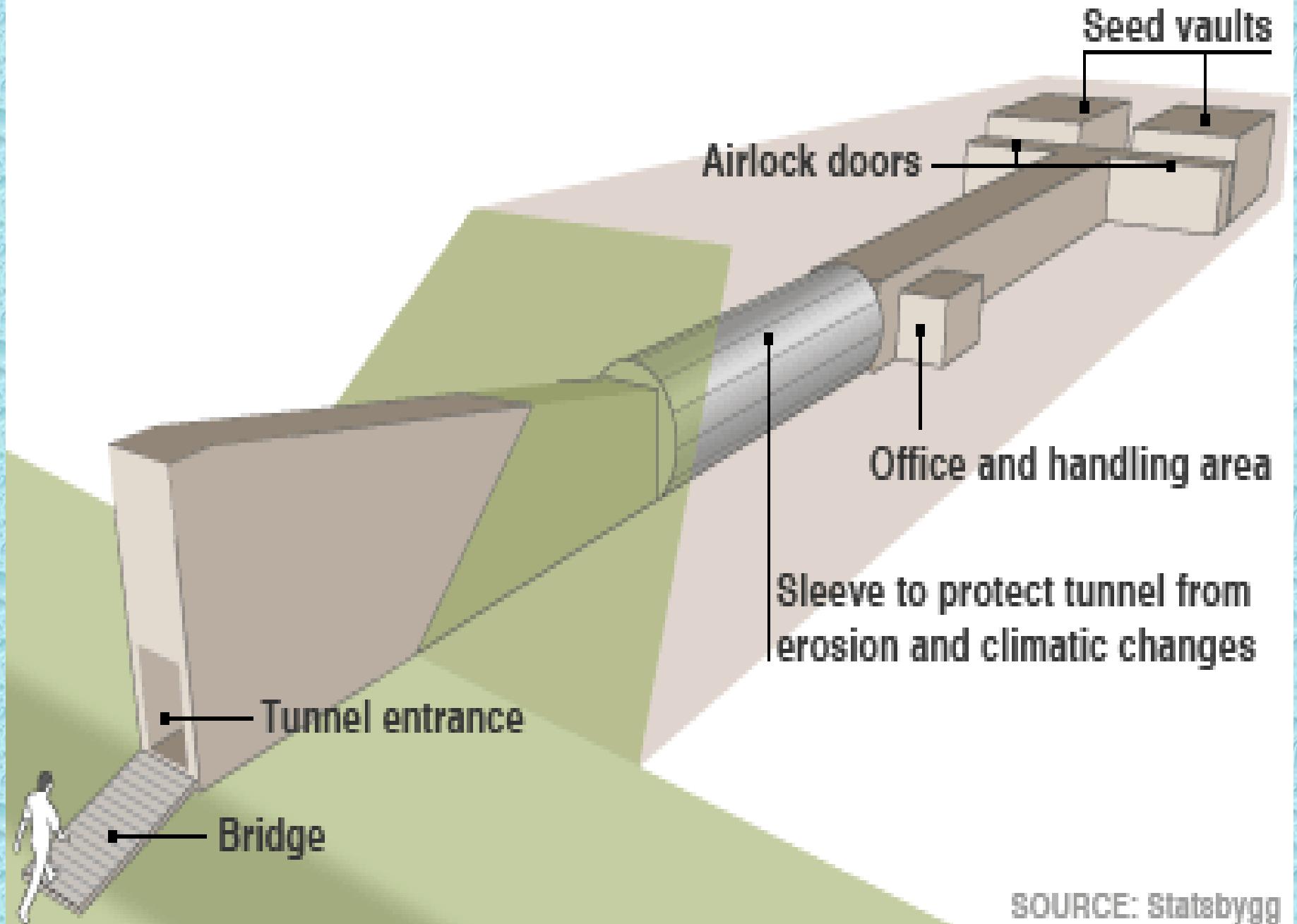
Cryo preservation techniques

Preservation by using liquid nitrogen at -196'C.

Tobacco, Brassica, turnip, radish, onion, tomato, carrot, chilly, and rice are preserved successfully by using this method .



SVALBARD INTERNATIONAL SEED VAULT



SOURCE: Statsbygg

2. National bureau of animal genetic resources

It is located at karnal, Haryana

It preserves semen of domesticated bovine animal

3.National facility for plant tissues culture Repository

- It conserves crops and trees by tissues culture



Advantages of Ex-situ conservation

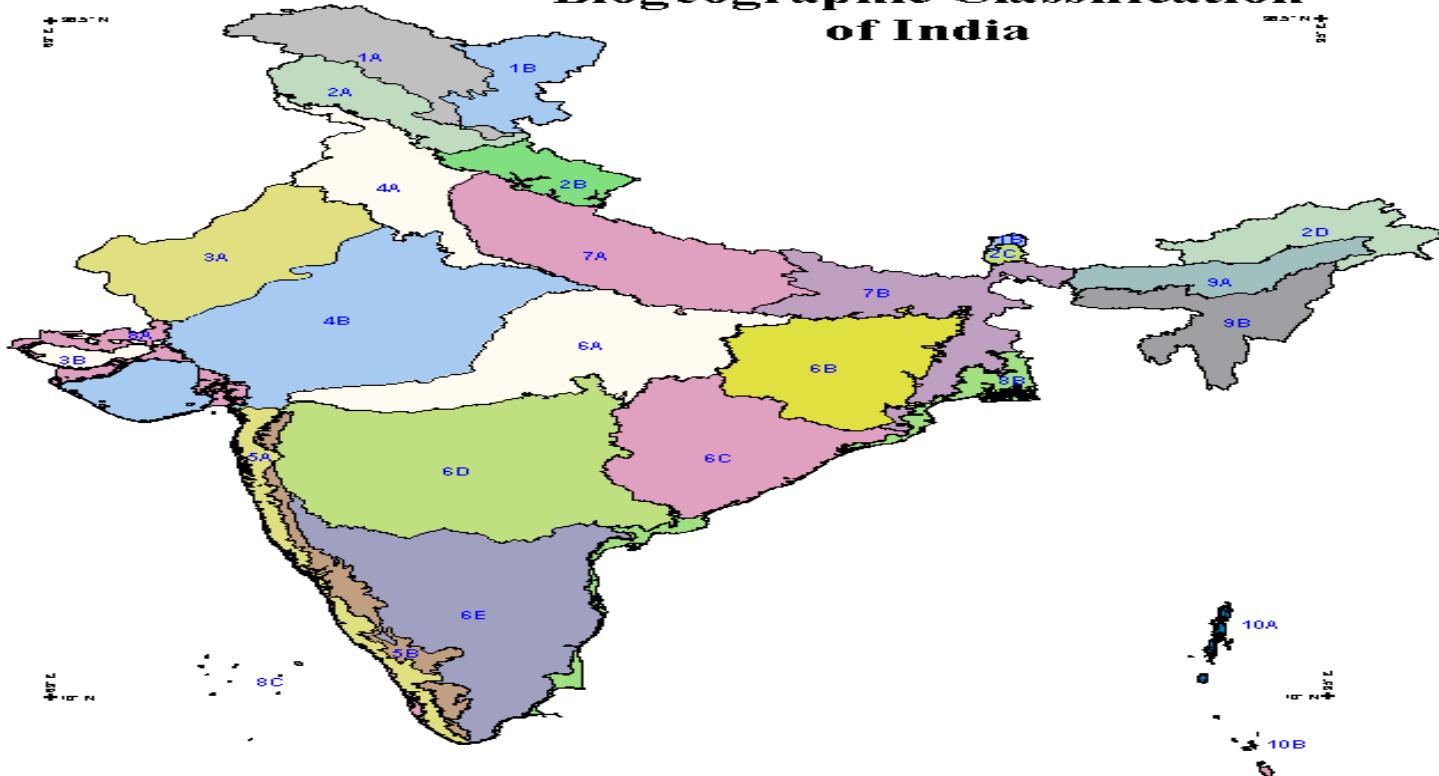
- 1. Endangered species increased due to special attention.
- 2. Longer life span for animals provided
- 3. Endangered species do not have chances of survival in the world.

Dis advantages of Ex-situ conservation

- It is expensive method
- The freedom of wild life is lost
- Animals can not survival in the natural environment.

- **Bio geographical classification of India**
- 1. India is a mega diversity country
- 2. It has different types of climate and topography
- 3. India occupies 10th position among the plant rich countries of the world.

Biogeographic Classification of India



1A: Trans-Himalaya-Ladakh Mtns.
 1B: Trans-Himalaya--Tibetan Plateau
 2A: Himalaya--North-West Himalaya
 2B: Himalaya--West Himalaya
 2C: Himalaya--Central Himalaya
 3D: Himalaya--East Himalaya
 3A: Desert--Thar
 3B: Desert--Katchchh
 4A: Semi-Arid--Punjab Plains
 4B: Semi-Arid--Gujarat Rajputana
 5A: Western Ghats--Malabar Plains
 5B: Western Ghats--Western Ghats Mtns.
 6A: Deccan Peninsula--Central Highlands

6B: Deccan Peninsula--Chotta-Nagpur
 6C: Deccan Peninsula--Eastern Highlands
 6D: Deccan Peninsula--Central Plateau
 6E: Deccan Peninsula--Deccan South
 7A: Gangetic Plain--Upper Gangetic Plain
 7B: Gangetic Plain--Lower Gangetic Plain
 8A: Coasts--West Coast
 8B: Coasts--East Coast
 8C: Coasts--Lak shadweep
 9A: North-East--Brahmaputra Valley
 9B: North-East--North-East Hills
 10A: Islands--Andamans
 10B: Islands--Nicobars



• India's major Bio geographic habitats

Bio geographic zones	Biotic province	%	Total area biomass
Trans – Himalayan	Upper regions	5.75	186200
Himalayan mountain	North-west Himalayas	17%	6900
	west -Himalayas		720000
	central- Himalayas		123000
	East Himalayas		83000
Desert	Kutch	6.9%	45000
	Thar		18000
	Ladakh		NA
Semi-Arid	Central- India	15.6%	107600
	Gujarat -Rajwara		404400
Western-Ghats	Malabar-Coast	5.8%	59700
	Western Ghat Mountains		99300
Deccan Peninsula	South	4.3%	378300
	Central		341000
	Eastern		198000
	Chhota Nagpur		217000
	Central high lands		287000
Gangetic plain	Upper Gangetic plain	11%	206400
	Lower Gangetic plain		153000