

# Environmental Studies: Ecosystems, Bio-diversity & its Conservation

# Introduction

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- Environmental studies deals with every issue that affects an organism.
- It is essentially a multidisciplinary approach that brings about an appreciation of our natural world and human impacts on its integrity.
- It is an applied science as it seeks practical answers to making human civilization sustainable on the earth's finite resources.

# definition

- Definitions of Environment : Some important definitions of environment are as under:

## 1. Boring

- ‘A person’s environment consists of the sum total of the stimulation which he receives from his conception until his death.’ It can be concluded from the above definition that Environment comprises various types of forces such as physical, intellectual, economic, political, cultural, social, moral and emotional

# definition

## 2. Douglas and Holland:

‘The term environment is used to describe, in the aggregate, all the external forces, influences and conditions, which affect the life, nature, behavior and the growth, development and maturity of living organisms.’

# Scope

- The scope of environmental studies is very wide and it deals with many areas like i) Conservation of natural resources, ii) ecological aspects, iii) pollution of the surrounding natural resources, iv) controlling the pollution, v) social issues connected to it, and vi) impacts of human population on the environment.
- The study creates awareness among the people to know about various renewable and non-renewable resources of the region.
- It provides necessary information about biodiversity richness and the potential dangers to the species of plants, animals and microorganisms in the environment.
- The study enables one to understand the causes and consequences due to natural and man induced disasters (flood, earthquake, landslide, cyclones etc.,) and pollutions and measures to minimize the effects.

# Why is it so important?

- We live in a world in which natural resources are limited
- Added to this is misuse of resources. We waste or pollute large amounts of nature's clean water; we create more and more material like plastic that we discard after a single use; and we waste colossal amounts of food, which is discarded as garbage.
- These accumulate in our environment, leading to a variety of diseases and other adverse environmental impacts now seriously affecting all our lives. Air pollution leads to respiratory diseases, water pollution to gastro-intestinal diseases, and many pollutants are known to cause cancer.
- Improving this situation will only happen if each of us begins to take actions in our daily lives that will help preserve our environmental resources.

# 1. Productive value of nature

- The flowering plants and insects that form the most species rich groups of living organisms are vital for the future development of man
- Once they are lost, man cannot bring them back.
- Thus the urgent need to protect all living species is a concept that we need to understand and act upon

## 2. Aesthetic/Recreational value of nature

- The aesthetic and recreational values that nature possesses enlivens our existence on earth
- This is created by developing National Parks and Wildlife Sanctuaries in relatively undisturbed areas
- The beauty of nature encompasses every aspect of the living and non-living part of our earth.



### 3. The option values of nature

- While we utilize several goods and services of nature and enjoy its benefits, we must recognize that every activity that we do in our daily lives has an adverse impact on nature's integrity
- Our present generation has developed its economies and lifestyles on unsustainable patterns of life. however, nature provides us with various options on how we utilize its goods and services. This is its option value
- We can use up goods and services greedily and destroy its integrity and long term values, or we can use its resources sustainably and reduce our impacts on the environment.
- The option value allows us to use its resources sustainably and preserve its goods and services for the future.

## 4.Environment Issues Being of International Importance

- It has been well recognized that environment issues like global warming and ozone depletion, acid rain, marine pollution and biodiversity are not merely national issues but are global issues and hence must be tackled with international efforts and cooperation

# Need for awareness

- It is essential to make the public aware of the formidable consequences of the Environmental Degradation, if not retorted and reformative measures undertaken, would result in the extinction of life
- We are facing various environmental challenges. It is essential to get the country acquainted with these challenges so that their acts may be eco-friendly. Some of these challenges are

# 1. Growing Population

- A population of over thousands of millions is growing at 2.11 per cent every year. Over 17 million people are added each year. It puts considerable pressure on its natural resources and reduces the gains of development. Hence, the greatest challenge before us is to limit the population growth. Although population control does not automatically lead to development, yet the development leads to a decrease in population growth rates. For this development of the women is essential

## 2. Poverty

- The poverty and environmental degradation have a nexus between them.
- The vast majority of our people are directly dependent on the nature resources of the country for their basic needs of food, fuel shelter and fodder.
- About 40% of our people are still below the poverty line.
- Environment degradation has adversely affected the poor who depend upon the resources of their immediate surroundings.
- Thus, the challenge of poverty and the challenge environment degradation are two facets of the same challenge. The population growth is essentially a function of poverty. Because, to the very poor, every child is an earner and helper and global concerns have little relevance for him.

### 3. Agricultural Growth

- The people must be acquainted with the methods to sustain and increase agricultural growth with damaging the environment. High yielding varieties have caused soil salinity and damage to physical structure of soil.

## 4. Air and water pollution

- Majority of our industrial plants are using outdated technologies and makeshift facilities devoid of any provision of treating their wastes. A great number of cities and industrial areas have been identified as the worst in terms of air and water pollution

# People in Environment

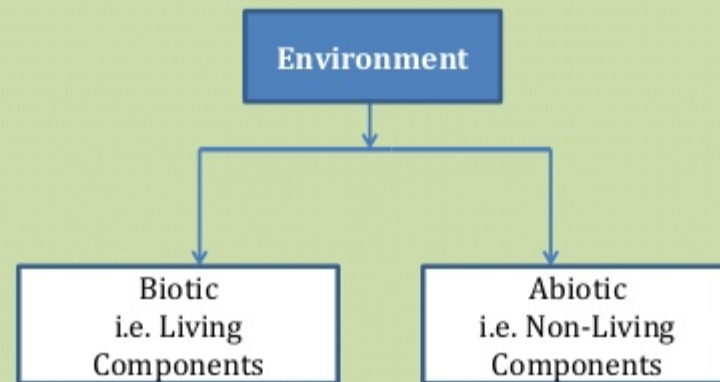
- There are several internationally known environmental thinkers. Among those who have made landmarks, the names that are usually mentioned are Charles Darwin, Ralph Emerson, Henry Thoreau, John Muir, Aldo Leopold, Rachel Carson and EO Wilson.
- There have been a number of individuals who have been instrumental in shaping the environmental history in our country. Some of the well-known names in the last century include environmentalists, scientists, administrators, legal experts, educationists and journalists



# Components of Environment

## Components of Environment

- Environment can be divided into following Components



# Ecosystem

- Definition
- The living community of plants and animals in any area together with the non-living components of the environment such as soil, air and water, constitute the ecosystem.
- It is of two types: natural ecosystems and man made ecosystems (agricultural land).
- It functions through several biogeochemical cycles and energy transfer mechanisms.

# Structure of an Ecosystem

- Components that make up the structural aspects
- of an ecosystem include:
- 1) Inorganic aspects – C, N, CO<sub>2</sub>, H<sub>2</sub>O.
- 2) Organic compounds – Protein, Carbohydrates,
- Lipids – link abiotic to biotic
- aspects.
- 3) Climatic regimes – Temperature, Moisture,
- Light & Topography.
- 4) Producers – Plants.
- 5) Macro consumers – Phagotrophs – Large
- animals.
- 6) Micro consumers – Saprotrophs, absorbers
- – fungi.

# Functional aspects

- 1) Energy cycles.
- 2) Food chains.
- 3) Diversity-interlinkages between organisms.
- 4) Nutrient cycles-biogeochemical cycles.
- 5) Evolution.

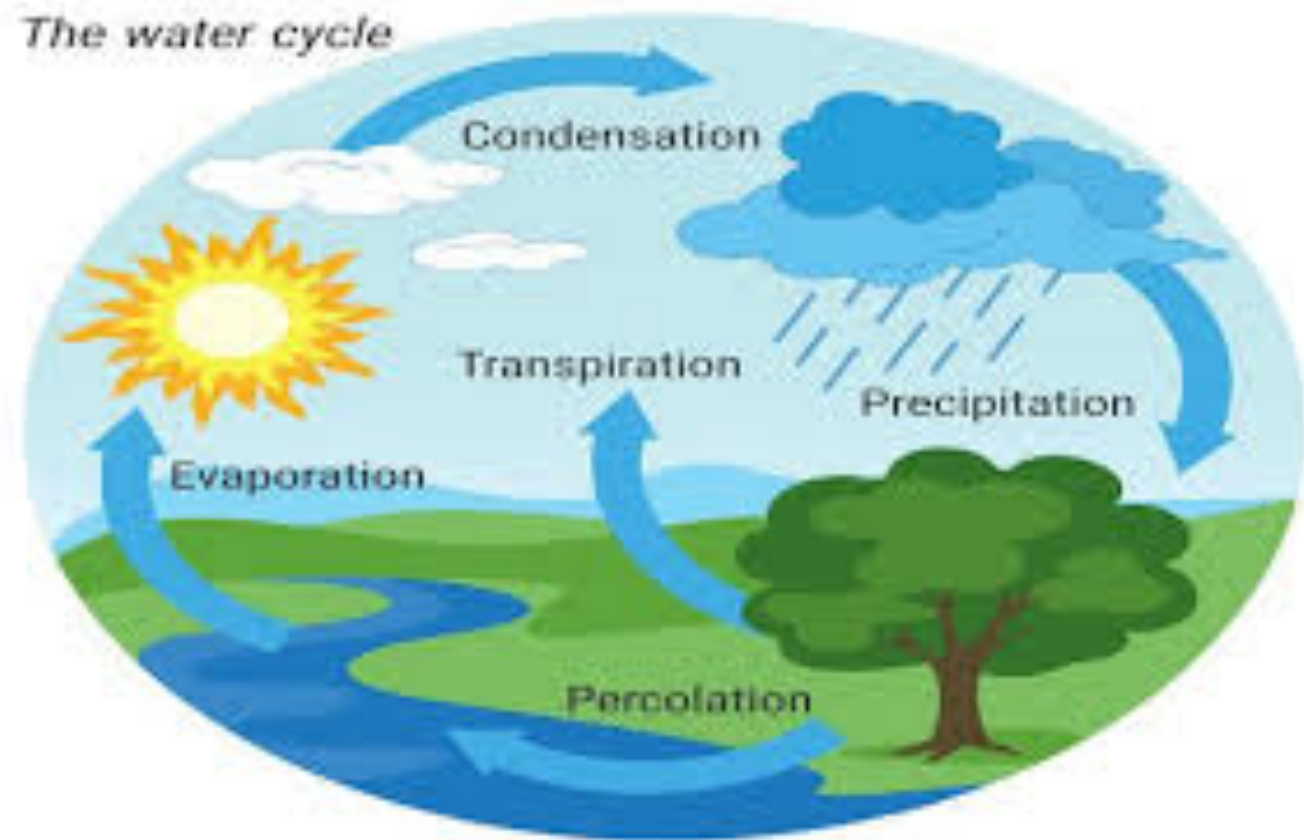
# Producers, Consumers and Decomposers

- Plants are the ‘**producers**’ in the ecosystem as they manufacture their food by using energy from the sun. In the forest these form communities of plant life. In the sea these include tiny algal forms to large seaweed.
- The herbivorous animals are **primary consumers** as they live on the producers. E.g. deer, elephants.
- At a higher tropic level, there are carnivorous animals, or **secondary consumers**, which live on herbivorous animals. E.g. tiger, leopards, wild cats.
- Decomposers or detritivores are a group of organisms consisting of small animals like worms, insects, bacteria and fungi, which break down dead organic material into smaller particles and finally into simpler substances that are used by plants as nutrition.

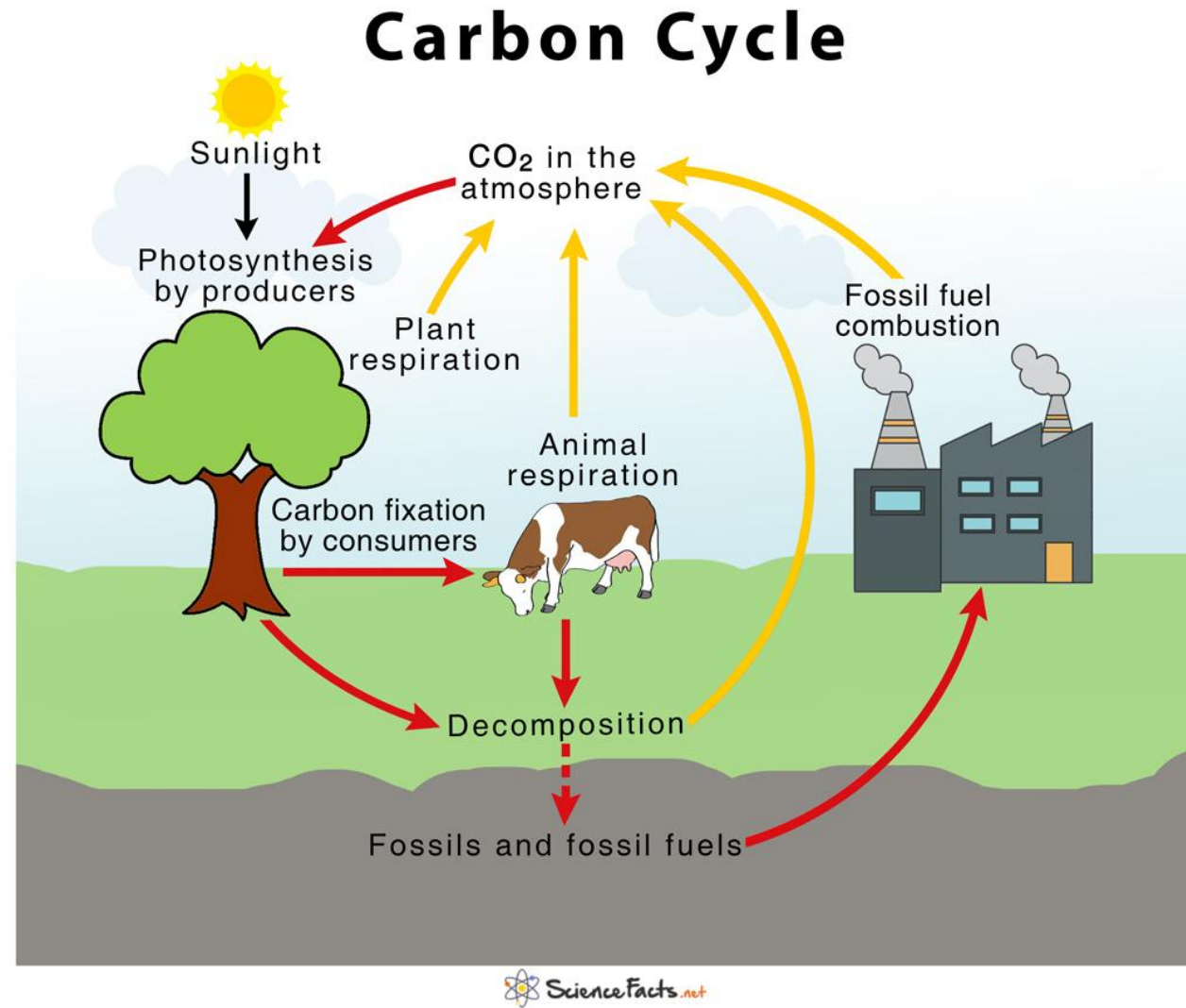
# ENERGY FLOW IN THE ECOSYSTEM

- All the functions of the ecosystem are in some way related to the growth and regeneration of its plant and animal species. These linked processes can be depicted as the various cycles ( water cycle, carbon cycle, nitrogen cycle, oxygen cycle and the energy cycles etc.).
- These processes depend on energy from sunlight. During photosynthesis carbon dioxide is taken up by plants and oxygen is released. Animals depend on this oxygen for their respiration. The water cycle depends on the rainfall, which is necessary for plants and animals to live. The energy cycle recycles nutrients into the soil on which plant life grows.
- Our own lives are closely linked to the proper functioning of these cycles of life.

# Water Cycle



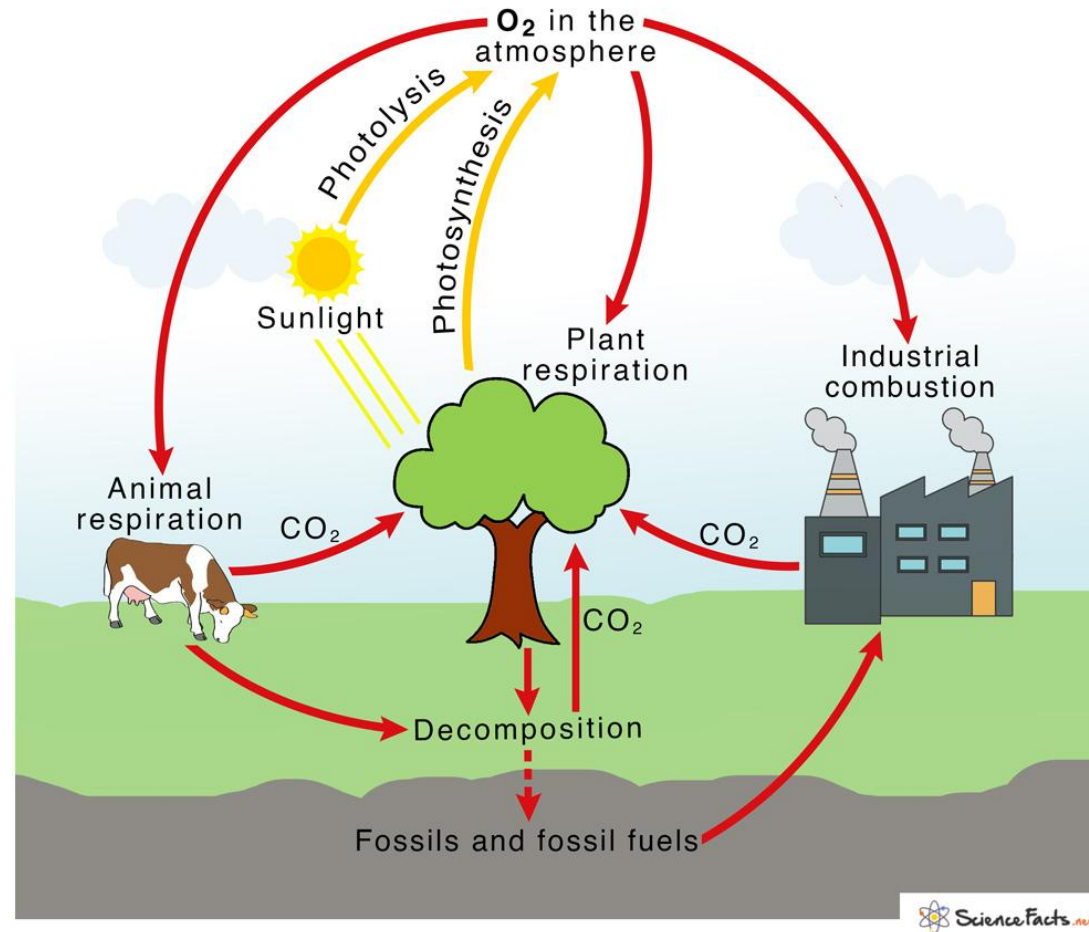
# Carbon Cycle



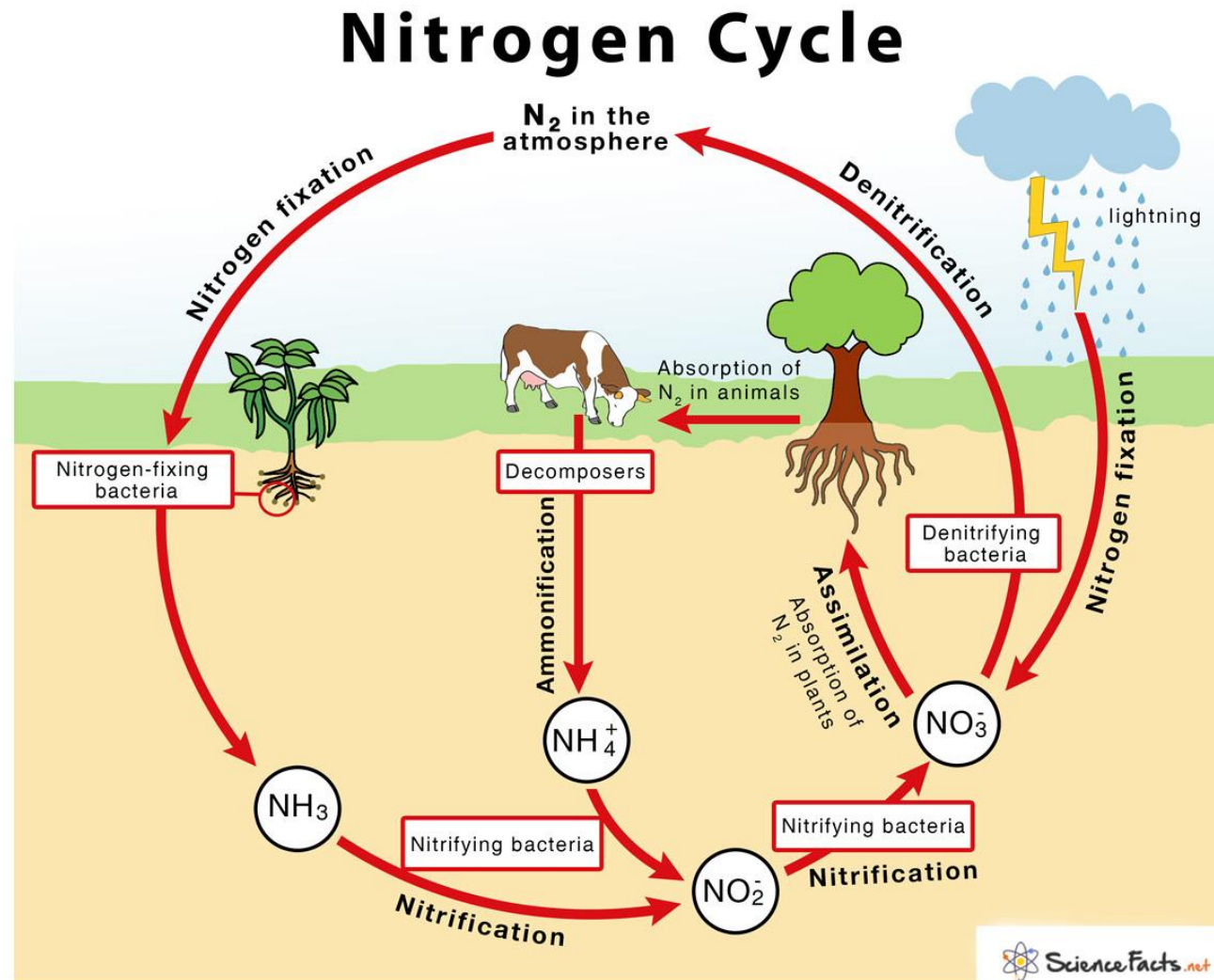


# Oxygen cycle

## Oxygen Cycle

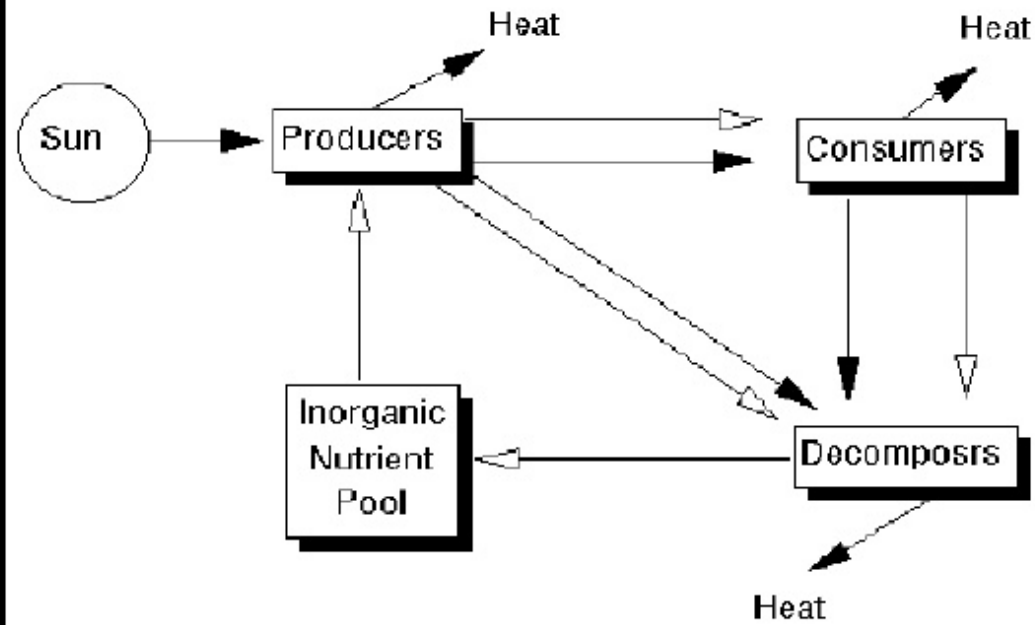


# Nitrogen cycle



# Energy cycle

## Energy Cycle



# Ecological succession

- Ecological succession is a process through which ecosystems tend to change over a period of time. Succession can be related to seasonal environmental changes, which create changes in the community of plants and animals living in the ecosystem. Other successional events may take much longer periods of time extending to several decades. If a forest is cleared, it is initially colonized by a certain group of species of plants and animals, which gradually change through an orderly process of community development.
- There is a tendency for succession to produce a more or less stable state at the end of the successional stages. Developmental stages in the ecosystem thus consist of a pioneer stage, a series of changes known as seral stages, and finally a climax stage.

# FOOD CHAINS, FOOD WEBS AND ECOLOGICAL PYRAMIDS

- The transfer of energy from the source in plants through a series of organisms by eating and being eaten constitutes food chains. At each transfer, a large proportion of energy is lost in the form of heat.
- These food chains are not isolated sequences, but are interconnected with each other. This interlocking pattern is known as the food web.
- Each step of the food web is called a trophic level. Hence green plants occupy the first level, herbivores the second level, carnivores the third level and secondary carnivores the fourth level. These trophic levels together form the ecological pyramid.

# Food Chains

The most obvious aspect of nature is that energy must pass from one living organism to another. When herbivorous animals feed on plants, energy is transferred from plants to animals. In an ecosystem, some of the animals feed on other living organisms, while some feed on dead organic matter.

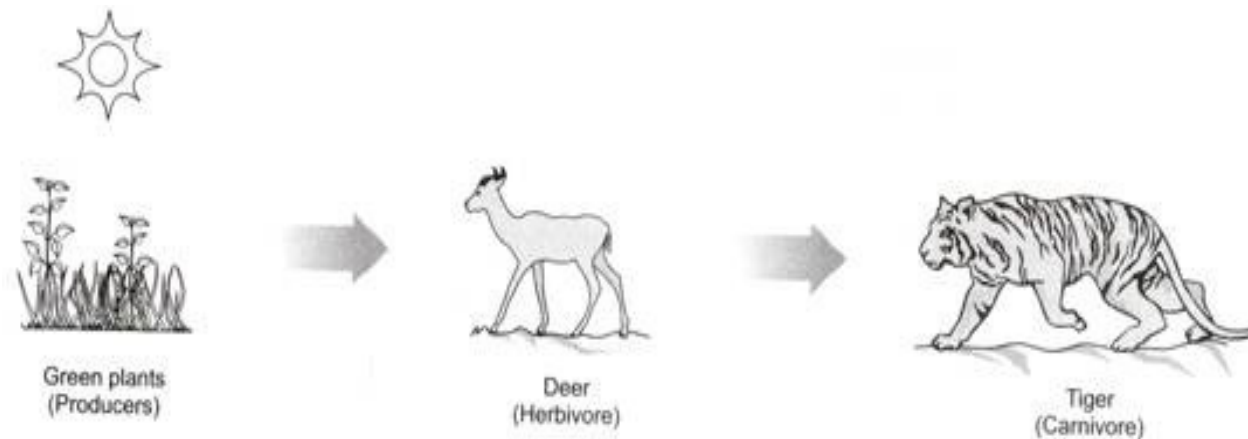
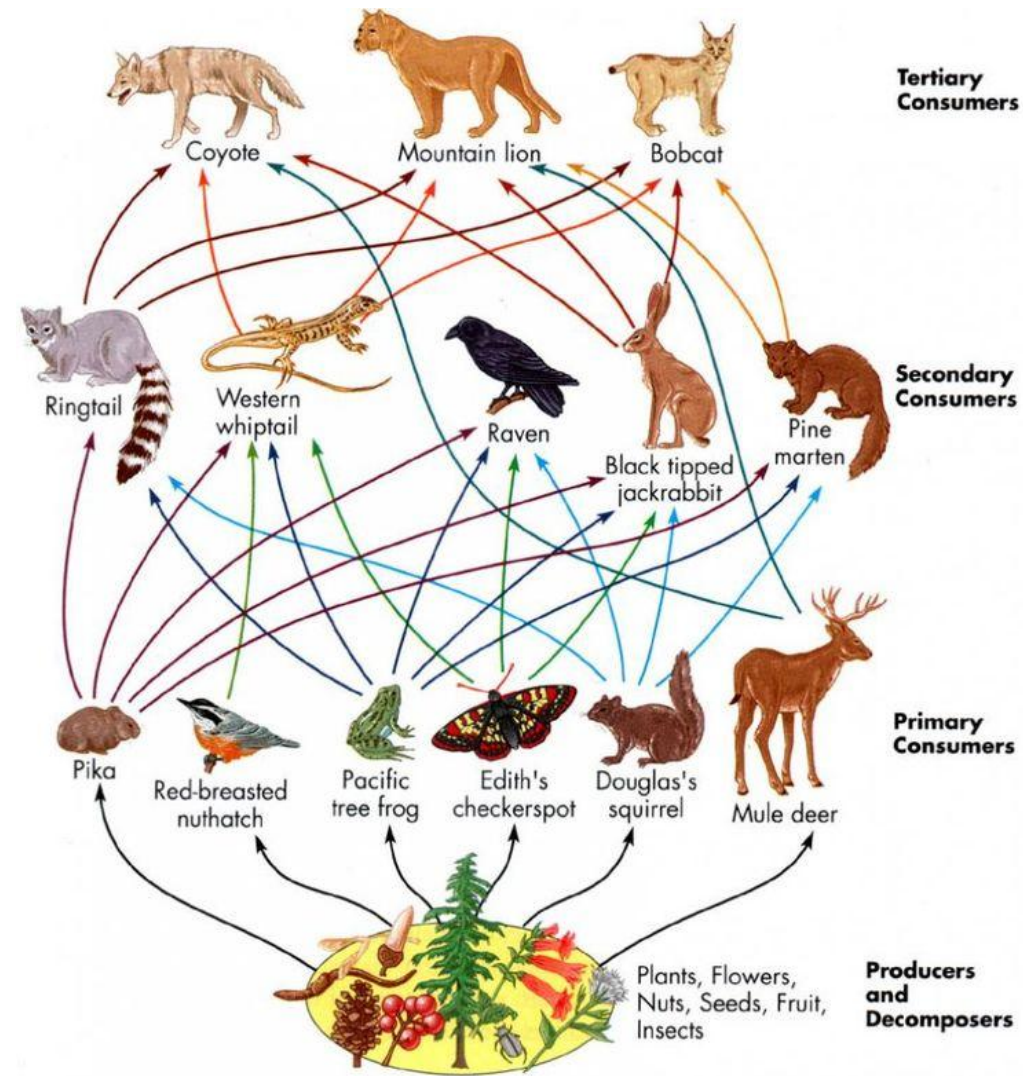


Fig. 8.2 A food chain in a forest ecosystem

# Food Webs



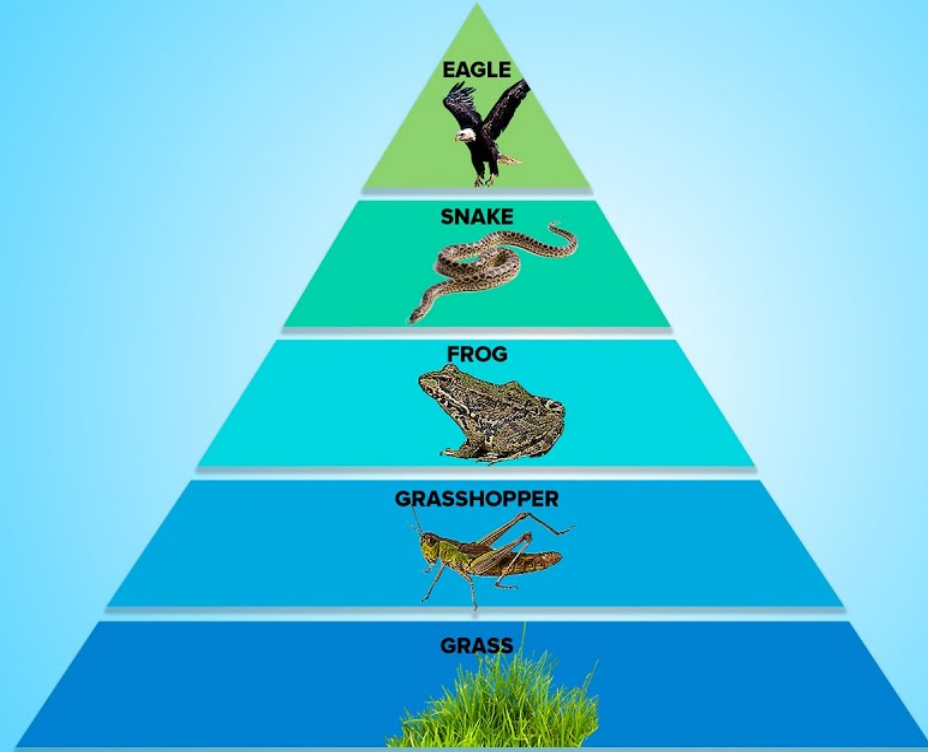
# Ecological pyramid

- In an ecosystem, green plants – the producers, utilize energy directly from sunlight and convert it into matter. A large number of these organism form the most basic, or first ‘trophic level’ of the food pyramid. The herbivorous animals that eat plants are at the second trophic level and are called primary consumers. The predators that feed on them form the third trophic level and are known as secondary consumers. Only a few animals form the third trophic level consisting of carnivores at the apex of the food pyramid. This is how energy is used by living creatures and flows through the ecosystem from its base to the apex. Much of the energy is used up in activities of each living organism.



# Ecological pyramid

## ECOLOGICAL PYRAMID



- Ecological pyramid shows the flow of energy or biomass at each trophic level in a particular ecosystem
- There are three type of ecological pyramids i.e.
- Pyramid of number, mass and energy