ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY

1.1 ENVIRONMENT

Environmental science is the study of nature and the facts about environment. Environment can be defined as "all the social, economical, physical and chemical factors that surrounds man" or "all abiotic and biotic components around man-all living and non living things surrounds man".

1.1.1 PREREQUISITE DISCUSSIONS

The word environment is derived from the French word 'environ' which means to 'encircle or surround'.

Objective of this course is to develop concern for our own environment which will lead us to act at our own level to protect the environment we all live in.

Ever since people first recognized that their health and well-being were related to the quality of their environment, they have applied thoughtful principles to attempt to improve the quality of their environment.

There are three reasons for studying the state of the environment.

The first is the need for information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.

Second, there is a need to change the way in which we view our own environment, using practical approach based on observation and self learning.

Third, there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.

1.1.2 CONCEPTS

According to ancient man the environment was the Panchaboodhas (i.e.) air, water, land, sky and energy.

The human were disciples of nature. They were able to protect themselves from harmful one and protect the others. But according to modern man the environment is only air land and water.

Exploitation of various earth resources to satisfy the increasing needs of human population has resulted in 1) depletion of various resources of earth 2) pollution. Principles of environmental education:

- Examine the major environmental issues
- Discover the root cause
- Develop problem solving skills
- Promote co-operation in solving problems
- Emphasis active participation in prevention and solution to problems

1.1.3 SCOPE OF ENVIRONMENTAL SCIENCE

- Studying the interrelationship between the components of environment.
- Carrying out impact analysis and Environmental Audit
- Preventing pollution from existing and new industries
- Stopping the use of biological and nuclear weapons
- Managing unpredictable disasters etc.

1.1.4 PUBLIC AWARENESS

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection.

- Public awareness of environmental issue is at infant stage
- 30-40% of public of developing country are aware of environmental. Problems but they do not bother about it.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in std. of living has lead to serious environmental disasters.
- Debates on environmental Issues are treated as anti-developmental.

1.1.5 APPLICATION

- Environmental science is essentially the application of scientific methods and principles to the study of environmental issues, so it has probably been around in some forms as long as science itself.
- Environmental science is often confused with other fields of related interest, especially ecology, environmental studies, environmental education and environmental engineering.
- Environmental science is not constrained with any one discipline and it is a comprehensive field.

1.1.6 RISK AND HAZARDS IN THE ENVIRONMENT

Environmental risk due to various environmental hazards is an important topic for environmental engineers to recognise and understand in order to protect human society and ecosystems from harms or damages at local, regional or global scales. For example, to deal with contaminated soil and ground water at a brown field, risk and exposure assessment help engineers choose an optimal solution to either treat the hazard (e.g., to remove the contaminants from the soil and water) or reduce the exposure (e.g., to cover up the land with a barrier).

A hazard is a threat to life, health, property, or ecosystems, i.e., it involves something that could potentially be harmful. Therefore, when a dormant hazard comes to fruition, it will cause physical damage or destruction, loss of life, or drastic change to the environment, and result in an incident, accident, emergency event, or disaster. Hazards may be classified into:

- Chemical hazards – Combustion of Fossil fuels, industrial effluence, pesticides heavy metals.
- Physical hazards – Radioactive and UV radiations, Global warming, Chlorofluro carbons, Noise etc.
- Biological hazards – Bacteria, Viruses, Parasites.

1.2 ECOSYSTEM

Living organisms cannot be isolated from their non-living environment because the later provides materials and energy for the survival of the farmer.

An ecosystem is therefore defined as a natural functional ecological unit comprising of living organisms and their non-living environment that interact to form a stable self supporting system.

1.2.1 PREREQUISITE DISCUSSIONS

EO Wilson is an entomologist who envisioned that biological diversity was a key to human survival on Earth. He wrote 'Diversity of life' in 1993, which was awarded a prize for the best book published on environmental issues.

He emphasised the risks to mankind due to manmade disturbances in natural ecosystems that are leading to the rapid extinction of species at the global level.

An Indian ornithologist and naturalist, Salim Ali known as the "birdman of India", was among the first Indians to conduct systematic bird surveys across India.

He was instrumental in creating the Bharatpur bird sanctuary (Keoladeo National Park) and prevented the destruction of what is now the Silent Valley National Park. He was awarded India's second highest civilian honour, the Padma Vibhushan in 1976.

His autobiography, **Fall of a sparrow**, should be read by every nature enthusiast. He was our country's leading conservation scientist and influenced environmental policies in our country for over 50 years.

1.2.2 CONCEPTS

Ecology is the study of the distribution and abundance of organisms, the flows of energy and materials between abiotic and biotic components of ecosystems.

Structure of Ecosystem

1. Abiotic or non-living components or physical components
2. Biotic or Living components
3. Energy components

Function of organisms in an ecosystem

- Producer (autotrophy): make food; plants, algae
- Consumer (heterotrophy): eat other organisms
- Decomposer: eat dead organic matter; bacteria and fungi

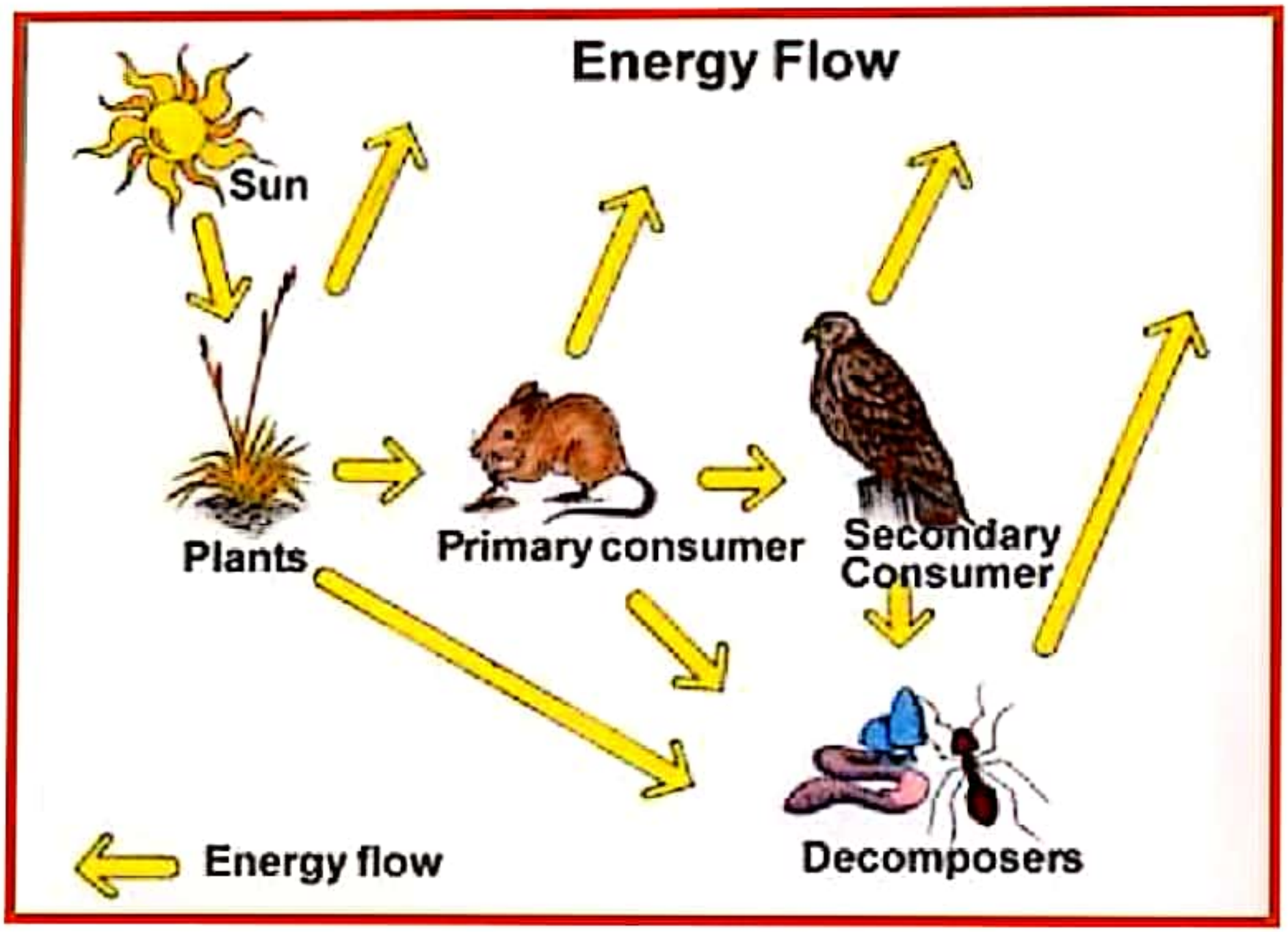
Classes of Consumers

- Herbivore – primary consumer – eats plants
- Carnivores – secondary – meat eaters; eat herbivores
- Tertiary – feed on carnivores
- Omnivores – eat plants/animals

1.2.3 ENERGY FLOW IN ECOSYSTEM

- All organisms must obtain a supply of energy and nutrients from their environment in order to survive.
- The transformations of energy in an ecosystem begin first with the input of energy from the sun.
- Because, it is the first step in the production of energy for living things, it is called "Primary production".
- Photosynthesis -- Chemical reaction where green plants use water & carbon dioxide to store the sun's energy in glucose.
- ENERGY is stored in glucose.
- Glucose is stored as starch in plants
- The majority of autotrophs are photoautotrophs that harness the energy of the sun and pass some of this energy onto consumers through feeding pathways.
- The energy contained within producers and consumers is ultimately passed to the decomposers that are responsible for the constant recycling of nutrients.

- Thus, there is a one-way flow of energy through the biotic community and a cycling of nutrients between the biotic and abiotic components of the ecosystem
- Energy flow cannot occur in reverse direction.



Energy Flow

- Starts from autotrophs (the producer level, i.e., first trophic level) to Heterotrophs including plant eaters or Herbivores (second trophic level) and so on.
- The amount of energy decreases with successive trophic levels.
- Only About 1% of energy from the sun is used by green plants & rest remains unutilized.
- Similarly, there is loss of energy in each trophic level.
- The transfer of food energy between the organisms in an ecosystem can be tracked by constructing food chains, food webs, pyramids of numbers, biomass and energy and energy flow diagrams.