Slides for Over Head Projection

Chapter 1: INTRODUCTION OF ENVIRONMENT

Lecture No.: 1: Concept and Components of Environment

Slide No.: 1:

Introduction to Environment
Components and Definitions
General Preception
Definition: EPA 1986

The term Environment has been defined under section 2(a) of "Environment Protection Act (1986) to include water, air, land and inter-relationship between water, air, land and human beings, other living creatures, plants, microorganisms and property".

Definition: Mason and Langenhim

"The sum of all substances and forces external to an organism which determines its existence and regulates its process".

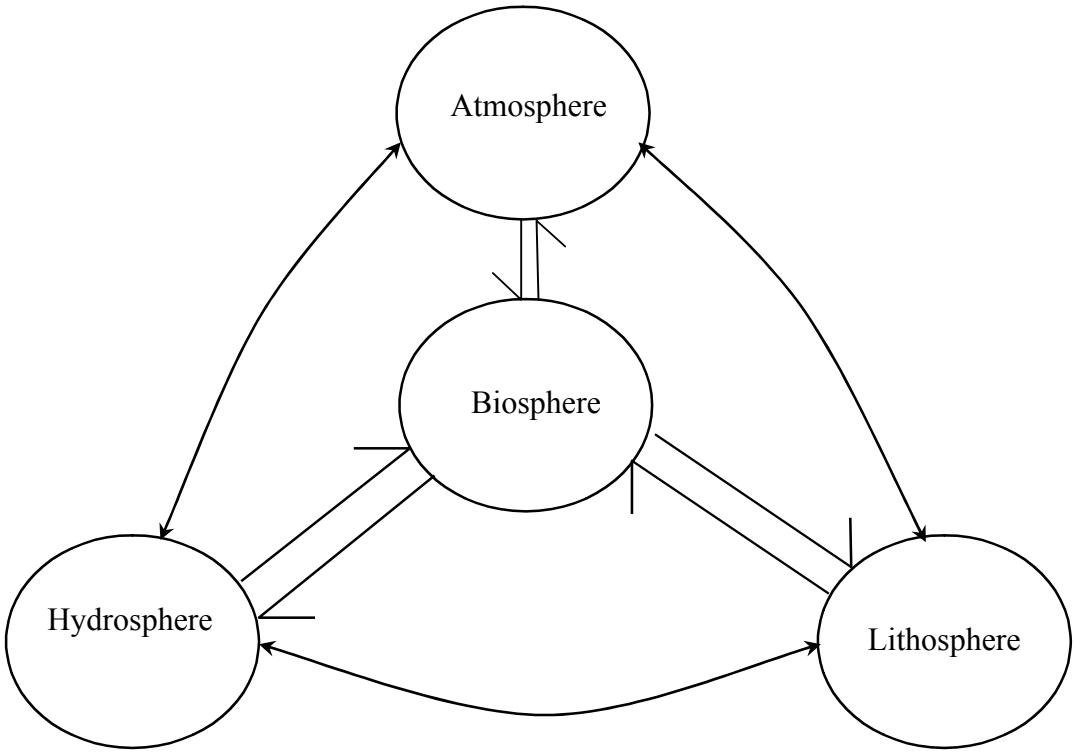

Figure 1.1: Pyramid of Life

Slide No.: 2

Major Environmental Problems are:

Air Pollution
Water Pollution
Depletion of Biodiversity
Waste Production
Food Supply Problems

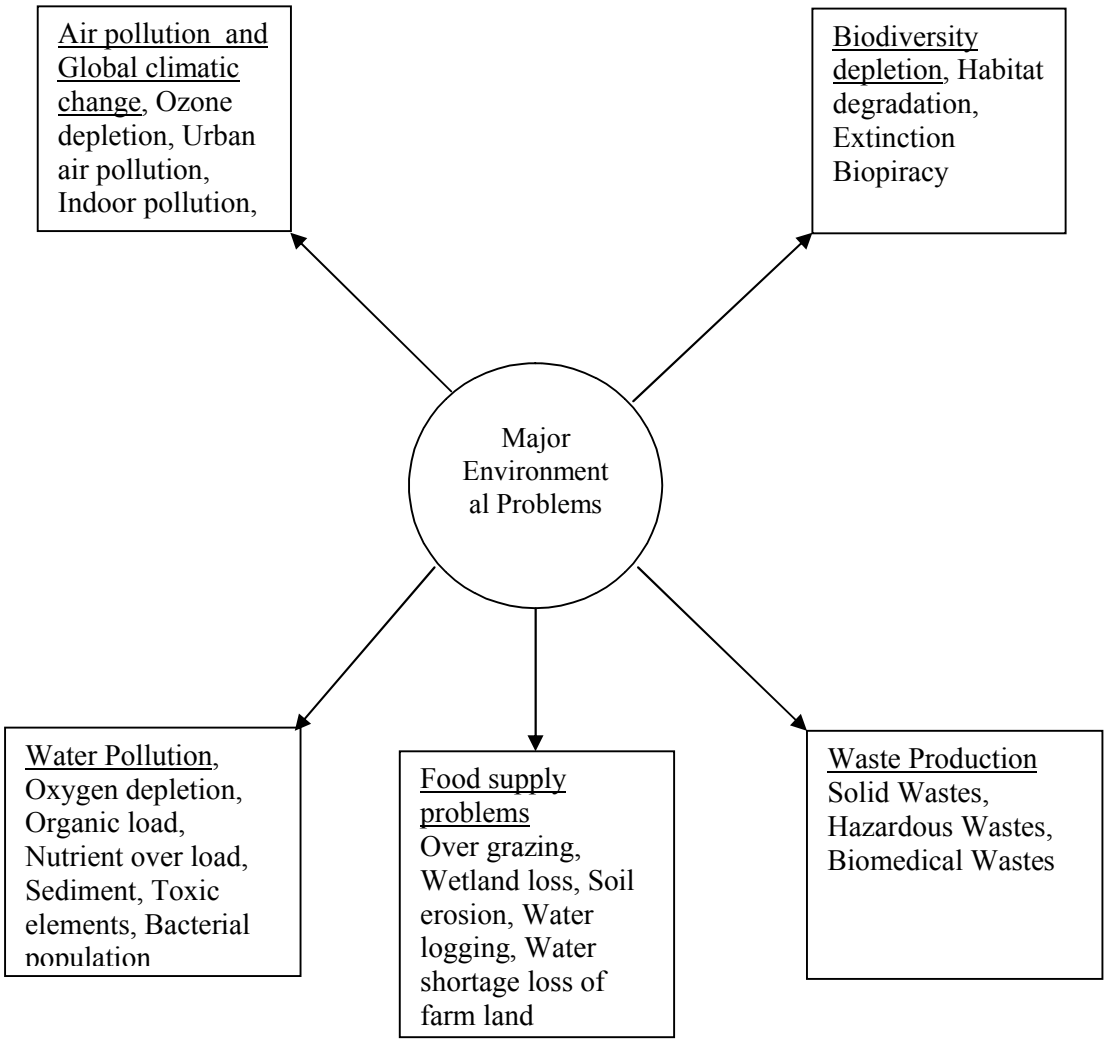

Figure 1.2: Major Environmental Problems

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Atmosphere

i) Homosphere – Extends upto 80 km
Composition Uniform

- Nitrogen 78.0% (by volume)
- Oxygen 20.946% (by volume)
- Others 0.97%
  - Argon (Ar) 9340 ppm, Inert gas
  - Carbon-di-oxide (CO_2) 300 ppm, Active gas
  - Neon (Ne) 182.0 ppm, Inert gas
  - Helium (He) 53.0 ppm, Inert gas
  - Krypton (kr) 1.2 ppm, Inert gas
  - Nitrous Oxide (N_2O) 1.0 ppm, Important gas
  - Xenon (xe) 0.9 ppm, Inert gas
  - Hydrogen (H_2) 0.5 ppm, Active gas
  - Ozonee (O_3) Traces, Active gas
  - Radon (Rn) Traces Radio active

ppm = parts per million (by volume)

Other materials which are highly variable are sulfur-di-oxide (SO_2), Carbon-mono-oxide (Co) and water vapor.

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ii) Heterosphere 80 km – 10,000 km
Composition Non Uniform

(i)	Molecular Nitrogen Layer (N_2)	- 80 km → 200 km
(ii)	Atomic Oxygen Layer (O)	- 200 km → 1100 km
(iii)	Helium Layer (He)	- 1100 km → 3500 km
(iv)	Hydrogen Layer (H_2)	- 3,500 km → 10,000 km

Thermal Structure

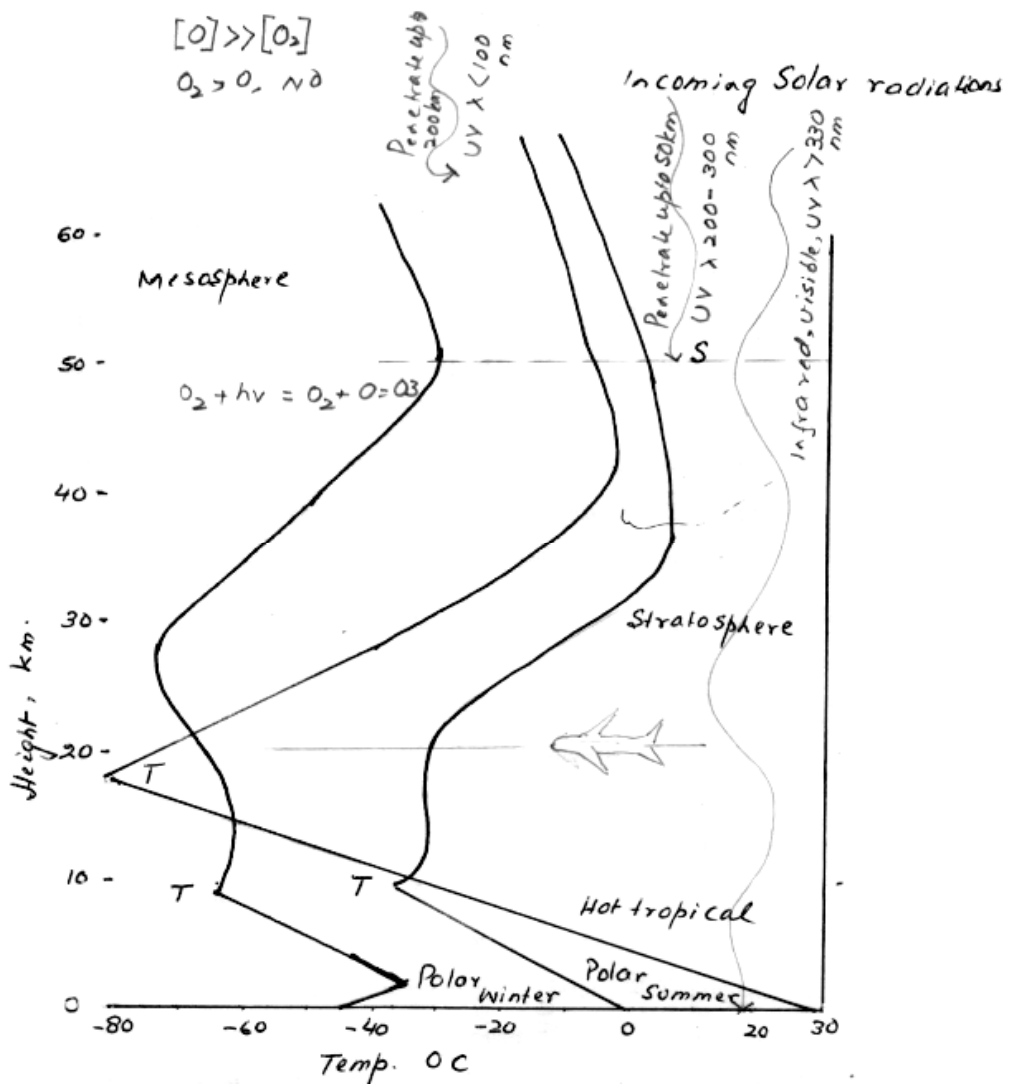

Figure 1.3: Structure of Atmosphere

CHAPTER – 2.0

INTRODUCTION TO BIOLOGICAL SYSTEMS

(Total Lectures Six)

Lecture No. 1 : Introduction
Origin and Story of Life
Figure 2.1
Biological Spectrum
Principle of Ecology Figure 2.2

Lecture No. 2 : Cell Structure and Organisation
Prokaryotic and Eukaryotic Cells
General Organisation of Prokaryotic Cell (Figure 2.3)
General Organisation of Eukaryotic Cell (Figure 2.4)
Functions of Components
Comparison of Prokaryotic and Eukaryotic Cells

Lecture No. 3 : Molecular Organisation of Cells
Metabolism - Principle
- Role of enzymes
Basics of Metabolism
Figure 2.5

Lecture No. 4 : Types of Plants and Animals
Five Kingdom approach (Fig. 2.6 a, b, c)
Estimates of Species in India (Table 2.1)

Lecture No. 5: Kingdom Monera
Kingdom Protista
Kingdom Plantae

Lecture No. 6 : Kingdom Animalia

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Chapter 2: INTRODUCTION TO BIOLOGICAL SYSTEMS

Lecture No.: 1

Introduction to Biological Systems
Earth is a unique planet – Free water, free oxygen and live forms

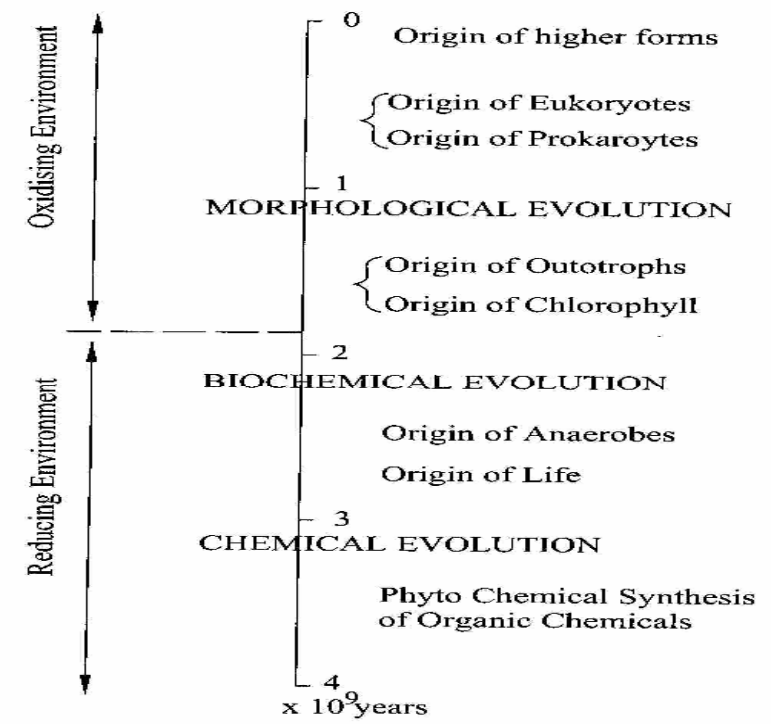

Figure 2.1 Story of Life

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Biological Spectrum

Cell ⟶ Tissue ⟶ Organ ⟶ Organ Systems
(Prokaryotic and eukaryotic organisms)
⟶ Organisms ⟶ Population ⟶ Community ⟶ Biosphere
(multicellular organisms)

Living forms exist at:

Cellular level **- Bacteria, Algae, Protozoa**
Organism level **- Higher Plants and Animals**
(Multicellular having tissues and organs)

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Every living being exists where metabolic needs are fulfilled.

Ecological Principle

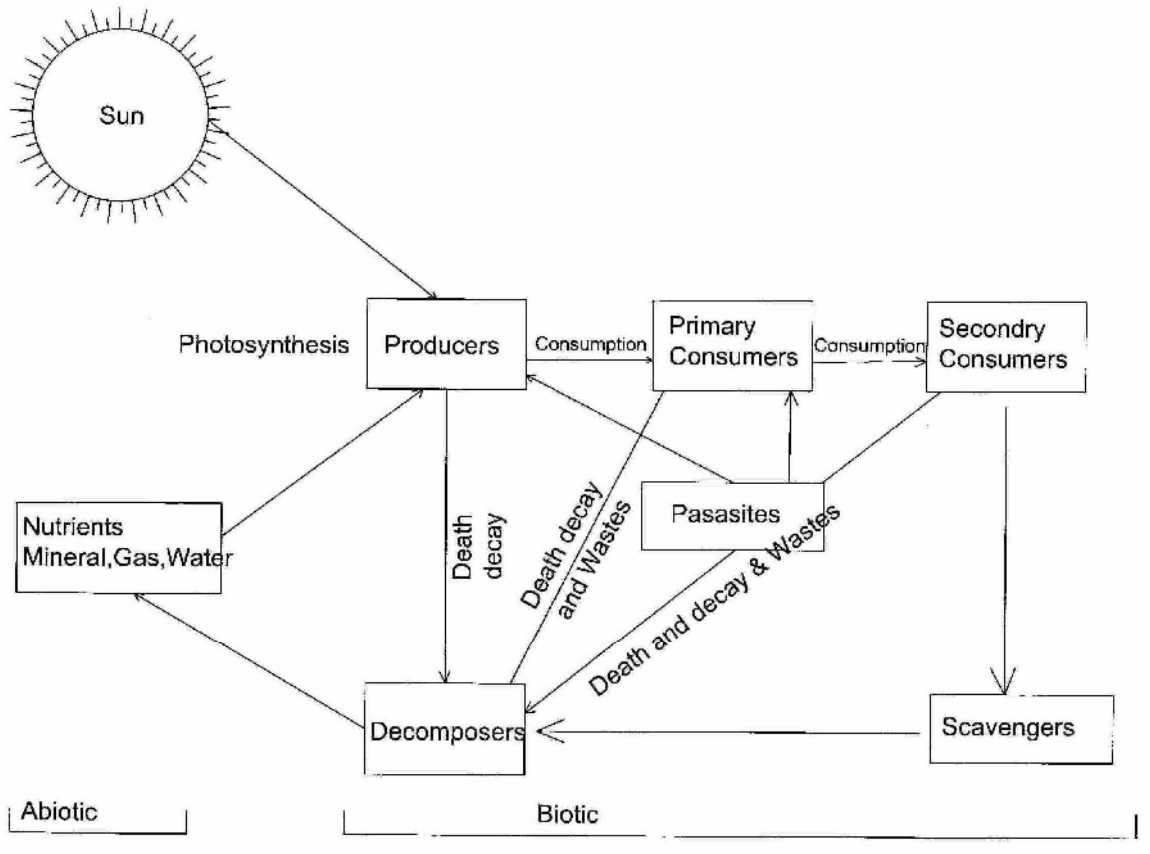

Figure 2.2: Principle of Ecology

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Cellular Organisations:

Prokaryotic
Eukaryotic

CHAPTER – 3.0

FUNDAMENTALS OF ECOLOGY

(Total Lectures Eight)

Lecture No. 1 : Definition
Ecology as a System – Ecosystem approach
First order classification of ecosystems
Ecosystem concept (Fig. 3.1)
Structure and Functional Components
Steps in ecosystem analysis

Lecture No. 2 : Energy Circuits
Flow of Energy in Ecosystem
Estimates of Annual Net Productivity

Lecture No. 3 : Biogeochemical Cycles
Principles, Types
Nitrogen Cycle (Figure 3.3)

Lecture No. 4 : Phosphorus Cycle (Figure 3.4)
Sulfur Cycle (Figure 3.5)
Generalised Concept of Nutrient Cycle (Figure 3.6)

Lecture No. 5 : Food Chain, Food Web
Trophic Levels
Description Through Managed Fish Pond (Figure 3.7)
Ecological Pyramids (Figure 3.8)

Lecture No. 6 : Development and Evolution
Concept, Laws of Leibig and Shelford
Physical Factors
Ecological Regulation

Lecture No. 7 : Ecological Succession
Community Energetics, Community Structure
Nutrient Cycling
Homeostatics

Lecture No. 8 : Summing and Revision
Interrelationshiphs

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Chapter 3: FUNDAMENTALS OF ECOLOGY

Lecture No. 1

Slide No. 1

Fundamentals of Ecology

Ecology deals with interactions of living and non living environment.

Definition:

Ecology is a science which deals with relationship of living with the nonliving environment. Literally ecology is the study of organisms interacting with environment. It is a gross study of nature's anatomy and physiology.

First Order Classification of Ecosystem

		Annual Energy Flow kal/m^2
1.	Unsubsidised Natural Solar powered Ecosystem Examples: Open seas, upland forests. These system constitute basic life support systems.	1000-10,000 (2000)*
2.	Natural subsidized solar powered Ecosystem Examples: Tidal estuary, Rain forest. Natural productive Systems. They produce excess organic matter which is either stored or exported to other systems	10,000-40,000 (20,000)
3.	Mansubsidised solar powered systems Examples: Agriculture, Aquaculture. They are fibre and food producing systems supported by auxiliary fuel or energy.	10,000-40,000 (20,000)*
4.	Fuel powered Urban-Industrial Systems Examples: City, suburbs, industrial parks. They are man's wealth producing and pollution producing systems in which fuel replaces solar energy. They are dependent on other systems for life support, food and fibre.	100,000-3,000,000 (2,000,000)*

*estimated average values

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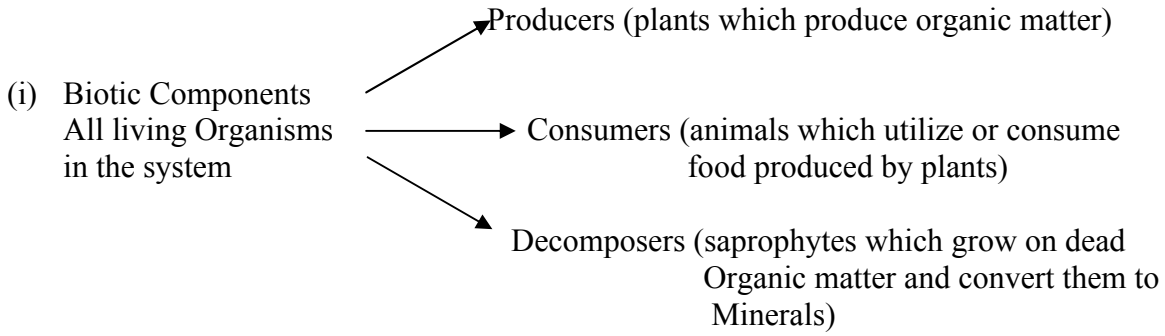
Concept of Ecosystem

The living organisms (Biotic community) and physical features (biotic components and gradients) of environment collectively constitute an ecological complex or a system known as Ecosystem.

Structure of Ecosystem



The amount of living material at any given time and at any given space is termed Standing Crop.

(ii) Abiotic components: include nonliving materials minerals and energy collectively called Standing State.

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Functional Components

(i) Autotrophs or Producers:

They constitute a self nourishing component. They utilize carbon-di-oxide from water/ air and solar energy with many other inorganic minerals from the environment they live in and produce organic matter in excess of their own requirements and store as food. The pre-requisite of these organisms is that they possess a system of photosynthetic pigments viz. chlorophyll, xanthophyl and phycocyanin.

(ii) Heterotrophs or Consumers and Decomposers:

They constitute those which consume the food produced by autotrophs/ producers, are animals. The plants on death and decay and animals on death and decay and the waste products (produced and thrown out of the body) promote the growth of individuals which can degrade the organic matter bacteria and release minerals (decomposers – bacteria and fungi).

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Abiotic components Basic inorganic and organic compounds molecules, ions, salts, H_2O, Co_2, O_2, Ca^{++}, Mg^{++}, Na^{+}, K^{+}, P, $Co_3^{=}$ HCo_3 Cl^{-}, $So_4^{=}$ amino acids, sugars
Small quantity in solution immediately available, larger quantity in particulate form
Bottom, sediment
Water depth, temp. cycle, light – cycle climatic regimes
Rate of release of nutrients from solids, input temperature cycle, light cycle, determines the rate of functions

Biotic components Rooted vegetation – submerged, floating, emergent
Phytoplanktom – Algae
Zooplankton – Protozoa, Crustacea
High forms – Small fish, large fish
Bacterial, fungus in water and water mud interface

An ecosystem can be conveniently analysed by:

(a) Energy circuits / flows
(b) Nutrient cycles
(c) Food chains – Trophic Chains
(d) Diversity pattern
(e) Development and evolution

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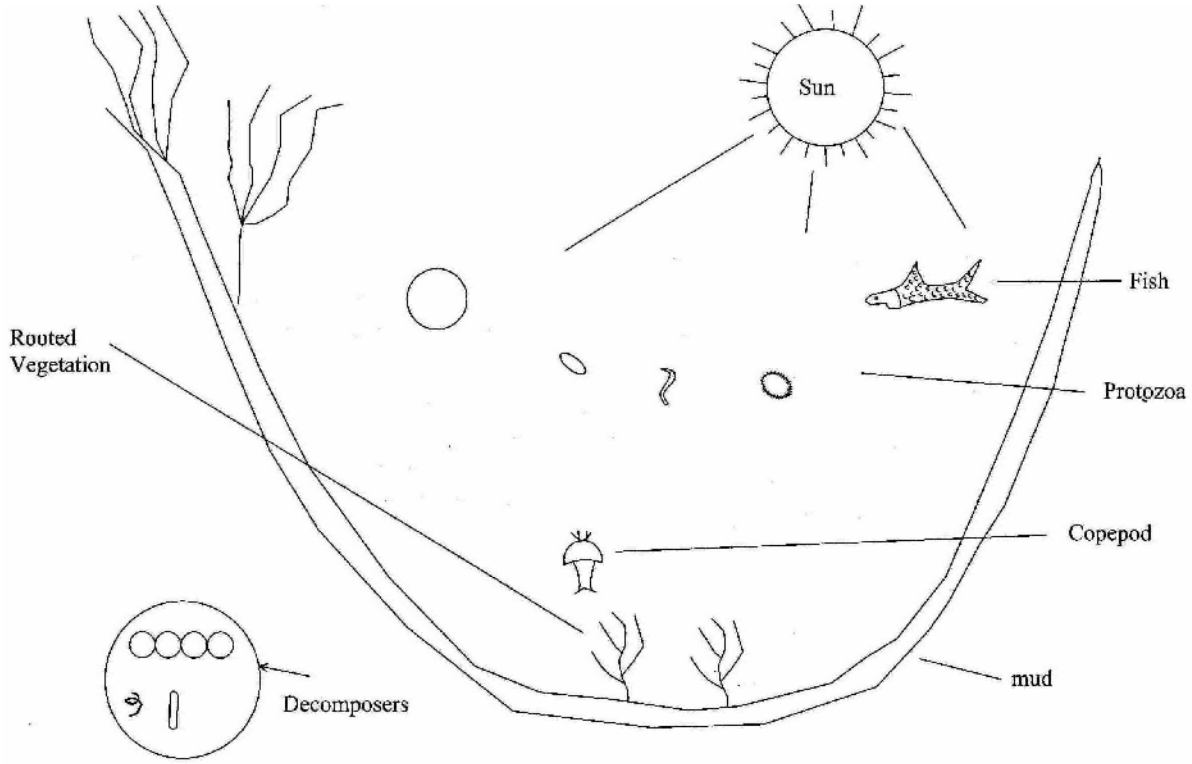

Figure 3.1: Pond as on Ecosystem