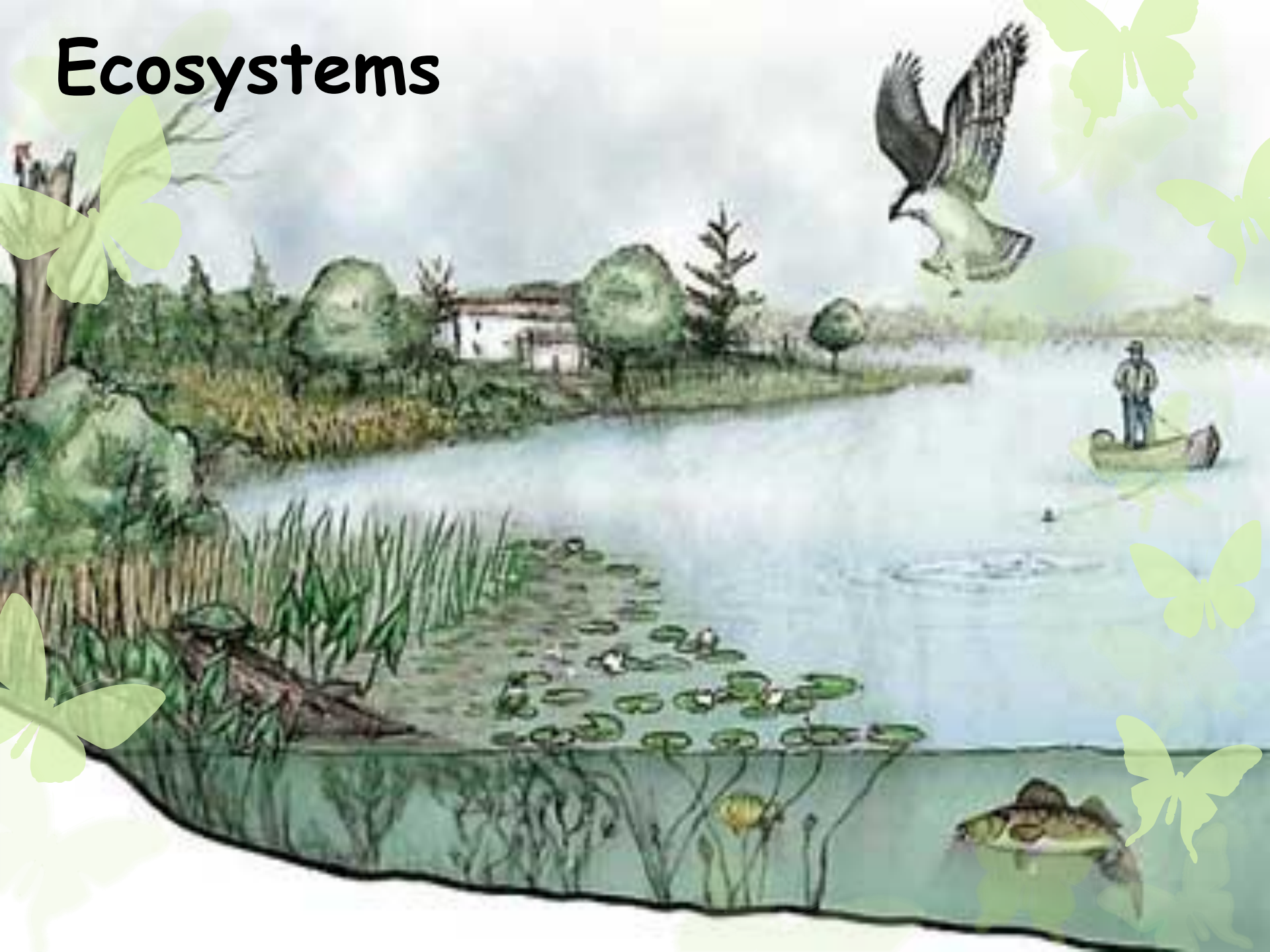


Ecosystems




Contents

- ❑ Concept of an Ecosystems and their Classification
- ❑ Structure and function of an ecosystem
- ❑ Energy flow in the ecosystems
- ❑ Carbon and Nitrogen Cycles
- ❑ Food chain, food web and ecological pyramids
- ❑ Ecological succession
- ❑ Study of common ecosystems

Concept of an Ecosystems

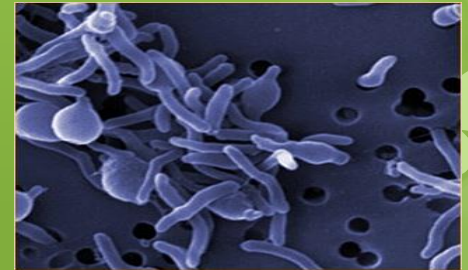
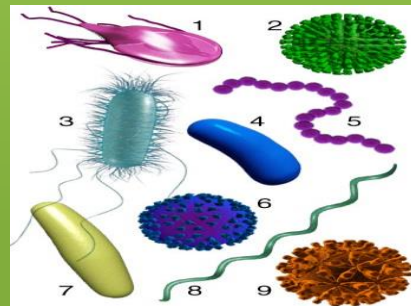
- Is being studied because of:
- 1. variation of Geographical Features
- 2. variation of Climatic conditions
- 3. soil characteristics

- ❑ Organism: cell is basic component of organism; accordingly we have single cell/multi cell organisms
- ❑ Species: a set of organisms that resemble(/same) one another ,are capable of reproducing naturally and produce a fertile/rich and live off (/rotten/bad) spring;
- ❑ Populaton: all the members of a species living and inteacting within a specific geographical region.
 - ❑ Ex., neem trees in a forest, people in country,gold fish in a pond.

- 
- Community: is the assemblage of all the interacting populations of different species existing in a geographical area and each population plays a different role in a community.

ECOSYSTEM

An ecosystem is a biotic assemblage of plants, animals, and microbes, taken together with their physicochemical environment.



Cont..

- ❑ It is a group of biotic communities of species(**living**) interacting with one another and with their **non living** environment exchanging energy and matter.
- ❑ So the study of these ecosystems is often known as **ECOLOGY**

Living things



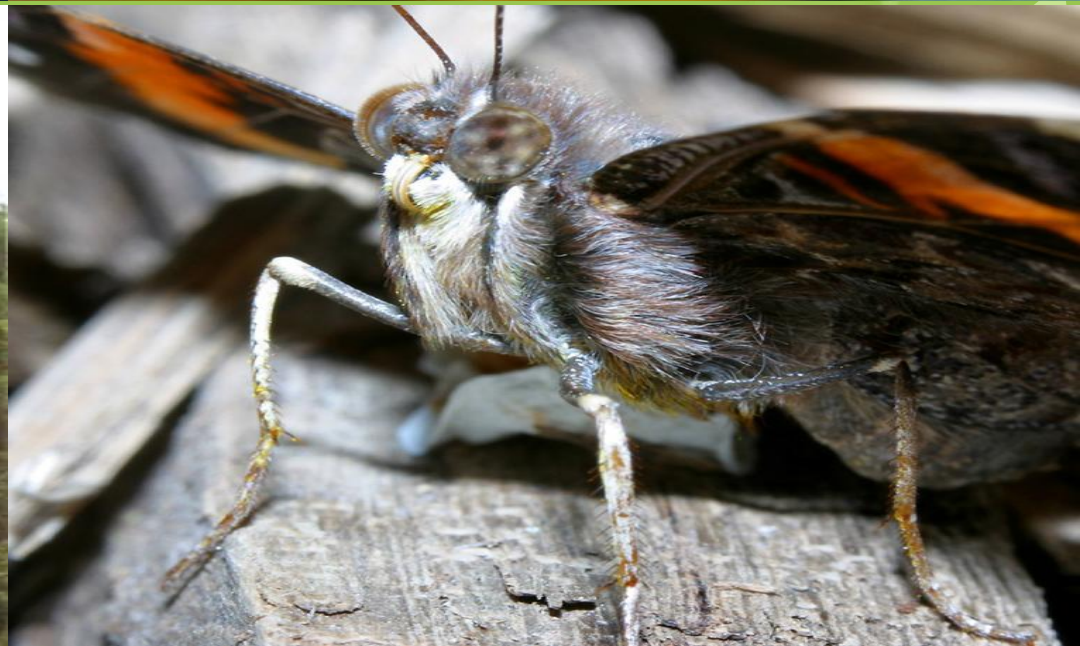
Living things



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Non-living things



Photo: Whitsand Bay, thesurfgallery.co.uk



www.toddadams.net



www.surfshacks.co.uk



Sunlight
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NON-Living things



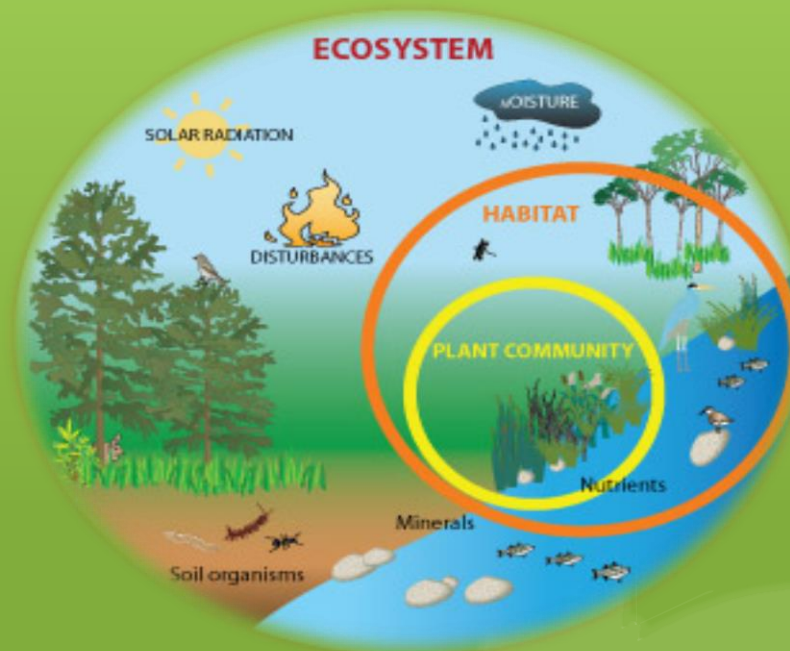
Living things

+ Nonliving things

ECOSYSTEM

Definition of ecosystem

- ❑ 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.
- ❑ Natural ecosystems include the forests, grass-lands, deserts, and aquatic ecosystems such as ponds, rivers, lakes, and the sea.
- ❑ Man modified ecosystems include agricultural land and urban or industrial land use patterns.



Concept of an Ecosystem

Life supporting systems
(Forests, Grasslands, Oceans,
Lakes, Rivers, Mountains,
Deserts...)

show wide variations in
their structural
composition & functions

However, they are alike ...
*in the fact that they all consist
of living entities interacting with
their surrounding exchanging
matter and energy*

Concept of an ecosystem

- ❑ The nature of the ecosystem is based on its geographical features such as hills, mountains, plains, rivers, lakes, coastal areas or islands.-----constitutes

GEOGRAPHICAL FEATURES OF THE AREA

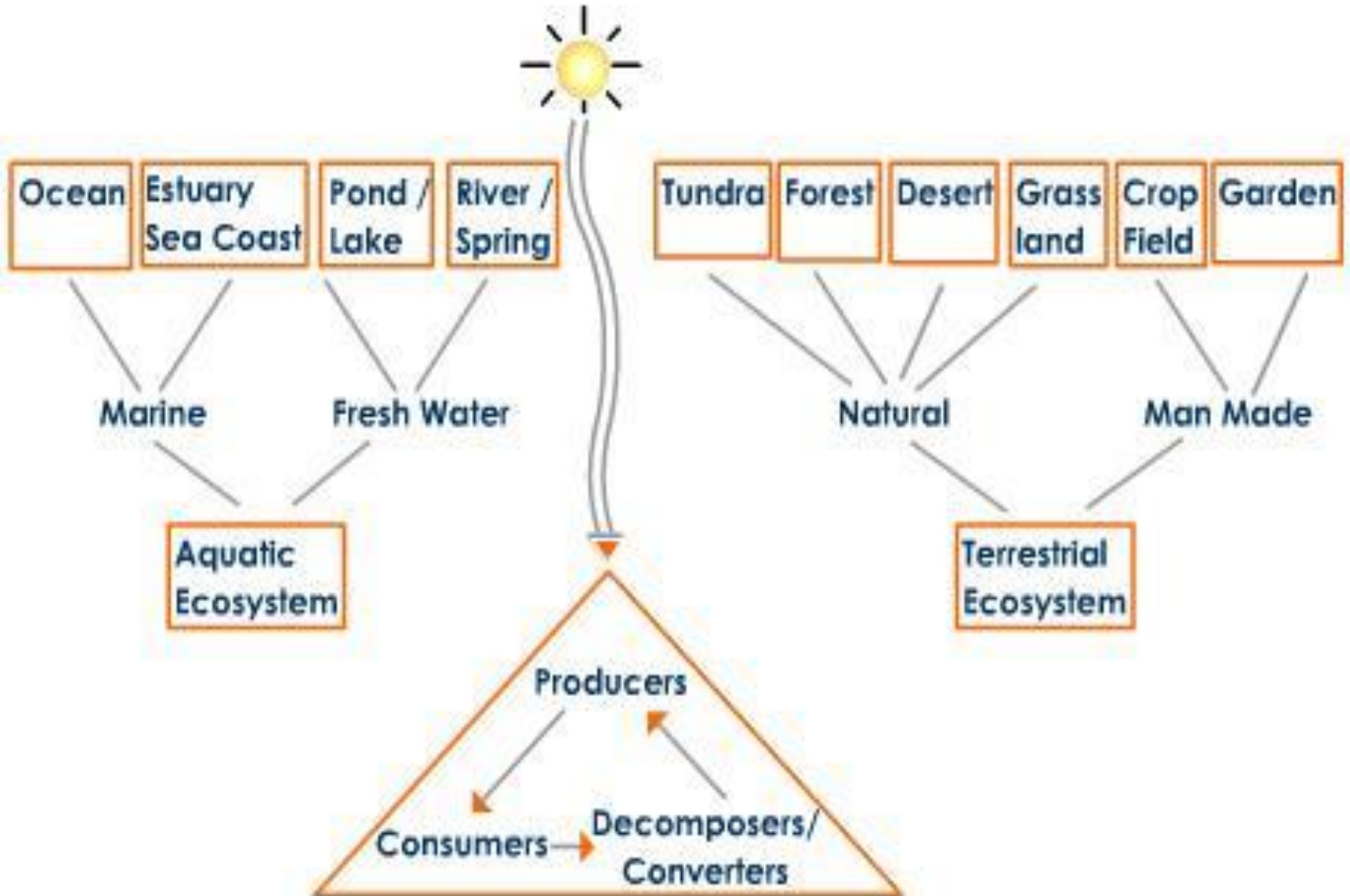
- ❑ It is also controlled by climatic conditions such as the amount of sunlight, the temperature and the rainfall in the region.

Contd...

- ❑ Ecosystems are divided into terrestrial or land-based ecosystems, and aquatic ecosystems in water.
- ❑ These form the two major habitat conditions for the Earth's living organisms.
- ❑ Ecosystems have been formed on land and in the sea by evolution/growth that has created species to live together in a specific region.
- ❑ Thus ecosystems have both non-living and living components that are typical to an area giving it its own special characteristics that are easily observed.

Understanding Ecosystems

Types of Ecosystem



- ❑ Different biogeographic regions in India - the Himalayas, the Gangetic Plains, the Highlands of Central India, the Western and Eastern Ghats, the semi-arid desert in the West, the Deccan Plateau, the Coastal Belts, and the Andaman and Nicobar Islands.
- ❑ Each area has structurally and functionally identifiable ecosystems such as different types of forests, grasslands, river catchments, mangrove swamps in deltas, seashores, islands, etc.

- ❑ **Robust ecosystem** - less affected by a certain level of human disturbance.
- ❑ **Fragile ecosystem** - are quickly destroyed by human activities.
- ❑ **Mountain ecosystems** are extremely fragile/delicate - degradation of forest cover leads to severe erosion of soil and changes in river courses.
- ❑ **Island ecosystems** are easily affected by any form of human activity which can lead to the rapid extinction of several of their unique species of plants and animals.
- ❑ **River and wetland ecosystems** can be seriously affected by pollution and changes in surrounding land use.

Ecosystem degradation

- ❑ Ecosystems are the basis of life itself!
- ❑ Some species, if eliminated seriously affect the ecosystem. These are called 'keystone' species.
- ❑ Ecosystems are however frequently disrupted by human actions which lead to the extinction of species of plants and animals that can live only in the different natural ecosystems.
 - ❑ Extinction occurs due to changes in land use.
 - ❑ Forests are deforested for timber
 - ❑ Wetlands are drained to create more agricultural land
 - ❑ Pollution from industry and waste from urban settings can also lead to extinction of several species

Contd..

- ❑ The reason for the depletion of natural resources is twofold
 - ❑ our rapidly **exploding population**
 - ❑ **consumerism** or the growth of affluent societies, which consume and waste a very large proportion of resources and energy

What makes ecosystems different?

1



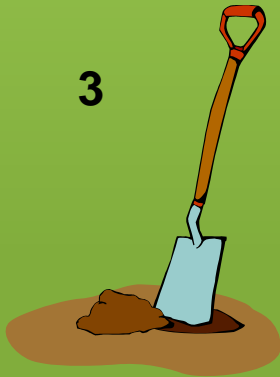
Amount of water

2



Amount of sunlight

3

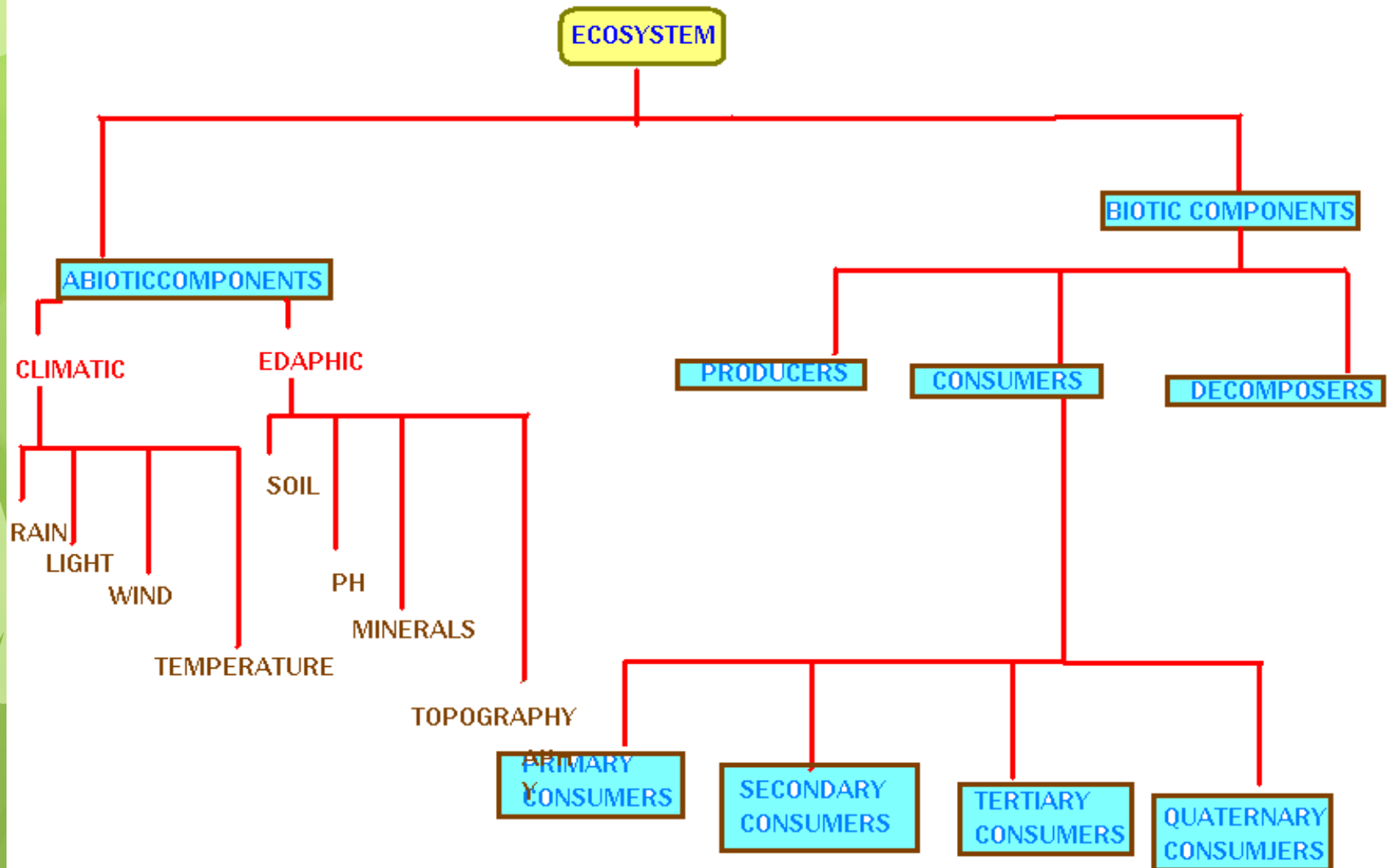


Type of soil

Structure of an Ecosystem

- ❑ Structural aspects
- ❑ Components that make up the structural aspects of an ecosystem include:
 - ❑ Inorganic compounds - C, N, CO₂, H₂O
 - ❑ Organic compounds - Protein, Carbohydrates, Lipids - link abiotic to biotic aspects.
 - ❑ Climatic regimes - Temperature, Moisture, Light & Topography.
 - ❑ Producers - Plants.
 - ❑ Macro consumers - Phagotrophs - Large animals.
 - ❑ Micro consumers - Saprotrophs, absorbers like fungi

STRUCTURE OF ECOSYSTEM



ABIOTIC FACTORS

□ This is broken down into 4 different areas.

□ 1: CLIMATIC FACTORS:

Light, temperature, water availability, wind

□ 2: EDAPHIC FACTORS: (soil)

Aeration, drainage, humus content, mineral content, soil pH

□ 3: GEOGRAPHIC FACTORS/FEATURES:

Aspect (direction), slope, altitude, shelter.

Ex: Hills, mountains, plains, rivers, lakes, coastal areas, islands, estuary

□ 4: CHEMICAL FACTORS:

Oxygen, pH, mineral availability, salinity

Functions of Ecosystem

- ❑ All the Functional aspects of Ecosystem(every) relates to the growth and Regeneration of Plants and Animals.
- ❑ This is possible through the Mechanism(in-built system) of biogeological cycles and other functions of Ecosystem(every)
- ❑ The in -built mechanism also controls the population size of all the species contained in it.
- ❑ They leads to maintain distinct abiotic/biotic components and Ultimately influence the Quality of Human life.

Functions of Ecosystem

- ❑ Functional aspects of ecosystem:
 - ❑ 1) Productivity & Energy cycles.
 - ❑ Productivity is measured in $\text{Kcal}/(\text{m}^2.\text{year})$
 - ❑ The rate of biological energy flow i.e. production and respiration rates of the community.
 - ❑ 2) Food chains.
 - ❑ Rate of materials or nutrient cycles.
 - ❑ 3) Diversity-inter linkages between organisms.
 - ❑ Biological or ecological regulations which include regulations on organisms by the environment and regulations on environment by the organisms (N_2 fixation by organisms).
 - ❑ 4) Nutrient cycles-biogeochemical cycles.
 - ❑ 5) Evolution

Functions of Ecosystem

- ❑ Functional aspects of ecosystem:
- ❑ 1) Productivity:
 - ❑ i) Primary : The rate at which the Solar energy captured by the plants through Photosynthesis
 - ❑ ii) Secondary: the biomass available for consumers

Producers, Consumers and decomposers

- ❑ Ecosystem consists of basically following biotic components:
 1. Producers
 2. Consumers
 3. Decomposers

Contd...

- ❑ Every living organism is in some way dependent on other organisms.
- ❑ Plants are food for herbivorous animals which are in turn food for carnivorous animals.
- ❑ Thus there are different trophic levels (specific feeding stage/level) in the ecosystem.

Producers

- ❑ Plants are the 'producers' in the ecosystem as they manufacture their food by using energy from the sun.
- ❑ Plants manufacturer organic compounds from inorganic substances from their environment.
- ❑ Green Plants are able to do this by photosynthesis where the sun provides necessary energy.
- ❑ Green Plants are autotrophic organisms or primary producers.



I. Procedures (Autotrophs)

Procedures synthesize their food themselves through photosynthesis

Example : All green plants, trees.

Photosynthesis

The green pigments called chlorophyll, present in the leaves of plants, converts CO_2 and H_2O in the presence of sunlight into carbohydrates.



\square This process is called photosynthesis

Consumers (heterotrophs)

Consumers are organisms which can not prepare their own food and depend directly or indirectly on the producers.

Ex:

Plant eating species

Insects, rabbit, goat, deer, cow, etc.

Animal eating species

Lions, tigers etc

Classification of consumers

Consumers are further classified as

(i) **Primary consumers (Herbivores) (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, horse, etc.,



❑ Secondary consumers (primary carnivores)

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

Example

Frog, cat, snakes, foxes, etc.,

Tertiary consumers (Secondary carnivores) (Meateaters)

Tertiary consumers are secondary carnivores, they feed on secondary consumers.

They depend on the primary carnivores for their food.

Examples

Tigers, lions, etc.,



Omnivore:

They feed on both plants and animals.

Detritivores:

They feed on the parts of dead organisms, wastes of living organisms, their castoff and partially decomposed matter.

Ex: beetels, termites, ants, crabs

← Detritus feeders →

← Decomposers →



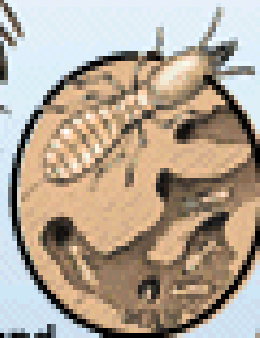
Long-horned beetle



Bark beetle engraving



Carpenter ant galleries



Termite and carpenter ant work



Dry rot fungus

Wood reduced to powder

Mushroom



Time progression →

Powder broken down by decomposers into plant nutrients in soil

Decomposers

- ❑ They derive their nutrition by breaking down the complex organic molecules to simpler organic compounds and ultimately in to inorganic nutrients.
- ❑ Even after animals and plants have died they serve as food for the **decomposers**. Bacteria and fungi feed off dead, decaying, organic material and break it down into simple nutrients that are returned to the soil or water. These substances are then re-used by the producers.

Decomposers

- Saprophytic organisms (Bacteria & Fungi) that obtain their energy by decomposing the dead parts of the living organisms.

