Ecosystems

Environment

- **Environment-**natural surroundings and external conditions of an organism, which include all living and non-living factors that affect the organism
- **Organism-** is the basic unit of an ecological hierarchy, can be unicellular such as *Amoeba* and *paramecium* or multicellular such as humans
- **Population-** a group of individuals of the same species inhabiting a given geographical area at a particular time and functioning as a unit
- **Community-** includes all individuals of different species living within a certain geographical area
- **Ecosystem-** includes both living and non-living components of an area
- **Biosphere-** The sum total of all ecosystems and their interactions

Components of an ecosystem

- **Abiotic factors-** non living components like light, temperature, water, air etc.
- **Biotic factors-**living organisms
- **Autotrophs or producers**- organisms that can manufacture their own food from inorganic raw materials, also known as producers
- **Heterotrophs-**cannot synthesize their own food; dependent on other organisms for their food requirements.
- **Herbivores or primary consumers -** feed only on plants e.g., deer, horse, sheep etc.
- **Carnivores or secondary consumers -** eat other animals e.g., frog, cat, spider etc.
- **Omnivores-** feed on both plants and animals e.g. bear, man etc.
- **Decomposers-**obtain nutrients by breaking down remains of dead plants and animals, includes some bacteria and fungi.

Functions of an ecosystem

- **Productivity-** rate of production of organic matter (food) by producers
- **Decomposition or recycling of nutrients -** breakdown of organic matter or biomass with the help of decomposers

Energy flow through an ecosystem

- **Trophic level -** level of species in an ecosystem on the basis of the source of nutrition
- **Producers-** form the first trophic level, they manufacture food trophic levels are connected through food chains
- **Food chain-** a linear sequence of organisms in which each organism is eaten by the next member in the sequence e.g., plants → grasshopper → frog → eagle
- **Generalised Food chain**

Producers → Herbivores or primary consumers → Carnivores or secondary consumers → Omnivores or tertiary consumers → Decomposers

- **Food web-**interconnected network of food chains
- **10% law of energy transfer-** only 10% energy is transferred from a lower trophic level to a higher trophic level, which means that energy keeps on decreasing as one moves up different trophic levels
- The graphical representation of energy exchange in the ecosystem is known as "**Pyramid of energy**".
- Since so little energy is available for the next trophic levels of consumers, food chains generally consists of three or four trophic level.
- **Biomagnification-**increase in the concentration of pollutants or harmful chemicals with each step up in the food chain

Biodiversity is the species richness of the biosphere. It is defined as the number and variety of life forms such as plants, animals and microorganisms in an area.

  - It supports all the essential living resources such as wild life, fisheries and forests.
  - Forests help in maintaining the delicate balance of nature.
  - Animals living in forests are called wild animals.
  - The plants found in a particular area are known as **flora** of that area.
  - The animals found in a particular area constitute **fauna** of that area.
  - Those species of plants and animals, which are found only in a particular area, are called **endemic species**. (**Species** is a group of organisms in population which are capable of interbreeding)

- The animals, whose numbers are diminishing to a level that they might face extinction, are called **endangered animals**. For example: tiger, lion, and elephants
- **Project tiger** was launched by the government of India to protect endangered tigers in their natural habitat.
- The flora and fauna of a particular habitat can be protected through special **protected areas**.

Protected areas

- **Wildlife sanctuary**:

It is the place where wild animals are protected from hunting and are provided with suitable living conditions. For example: Madhumalai wildlife sanctuary in Tamil Nadu, Chilika bird sanctuary in Orissa, etc.

- **National parks**:

These are the areas reserved for wildlife. They are maintained and preserved by the government for the public to visit. For example: Ranthambore National Park in Rajasthan, Kanha National Park in Madhya Pradesh, etc. Satpura National Park is the first reserve forest of India.

- **Biosphere Reserves**:

It is a large protected land for conservation of wild life, plant and animals resources, and the traditional life of the tribal groups living in the area. For example: Pachmarhi Biosphere Reserve and Nilgiri Biosphere Reserve in India.

Red Data Book:

It is the source book maintained by IUCN (International Union for Conservation of Nature and Natural resources). It keeps a track record of various endangered species of plants and animals.

Migration

- It is the movement of birds and animals from their original habitat to other places at a particular time.
- Migratory birds fly to distant areas every year during a particular time because of
  - climatic changes- their original habitat becomes very cold and inhospitable
  - lack of food availability
- Numerous migratory birds including ducks, geese, flamingos, and cranes fly to India every year.

Ecological Pyramids: A food pyramid/ecological pyramid is a graphical representation designed to show the biomass and productivity at different trophic levels. These pyramids can be studied with help of food chains that exist in the ecosystem.

In an ecosystem, there are three kinds of ecological pyramids:

- **Pyramid of number:** The pyramid of number represents a relationship between producers, herbivores and carnivores in terms of their number or abundance.
- **Pyramid of biomass:** Pyramid of biomass represents the amount of biomass available at each trophic level.
- **Pyramid of energy:** Pyramid of energy represents the amount of energy at each trophic level and the amount of energy lost at each transfer to the next trophic level.

Interdependence between Organisms: Interdependence between organisms arise from interactions between populations of two different species. These interactions can be beneficial, harmful or neutral.

- **Symbiosis:** In this kind of interaction, both the species are benefited. Example: Lichens represent a symbiotic relationship between a fungus and a photosynthetic algae.
- **Parasitism:** In parasitism, one partner is benefited while the other is harmed. The partner who is benefited is called the parasite while the partner who is harmed is called the host. The parasite survives on the expense of host usually without killing them. For example, lice living in the hair of humans.
- **Predation:** In predation also, one organism is benefited while the other is harmed. However, unlike parasite, the predator kills the prey to fulfil its energy requirement. Example: tiger preying on deer, etc.