WHAT IS ECOSYSTEM? DEFINITION, STRUCTURE, TYPES, AND FUNCTIONS

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The **ecosystem** term was first coined by an ecologist Arthur Tansley in 1935. The ecosystem is a balance or equilibrium between living and non-living factors of the ecosystem where they tend to interact with each other. All living things, including plants, animals, and microorganisms, depend on non-living substances to survive and maintain the equilibrium of the natural environment.

This relationship between the living and nonliving elements is studied by the study of ecosystems. In this article, we will discuss ecosystem structure, function, and types of ecosystems.

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What is an Ecosystem?

Ecosystem Definition: An ecosystem can be defined as a unit of ecological studies that includes all the interactions between living organisms with their surrounding non-living environment.

In the word "ecosystem", "eco" means environment, and "system," refers to connected processes or elements. **Ecosystems are made up of both biotic (or alive) and abiotic (or nonliving) components.** It is a biological community where living and non-living components of the planet interact with each other. Ecosystem varies in the size and number of organisms they consist of. When the ecosystem is land-based it is called a terrestrial ecosystem and when it is water-based it is called an aquatic ecosystem.

Structure of Ecosystem

The structure of an ecosystem is made of two main components: biotic and abiotic components. The biotic component interacts with the abiotic components to maintain the flow of energy. The energy is distributed in the environment. The ecosystem includes 2 main components for a working ecosystem:

- Biotic Component
- Abiotic Component



Ecosystem and Its Component

Biotic Components

Plants, animals, microorganisms, aquatic plants, and all other living creatures are the biotic components of the ecosystem. These biotic components can be classified into:

- **Producers:** All autotrophs like plants, phytoplankton, etc. that can produce their food using sources like sun, water, carbon dioxide, or any other chemical elements belong to this category.
- **Consumers:** All heterotrophs, primarily animals, that are dependent on the producers or other organisms are called consumers. These consumers are subdivided into the following groups:
 - **Primary consumers:** All <u>herbivores</u> that directly depend on plants, such as cows, goats, rabbits, and sheep, are considered primary consumers.
 - **Secondary consumers:** All_that depend on primary consumers for food are considered secondary consumers. The secondary consumer can be <u>omnivores</u> or <u>carnivores</u>.
 - **Tertiary consumers:** All animals that depend on secondary-level organisms for their food are known as tertiary consumers.
 - **Quaternary consumer**: Those animals that depend on the tertiary level organism for their food and are known as the quaternary consumer. This level is present in some food chains only.
- Decomposers: All microorganisms, such as bacteria and <u>fungi</u>, that depend on decaying and dead matter for food fall under this category. It contributes to environmental cleanup and ecosystem nutrient recycling. These nutrients support plant development and subsequently ecosystem maintenance.

Abiotic Components

It involves all the non-living things present in the environment. Some of the <u>abiotic components</u> are sun, soil, water, minerals, climate, rocks, temperature, and humidity. These components' functioning together enables the ecosystem's energy and nutrition cycles. The sun's rays are the primary energy source. An ecosystem's temperature changes have an impact on the types of plants that may flourish there. The availability of nutrients and soil nature determines the type and abundance of vegetation in an area. All the abiotic factors are essential factors that determine the number and type of organisms present in a region.

Functions of Ecosystem

Following are some of the <u>functions of the ecosystem</u>;

- 1. It regulates different life processes.
- 2. The various components of an ecosystem are designed in a manner to support the life systems.
- 3. It regulates various types of nutrient cycles.
- 4. It maintains the balance of energy flow between various levels of the ecosystem.
- 5. It regulates the cycling of nutrients between abiotic and biotic factors.

Types of Ecosystem

An ecosystem can be small or large. There are 2 types of ecosystem:

- Aquatic Ecosystem
- Terrestrial Ecosystem

Aquatic Ecosystem

Oceans, rivers, seas, lakes, springs, and other water bodies are aquatic biomes. The bulk of the earth's surface is covered by the water. Two-thirds of the earth's surface is made up of oceans, seas, the intertidal zone, reefs, the seabed, and rock pools. This ecosystem includes plants, fishes, amphibians, coral reefs, huge sea creatures, and insects.



There are 2 types of aquatic ecosystem:

- Freshwater Ecosystem
- Marine Ecosystem

Freshwater Ecosystems

A freshwater ecosystem has low salinity levels, providing a good environment for a variety of plants and animals. The sizes of freshwater resources range from small ponds to very large rivers. Freshwater resources vary from one another in terms of how they travel. While some freshwater bodies are constantly moving, like rivers, others remain still, like ponds.

Freshwater Ecosystem Types: Based on the region, the three main categories of the freshwater environment are the lotic, lentic, and wetland freshwater ecosystems.

- Lotic: In a lotic freshwater ecosystem, the water bodies travel in one direction. Numerous rivers and streams start at their sources and meet rivers or oceans at their mouths as they travel toward their destinations.
- Lentic: All non-flowing (still) waterways, such as ponds, swamps, bogs, lagoons, and lakes are lentic ecosystems. Due to the saturation of the underlying land, water will temporarily remain on the earth's surface. They are closed structures that keep the water still. Because every lentic system has multiple areas with different biological environments, animals, and plants in that system behave and adapt in different ways.
- Wetlands: Wetlands contain water and are home to vascular plants. Wetland environments are more often known as marshes, swamps, and bogs. Because soil and water are so close together, wetlands are highly productive. The plant species found in wetlands are referred to as hydrophytes since they have adapted to the area's moist and humid climate. Wetland ecosystems contain hydrophyte plants such as cattails, pond lilies, and sedges. Various amphibians, reptiles, birds, shrimp, shellfish, and other animal species find refuge in wetlands.

Living creatures that live in Freshwater Ecosystems: Fishes, amphibians, reptiles, mosquitoes, dragonflies, bees, wasps, water spiders, ducks, geese, etc.

Marine Ecosystems

Aquatic environments with high levels of dissolved salt are marine ecosystems. These comprise the deep ocean, the open ocean, and the coastal marine ecosystems. Each of these has unique biological and physical properties. The ecosystem's exposure to the sun, the amount of oxygen and nutrients that are dissolved in the water, the distance from land, the depth, and the temperature are all significant abiotic factors. Marine ecosystems have unique biotic and abiotic characteristics.

Terrestrial Ecosystem

A terrestrial ecosystem refers to an ecosystem of diverse land surfaces. Forests, deserts, grasslands, tundra, and coastal regions are all examples of terrestrial ecosystems. These terrestrial ecosystems are climate-dependent.

- 1. **Forests:** A type of terrestrial ecosystems that is covered in trees, creating several canopy layers. A variety of animal species live in dense tree covers and tropical rainforests. Forests are home to about 300 million different plant and animal species. A forest is a type of ecosystem that includes tropical rainforests, plantation forests, and temperate deciduous forests.
- 2. **Grasslands:** It has a dry environment that permits relatively little vegetation. Primarily, different species of grasses, are what define the grassland ecosystem. In this environment, grass and herbs predominate. The ecosystem of grasslands is significant to the animal kingdom.
- 3. **Tundra:** Tundra has extreme environmental conditions like that of the polar region. The location is typically windy, blanketed in snow, and devoid of trees. Its environment is constantly covered in absolutely frozen dirt. Small ponds are formed when the snow melts. Some lichens can flourish in such ponds.
- 4. **Deserts:** Deserts are unproductive land surfaces with extreme temperature swings and inadequately maintained species. One of the driest land regions on the globe. A desert receives an extremely small amount of rainfall. Because of this, there is less vegetation. The desert ecosystem's plants and animals have learned the skill of surviving extreme environments.

Functional Units of Ecosystem

The ecosystem's function is to maintain its various parts working together. It is a natural process of a transfer of energy in different biotic and abiotic elements of the world. Ecosystems maintain all the important ecological processes, including nutrient cycling. Ecosystems have different functional units those are:

- Production: Any ecosystem must have a consistent supply of solar energy to survive and function. Primary
 production is influenced by the types of plants that live there. Green leaves act as food preparators, while roots
 draw nutrients from the soil. Herbivores consume the plants, which then provide food for carnivores.
- Decomposition: Decomposition is the breakdown of complex organic matter by decomposers into inorganic components such as carbon dioxide, water, and nutrients. The decomposers break down garbage and dead organic material. The primary decomposers in many ecosystems are fungi and bacteria.
- Energy flow: Radiant energy from the sun is the primary source of energy in all ecosystems. The ecosystem's autotrophic, or self-sustaining, creatures utilize the energy of the sun. Plants use the sun's energy to change carbon dioxide and water into simple, energizing carbohydrates. The more complex chemical substances, like proteins, lipids, and starches are produced by autotrophs.
- Energy goes unidirectionally from the sun to producers, herbivores, and carnivores. Decomposers convert the dead autotrophs and heterotrophs into nutrients, which are energy sources for plants.
- **Nutrient cycling:** Chemical substances known as nutrients are substances that organisms need for growth and the maintenance of life. A vast range of chemical compounds is created when bio-elements interact. The

organisms catch them, concentrate and combine them in different ways in their cells, and release them during metabolism and death.

Ecosystem Diversity

Ecosystem diversity refers to the variety of different habitats and communities found in a particular area, along with the various interactions between them. These ecosystems include forests, grasslands, deserts, rivers, and oceans, each supporting a unique array of plants, animals, and microorganisms. The diverse range of ecosystems contributes to the overall health and stability of the environment, providing essential services like air and water purification, soil fertility, and climate regulation. Ecosystem diversity is crucial for maintaining biodiversity, as it ensures the survival of a wide range of species and helps ecosystems adapt to environmental changes. Protecting and conserving ecosystem diversity is essential for preserving the delicate balance of nature and ensuring the well-being of both wildlife and humans.

Concepts of Ecosystem

These are the important concepts under the ecosystem. Those are:

Food Chain and Food Webs

The cycle of energy starts with solar energy. The chain of energy transfer from one level to the topmost level is known as the <u>food chain</u>. Plants absorb solar energy and synthesize their food. Later on, herbivores feed on the plants for energy. Similarly, carnivores and omnivores feed on them for energy.



The interconnected food chain is known as the <u>food web</u>. In nature mostly food webs are common instead of the food chain.

Also Read: Difference Btetween Food Webs and Food Chain



Ecological Pyramids

These are the graphical representations of the number, energy, and biomass of the trophic level of an ecosystem. Charles Elton postulated the ecological pyramid in 1927. The base of the <u>ecological pyramid</u> denotes the producers of that particular ecosystem. Then it is followed by the consumers and the top decomposers.



Energy Flow in Ecosystem

The flow of energy in the ecosystem is always in one direction or unidirectional. Even though producers tend to absorb 100% sun's light energy in their capacity, they only pass on 10% of that energy to the next trophic level and then only 10% of that energy is passed into the next level.

Biogeochemical Cycle

It is also known as the <u>nutrient cycle</u> and includes all the phenomena that ensure that all the basic elements of nutrients like carbon, nitrogen, and phosphorus that are absorbed by living organisms from the environment are returned to the environment. This process involves the transfer of nutrients between abiotic and biotic factors and vice-versa. It includes the <u>carbon cycle</u>, <u>nitrogen cycle</u>, <u>water cycle</u>, <u>phosphorus cycle</u>, etc.

Conclusion – Ecosystem

Ecosystems are the complex webs of life that includes all living organisms and their physical surroundings, working together in harmony. They provide essential services like clean air, water, and food, supporting life on Earth. Understanding and protecting ecosystems is crucial for maintaining biodiversity and ensuring the well-being of both wildlife and humans. By conserving ecosystems and practicing sustainable living, we can preserve the delicate balance of nature and secure a healthy environment for future generations to thrive in