Chapter

7

DIFFERENT ECOSYSTEMS

In "Habitat" chapter of class VI you have studied many things related to habitat. Try to recall some of them.

- The dwelling place for plants and animals is called habitat.
- One habitat is shared by different types of plants and animals.
- There are different living and non living things in one habitat.

Try to add more such points to your list.

- ……..
- ……..

Fig-1

This type of doubt may arise in your mind as well. Let us try to understand how the term ecosystem came into existence and in what way ecosystem is different from habitat.

What is Ecosystem

The word ecosystem was first used in 1935 by A.G. Tansley (a British Botanist and Ecologist) to describe a basic unit of nature. Tansley coined the word as reduction of the term "Ecological system" to Ecosystem. According to him nature works as a system in which organisms and their communities are profoundly influenced by many non living environmental factors and vice versa.

Prior to Tansley many other ecologists had also worked on understanding the relationship between living things and their environment using different terms like habitat, biome, ecological system etc.

Till the use of the term ecosystem, people were studying interrelationships in nature in separate units either at small level like habitat or at a larger level as biome. Tansley was the first person to look at all these as a functional system. Thus all inter relationships are studied as parts of the ecological system.

Do you know?

In Ecosystem we study about the changes occurring in the habitat like organisms moving away from the habitat or entering the habitat.

Now you would be able to understand that Venkatesh and Gayathri both are correct in their own ways. The habitat that Venkatesh talks about is a part of the larger ecosystem.

In the following section we will try to understand the structure and function of the ecosystem.

Lab Activity

Structure of the ecosystem

From the discussion related to Venktesh and Gaythri's doubt, we can conclude that there are several ecosystems around us. A field, a pond or your school garden all are examples of the same.

Aim : Study an Ecosystem at your school/home garden to understand its structure. For this you will require the following material.

Material Required : Measuring tape string, small sticks, hand lens, hand trowel.

Procedure : To know about Structure of the ecosystem you have to follow the following procedure

1. Use a tape to measure a square area that is one meter long and one meter wide. It can be on grass, bare dirt or sidewalk.
2. Mark the edges of the square with the help of string/chalk as shown in figure.
3. Observe the study area (that has been marked). Look for plants and animals that live there. Use the hand lens.
4. Record all the living organisms you see. You can even dig to go deeper to find out other living organisms that may be present there.

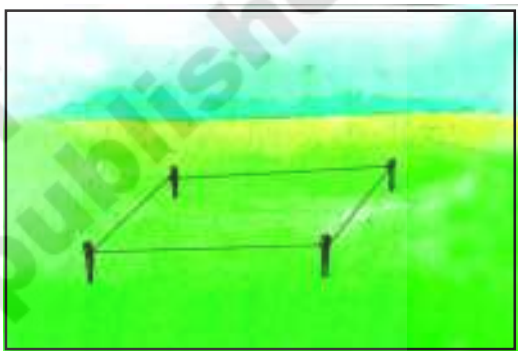


Fig-2 Marked area of 1 meter square.

Observations / Findings: (Note your Observations below)

- ……..
- ……..
- ……..
- ……..
- ……..
- ……..
- ……..
- ……..
- ……..

Discussion :

- What living things did you find in your study area? Try to count them if possible.
- Which kind of living thing was most common in your study area?
- How was your study area different from those of other student groups?
- Other than the living organisms what other things can you record from your study area?

From the above activity we see that an Ecosystem is made up of groups of living things and their environments. The living things like plants, animals and micro organisms are known as biotic components of the ecosystem, where as others like, soil, water, sunlight etc are called as abiotic components of the ecosystem.

All these organisms live together and interact with one another in many ways.

Interdependence between the biotic components

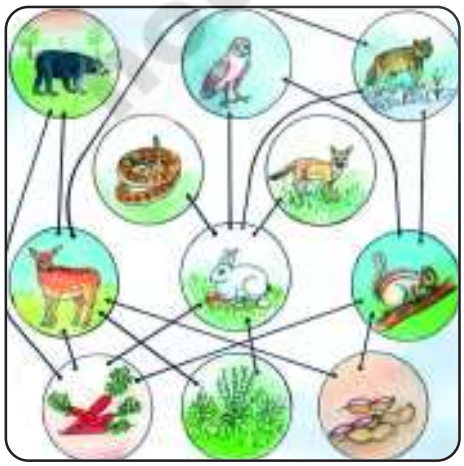


Fig-3

- What do the arrows in the figure indicate?
- Trace the path from grass to tiger. You may trace out other paths as well.
- On how many organisms is rabbit dependent? Write their names.
- How many organisms depend on rabbit? Write their names.

We know that there is a feeding relationship between plants and animals. Along with this we can see an interdependence between plants and animals for space, reproduction, shelter etc. as well.

- From where does plants get their food?
- What other things do animals need for their survival?

We find that not only the biotic components show interdependence among themselves but biotic and the abiotic components like air, water, soil, etc are also interdependent.

All the organisms in an ecosystem derive energy from food to live. The sun is the main source of energy for all living things. Plants trap this energy through photosynthesis. Animals do not get energy directly from the sun. Many animals eat plants, however, which use sunlight to make food. Animals that do not eat plants still depend on the energy of sunlight as they eat other plant eaters.

When scientists describe the way energy moves through ecosystems, they

used the term food chains. A Food chain has three levels.

Several plants, algae etc use sunlight to make their food and are called **producers. Consumers** eat other living things and get their energy from them.

The last level is made up of **Decomposers**. They feed on wastes, derbis of plants and animals or on their remains after they die. They return nutrients to the soil for plants to use as the cycle begin again so they are also called **recyclers.**

Activity-2

Fig-4

Observe the food web given above fig.…

Now answer the following questions:

- Which are the producers in the food web?
- Which are consumers?
- Where does the food web start from?
- Name the organisms where the food web ends.
- What happens when plants and animals die in a food web?

Changes in the ecosystem

Organisms affect their environments to meet their needs. Usually the changes they cause are small and help in keeping the ecosystem stable.

Some changes affect other organisms. As animals eat plants or other animals, they reduce the number of organisms in their habitat.

For example, there are many insects in a bird's habitat. When a bird eats insects, it helps keep the number of insects from getting too large. This helps keep the bird's habitat and the whole ecosystem healthy and stable. But when there are too many birds eating insects, they reduce the insect's population quickly. In case of time, there will not be enough food for the birds. In this situation some birds leave the area or die and few younger birds will be born. This brings the ecosystem back into balance.

Ecosystem can also change quickly; powerful storms, tsunami, etc can destroy ecosystems very quickly.

Humans are also instrumental in bringing about changes in ecosystem.

Ecosystem can vary from a small plant to a dense forest. The biosphere is the largest ecosystem present on earth. It would be very difficult to study biosphere as a whole, hence ecologists classified

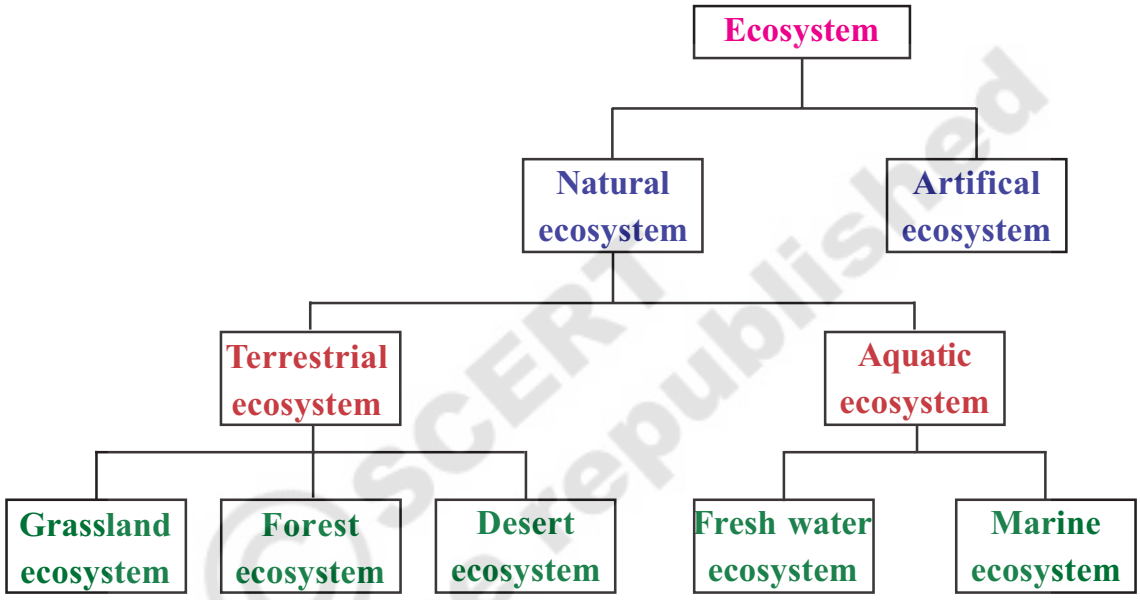
ecosystem based on various aspects. Some such classifications are artificial and natural, temporary and permanent.

Types of Ecosystem

Due to the Abiotic factors, different ecosystems develop in different ways. These factors and their interaction between each other and with biotic components have resulted in formation of different types of ecosystems as explained below.

On the basis of human interference and its effect ecosystem has been classified as follows:

Flow chart of classification of ecosystem



Mangrove ecosystem - Coringa

Mangroves are one of the most productive ecosystems on earth, deriving nourishment from terrestrial fresh water and tidal salt waters. Mangrooves are the forest that grow in back waters low depth areas of sea shore. Mangroves serve as important feeding, nursery and breeding grounds for a variety of commercially important organisms and also serve as protected areas for endangered species.

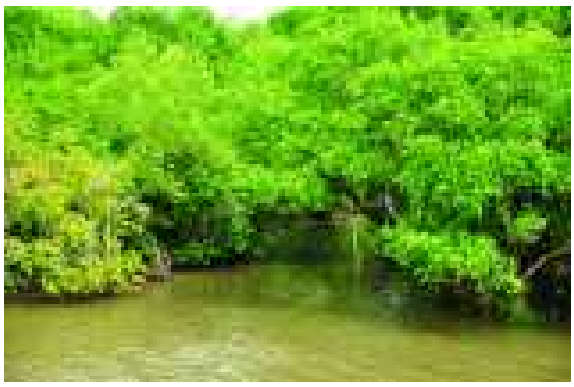


Fig-4 View of mangrove in Coringa

Coringa mangrove is situated south of Kakinada Bay and is about 150 km south of Visakhapatnam. Coringa is named after the river Corangi. Coringa mangroves receive fresh waterfrom Coringa and Gaderu rivers, tributories of Gautami Godavari river and salt waters from Kakinada bay. Numerous creeks and canals travel in this ecosystem. Let us observe biotic and abiotic components of coringa ecosystem.

Biotic components

Producers - mangrove, spirogyra, euglena, oscilatoria, blue green algae, ulothrix, etc.

Consumers - shrimp, crab, hydra, protozoans, mussel, snails, turtle, daphnia, brittle Word, tube Worm, etc.

Decomposers - Detritus feeding bacteria, etc.

Abiotic components - Salt and fresh water, Air, temperature, soil, etc.

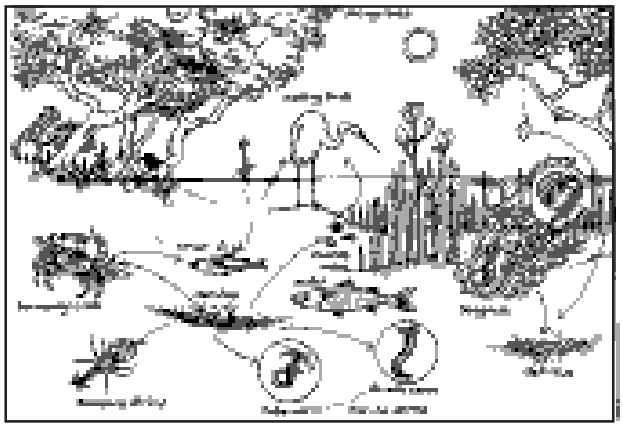


Fig-5 Food web in Coringa Ecosystem

Do you know?

It is said that there are more micro organisms in the sea than there are stars in the universe. The worlds oceans host 32 of the 34 known phyla on earth and ocean between 5,00,000 and 10 million marine species. Species diversity is as high as 1000 per square metre in the Indo-Pacific Ocean and new oceanic species are continuously being discovered.

We have studied that a living community cannot live in isolation. It lives in an environment which supplies its material and energy requirements and provides other living conditions. The living community, together with the physical environment forms an interacting system called the Ecosystem. An ecosystem can be natural or artificial, temporary or permanent. A large grassland or a forest, a small tract in a forest or a single log, an edge of a pond, a village, an aquarium or a manned spaceship can all be regarded as ecosystem. An ecosystem can thus be defined as a functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment.

Collect Brochure of CoP-11, Biodiversity Conference, Hyderabad, 1-19, Oct, 2012. Discuss about ecosystems in your class.

The Desert Ecosystem

The desert occupy about 17% of the land and occur in the regions with an average rainfall of less than 23mm per year. Due to extremes of temperature, the species composition of desert ecosystem much varied and typical. The various components of a desert ecosystem.

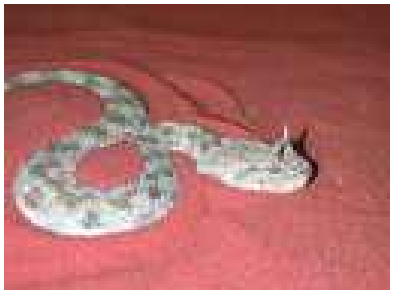




Fig-6 Animals in Desert Ecosystem

1. Producers – The shrubs, bushes, grasses and some trees are the main producers in deserts. The shrubs have extensive and much branched root system with the stems and leaves variously modified. Some succulent cacti are also found in desert. These store water in their stem to be used during the time of water scarcity. Some lower plants such as lichens, xerophytes mosses and blue green algae are also found there.

2. Consumers – Only a few animals are found in deserts. The most common animals are those reptiles and insects which are able to live under xeric conditions. Mammals and insects which are able to live under xeric conditions. Mammals are represented by a few species of nocturnal rodents. Some birds are also present. The camel, called the ship of desert, feeds on tender shoots of the plants and is to store large quantities of water in its stomach. The larger animals including carnivores are scare. The desert animals have various morphological and physiological adaptations which enable them to live in such extreme environment.

3. Decomposers – Due to poor vegetation and less amount of dead organic matter, decomposers are few. They are thermophilic fungi and bacteria. Why should we appreciate the role of decomposers.

Forest eco system

Activity-3

All of your classmates are divided into four groups. Collect the information on forests of Andhra Pradesh and write the flora and fauna and fill up the following table. Collect more information from internet or from school library.

Name of the forest

Flora		Fauna	
Trees		Herbivores	
Shrubs		Carnivores	
Creepers		Rodents	
Mass and fungi		Birds	
Add other plants		Insects	

Display your observations on wall magazine of your class and compare with the other groups.

Investigations:

1. Do all forests have same type of vegetation?
2. Are producers of forest ecosystem higher than its consumers?
3. Do all the forests have same type of animals?

Forest eco systems have unique environment and are categorized based on the type and ages of trees, climate and soil. They impact the environment at scales ranging from local to regional by influencing climate, nutrients dynamics and water movement. Forests are found all over the world and they provide valuable economic and environmental services.

Fig-7 Flora and Fauna

Flora: These are mainly trees that show much species diversity and greater degree of stratification. The trees are of different kinds depending upon the kind of the forest formation. Besides trees there are also present shrubs and a ground vegetation.

Fauna: It includes herbivores like animals feeding on tree leaves as ants, flies, beetles, leaf hoppers, bugs and spiders etc., and larger animals grazing on shoots / fruits of tree. Elephant, Nilgai deer, moles, squirrels, shrews. Flying foxes, fruit bats, mongooses. Also carnivores like snakes, birds, lizards, fox etc., Top carnivores like Lion, tiger also live in forest feeding on animals.

Decomposers: These includes wide variety of micro organisms those live on dead bodies of fl\ora and fauna including fungi and bacteria.

Energy flow in an ecosystem

The existence of living world depends upon the flow of energy and circulation of materials through the ecosystem. The energy is required for the performance of all the life activities.

The main source of this energy is sun. The solar energy enters the space in the form of light rays. Approximately 57% of solar energy is absorbed in the atmosphere and scattered in space. About 36 percent is expended in heating water and land and in evaporating water. Nearly 8 percent of light energy strikes the plants, of which 80-85 percent is absorbed, and only 50 percent of it is utilized in photosynthesis.

This energy is captured by plants and is stored in the form of potential energy in foodstuffs. These are known as *producers* and represent the first trophic level in the ecosystem. The energy stored by plants is passed through the community or ecosystem in chain. A food chain consists of four steps-the producers, primary consumers, secondary consumers and tertiary consumers. The energy flows from the producers to consumers. At each transfer a large proportion (80 to 90 per cent) of potential energy is dissipated as heat produced during the process of respiration and other ways. To know more details about energy flow see annexure.

Key words

Habitat, Ecosystem, Food Web, Producers, Consumers, Decomposers, rodants, flura and fauna, thermophill, mangroves, energy flow, nocternals, biotic components, abiotic components.

What we have learnt

- The word ecosystem was coined by A.G. Tansley.
- Interrelationship between biotic and abiotic factors can be studied as a part of an ecosystem.
- Living things like plants, animals and microorganisms are the biotic components of the ecosystem.
- Abiotic components of an ecosystem constitute soil, water, sunlight etc.
- Several ecosystems exist around us.
- Food chains/food webs explain interdependence between biotic and abiotic components in the form of nutrient and energy.
- Food chains have three level- producers, consumers, decomposers.
- The producers trap the sunlight to produce food for themselves as well as for others.
- Consumers get energy by eating either producers or other plant eaters.
- Decomposers/recyclers feed on the wastes of plants and animals or remains of plants and animals after they die.

Improve your learning

1. Define an ecosystem. Explain it with a suitable example. (AS 1)
2. Explain how diversity of living organisms helps in enriching any ecosystem. (AS 1
3. An ecosystem that had mice. What happens if more cats were added to it? (AS 2)
4. In grassland ecosystem, rabbit eats only plants. They eat plants faster than the plants can grow back. What must happen to bring the ecosystem into balance? (AS 6)
5. What happens when two animals having similar habits share one ecosystem? AS 1)
6. What is the difference between habitat and ecosystem? (AS 1)
7. Who am I? (AS 1)
   - I am the base of food chain. .....
   - I depend on plants for food. .....
   - I break down the remains of dead plants and animals. .....
8. Which of the following is a producer? and why? (AS 1)

   (a) fox (b) fungus (c) chicken (d) grass
9. plant, tiger, rabbit, fox, hawk

   Did you find any connection among the above list of things. If we remove Rabbit from the list what will happen? (AS 6)
10. List out producers (Plants, Bushes, Trees). Consumers (herbivores, cornivores) and Decomposers that you observed in your agriculture field or school garden. (AS 4)
11. What do you understand by food web?

    Describe your own food web with the help of a diagrammatic representation.(AS 1)
12. What do you understand by inter-dependency of animals and plants? How do you appreciate? (AS 6)

WHAT WE ARE DOING TO THE FORESTS OF THE WORLD IS BUT A MIRROR REFLECTION OF WHAT WE ARE DOING TO OURSELVES AND TO ONE ANOTHER

-Mahatma Gandhi

ANNEXURE

Energy flow in ecosystem

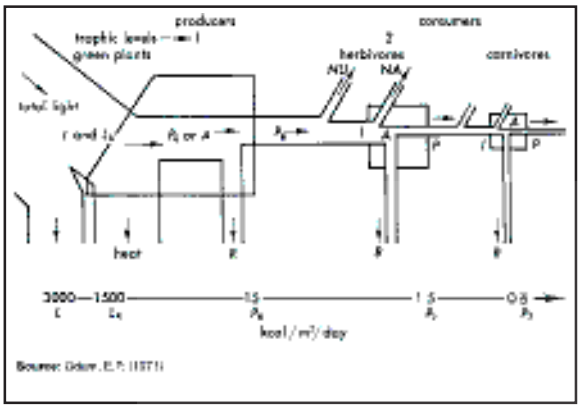


Fig of Energy flow in an ecosystem

Fig. Diagrammatic representation of energy flow through a food chain of ecosystem. The boxes represent biomass or population mass and the pipes show the path of flow of energy between living units. The relative size of block suggests the quantity of energy flowing through each pipe.

L = Total energy input;
LA = Light absorbed by plants;
P_G = Primary gross production;
A = Total assimilation;
P_N = Net primary production;
P = Secondary production;
NU = Energy not used;
NA = Energy not assimilated by consumers;
R = Respiration.

The energy flow through an ecosystem can be represented diagrammatically in a simplified manner. In fig. the boxes and out at each level. Only about half the average light energy impinging upon the green plants is absorbed in the photo synthetic process, out of which 1 to 5 per-cent is converted into food energy and the rest of it passes out as heat into the atmosphere.

Energy accumulated by plants or the producers in an ecosystem is called primary production. The total energy produced during photo synthesis is the Gross primary production. And is represented by P_G or A and energy left after respiration and stored as organic matter in the producers is the Net primary production represented by P_N. Net primary consumers actually represent food potentially available to primary production which feed upon plants. The primary consumers, therefore, take in chemical potential energy in the form of plant food. Most of it dissipates in the form of heat (produced during the respiration) and is lost out of ecosystem. Only a small part of energy is fixed in the form of chemical potential energy in the protoplasm. The same process is repeated at the secondary consumers or primary carnivorous level and so on. Therefore at each step in the transfer of energy from one trophic level to another a large amount of energy is degraded in to heat and never returns ecosystem.