Unit-6

Lesson - 22

Concept of Ecosystem

Although the term ecology may be the contribution of the 19th century, but the concept of ecology is very ancient in terms of our culture. Since ancient times, the Indian sages and the intellectuals have linked the interrelationships of nature and organisms in the form of symbols of religion social norms and conduct to make it a part of mass consciousness. Like a cow is considered as a mother. As a result, these interconnections were carried on as friends for thousand of years, but in the modern era, the human aspiration of conquering the nature has abandoned the eternal rules and practices and has considered the physical pleasures to be the only basis of life. Consequently, there was deterioration in the interrelationships between organisms and nature, which resulted in the emergence of the ecological concept.

The term ecology was the first of all used by Hackel (1869) for the areas of vegetation. the term Ecology as framed by hackel is formed of two Greek words 'Oikos' meaning habitat and 'Logos' meaning study. Many scholars before Hackel have presented their ideas about ecology indirectly. Humboldt (1769) was of opinion that Earth is not just a substance. in the same way Ritter (1779-1859) wrote that on the Earth's surface there is a harmony in the spatial distribution of various elements.These elements are so interconnected that they provide that area a distinct status.Ritter further stated that the rules of the origin of the earth are not framed by man, but the Earth has its own rules which are important for human welfare.

Although Hackel started the ecological study, but in fact, in 1935, the use of the term ecosystem in the study of biosphere carried out by A.G Tansley, attracted the attention of the world towards ecosystem. According to Tansley, "the system resulting from the interrelationship of all living and nonliving factors of the environment is called ecosystem". R.Dajoz has defined ecosystem in the following way

"Ecology is the science concerned with the study of the condition of existence of living organism and the interrelation between the organism and the environment in which they live".

From the above discussion it is clear that ecosystem is a system which is the result of the interactions between organism and their environment. This system is developed under natural laws. So in the study of the ecosystem, the secrets of such arrangements are ascertained. This system is so complex that just as scholars are exploring these secrets, new secrets are being revealed. Although the man in the pride of scientific achievements and technological advances has started accepting that he is not a slave of nature. He is free to use and consume nature according to his own wishes. The adverse consequences of this trend of human beings have now started to appear in different forms of environmental deterioration.

Concept of Ecosystem

A timely and sequential study of interconnections between organisms living in a geographic unit and the enticronment of that unit, is called ecosystem. According to A. G Tansley (1935) the system in which all biotic and abiotic factors of the environment are inter-connected, is called a

ecosystem.

The following definitions are presented by many other scholars related with ecosystem. According to **R.L Lindeman** (1942) the term ecosystem applies to 'any system composed of physical -chemical -biological processes, within a space-time unit of any magnitude.'

F.R Fosberg (1963) defined ecosystem as 'a functioning interacting system, composed of one or more living organisms and their effective environment both physical and biological' **E.P Odum** (1971) stated that ' living organisms and their non-living environment are inseparably interrelated and interact with each other' According to **A.N Strahler and A. H Strahler**, (1976) "The total assemblage of components interacting with a group of organisms is known as ecosystem. Ecosystems have inputs of matter and energy, which build biological structure..."

An ecosystem is the basic unit of an ecological study, which may vary in size and extent. For example an ecosystem may be as wide as global ecosystem which may cover the entire globe, on the other hand it may be as small as a bird cage in a zoo or may be limited to a lake. An ecosystem may be natural or man made.

Types of Ecosystem

(A) On the Basis of Sources of Energy

(i) Natural Ecosystem

The ecosystems developed of natural stages is called the natural ecosystem, these ecosystems are of two types- Terrestrial and Marine. In the terrestrial natural terrestrial ecosystem, forests, grasslands, pond, river, desert, mountainous region etc are included. The marine ecosystem is the largest and permanent ecosystem. Forests, grasslands, deserts, open seas are all examples of Natural Ecosystem.

(ii) Man-made or Artificial Ecosystem

Man-made and well maintained mechanisms are called artificial ecosystems, like farms, zoo, kitchen garden, aquarium etc.

(b) On the Basis of Habitat-

(i) Terrestrial ecosystem

(ii) Marine ecosystem

(c) On the basis of usage

(i) Agriculture Ecosystem

(ii) Non-agriculture ecosystem

(d) On the Basis of Development-

(i) Well developed ecosystem (Mature)

(ii) Undeveloped ecosystem (incomplete)

(iii) Mixed ecosystem

(iv) Inactive ecosystem

Structure of Ecosystem

The structure of an ecosystem is formed by the mutual interactions of biotic and abiotic components of the environment.

Biotic components

All living organisms of an ecosystem are called Biotic components of that ecosystem, these organisms are interconnected through mutual interactions. They are also related with each other on functional basis. Therefore, separating any one type of organisms from any ecosystem can threaten the existence of other remaining organisms of that system, which may create imbalance in the ecosystem.

Biological components can be classified on the basis of their nutritional potential and functionalities as follows:-

1. Classification on the basis of nutritional potential

(i) Autotrophs Components

Autotrophic components, which are also called primary producers, they prepare their own food, by the process of photosynthesis from solar energy and from the soil through their roots and provide food products for other vegetarian organisms. Green plants capable of Photosynthesis, Blue green algae, Photosynthetic bacteria are autotrophic components of the ecosystem.

(ii) Heterotrophs components

These are those Heterotrophs components which consumes the food provided by the autonomous primary producers. Heterotrophic components that consume the food produced by the autotrophs are also called consumers. On the basis of the process of consumption of food, they are classified into three parts.

A) Sarophyte

They survive on the organic compounds

found in the solutions that are derived from dead plants and animals.

B) Parasites

They are dependent for food and survival on the other living organisms.

C)Holozonic

These organism get their food through their mouth. All large animals, including man, are included in this category.

2. The components of the ecosystem are divided into three different categories on the basis of their functions:-

(i) Producers

This include all the green plants which prepare their own food from the soil through their roots and with the help of photosynthesis and are known as primary producers.

(ii) Consumers

They obtain their food from the primary producers. They are of three types:-

a) Herbivorous or Primary Consumers

All living organisms that obtain their food from plants or their food products like Rabbit, Deer, Goat and cow etc and different types of marine organisms are included in this category.

b) Carnivorous or Secondary Consumers

They obtain their food by hunting herbivorous organisms. They are also called as secondary consumers like frog, cat, fox, dog and lion etc.

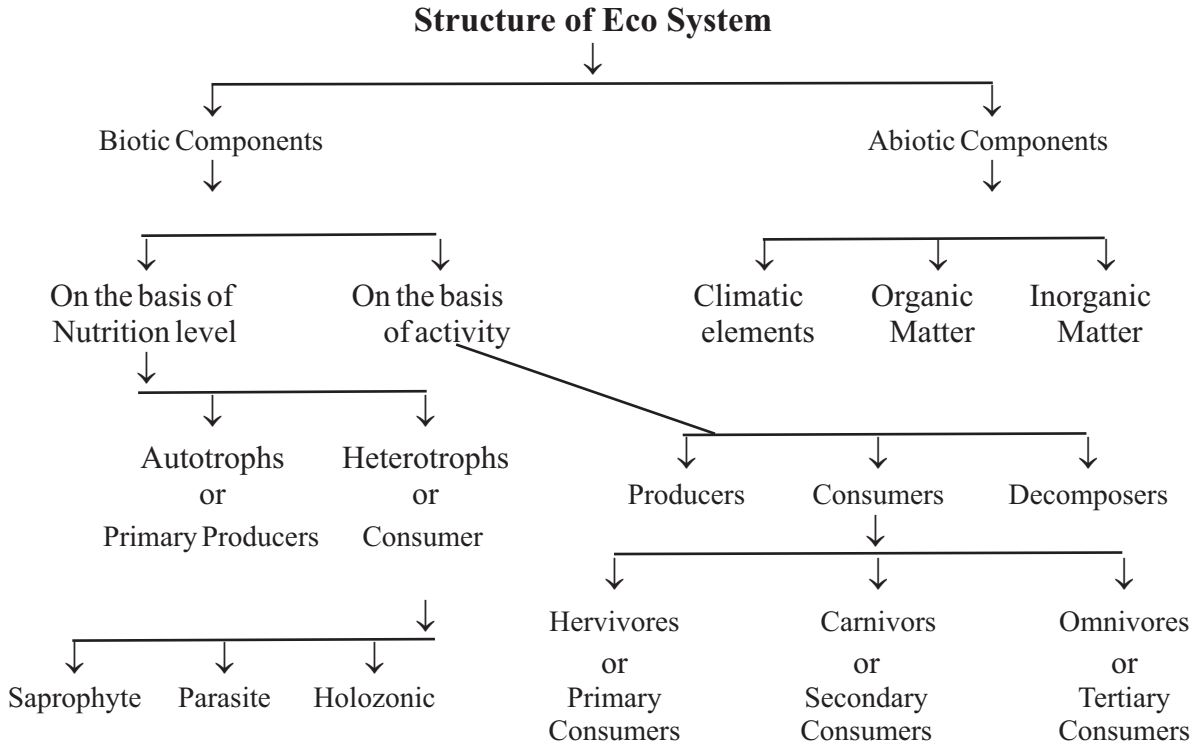
c) Omnivores or Tertiary Consumers

Those creatures are included in this category that obtain their food from plants, herbivorous and carnivorous animals.

Man, Eagle, vulture, fishes and lion are included in this. This is the reason why they are called tertiary consumers and are often referred as Top consumers.

(iii) Decomposers

The microorganisms are included which decomposes all dead plants and animals and other organic substances. These organisms during the process of decomposition receive their food as well



as rearrange organic substances so that these may be available to primary producers for their use.

All the components that are discussed above are helpful in balancing the ecosystem.

Abiotic components

Abiotic components are of three types:-

(i) **climatic elements**:- like sunlight temperature, rainfall, humidity, water vapour etc.

(ii) **carbonic substances**:- protein, carbohydrate, fat, oil products etc. They are called the body building substances.

(iii) **Non -carbonic substances**:-like oxygen, carbon dioxide, nitrogen, hydrogen, water, carbon sulphur calcium and mineral salts etc. These elements play a special role in the cycling of substances in the ecosystem and provide strength to the organism.

Food Chain

In the ecosystem all the organisms that are included under the category of producers and consumers are organized in a sequence or series,this organised sequence of organisms by which food energy and nutrients are transfered is called food chain.

Tropic Level

Every level of the food chain is called as tropic level.

Grass →	Grasshopper →	Lizard →	Hawk
↑	↑	↑	↑
First tropic level	Second tropic level	Third tropic level	Fourth tropic level

Food Web

Many food chains are active in every ecosystem at the same time. There are many food options available to herbivores and carnivores, in this way many food chains get interconnected and this forms food web. If the food web is more complex, the ecosystem will be more permanent and will last for a longer period of time.

Ecopyramids

All the producers, consumers and carnivores are arranged on the basis of their number, biomass and amount of flow of energy, in rectangular form, this representation is called ecological pyramid.

Energy flow in Ecosystems

The biotic and abiotic components of an ecosystem function actively in a certain process and are controlled by the ecological conditions of that system. Energy is required in order to remain active. This energy keeps an ecosystem active. This entire process is called energy flow. This energy flow is kept under control in its natural form by nature. The ecosystem will be in danger, if there is a slight change in this process, due to human or natural reasons.

The energy flow is continuously required to keep the ecosystem active and functioning smoothly. The main source of energy on the Earth is Sun, but in fact, very less amount of solar energy is used in ecosystems. Like only 0.02% of the solar energy is transformed by plants in form of chemical energy and some portions are used in other functions of the ecosystem. This small portion of solar energy is capable of keeping the ecosystem active.

Chlorophyll, that is found in plants, absorbs the solar energy and transforms it into organic molecules. This process is called photosynthesis. The plants with the help of carbon dioxide and water, convert the solar energy into the food through the process of photosynthesis, by the following chemical formula:-

$$(6\,CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Solar Energy}} C_6H_{12}O_6 + 6\,O_2)$$

Thus the solar energy, carbon dioxide, chlorophyll present in the plants is absorbed for the process of photosynthesis, and are converted into biological elements like oxygen, glucose and carbon dioxide by atomic actions. The plants develop from glucose and carbon dioxide and the oxygen and water vapour are released in the atmosphere through the respiratory action of the plants.

The stored chemical energy in the plants are obtained as food by the Herbivores animals. During the transfer of energy from plants to herbivores

animals, there is loss of energy. Further more when carnivores animals feed upon herbivores animals, the energy is again diminished. In this way when the energy is transferred from one trophic Level to the other, this transfer of substantial portions of the energy is lost. Thus the amount of energy keeps on reducing at every tropic level.

According to Odum we receive 3000 kilo calories per sq m energy everyday from solar radiation. Out of this, about 1500 kilocalories are absorbed by the plants and only 1% (15 kilo calorie) of this amount is converted into chemical energy. This amount is further reduced to 1.5 kilo calorie and 0.3 kilocalorie at second and third trophic levels respectively.Generally, most of the energy is lost while transferring from one tropic level to another tropic level, but its quality increases.It is also necessary to know that the rule of energy conservation is enforced everwhere in nature, according to which energy can neither be generated nor destructed, although the form of energy can change. In this way the amount of incoming and outgoing energy remains same in an ecosystem.

Human Influence

The ecosystem is the result of the interaction between the organisms and their environment, residing in a geographical unit. Among all these creatures, human beings are such organisms that influence the environment through their various actions, in order to get maximum benefit from it.In fact, the basis of the development of human civilization has been the exploitation of the nature.The nature replenish some substances on its own but there are many elements that can not be replenished. This results in imbalance in ecosystem,which may be dangerous for both, human beings as well as their environment.The favourable and unfavourable effects of human beings can be seen on the ecosystem.Both humans and the environment are benefited from favourable effects, but there is some kind of loss to any one of them due to adverse effects.

Positive Impact of Man on Ecosystem

Man has tried to use and control the natural resources by his intellectual knowledge and technological development, from the very beginning. Man has achieved success to solve his problems by his knowledge of land use development of agriculture, forestry, wild life management etc. For example, the fast growing population gave birth to many problems such as lack of land, lack of food grains and various diseases, but the man tried to solve these problems by better land use, use of chemical fertilizers, seeds developed quality and developed agricultural equipments for the maximum production of food grains and by inventing medicines to controll diseases and achieved success in all his efforts.

Negative Impact of Man on Ecosystem

Unfavourable effects of man has created more adverse effects on ecosystem than the favourable ones. It is due to these adverse effects, many severe environmental problems have been generated. If these problems are not controlled timely, one day the human life will be wiped off from the Earth, The adverse effects of the human beings on the ecosystems are as follows:-

1. Adverse impact of Agriculture activities
2. Adverse impact of Deforestation
3. Adverse impact of Mining
4. Adverse impact of Industrialisation
5. Adverse impact of Climate Change
6. Adverse impact of Natural Disasters

1. Adverse impact of Agricultural activities

In order to solve the problems arising due to the rapid increase in the population, the man has expanded the agricultural land and developed chemical fertilizers, high yielding variety of seeds and agricultural equipments and other instruments, but at the same time, adverse effects have also occurred on the ecosystem as a result of these developments. Man has not only cleared the grasslands and forests for the expansion of the agricultural land but he also tried to extract the land from the sea, which directly and adversely effected wildlife, pastures and marine ecosystem. Similarly, the usage of chemical fertilizers and pesticides for the more production of food grains, has not only done the task of making the land infertile for agriculture but it has also contaminated the groundwater. In order to get higher production of crops, there has been continuous use of ground water for irrigation, which has decreased the level of ground water, thereby, drinking water crisis has risen in areas with scanty rainfall like Rajasthan.

2. Adverse Impact of Deforestation

An adverse effect of the uncontrolled deforestation, for the expansion of agriculture and other economic activities by man can be easily seen on the climate, soil, wildlife and birds of the ecosystem. As the result of deforestation, climate becomes warmer, the amount of rainfall received is also decreased, land erosion occurs and there is destruction of wildlife. Today, in many parts of the world including India, due to uncontrolled deforestation many wildlife species are extincted or are on the verge of getting extinct. This has caused imbalance in the ecosystem, because natural vegetation is the main basis of forest ecosystem.

According to the Forest Report of 2015, the total forest area of the country is approximately 7,01,673 square kilometre which is about 22.02% of the total area of the country. In which dense forest area is 4,80,214 sq km (13.92%) and open forest is 2,21,459 sq km (8.10%). The geographical area covered by trees, is 92,572 square km which is 2.82% of the entire geographical area. India is one of the few countries where forest policy has been implemented since 1894. This policy was amended in 1952 and 1988. The main basis of the amended forest policy of 1988, was protection, conservation and development of forest. National Forest Programme has also been prepared in the form of a long-term strategy for the next 20 years. The purpose of this programme is to prevent the deforestation and cover one-third of the country with trees.

3. Adverse Impact of Mining Activities

With the industrial and technological development, the mining process also increased but this has caused many environmental problems. Under the mining process, the land is dug widely, due to this deep pits are created on the earth's surface and this causes destruction of the natural vegetation and wildlife of that region. Lakhs of square kilometres of land of the region, becomes unusable. The incidents of landslides increases. The amount of dust particles in the atmosphere increases due to underground explosions which are done for mining operations, which causes adverse effects on the health of the people residing in these areas. As a result imbalance is created in the ecosystem.

4. Adverse Impact of Industrialization

As a result of industrialization, environmental pollution has increased tremendously. Industrial units are the main source of air and water pollution. The Industrial units are the main source of air and water pollution. The atmosphere is constantly being polluted due to the poisonous gases emerging from these units on one side and on the other side the chemical waste water fluids coming from these industrial units are polluting rivers, groundwater and sea water. Due to the polluted rivers and groundwater, the problem of drinking water in the neighboring areas of industrial cities is now very critical. A vivid proof of this, is the emergence of chemical water in tube wells of Pali city. Depletion of ozone gas due to toxic gases and acidic rainfall near industrial areas, has become normal event. All these processes affect the ecosystem indirectly.

Central Pollution Control Board has been established for the monitoring and controlling water and air pollution, in our country, which holds the responsibility of the implementation of the Water Pollution Prevention and Control Act of 1971, Air Pollution Prevention and Control Act, 1981,Water cess act 1971.Standards of industrial effluents and emission of various categories of industries have been notified under this Act. Cement, Thermal Power Plants, Wine Making Factory, Sugar, Fertilizer, Iron and Steel Industry, oil refineries, paper and pulp industry, petrochemical industry, pesticides manufacturing, leather industry, Pharmacy and manufacturing industry of pigments, caustic soda and zinc ,copper and aluminum smelting industries are all kept under the category of industries which cause severe pollution. Out of the total of 1551 industrial units of these industries, 1350 units have installed adequate facilities for pollution control.

Hazardous Waste Management Department has been set up to protect, manage and maintain hazardous chemicals and wastes so that heath and environment can be protected from pollution. The activities of this department are important in these three areas- chemical safety, Better management of hazardous wastes and municipal solid waste management. It is estimated that approximately 4.4 million tonnes of hazardous substances are emitted in the country. The management of dangerous

substances and waste in the country were provided legal form through Municipal solid waste (management and handling) Rule 2000, Fly ash notification 1999, plastic recycling (action and usage) rule1999/2000 .

(5) Adverse Impact of Climate Change

Ecosystem of any region is controlled by the climate. Since the Industrial Revolution, climate is undergoing changes by many actions of human being, which also affects the ecosystem indirectly.The following actions of man are important factors for climate change :-

1. Deforestation

The man is over exploiting the forests for his own convenience and benefits, which has resulted in irregularity in the rain and increase in temperature.

2. Industrialisation

Poisonous Emissions of poisonous gases from industrial units not only pollutes the air but also influences the ozone layer.The ozone layer prevents the ultraviolet and infrared rays coming from the sun, from reaching the earth's surface by absorbing them.As a result of the toxic gases, there has been an unprecedented increase in the number of skin and respiratory cases in the world.

3.Invention of Nuclear Power

The most devastating scientific invention of man is the discovery of atomic bomb, underground explosions or explosions in the sea, affects the climate. The excess rainfall in the Barmer area after the pokaran explosion is the vivid proof of this.

Whatever is being done in the name of scientific progress by the man, it is directly affecting the climate and indirectly the ecosystem. From December 6 to 17, 2004, a meeting on climate change in Buenos Aires did not reach on any consensus on deciding the changes in weather and their causes and efforts to control them. The developed countries like United States of America, Soviet Union and Italy etc. are main source behind i t .
Not only these but other countries such as Saudi Arabia, Oman, Qatar are also opposed to reduce the carbon emissions, because by doing so, it could cause a crisis for their economy.

Today, the weather conditions of every country of the world is disturbed. It appears as there is no definite weather of rainfall.

There is no fixed place for snowfall because snowfall has been observed in Dubai, there is no fixed season for blossoming of flowers, it is also not possible to determine when the summer season will start and what will be the maximum temperatures. The main reason for this unusual behavior of the weather is the increase in global temperature. The Environmental Panel on Climate Change has given serious warnings about global Warming, That if it is not controlled then there will be a large number of storms and floods. The temperature will increase and the number of people who die from the heat stroke will also increase. The only way to reduce this,is to reduce the emissions of greenhouse gases from 50% to 70% by the level of emissions observed in 1990.

In June 2004, the Government of India released the first National Communication Report on climate change. In which the effect of greenhouse gases and their emissions were made clean for the first time. According to this report, due to the increase in the average temperature of 0.4°C in the last hundred years, there is increase of 10-12% of rainfall in the western, north-western part of the country and north of Andhra Pradesh.

(6) Adverse Influences of Natural Disasters

Human activities have resulted in increase of which natural disasters like floods, droughts, famine, landslides etc. The construction of dams on rivers has caused an increase in earthquake activity. Koyna dam was considered to be responsible for the earthquake of Latur in Maharashtra. In the decade of 1980, due to natural calamities in the world, the average loss of property was of 2 billion dollars, whereas in the 1990's the average loss increased to 12 billion dollars.

On December 26, 2004, more than 2, 00,000 people died due to tsunami waves. The sea level has risen near Andaman Nicobar coastal regions. Therefore it is clear that natural disasters have caused imbalance in the ecosystem.

Balance in the Ecosystem

From the description of the impacts of the

human actions on the ecosystem, it is clear that only the human actions are responsible for creating an imbalance in the ecosystem. But this does not mean that the man should stop the scientific and sit idle development. But there is a need to establish a balance between human activities and the environment. The destruction of the forest should be stopped, there should be increase in the forest area by planting trees, proper and effective measures should be taken to control the pollution, activities that cause imbalance in the ecosystem should be controlled so that a balance is maintained in the ecosystem and the future of the coming generations should be secured.

(i) Natural Balance

Various types of organisms are found in the world. In the community of any ecosystem, the size of the mass of any animal specie remains stable until a natural outbreak does not break its stability. This stability is called balance in nature in the field of ecology.

Presently famines, floods, irregularities in rainfall, earthquake extra are the examples of imbalance in the nature.

(ii) The System of Balance in nature

In order to maintain balance between biological community and the environment in nature, there are the following systems:-

A) Competition

Competition among organisms is helpful in controlling their population. Mostly the sources of food are limited in an ecosystem. There is a conflict between organisms in order to get food. Predator keeps a control on its own complexity through hunt. In the same way the animal which is being hunt, controlls predator's complexity on the basis of its availability of being hunt.

B) Ecosystem

The biotic and abiotic components of the ecosystem and their interactions keeps the balance in the ecosystem. They create a network of interrelationships which keeps a control on their population. Every animal specie creates a functional image by its lifestyle, which is called Niche. In brief Niche is the ecological role of a specie and plays a significant role in the transfer of energy and substances between the ecosystems. Thus, each specie balances the ecosystem in its own way. The specie may be of a plant or an organism, it plays a significant role in an ecosystem. Every specie maintains a natural balance through the food web and energy flow. The consumers of every higher order, by feeding on their lower order organisms, keeping the balance of biomass and pyramid of numbers, provides self control form to the ecosystem.

C) Behaviour

The population of some organisms is influenced by their behavior.

(iii) Barrier in natural balance

Human has created a great deal of barrier in the natural equilibrium by his activities. There was a time when the rabbits were not found at all in the continent of Australia. In the 19th century some tourists brought their rabbits here. Because in Australia there were no animals that could hunt rabbits, as a result of this, the number of rabbits increased steadily, as a consequence the rabbits started destroying the crops. To manage it, foxes were introduced there, which successfully controlled the number of rabbits. Thereafter, the foxes started hunting other animals as well as the birds that had settled there. This strengthens the fact that the process of balance is self controlled in nature.

(iv) The role of keystone species in maintaining the balance of nature

Keystone Species are such species that affect most the ecosystem of a particular area. Keystone species provide stability to the ecosystem and in the absence of such species, there are changes which can change the nature of the ecosystem and it may likely to end. Thus, the role of Keystone species in the ecosystem is very effective. Main predator species are Keystone Species, and they reflect their effect on the ecological community. The increase in the number of predators is an indication that it will limit the number of prey using them as their food. In the absence of predators, the number of prey species will also increase and in this situation there is a possibility of the destruction

of the entire ecosystem. In this way the key stone species determines the number of other species in the community.

An elephant is a keystone species. It dwells in the grasslands. Elephant is herbivores but it does not use the grass for its food. Its main food is shrubs and trees, and thus fruits and shrubs do not grow in a large number. As a result, grasslands remain in existence, which means that it prevents grassland from turning into forest. Similarly, the frog is also the Keystone Species, that keeps mosquitoes and insect kites restricted to their number. The absence of frogs will undoubtedly increase their numbers and the lives of the creatures will in trouble. In this way the keystone species keeps the balance in the ecosystem and it is also in favour of human beings.

(v) Role of wild animals in the maintenance of Natural balance

Wildlife have their own significant place and importance for the maintenance of balance in the nature. Wildlife maintain ecological balance in nature and once of the is balance is disturbed, its direct effect is seen on human beings. For Example: if the Carnivores are eliminated by hunters , then the number of Herbivores will increase in such an unimaginable way that they will let all the forests and forests will be totally destroyed. As a result the rainfall will be low and the crops will not be good in the absence of rain and as a result human beings will suffer loss due to crop failure. Thus the fact is highlighted that the wild creatures play an important role in the balance of nature.

Conclusion

Thus the above explanation indicates that the key stone species and wildlife have their important contribution in maintaining the balance of nature. Their conservation will establish balance in the nature.

Important points

1. The word Ecology is formed by the two Greek words, Oikos meaning dwelling place and Logos that means to study.
2. Ecosystem is the result of the interaction of organisms and the environment. the concept of Ecosystem was propounded by A.G. Tansley.
3. The ecosystem is that system in which all the biotic and abiotic factors of the environment are interrelated.
4. An ecosystem may be natural or manmade. The structure of the ecosystem is made by the interactions between biotic and abiotic elements.
5. The biotic and abiotic components of an ecosystem require energy to remain active, this energy keeps the ecosystem active and, This process is called energy flow in the ecosystem.

Exercise
Multiple choice questions

1. Who propounded the word 'biodiversity'?
   A) E.O.Wilson
   B) Desid Tilman
   C) Norman Mayors
   D) None of the above

2. How many hot spots of biodiversity are found in the world?
   A) 12 B) 20
   C) 25 D) 34

3. The total number of national parks in India is
   A) 103 B) 72
   C) 89 D) 96

4. The propounder of the word 'ecosystem' is
   A) A. G Tansley
   B) Foswerg
   C) E.P Odum
   D) Petter Hagett

5. Which statement is correct in reference to ecosystem:-
   A) ecosystem is the study of effects of environment on its organisms.
   B) ecosystem is the study of air, water and soil pollution
   C) ecosystem is the study of human environment
   D) Ecosystem is the study of organisms and their interrelationships with their environment

Very short type questions

6. What percentage of the entire earth, is land?
7. Biosphere is the result of which activities?

8. What percentage of plants species of the entire world is found in our country?
9. Name the green pigment present in the plants.
10. According to Odum, how much percentage of energy is received from the sunby the earth per sq m per day?

Short type questions

11. Define the term biosphere.
12. Write a short note on biodiversity in India.
13. Describe briefly the objectives of establishing national parks and wildlife sanctuaries.
14. Define ecosystem according to Tansley.
15. Describe energy flow in the ecosystem

Essay type questions

16. Write an essay on the concept of ecosystem.
17. Describe the energy flow in the ecosystem.
18. Describe the effects of industrialisation on ecosystem in detail.

Answer Key

1.A. 2.D. 3.A. 4. A. 5.D