

Environmental Conservation

Unit 6

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Introduction

In this course, so far, you have studied about the increase in population, poverty and pollution which are causing a rapid depletion of natural resources. In order to sustain the economic development of the people, there is a strong need to preserve the natural resources, both biological and physical. In this unit, you will study about the conservation of biological resources.

We begin this unit by defining environmental conservation. Conservation is the planned management of man's surroundings to prevent its exploitation, destruction or neglect. Man's impact on nature started becoming evident when he perfected the art of hunting. With the development of farming and animal husbandry, man began to control his environment. He exploited the natural resources of the earth to keep pace with his physical and cultural needs. With increase in world population, there was further depletion of natural resources. However, it took time for people to realize that man's interference with nature had probably done more harm than good and that man had been careless of the future. Enthusiasm for nature and wildlife surged, laying the foundation of the conservation movement as we know it now.

Environmental Conservation

The rapid decline in the quantity and quality of natural resources has led to a concern for their management and conservation. Natural resources are raw materials obtained or derived from nature. They are classified into renewable and non-renewable resources. Renewable resources are replaced from time to time by natural processes, like multiplication, recycling, etc. They are, in this sense, inexhaustible. Forests, pastures, wildlife and aquatic life come in this category. However, it is necessary to properly plan and manage their use. Non-renewable resources such as minerals, metals, soil, coal, oil deposits, etc., are available in limited amount and in no manner can be rebuilt or increased.

If man expects to have a future on the earth, he must use the resources in the most prudent manner possible. Conservation does not mean hoarding. It means the wise management of resources to provide a continuous supply for a long time into the future. This implies continuous renewal of a resource and recovering, recycling or reusing the products. Conservation of a natural area means its maintenance in a natural state for the purpose of enjoyment or study in order to understand and appreciate the complexities of ecological laws.

Concept of Conservation

Conservation is a broad concept which involves not only the scientific but ethical, moral, economic and political aspects as well. Conservation has been variously defined. Conservation for a petroleum engineer is largely minimising of waste from incomplete extraction and for a forester it may be sustained yield of products. In all cases, conservation deals with judicious development and manner of use of natural resources of all kinds. A generalised definition of conservation is "the maximization over time of the net social

benefits in goods and services from resources". Although it is technologically based, conservation cannot escape socially determined values.

Conservation may also be defined as the achievement of the highest sustainable quality of living for mankind by the rational utilisation of the environment, protection of nature to enrich the life of man and the control or elimination of environmental pollution in its many manifestations. Conservation advocates practices that will perpetuate the resources of the earth on which man depends or in whose continued existence he takes an interest. Conservation derives its tenets from a knowledge of ecology, the science concerned with interrelationship between living things and their environment.

But the question arises, why there is a need for conservation? The reasons are:

- a) world population is increasing at an alarming rate,
- b) world resources are being used up at an increasing rate due- to increase in population,
- c) pollution is increasing with the passage of time, and
- d) damage caused by human activities is sometimes irreversible.

Conservation involves perpetuation of the natural environment of man including the infinite resources of air, water, soil and life forms. Conservation involves the collective responsibility of governments, private organisations, industries and individuals and the setting aside of funds, finances for ecological research and execution of conservation projects.

Aims and Principles of Conservation

The aims of conservation are two-fold:

- i) to ensure the preservation of a quality environment that considers aesthetics and recreational as well as product needs.
- ii) to ensure a continuous yield of useful plants, animals and materials by establishing a balanced cycle of harvest and renewal.

Conservation is achieved through measures adopted in favour of a natural resource in order to increase its longevity and improve usage patterns. Some such measure are as follows:

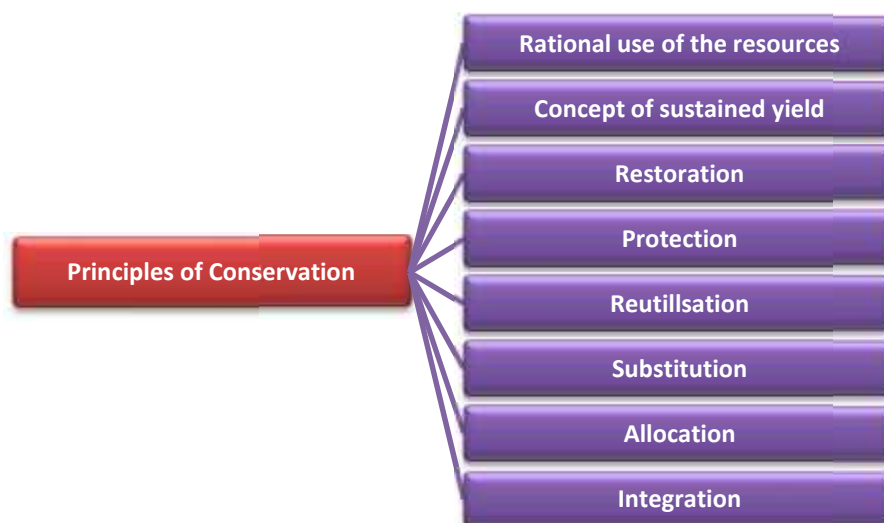


Fig: 6.1

- a) **Rational use of the resources** is one of the concepts in conservation of natural resources in an essentially undisturbed condition because they are of scientific interest, have aesthetic appeal or have recreational value. Preservation also serves an ecological purpose by maintaining the function of the total environment, for example, protection of forests assures a sustained yield of water into urban reservoirs, and protection of estuaries perpetuates ocean fishery.

But rational use is not just preservation. It also implies the direct use of resources for their commodity or recreational value. Thus, harvesting of forest crops, livestock grazing of grassland, catching fish and hunting wild animals can be considered a legitimate part of the rational use of natural resources, if they are carried out in such a way that the resource is perpetuated and not endangered.

- b) **Concept of sustained yield** is involved in these activities. This means cropping the annual surplus of individuals so as not to endanger the breeding stock of game animals or fish. Similarly, tree cutting or grazing of grass should remove only the annual increment and no more.
- c) **Restoration** is another important aspect of conservation. It is a widely familiar conservation measure which is essentially the correction of past careless activities that have impaired the productivity of the resource base. Deforested areas and mined and barren lands can be revegetated with some effort. Depleted animal and plant populations can recover if they are accorded protection. This measure is familiar in modern soil and water conservation practices applied to agricultural land.

Restoration is possible, however, only as long as species are protected and genetic diversity of life is maintained. When species become extinct, the restoration of past conditions become impossible.

- d) **Protection** of natural resources from commercial exploitation to prolong their use for recreation, watershed protection, and scientific study. This is the concept underlying the establishment and protection of parks and reserves of many kinds.
- e) **Reutilisation** is the reuse of waste materials, as in the use of industrial water after it has been purified and cooled. The same process becomes recycling if the waste material requires minor treatment before it can be reused, as in the use of scrap iron in steel manufacture.
- f) **Substitution**, an important conservation measure, has two aspects: (i) the use of a common resource instead of a rare one when it is for the same purpose, (ii) the use of a renewable rather than a non-renewable resource when conditions permit.
- g) **Allocation** concerns the strategy of use--the best use of a resource. For many resources and their products, the market price decides as to the use a resource is put, but under certain instances, general welfare may dictate otherwise. The allocation of resources may be controlled by government through the use of quotas, rationing and outright permits.
- h) **Integration** in resource management is a conservation measure because it maximises over a period of time. This is preferable to maximise certain benefits from a single resource at the expense of other benefits or other resources. Integration is a central objective of planning.

Wildlife Conservation

The term wildlife is commonly referred to represent the non-domesticated animals living in a natural habitat. In addition to many species having become extinct, some are endangered and a few are threatened. Before discussing the reasons for extinction and the need for wildlife conservation, let us define the terms **endangered**, **threatened** and **extinct**. **Endangered species** are those that were once abundant but have since dropped drastically in number due to human activities, and now their very existence is in danger. **Threatened species** are those that are likely to become endangered species within the foreseeable future, throughout or in a significant portion of its range. The threatened or endangered species for which no conservation measures are taken become **extinct**. You can have a look at Table for further clarification.

Categories of Animals at risk	
Classification	Meaning & Examples
Critically endangered	Will not survive without human assistance, examples: California condor, Florida panther, Great Indian Bustard
Endangered	In immediate danger of extinction, examples : whooping crane, red wolf, key deer, blue whale, gharial
Threatened	Abundant in parts of its range, but severely depleted in others, examples : grizzly bear, horned rhino
Rare	Not endangered at present, but at risk because of low numbers, includes many island species

Table: 6.1

To conserve the endangered and threatened species, and thereby prevent extinction of species is a major goal of wildlife conservation. You will study the reasons for extinction of species, the need for conservation of species and the task of conservation in the following subsections.

Reasons for Extinction of Wildlife

Wildlife extinction results from many forces operating in the society, such as economics, politics and psychology. Fig. 6.2; shows the specific activities that cause extinction of species and the relative importance of each. Some factors affect wildlife directly and others affect it indirectly. Let us examine each of these factors in a little more detail.

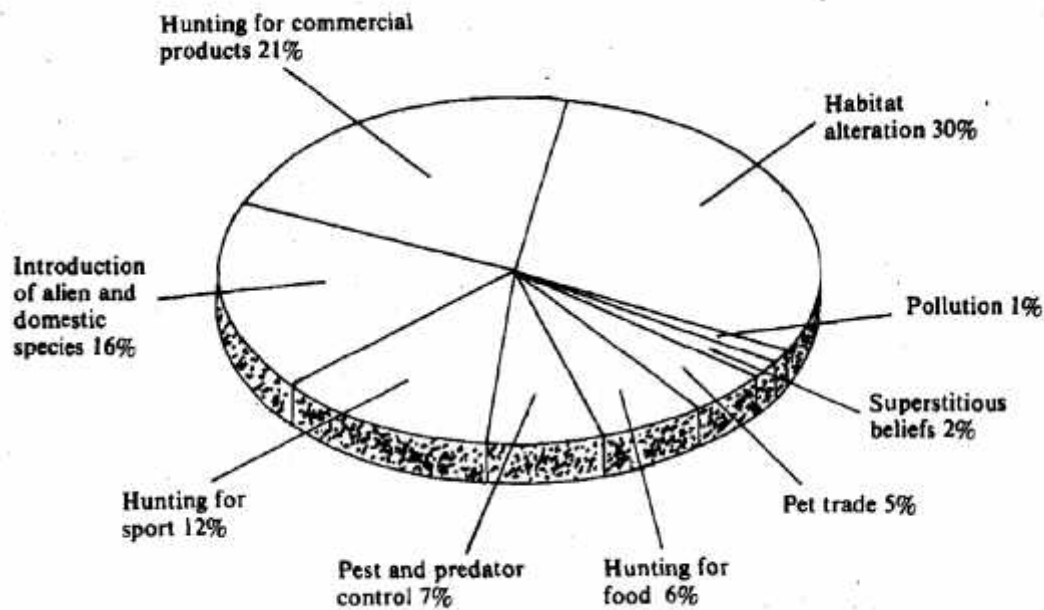


Fig 6.2 An approximate break down of the human activities that lead to extinction of species

a) **Alteration of habitat:** Destruction of the habitat of a particular wildlife species intentionally or unintentionally leads to extinction of species. The habitat may be destroyed by deforestation, drainage, overgrazing, expanding agriculture, urban and suburban development, highway construction, dam building, etc. As a result of destruction of its habitat, the species must either adapt to the changes, move elsewhere or may succumb to predation, starvation or disease and die.

b) **Commercial sport and subsistence, hunting:** Nature has great diversity. It has created, over many millions of years, a large number of species of plants and animals. But it is man who is responsible for the extinction of plant and animal species either directly or indirectly.

It may be a coincidence that all the motives for killing animals begin with the letter 'F': food, fats, finery (fur and feathers), fun, financial gain and fear. From time immemorial, man has hunted for food. It is only in relatively recent times that man is killing animals on a large scale for economic gains or even for sport.

Commercially, animals are hunted for their fur, hides, tusks, antlers and various other body parts. Rhinoceros is hunted for its horns. Crocodiles are hunted for their skin, which is used for various purposes. One of the most 'publicised commercial hunts is that of a whale. The "whalebone" or "baleen" was used to make combs and other products.

Hunting for sport is also a factor in wildlife extinction, Poaching of wildlife for sport and profit is widespread.

c) **Introduction of foreign species:** The introduction of foreign or alien species into new territories can often lead to ecological and economic disaster. An introduced species' niche may overlap that of a native species, the newcomer may out-compete the native species, resulting in its extinction. Though, species are often intentionally introduced to improve fishing and hunting, it can lead to problems also.

- d) **Control of pests and predators:** Natural predators remove the aged, sick and injured members of the prey population. In contrast, human beings generally remove the strongest specimens. Such predation will diminish the genetic vigour of a population. Thus human being and natural predators have opposing effects on population of prey. Natural predators make the prey population stronger, human beings make it weaker. Predators or pests are also important biotic components of the ecosystem and so great care should be taken while dealing with these components. Human beings hunt, trap and poison predators and pests. such as bears, wolves, lions, etc. In general, predator and pest control measures have two major impacts: (i) they kill natural predators that are a part of the balanced ecosystem, (ii) they can indiscriminately poison non-target species, having a ripple effect on organisms higher in the food chain.
- e) **Collection for zoos, private collections and research:** Animals and plants are gathered throughout the world for zoos, private collectors and researchers in biology and medicine. Amongst the legally exported animals there are many endangered, threatened and rare species. Researchers throughout the world use a variety of animals for their studies. Particularly primates such as monkeys and chimpanzees are sacrificed for research. Primates are desired because of their anatomical, genetic and physiological similarity to human beings. The chimpanzee, for example, is being used in work on human reproduction and cancer detection. Research animals often do not breed in captivity. They also have a high mortality, resulting in continual loss of wildlife.
- Moreover, the regulations for the supply of animals are poorly enforced. The hunters also know very little about effective live capture; therefore, deaths and injuries during capture are not uncommon. It is not only animals but plants like cacti and orchids are also being uprooted for sale elsewhere.
- f) **Pollution:** Pollution alters the habitat of plants and animals and play a significant role in extinction. Water pollution is especially harmful to the organisms living in estuaries and coastal zones. Toxic wastes entering the food chain can have devastating effect on their population. Insecticides and pesticides can also affect the plants and animals.

Other Ecological factors: There are other ecological factors that contribute to species extinction. Some of these are as follows:

- i. Degree of specialisation is an important factor. The more specialised an animal or plant is, the more vulnerable it is to extinction.
- ii. Location of the organism in the food chain is also important. The higher the animal is in food chain, the more susceptible it becomes. Larger animals are more profitable to hunt and they are easy targets because they are less fearful of human beings.
- iii. The distribution range also affects extinction. The smaller the range, the greater the threat of extinction. Population on islands are particularly susceptible.
- iv. Reproductive rate is also an important factor. Large organisms tend to produce fewer offspring at widely spaced intervals. Their offspring also tend to reach reproductive age late.
- v. Animal's tolerance for human presence or specific behavioural patterns also plays an important role.

Need for Wildlife Conservation

You will be curious to know why we should save endangered species. Why is it that all policy makers, scientists and interested citizens argue that species extinction is one of the most serious environmental problems? The importance of the need for protecting endangered species is discussed in detail in this section.

- i) **Value as a genetic reservoir:** Plants and animals possess undiscovered or undeveloped traits which are very important for the survival of a particular species. When all the genes of all the individual members in a given population are added together, a gene pool is created which is representative of that species. It is important to preserve all gene pools as they might prove useful to us in future. In any case, we do not know enough about interspecies relationships and ecosystem balance and its stability to allow any gene pool to get eroded or obliterated.

Large gene pools are also important to agriculturists. All domestic crops and livestock have originated from native plants and animals. All those native species are still needed to provide the new genetic characteristics that we need to help solve our present and future food production problems. If steps are not taken to preserve endangered species then these gene pools will be swept away.

- ii) **Value in maintaining ecosystem stability:** As you know, ecosystem includes abiotic factors like temperature, humidity etc. and biotic factors like plants and animals. The ecosystems maintain a delicate balance of nature. Each species interacts with other species and plays a role in the transfer of energy and materials within and between ecosystems, hence each one, in its own way, contributes to the stability of ecosystems. The function of a species whether plant or animal is very critical to ecosystem stability. **As** you know, the plants occupy the base of food webs, **so** extinction of a single plant species may lead to the extinction of animal species dependent on that particular plant species. A species, lost here and there may be of little consequence for overall ecosystem stability, but in the long run, the cumulative effect of such losses may some day threaten our existence. If we think that each species by itself is dispensable, then bit by bit we will destroy the rich biological world in which we live.

- iii) **Economic value:** In our daily life, we use many things which are products of wildlife. Many plants have medicinal value, for example, we get, penicillin from *Penicillium*, quinine from *Cinchona*, morphine from opium poppy. A chemical derived from the skeletons of shrimps, crabs and lobsters may serve as a preventive medicine against fungal infection.

Important plant and animal genes are needed to improve domestic crops and livestock. Many genetic reservoirs located in the tropics and subtropics are the source of virtually all the common valuable plants and animals. They provide genetic material needed in the continual battle to improve plant and animal resistance. Loss of these centres would have a global impact on food supplies.

Fish is a source of income to fishing lodges and sporting goods stores. Wildlife is a source of income to recreation and tourism industry. The most popular tourist attractions are national and state parks and forests.

Although the economic value of a given species may not be apparent, we cannot assert that a species has no economic value.

- iv) **Aesthetic value:** Aesthetic value of a species also promotes its preservation. For example, the taste of wild berries, the refreshing fragrance of wild flowers and the softness of a bed of moss have no monetary value, but still their aesthetic value compels us to preserve them.
- v) **Inherent value:** Each species has a right to exist. So, if a species exists, then it has a fundamental right to continue to exist without being driven to extinction by human activities. The inherent value of a species cannot be measured merely by the extent to which human beings can get along without it.

How to Save Endangered Species?

Preserving species is not a simple matter. The problems of wildlife management are very complex and there is much work on three overlapping levels, i.e., technical, legal and personal.

To achieve a desired abundance of a particular species of wildlife, it is imperative to save their habitat because wildlife populations respond very sensitively to their habitats. Thus, habitat management is an efficient technique. So, we can say that wildlife management includes habitat management.

Integrated species management programme is the best way for protecting wildlife. This approach is a diversified attack on the cause of extinction. Some of the tasks of integrated species management are given in the following Table.

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| <ol style="list-style-type: none"> 1. Reduce habitat destruction by careful selection of urban and other development. 2. Establish preserves to protect nesting grounds and other critical habitats. 3. Reduce commercial and trophy hunting when evidence shows that the hunted species is rare, threatened, or endangered and when synthetic products can replace those acquired from these animals and plants. 4. Improve wildlife management, including programmes to protect and manage non-game species. 5. Control the introduction of alien species, especially on islands. 6. Design careful predator and pest control management programme so as not to indiscriminately eliminate non-target species. 7. Reduce pollution 8. Increase public awareness of the value of wildlife and what factors cause extinction. 9. Fund captive breeding programmes to raise endangered species for release. 10. Establish breeding programmes to generate research animals. 11. Impose tough penalties, and increase the policing of animal and plant trade and poaching. 12. Promote international cooperation to curb the trade of endangered species. 13. Increase expenditures for all protective measures, possibly through new taxes; and 14. Intensify research efforts to learn more about ecosystem stability and to identify critical plants and animal habitats. |
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Table 6.2

A group of techniques specifically designed for benefiting one target species for each area and for achieving the specific objectives is called systems approach. The systems approach involves:

- a) intensive study and research by experts to isolate the problem,
- b) definition of goals,
- c) education of the public by all the media,
- d) programmes to retain and improve the habitat,
- e) action by agents to deter or apprehend poachers or game law violation,
- f) control of disease and parasites and to select individual predators, and
- g) well-researched transplanting of wildlife from areas where it has bred successfully to areas with high potential for population building.

With time, the concept of wildlife has been changed. Now wildlife is considered as a 'thing of beauty' and a 'gift of nature' which needs to be preserved rather than a 'game' to be hunted as considered before. This new concept of wildlife has resulted in its protection in the protected areas, i.e. national parks, sanctuaries and reserves. You will study about these in the following sub-sections.

Protected Areas: National Parks and Sanctuaries

Natural communities, little affected by man's activities, are thought to be worth preserving for a variety of reasons. By declaring some areas as national parks or wildlife sanctuaries, the natural community along with its ecosystem is preserved. Let us first define national parks, sanctuaries and reserves. A **national park** is an area dedicated to conserve the environment, natural and historical objects and to conserve the wildlife therein, and at the same time, to provide for enjoyment from them, in such a manner and by such means, as will leave them unimpaired for the enjoyment of future generations. In national parks, all private rights are non-existent and all forestry operations and other usages such as grazing of domestic animals are prohibited.

In a **wildlife sanctuary**, killing, hunting, shooting or capturing of any species of birds and mammals is prohibited except by or under the control of the highest authority in the department responsible for management of the sanctuary. Private ownership rights may be allowed to continue in a sanctuary and forestry and other usages permitted to the extent that they do not adversely affect wildlife.

Any area where special protection is offered to wildlife is declared a **protected area** Such as:

- a) River valley projects and other irrigational works that attract water birds and other wildlife.
- b) An area where protection is offered to wildlife in or around large towns of sacred places.

Reserves are areas demarcated especially for the protection of wildlife.

Advantages of Protected Areas

There is much scientific benefit to be derived by studying the ecosystem in a protected area particularly the functioning of the biosphere. From studies of undisturbed ecosystems, much can be learnt about the behaviour of these systems. Only with such a control can man gauge how much damage he has caused to his environment. Furthermore, more or less undisturbed communities are important to the continued operation of the systems that

man has created. Thus, watershed forests are protected to maintain stream flow and avoid siltation of reservoirs. Similarly, protected estuaries guarantee continued production of marine life important to man for food and other purpose. Outdoor activities in a natural setting or contact with plants and animals in a wild state appears to be important to man's psychological well being. So, protected areas are of aesthetic and recreational values too.

By declaring certain areas as protected, the laws to regulate that protection should apply automatically. It becomes easier to monitor the population of the species living in the area, prevent poaching and also avoid exploitation of the area into consideration by excessive tree felling or overgrazing.

Acv to Protect Wildlife: As a result of worldwide concern, the International Union for Conservation of Natural Resources (IUCN) was formed, as also its appendage, the Survival Service Commission, which sought to supply up-to-date information about every species of animal in danger of extinction. The World Wildlife Fund now called World Wide Fund for Nature (**WWF**), affiliated to IUCN, is also closely concerned with conservation problems.

Although, the establishment and proper management of parks and reserves permits the survival of certain species in certain areas, general programme of rational management covering the use of all lands and species is essential to the survival of wildlife throughout the world.