Causes of Depletion of Wildlife
&
Ecology in Wildlife Conservation and Management

Ancient man was simple-minded food gatherer and hunter. He looked upon nature with awe and respect and in fact he worshipped it. But from the time he began to use his superior intelligence and began to understand nature, he became progressively self-centred and in the process started disrespecting and destroying/degrading the natural environment. The various activities of man that have led to degradation of the ecosystem are:

a) Deforestation
b) Overgrazing
c) Agriculture
d) Mining
e) Urbanisation

The term wildlife probably originated in 1913 in a book, Our Vanishing Wildlife by William Hornaday, Director of the New York Zoological Park. The main focus of this book was on the over-exploitation of game birds, mammals and fishes; and also the harvesting of some birds that were not game, notably the song birds that the European immigrants often hunted. By 1937, the term wildlife had been contracted into one word.

Though the word wildlife was coined and contracted as one word by the nineteen thirty seven, it was not defined in the well-known dictionaries. It was, however, included in the Webster's dictionary in 1986. Webster's dictionary defines wildlife as "living things that are neither human nor domesticated", and the Oxford dictionary says that the wildlife is "the native flora and fauna of a particular region".

Generally, we all think that only large animals, carnivores, game animals and birds constitute the wildlife. In the present times, the term wildlife encompasses much more than the above mentioned life forms. Now plants, microorganisms and all other lesser known living beings too fall within the purview of wildlife. One essential characteristic feature of wildlife is that they grow and survive in a particular area, without the care of human beings. They are well adapted to the soil, light and temperature conditions of that particular area. All our garden flowers are

descendants of the wild flowers. The wild flowers grow on their own in nature, complete their life cycles and grow again the next season.

CAUSES OF DEPLETION OF WILDLIFE OR THREATS TO WILDLIFE

As many as 500 million kinds of plants, animals and microorganisms have made earth their home since life began, over 3.5 billion years ago. Presently, it is believed that there are only 5 to 10 million species alive. We, however, do not have an exact figure because there are many areas on the earth that are biologically unexplored. Tropical rain forests are examples of such areas, about which we know little. About 90% of the organisms living there remain unclassified. Thus, since life began about 490 million species have become extinct. The causes that lead to extinction of many wildlife species are:

1) Hunting and export
2) Elimination or disturbance of wildlife habitats
3) Domestication
4) Introduction of new species
5) Pesticides
6) Pests, medical research and zoos

Hunting and Export:

The hunting and export of excessive numbers of certain animal species is another important factor leading to dangerous reductions in numbers. There are three main types of hunting: i) commercial hunting-in which the animals are killed for profit from sale of their furs or other parts; ii) subsistence hunting-the killing of animals to provide enough food for survival; and iii) sport hunting-the killing of animals for recreation. Although subsistence hunting was once a major cause of extinction of some species, it has now declined sharply in most areas. Sport hunting is now closely regulated in most countries; game species are endangered only when protective regulations do not exist or are not enforced. On a worldwide basis, commercial hunting threatens a number of large animal species. The jaguar, tiger, snow leopard, and cheetah are hunted for their skins, elephants for their ivory tusks and rhinoceros for their horns.

Elimination or Disturbance of Wildlife Habitats:

Habitat refers to the area where species seek food, get shelter, and reproduce. The greatest threat to wild plant and animal species is due to destruction or alteration of their habitat. If an animal's habitat is destroyed or disrupted, it must adapt to the new changes, move elsewhere or die. When it is forced out of its territory, and if it finds a suitable habitat there is a possibility that the habitat is already in use. Consequently, it must compete with the existing animals of the same species or animals in similar niches. The other option is that it must migrate into a marginal habitat where it may succumb to predation, starvation or disease.

Habitat is disturbed or destroyed due to various factors such as; deforestation, drainage or filling of wetlands, overgrazing, expanding agriculture, urbanisation, various development projects, mining and several others. The Great Indian Bustard has been exterminated because of habitat destruction and hunting. Similarly, the Bengal tiger faces extinction as its jungles are torn down to supply timber and farm land. Pollution also disturbs the natural habitat considerably. Industrial wastes cause severe impact, particularly on the aquatic habitats.

Domestication:

It means that man has taken under his direct care the living beings which are useful to him. Through extensive breeding programmes, he has modified them to derive maximum benefit of their products. During the process, the species have lost certain useful characteristics so much so that these forms cannot survive on their own in nature. A very good example is corn, which is pampered so much by man that if it is left on its own, it cannot survive. The domestic cattle are carriers of several diseases which they can transmit to wild animals. For example, the steady rehabilitation of the Great Indian Rhinoceros was seriously hampered by the rinderpest disease which they contracted from the local domestic cattle.

Introduction of New Species:

As long as human beings have travelled around the world, they have carried with them (accidentally or intentionally) many species of plants and animals, which they have introduced to new geographical areas. In some instances, an opening has existed in the new environment and the foreign or alien species has been able to establish itself without seriously affecting the population size of the native species. But in other instances, the alien has been a superior predator,

parasite or competitor and has brought about extinction or near extinction of native species. It can also cause a population explosion of the existing species by killing off their natural predators.

We shall now take up one example that demonstrates the devastating effects of the introduction of alien species on islands. In islands, particularly the endemic species are often inadequately equipped to deal with invasions of humans and their domestic animals. For example, the bird dodo lived only in Mauritius, which is a small island in the Indian Ocean. The dodo possessed two characteristics that were its eventual undoing; it had no fear of people and, therefore, could be easily clubbed to death, and it was flightless, so, it had to lay its eggs on the ground. The dodo became extinct by 1681, after the introduction of pigs to the island, who consumed its eggs.

Pesticides:

Another recently realised danger to wildlife in many parts of the world has come from the development of more effective pesticides. As agriculture became more efficient so the need to control crop pests also became more urgent, and the agricultural chemists have devoted a great deal of their time and energy to synthesising compounds to meet this need. In the early 1960s it became clear that a certain group of chlorinated hydrocarbons, notably aldrin, dieldrin and heptachlor, which are undoubtedly extremely effective in controlling pests, are proving increasingly harmful to many wild animals. Their great disadvantage, it was discovered, was that whereas most other pesticides were fairly rapidly destroyed when they fell on the ground, the above three pesticides persisted in the soil for years, and tended to accumulate (bioaccumulation) since each year's spraying reinforced the persisting residues from previous years.

The first effect of these pesticides is a gradual accumulation in the bodies of worms, insects and some small animals. These in turn are eaten by birds, which thus acquire these accumulations, and the effects of which may be reproductive failure and egg shell thinning. These effects have been seen in birds like peregrine falcon, eastern and California brown pelicans, osprey, bald eagle.

In India, the threat to wildlife through the use of these compounds had taken rather a different turn. Here the farmers have been using them directly as poisons to kill tigers, leopards and other large animals either by adding a few grams to the

animal's food or by scattering poisoned bait along their known tracks. In Kerala, elephants have also been killed by poisoned bananas.

Pets, Medical Research and Zoos:

Animals and plants are gathered throughout the world for zoos, private collectors, pet shops and researchers in biology and medicine. Worldwide more than 6 million live birds are sold each year, most of them as pets, in countries like United States, Great Britain and West Germany. Large number of these animals dies during shipment and after purchase; many are killed or abandoned by their owner. Researchers throughout the world use a variety of animals such as mice, rats, dogs, cats, primates, birds, frogs, guinea pigs and rabbits for their studies, many of which came from the wild. Demand is especially great for monkeys and the great apes such as chimpanzees. Taken from their homeland in Africa, as many as five chimpanzees die for every one that enters the laboratory. Some biologists believe that the species will be extinct in the wild by the end of the decade. Primates are desired because of their anatomical, genetic and physiological similarly to humans. Primates have played important part in biomedical research. Public zoos, botanical gardens and aquariums are under constant pressure to exhibit rare and unusual animals such as orangutan. For each exotic animal or plant that reaches a zoo or botanical garden alive, many others die during capture or shipment.

The Red Data Book:

Species judged as threatened are listed by various agencies as well as by some private organisations. The most cited of these lists is the Red Data Book. It is a loose-leaf volume of information on the status of many kinds of species. This volume is continually updated and is issued by the International Union for Conservation of Nature (IUCN) located in Morges, Switzerland. "Red" of course is symbolic of the danger that these species bot'h plants and animals presently experience-throughout the globe. The Red Data Book was first issued in 1966 by the IUCN's Special Survival Commission as a guide for formulation, preservation and management of species listed. In this Book, information for endangered mammals and birds is more extensive than for other groups of animals and plants, coverage is also given to less prominent organisms facing extinction.

The pink pages in this publication include the critically endangered species. As the status of the animal’s changes, new pages are sent to the subscribers. Green

pages are used for those species that were formerly endangered, but have now recovered to a point where they are no longer threatened. With passing time, the numbers of pink pages continue to increase. There are unfortunately few green pages.

EXTINCT AND THREATENED SPECIES:

Some of wildlife species are considered threatened and some are extinct.

1. **Extinct Species:**

   These no longer exist outside museums and photographs. Some extinct species include the dodo, Carolina parakeet, heath hen, Labrador duck, Cheetah, Pink-headed.duck, and Jerdon's Courser.

2. **Threatened Species:**

   Many plant and animal species are threatened by the possibility of extinction. The Survival Service Commission (now called Species Survival Commission) of International Union of Conservation of Nature (IUCN) has established four categories of threatened species. These describe the degree to which a species is threatened with extinction. These categories are:

   a) **Endangered Species:** A species is considered endangered when its numbers are so few or land its homeland is so small, that it may become extinct if not given special protection. Example: lion-tailed macque.

   b) **Rare Species**: These are those species whose numbers are few or they live in such small areas or in such unusual environments (endemics), that they could quickly disappear. Example: Hawaiian monk seal ***(Monachus schauinslandi)*** and Great Indian Bustard ***(Ardeotis nigriceps).***

   c) **Depleted (Vulnerable) Species**: These are the species whose numbers are greatly reduced from those of the recent past, and they are continuing to decrease. It is the continued decrease that is the main cause of concern. Animals in this category can quickly change to a rare or endangered status.

   d) **Indeterminate Species:** The fourth category consists of those species that seem to be in danger, but there is not enough information about them to make a reliable estimate of their true status.

Out of Danger Species:

This includes species that were formerly included in one of the above categories, but are now considered relatively secure because effective conservation measures have been taken or the previous threat to their survival has been removed.

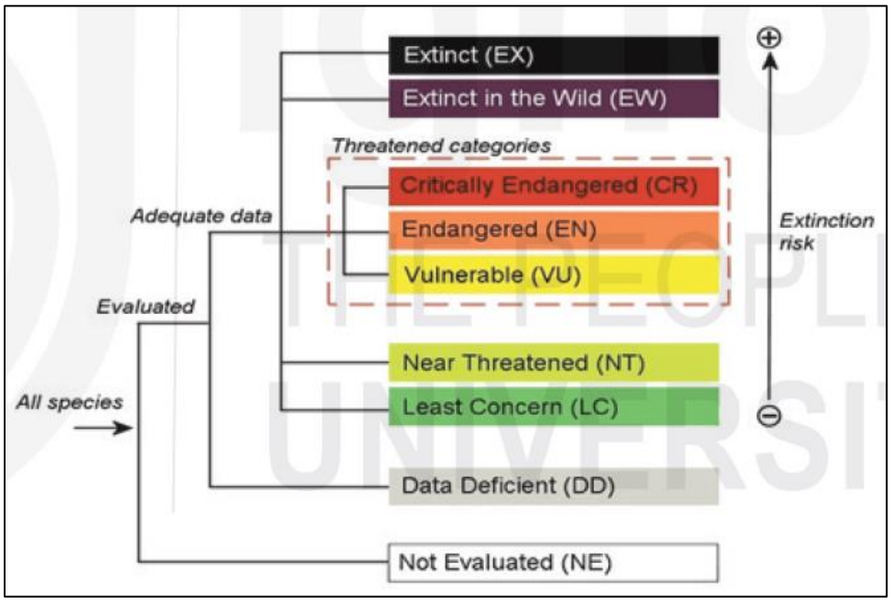


Figure: Nine Red List Categories

1. Extinct (EX), a designation applied to species in which the last individual has died or where systematic and time-appropriate surveys have been unable to log even a single individual
2. Extinct in the Wild (EW), a category containing those species whose members survive only in captivity or as artificially supported populations far outside their historical geographic range
3. Critically Endangered (CR), a category containing those species that possess an extremely high risk of extinction as a result of rapid population declines of 80 to more than 90 percent over the previous 10 years (or three generations), a current population size of fewer than 50 individuals, or other factors
4. Endangered (EN), a designation applied to species that possess a very high risk of extinction as a result of rapid population declines of 50 to more than 70 percent over the previous 10 years (or three generations), a current population size of fewer than 250 individuals, or other factors
5. Vulnerable (VU), a category containing those species that possess a very high risk of extinction as a result of rapid population declines of 30 to more than 50 percent over the previous 10 years (or three generations), a current population size of fewer than 1,000 individuals, or other factors
6. Near Threatened (NT), a designation applied to species that are close to becoming threatened or may meet the criteria for threatened status in the near future
7. Least Concern (LC), a category containing species that are pervasive and abundant after careful assessment
8. Data Deficient (DD), a condition applied to species in which the amount of available data related to its risk of extinction is lacking in some way. Consequently, a complete assessment cannot be performed. Thus, unlike the other categories in this list, this category does not describe the conservation status of a species
9. Not Evaluated (NE), a category used to include any of the nearly 1.9 million species described by science but not assessed by the IUCN

CONSERVATION OF WILDLIFE

Wildlife is a term that refers to animals that are not normally domesticated. They are a living resource that will die and be replaced by others of their kind. Wildlife plays an important role in balancing the environment and provides stability to different natural processes of nature. It can be found in all ecosystems, desert, rainforests, plains and other areas. Wildlife is important for its beauty, economic, scientific and survival value. It helps to maintain the ecological balance of nature and maintains the food chain. It provides useful substances and wild animal products like ivory, leather, honey, tusk etc. Besides being a country's cultural asset it also provides aesthetic value to man. We largely depend on wildlife for every elementary requirement in our life. For example: the clothes we wear and the medicines we consume are obtained from wildlife products.

Ecology is the study of earth systems and is integral in wildlife conservation. We cannot begin to protect an animal without knowing what is happening around it. Wildlife conservation encompasses all human activities and efforts directed to preserve wild animal from extinction. It involves both protection and scientific management of wild species. Wildlife and nature have largely being associated which humans for numerous emotional and social reasons.

Although most countries of the world are very particular regarding conservation of wildlife, the number of wild animals is reducing day by day. World Wild Life Fund is the international agency, which is doing commendable work in promoting the protection of wildlife. There are national agencies also engaged in the conservation of wildlife.

Some of the ecological steps in the direction of wildlife conservation could be as follows:

1. To survey and collect all the information about wildlife, especially, their number and growth.
2. To protect habitat by protecting forests.
3. To delimit the areas of their natural habitat.
4. To protect wildlife from pollution and from natural hazards.
5. To impose complete restriction on hunting and capturing of wildlife.
6. To impose restrictions on export and import of wildlife products and severe punishment to be given to those who indulge in this activity.

7. To develop game sanctuaries for specific wild animals or for general world life.
8. To make special arrangements to protect those species whose number is very limited.
9. To develop general awareness at national and international level regarding protection of wildlife.
10. To adopt a system of wildlife management through trained personnel.

India is a good example where several steps have been taken for wildlife conservation. It is a country of varied wildlife, where more than 500 types of wild animals, 2,100 types of birds and about 20,000 types of reptiles and fishes have been found. According to an estimate, in India, about 200 species of wild animals and birds have already become extinct and another 2,500 are on the verge of extinction. Some of them are black buck, chinkara, wolf, swamp deer, nilgai, Indian gazelle, antelope, tiger, rhinoceros, Gir lion, crocodile, flamingo, pelican, bustard, white crane, grey heron, mountain quail, etc. In India, the government and NGOs are taking keen interest in the protection of wildlife. The Wild Life Protection Act, 1972 (as amended in 2002) has several provisions for the conservation of wildlife.

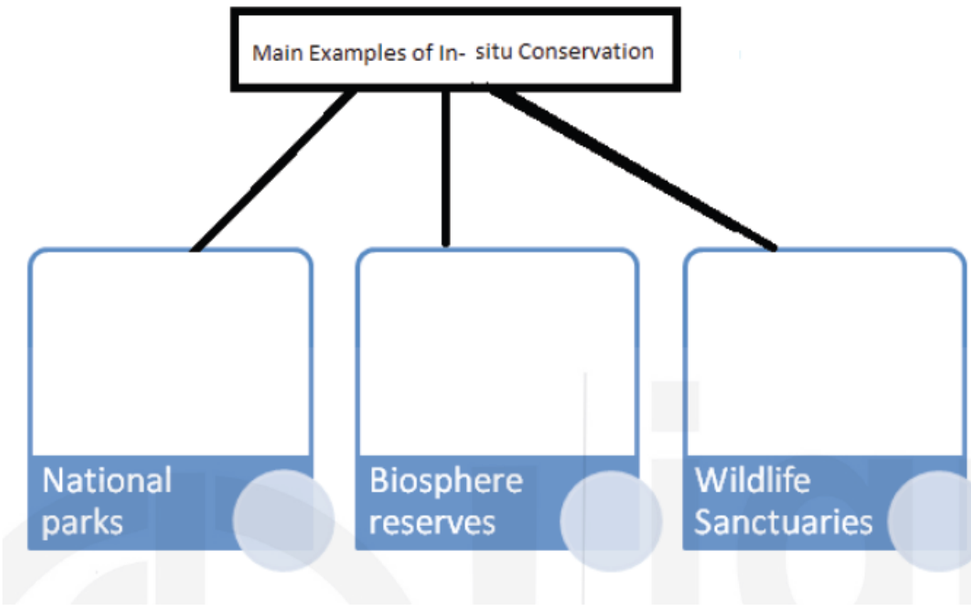
India is blessed with a total of 771 Protected Areas that include 104 National Parks, 544 Wild Life Sanctuaries, 46 Community Reserves, and 77 Conservation Reserves, covers the total area **162099.47 km^2 (coverage 4.93% of the country)**. These protected areas have been established all over the country in order to secure the future of the endangered species. Apart from this, a Wild Life Conservation Week is also celebrated from 7th of October every year. But still there is a long way to go in this direction.

Methods Used for the Conservation of Wildlife:

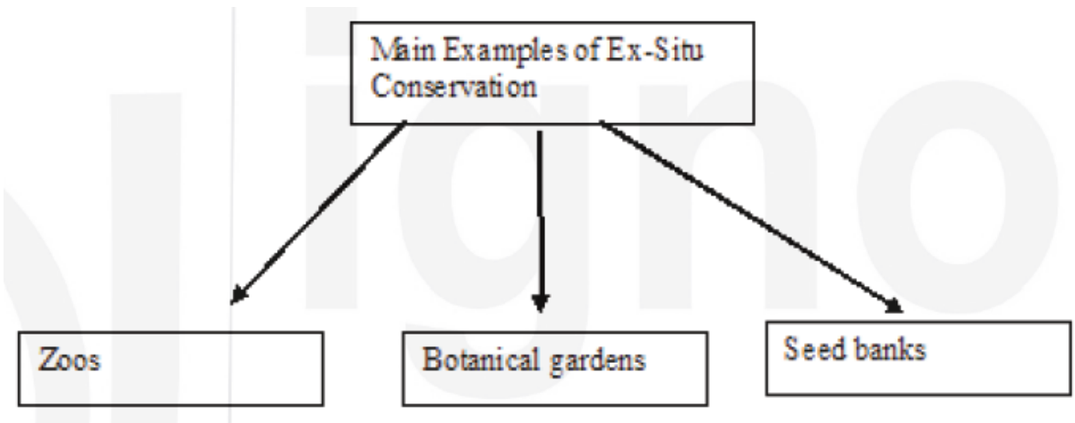
Methods of conservation of faunal and floral species are broadly classified into two methods, such as **In-situ conservation and Ex-situ conservation**.

1. **In-situ conservation** is the most appropriate method. This approach includes protection of total ecosystems through a network of Protected Areas. The common natural habitats (protected areas) that have been set for in-situ conservation of wildlife include national parks, sanctuaries, biosphere

reserves, several wetlands (mangroves, coral reefs etc.), sacred groves and lakes.



2. **Ex-situ conservation** involves cultivation of rare plants and rearing of threatened animal species in zoological and botanical gardens and preservation of the plant species in the form of seeds in seed banks etc. by means of tissue-culture techniques. Individuals of the species are maintained in artificial conditions under human supervision. These methods include maintaining gene banks, pollen preservation and the most useful is the cryopreservation by with tissue culture and germ plasm conservation are made.



Some important techniques used in *ex-situ* conservation are:

i) Captive breeding

Captive breeding is one of the important strategies used by both government and non-government organizations. Captive-breeding programs of endangered and threatened species have become familiar programs that strive to preserve biodiversity and species-survival plans such as cheetah.

ii) Embryo Storage and transfer technology

Techniques for embryo transfer and artificial insemination, which have been developed for laboratory animals and farm animals, are potentially very useful for improving the reproductive potential of captive populations of endangered species. These kinds of techniques have been worked out mainly for mammals.

iii) Artificial insemination

Artificial insemination is another technology that may be useful. Sperm can be frozen and used later, or transferred to another breeding facility to increase genetic diversity.

iv) Somatic cell cloning

Somatic Cell Cloning holds some promise for propagating from one or a few survivors of an almost extinct species. This was first done with domestic sheep at the Roslin Institute in Edinburgh but has since been done with other mammals. It has already been used to rescue a rare breed of cattle that had been reduced to a single old female ("Lady") and some frozen sperm.

v) Fostering

Many egg-laying animals (i.e. birds and reptiles) are capable of producing many more eggs than they can rear. This raises the possibility of collecting the extra eggs and hatching and rearing the animals in captivity with a foster parent, then using them to supplement wild populations.

vi) Translocations

Sometimes conservation of faunal species involves or necessitates translocation of animals. This means the movement of individuals from its natural habitat, or from captivity, to another habitat. Translocations are carried out in connection with introductions or reintroductions, and should be handled with extreme caution.

vii) Seed bank

The preservation of plant germplasm in seedbanks, (or genebanks), is one of the techniques of ex-suit conservation of plant species. Seeds have a natural dormancy feature, which allows for their suspended preservation for long periods of time with little damage, provided the conditions are favourable. Banking

dormant seeds enables to keep genetically representative samples of rare and endangered plant species as a kind of "genetic insurance".

Role of seed bank in conservation

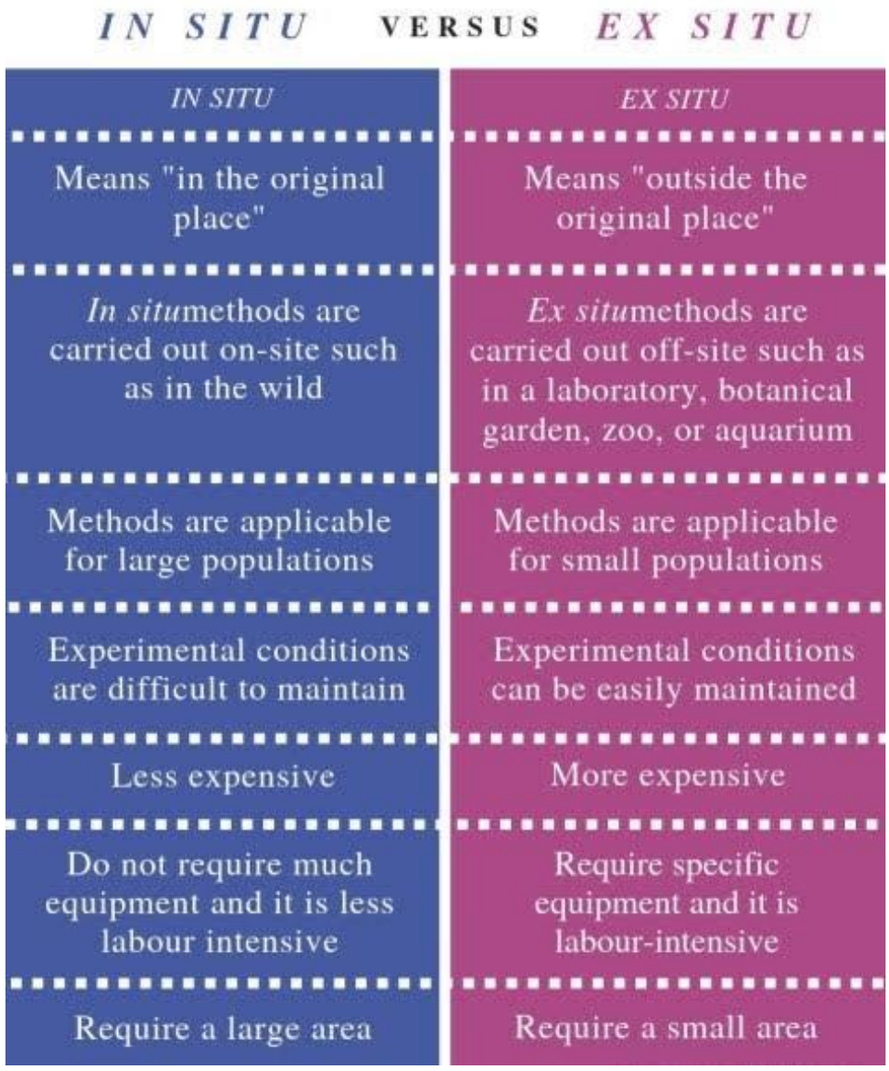
Genetic diversity among plant species has a significant impact on human life. For example, many of our medicines were first discovered from plants. It is not known which other plants could later on prove beneficial. The conservation of diversity is therefore very important to human life. Many think plants must survive in order for their benefits to be discovered.

viii) Botanical Garden

Together, the world's 1500 botanic gardens, arboreta, and national plant collections maintain the largest array of plant diversity outside of nature, and they have major, if often overlooked, potential as resource centers for conservation, education, and development. There are 34 botanic gardens in India including the National Botanical Garden in Noida, Uttar Pradesh. A scheme entitled "Assistance to Botanic Gardens" provides one-time assistance to botanic gardens to strengthen and institute measures for the *ex situ* conservation of threatened and endangered species in their respective regions.

ix) Zoological Garden

The basic philosophy behind the creation of zoological parks in modern times is to create an understanding of the environment and ecological balance of life, meaning strengthening the bond between people and the living earth. These zoological parks are no more picnic spots. They are now centres for *ex-situ* wild life conservation and environmental education. Zoos can directly contribute in preventing the extinction of endangered species. This is done by propagating the population of such species *ex-situ*. The *ex-situ* zoo population is managed to support the survival of species in wild. There is increasing number of cases where *ex-situ* populations are crucial components of species survival.



WHY CONSERVE WILDLIFE?

(Importance/Significance/Value of Wildlife)

1. Economic Significance

Certain wild species are important because of their actual or potential economic value to people. Wildlife resources provide people with a wide variety of direct economic benefits. Some of which are: as source of food, spices, flavouring agents, scents, soap, cooking oil; lubricating oils, waxes, dyes, natural rubber, medicines and several other important materials. Most of the plants that supply 90% of the world's food today were domesticated from wild plants in the tropics. Besides providing direct benefits, many wildlife species benefit; us indirectly. As many insect species carry out pollination for many food and non-food species. Predatory insects, parasites, and disease-causing bacteria and viruses are increasingly used for the

biological control of various weeds and insect pests, thus helping reduce losses of crops and trees.

2. **Medicinal Value**

About 40% of all drugs used throughout the world have active ingredients extracted from plants and animals. The world-wide annual sales of drugs based on naturally derived chemicals amount to at least $40 billion. Asprin, which is probably the world's most widely used drug, was developed according to a chemical "blueprint" supplied by a compound extracted from the leaves of tropical willow trees. Penicillin is produced by a fungus and certain species of bacteria produce other life-saving antibiotics such as tetracycline and streptomycin. Thanks to those antibiotics and more than 1000 other drugs, diseases like typhoid fever, scarlet fever, bubonic plague, diptheria, syphilis and gonorrhoea can be treated more effectively. Certain flowering plants also produce medicinal compounds. For example quinine is used to treat Malaria (from the cinchona tree); digitalis is used to treat chronic heart trouble (from the foxglove plant); and morphine and cocaine are used to reduce pain (from the opium poppy plant and the coca shrub respectively). Drugs that have been extracted from plants are used to treat leukemia, several forms of tumors, cancer, various heart ailments, and hypertension (high blood pressure). Therefore, the discovery of other life-saving drugs depends on the survival of microorganisms, plants and animals that some persons might consider to be insignificant. Furthermore, fewer than 5,000 of the earth's 220400 species of flowering plants have been analysed by scientists for the presence of valuable drugs.

3. **Medical Research**

Many animal species are used to test drugs and vaccines and to increase our understanding of human health and disease. The nine-banded armadillo for example is being used to study leprosy and prepare a vaccine for this disease. This disease has been a curse to humankind since ancient times, and a cure has been difficult to find, because the bacteria that cause the disease grow in humans but not in laboratory conditions. This was a major problem in developing a vaccine. However, in 1971 it was discovered that the bacteria flourished in the nine-banded armadillo. Fortunately, that species is with us. Scientists now have a good opportunity to study and perhaps someday to conquer leprosy. Similarly, the Florida manatee, an endangered mammal, is being used to help understand haemophilia. It is

believed that many new drugs would come from currently unclassifed plant and animal species, mostly located in the tropical forests and oceans. For example, an estimated 10% of the world's marine species contain anti-cancer chemicals.

4. **Genetic Reservoir**

Despite the present and future economic and health importance to human beings, very little is known about most of the earth's 1.7 million identified species. Less than 1% of the earth's identified plant species have been thoroughly studied to determine their possible usefulness. Loss of this biological and genetic diversity reduces our ability to respond to new problems and opportunities-as though we have thrown away millions of gifts without unwrapping them. The maintenance of large gene pool is also of great interest to agriculturists. All domestic crops and livestocks originated from native plants and animals. And those native species are still needed to provide the new genetic chamcteristics that we need to help solve our present and future food production problems. For example, the new varieties of wheat and rice, which have significantly increased food production in the recent years, have been produced by breeding experiments that utilised thousands of native and domesticated varieties of rice and wheat.

5. **Ecological Significance**

Besides serving as a valuable genetic reservoir, 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. Each and every species in an ecosystem is important for maintaining ecosystem stability. If a number of species disappear, the diversity diminishes and number of checks and balances on plant and animal populations decreases. As species are lost, the stabilising influences of predation, parasitism, and competition are disrupted, and an ecosystem thus becomes more vulnerable to disturbances, that in some cases threaten to destroy it.

Although, we tend to mourn the extinction of an animal species more than the loss of a plant species, the extinction of plant species is often more critical to ecosystem, stability. Because plants occupy the base oflthe food webs, a single disappearing plant species may cause extinction of 10 to 20 animal species, because they were dependent on that species for food or shelter at some time of their life span.

6. Aesthetic and Recreational Significance

Many wild species are a source of beauty, wonder; joy, and recreational pleasure for large number of people. Observing leaves change colour in autumn, smelling the aroma of wild flowers, watching an eagle soars overhead are some of the pleasurable experiences that are unexplainable and even not bought with money.

To sum up, we can say that we have inherited our earth from our parents and would pass it out to our children. All of us, the believers in conservation should save our natural resources, both living and non-living, and should be obligated to pass on something better than what we have received, to the future generation.