

# **ANIMAL DIVERSITY & ECOLOGY (ZO 501)**

**MSc 1<sup>st</sup> YEAR**

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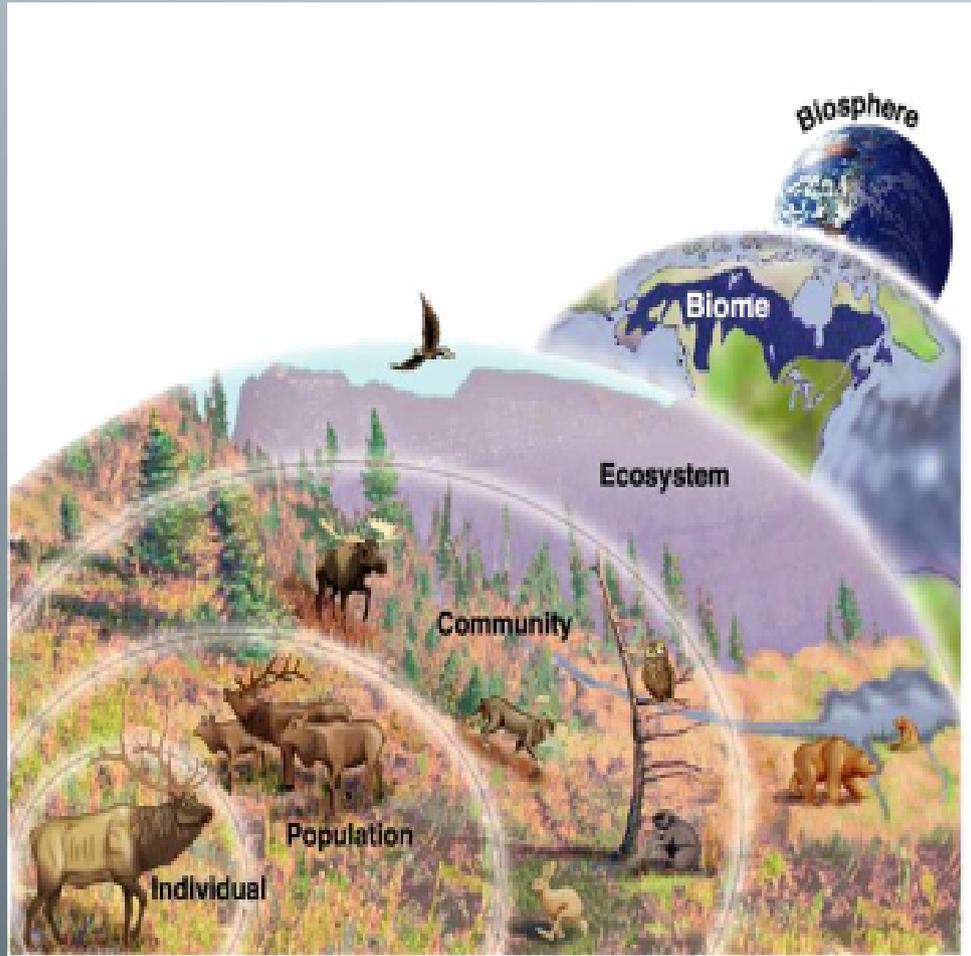
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# Introduction to Ecology

- Term derived from Greek oikos meaning 'house' and logos meaning 'study'.
- Therefore, Ecology is study of living space or house.
- In more scientific definition, Ecology is the study of organisms, environment and how the organisms interact with each other and their environment.
- Environment involves both biotic (all living organisms) and abiotic (all non-living parts like temperature, humidity, light etc.) components.

# Levels of Ecological Organization



- Individual- basic unit of study in ecology.
- Population- group of individuals of the same species, inhabiting the same area, and functioning as a unit of biotic community.
- Community- organization resulting from interdependence and interactions amongst population of different species in a habitat.
- Ecosystem- parts of nature where living organisms interact amongst themselves and with their physical environment.
- Biome- large regional unit characterized by a major vegetation type and associated fauna found in a specific climate zone. It includes forest biomes, grassland and savanna biomes, desert biome, etc.
- Biosphere- the entire inhabited part of

# Types of Ecosystem

Broadly there are two types of Ecosystem-

Terrestrial Ecosystem- these are the ecosystems which are found on land. Many times water acts as a limiting factor in these kind of ecosystems. Example- rainforest, deciduous forest, grassland ecosystems.



Aquatic Ecosystem- these are the ecosystems which are found in water bodies like oceans, river, lakes, wetlands etc.



# BIODIVERSITY



- Biodiversity is a term used to describe the enormous variety of life on Earth. It can be used more specifically to refer to all of the species in one region or ecosystem.
- Biodiversity refers to every living thing, including plants, bacteria, animals, and humans.

# Importance of Biodiversity

- Economic- biodiversity provides humans with raw materials for consumption and production. Many livelihoods, such as those of farmers, fishers and timber workers, are dependent on biodiversity.
- Ecological life support- biodiversity provides functioning ecosystems that supply oxygen, clean air and water, pollination of plants, pest control, wastewater treatment and many ecosystem services.
- Recreation- many recreational pursuits rely on our unique biodiversity, such as bird watching, hiking, camping and fishing. Our tourism industry also depends on biodiversity.
- Cultural- it provides expression of identity, through spirituality and through aesthetic appreciation. Indigenous population and tribes have strong connections and obligations to biodiversity arising from spiritual beliefs about animals and plants.
- Scientific- biodiversity represents a wealth of systematic ecological data that help us to understand the natural world and its origins.

# Threats to Biodiversity

There are many reasons which causes threat to biodiversity, which includes-

- **Human Activities and Loss of Habitat:** Human activities are causing a loss of biological diversity among animals and plants globally estimated at 50 to 100 times the average rate of species loss in the absence of human activities.
- **Desertification and Deforestation:** These are the main causes of biodiversity loss. Both processes are decisively influenced by the extension of agriculture. The direct cost of deforestation is reflected in the loss of valuable plants and animal species.
- **Wildlife Trade:** Some animals and body parts of some animals are traded to different countries for economical benefits leading to their loss in number.
- **Climate Change:** As climate warms, species will migrate towards higher latitudes and altitudes in both hemisphere. The increase in the amount of CO<sub>2</sub> in the air affects the physiological functioning of plant and species composition. Moreover, aquatic ecosystems, particularly coral reefs, mangrove swamps, and coastal wetlands, are vulnerable to changes in climate.

# Result of Biodiversity Exploitation

- Due to over exploitation of biodiversity different species of plants and animals face different levels of threats. For this reason IUCN (International Union for Conservation of Nature) has generated a list called **IUCN red list**.
- This list includes names of different plant and species which are facing threats at present and which need to be conserved so that they can be saved from extinction.

# International Union for Conservation of Nature (IUCN)

- Was founded by Julian Huxley in 5<sup>th</sup> October 1948.
- It is an international organization which works in the field of conservation of nature and sustainable use of natural resources. It is involved in data gathering and analysis, research, field projects, advocacy, and education.
- It's headquarter is in Gland, Switzerland.



# THE RED LIST CATEGORIES

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Extinct



Threatened



Least Concern



**Extinct (EX):** no reasonable doubt that the last individual has died

**Extinct in the Wild (EW):** known only to survive in captivity, cultivation or well outside its natural range

**Critically Endangered (CR):** facing extremely high risk of extinction in the wild

**Endangered (EN):** facing a very high risk of extinction in the wild,

**Vulnerable (VU):** facing a high risk of extinction in the wild.

**Near Threatened (NT):** close to qualifying, or likely to qualify for a threatened category in the near future

**Least Concern (LC):** population is stable enough that it is unlikely to face extinction in the near future

**Data Deficient (DD):** not enough information on abundance or distribution to estimate its risk of extinction

# Biodiversity Conservation

Biodiversity conservation is the protection and management of biodiversity to obtain resources for sustainable development.

*"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."*

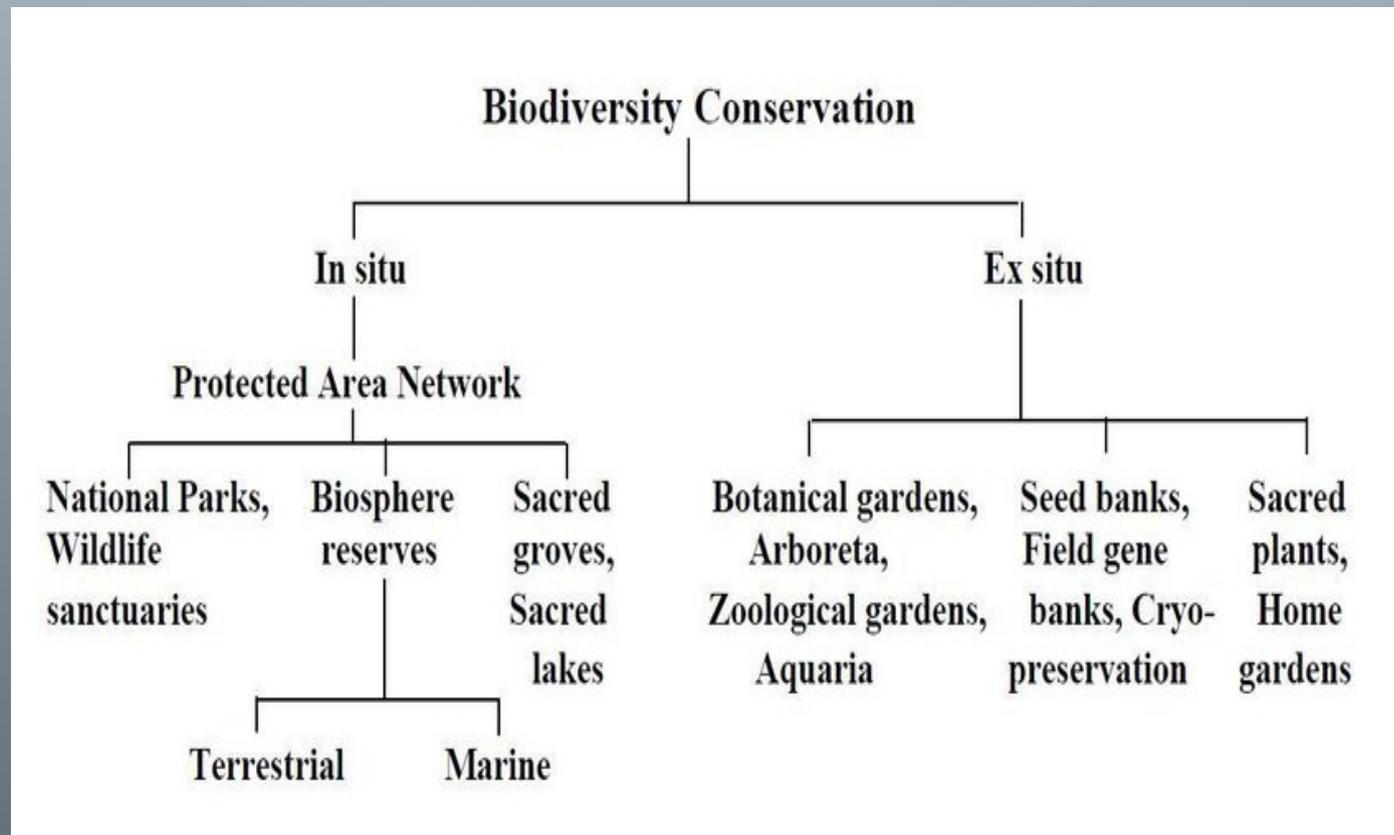
Biodiversity conservation has three main objectives:

- To preserve the diversity of species.
- Sustainable utilization of species and ecosystem.
- To maintain life-supporting systems and essential ecological processes.

# Conservation Methods

Broadly there are two methods for the conservation of Biodiversity-

- In-situ Conservation
- Ex-situ Conservation



# In-situ Conservation

- In-situ conservation of biodiversity is the conservation of species within their natural habitat. In this method, the natural ecosystem is maintained and protected.
- The in-situ conservation has several advantages. Following are the important advantages of in-situ conservation:
  - It is a cost-effective and convenient method of conserving biodiversity.
  - A large number of living organisms can be conserved simultaneously.
  - Since the organisms are in a natural ecosystem, they can evolve better and can easily adjust to different environmental conditions.
  - Certain protected areas where in-situ conservation takes place include national parks, wildlife sanctuaries and biosphere reserves.

# 1- Wildlife Sanctuaries

- These are the regions where only wild animals are found.
- Human activities such as timber harvesting, cultivation, collection of woods and other forest products are allowed here as long as they do not interfere with the conservation project.
- Also, tourists visit these places for recreation.
- Examples include Hastinapur Wildlife Sanctuary (Uttar Pradesh), Nandhaur Wildlife Sanctuary (Uttarakhand).

## 2- National Parks

- These are small reserves maintained by the government.
- Its boundaries are well demarcated and human activities such as grazing, forestry, habitat and cultivation are prohibited.
- Examples include Kanha National Park (Madhya Pradesh), Bandipur National Park (Karnataka).

## 3- Biosphere reserves

- These are multi-purpose protected areas where the wildlife, traditional lifestyle of the inhabitants, and domesticated plants and animals are protected.
- Tourist and research activities are permitted here.
- Examples include Nanda Devi (Uttarakhand), Cold desert (Himanchal Pradesh).

# Ex-situ Conservation

- Ex-situ conservation of biodiversity involves the breeding and maintenance of endangered species in artificial ecosystems such as zoos, nurseries, botanical gardens, gene banks, etc.
- There is less competition for food, water and space among the organisms.
  
- Ex-situ conservation has the following advantages:
  - The animals are provided with a longer time and breeding activity.
  - The species bred in captivity can be reintroduced in the wild.
  - Genetic techniques can be used for the preservation of endangered species.

# Ex-situ conservation strategies

1- Botanical and Zoological Gardens- these are dedicated to the collection, cultivation, preservation and display of a wide range of plants or animals labelled with their **botanical or zoological** names. Example includes Himalayan Botanical Garden (Uttarakhand), Nadankanan Zoological Park, Orissa



# 2- Gene Banks

These are used to preserve **genetic** material.

- In case of plants, process involves in-vitro storage, freezing cuttings from the plant, or stocking the seeds (e.g. in a seedbank).



- In case of animals this is done by the freezing of sperm and eggs in zoological freezers until further need.



## 3-Sacred Plants

- These are the plants which are considered sacred from the religious point of views which ultimately leads to their conservation by humans.
- Example includes Tulsi, Holy Basil.

## 4- Home Gardens

- The home garden can be defined as a farming system that combines different physical, social and economic functions on the area of land around the family home.

# Other Strategies for Biodiversity Conservation

Following are the important strategies for biodiversity conservation:

- All the varieties of food, timber plants, livestock, microbes and agricultural animals should be conserved.
- All the economically important organisms should be identified and conserved.
- Unique ecosystems should be preserved first.
- The resources should be utilized efficiently.
- Poaching and hunting of wild animals should be prevented.
- The reserves and protected areas should be developed carefully.
- The levels of pollutants should be reduced in the environment.
- Deforestation should be strictly prohibited.
- Environmental laws should be followed strictly.
- The useful and endangered species of plants and animals should be conserved in their nature as well as artificial habitats.
- Public awareness should be created regarding biodiversity conservation and its importance.

**THANK  
YOU**