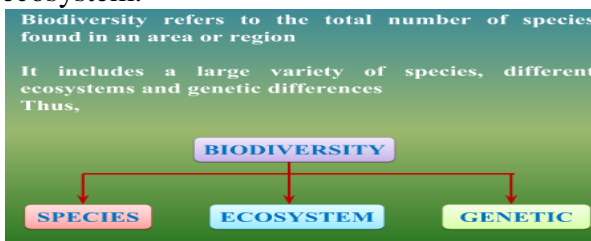
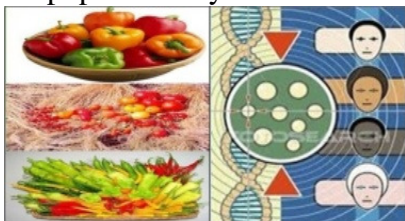


15. BIODIVERSITY CONSERVATION

- Biodiversity (Bio = Biological; Diversity = Variety)
- Sum total of all the variety of living organisms on earth constitute biodiversity.
- Biological diversity is usually considered at three different levels –
 - a) Genetic diversity i.e. at genetic level.
 - b) Species diversity i.e. at the level of species,
 - c) Ecosystem diversity i.e. at the level of ecosystem.



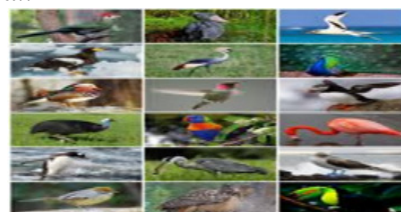
- **Genetic diversity**
Refers to the variety of genes contained within species of plants, animals and micro-organisms.
- New genetic variation in individuals occurs by gene and chromosomal mutation, and in organisms with sexual reproduction, it spreads across the population by recombination.



- The differences could be in alleles (different variants of the same gene), in entire gene (the traits determining particular characteristics) or in chromosomal structure.
- The amount of genetic variation (gene pool) present in an inter-breeding population is shaped or decided by the process of natural selection.
- India has high genetic diversity and is regarded as a Vavilov's centre of high crop genetic

diversity –named after the Russian agro-botanist N I Vavilov

- **Species diversity**
- Refers to the variety of species within a geographical area. Species diversity can be measured in terms of:
 - (a) **Species richness** – which is the number of various species in a defined area
 - (b) **Species abundance** – it refers to the relative numbers among species. For example, the number of species of plants, animals and microorganisms may be more in an area than that recorded in another area..



- **Taxonomic or phylogenetic diversity**
- Refers to the genetic relationships between different groups of species.
- When taxonomically unrelated species are present in an area, the area represents greater species diversity as compared to an area represented by taxonomically related species.
- **Ecosystem diversity**
- It refers to the presence of different types of ecosystems.
- Ecosystem diversity encompasses the broad differences between ecosystem, and the diversity of the habitats and ecological processes occurring within each ecosystem type.

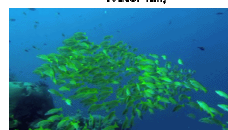
Ecosystem Biodiversity



Water fall,



Sun rise

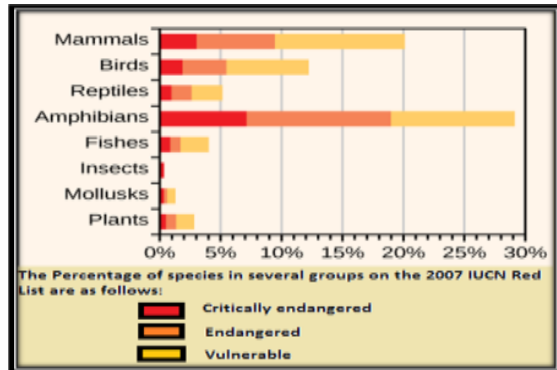


Ocean

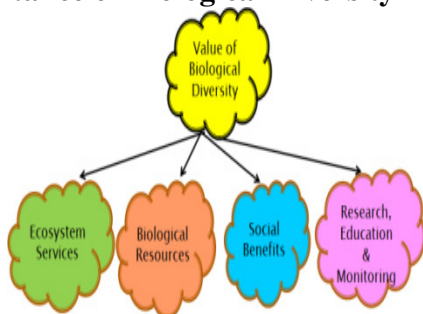


Sun set

- India is a country of vast diversity and it is among the 12 “mega-diversity” countries in the world.
- Number of species of Animals/Plants**

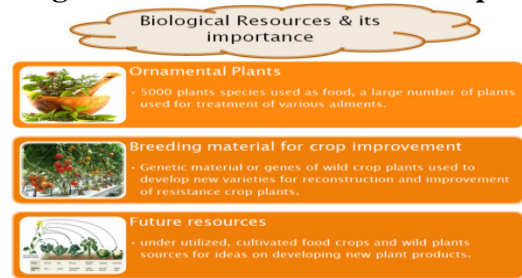


- The most diversity-rich are Western-Ghats and the North-Eastern region.
- A very large number of species found in these ecosystems are endemic i.e. they are found nowhere else except in India.
- These are concentrated mainly in North-East, Western-Ghats, north-west Himalaya, and Andaman and Nicobar Islands.
- About 33% of the flowering plants, vertebrates, 53% freshwater fish, 60% amphibians, 36% reptiles and 10% are endemic in India.
- A **biodiversity hotspot** is a biogeographic region that is both a significant reservoir of biodiversity and is threatened with destruction.
- Importance of Biological Diversity**

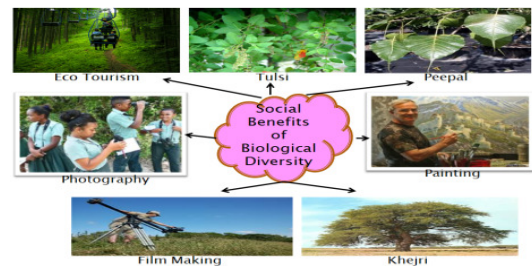


- Ecosystem services** also support human needs and activities such as intensely managed production ecosystems.
 - Protection of water resources
 - Soil protection
 - Nutrient storage and cycling
 - Pollution reduction

Biological resources of economic importance



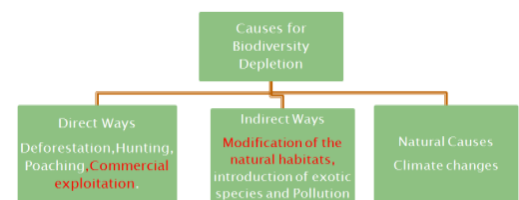
Social Benefits



Research, Education and Monitoring

To get better use from biological resources, research is going on -

- Maintain the genetic base of harvested biological resources
- Rehabilitation of degraded ecosystems.
- Ecological restoration
- Forestation, which will save the environment, soil, climate, wild life etc.
- Tissue culture, gene bank, use of insect and other pest resistant plants.
- India is uniquely rich in all aspects of biodiversity including ecosystem, species and genetic biodiversity.
- It has some of the world's most biodiverse regions like - desert, high mountains, highlands, tropical and temperate forests, swamp lands, plains, grasslands, areas surrounding rivers, as well as island
- Reduction/loss of plant and animal species is called Biodiversity depletion.



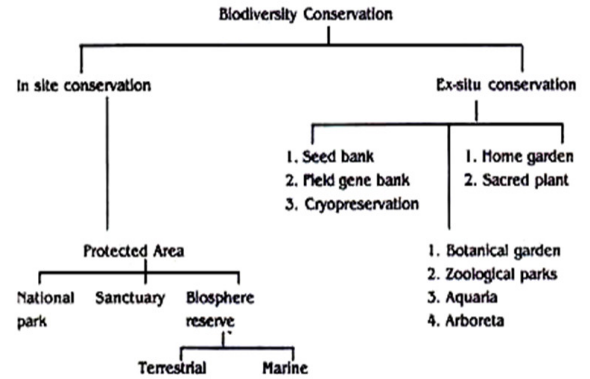
- The World Conservation Union (IUCN) (formerly known as International Union for the Conservation of Nature and Natural Resources, IUCN) has recognized eight Red List categories according to the conservation status of species. These categories are defined as follows-

List Category	Definition
Extinct	A taxon is extinct when there is no reasonable doubt that the last individual has died.
Extinct in the wild	A taxon is extinct in the wild when exhaustive surveys in known and/or expected habitats have failed to record an individual.
Critically endangered	A taxon is critically endangered when it is facing high risk of extinction in the wild in immediate future.
Endangered	A taxon is endangered when it is not critically endangered but is facing a very high risk of extinction in the wild in near future.
Vulnerable	A taxon is vulnerable when it is not critically endangered or endangered but is facing high risk of extinction in the wild in the medium term future.
Lower risk	A taxon is lower risk when it has been evaluated & does not satisfy the criteria for critically endangered, endangered or vulnerable.
Data deficient	A taxon is data deficient when there is inadequate information to make any direct or indirect assessment of its risk of extinction.
Not evaluated	A taxon is not evaluated when it has not yet been assessed against the above criteria.

- According to the Red List, in India, 44 plant species are critically endangered, 113 endangered and 87 vulnerable.
- Amongst animals, 18 are critically endangered, 54 endangered and 143 Vulnerable.
- Conservation is the planned management of natural resources to retain the balance in nature and retain the diversity.
- It also includes wise use of natural resources in such a way that the needs of present generation are met and at the same time leaving enough for the future generations.
- Conservation of biodiversity is important to:-
 - Prevent the loss of genetic diversity of a species,
 - Save a species from becoming extinct, and
 - Protect ecosystems damage and degradation.
- Conservation efforts can be grouped into the following two categories:
- 1. In-situ (on-site) conservation** includes the protection of plants and animals within their natural habitats or in protected areas. Protected

areas are land or sea dedicated to protect and maintain biodiversity.

- 2. Ex-situ (off-site) conservation** of plants and animals outside their natural habitats. These include botanical gardens, zoo, gene banks, seed bank, tissue culture and cryopreservation.



- A national park may be set aside for purposes of public recreation and enjoyment or because of its historical or scientific interest.
- Most of the landscapes and their accompanying plants and animals in a national park are kept in their natural state.
- A wildlife sanctuary is a naturally occurring area, such as an island, that provides protection for species from hunting, predation, competition or poaching; it is a protected area, a geographic territory within which wildlife is protected.
- A biosphere reserve is an ecosystem with plants and animals of unusual scientific and natural interest. It is a label given by UNESCO to help protect the sites in the year 1975.
- The plan is to promote management, research and education in ecosystem conservation. This includes the 'sustainable use of natural resources'.
- A Biosphere Reserve consists of core, buffer and transition zones.
- Project Tiger is governed by National Tiger Conservation Authority (NTCA).
- Project Elephant was launched in 1992 by the Govt. of India, (MoEFCC) to provide financial and technical support of wild life management efforts by states for their free ranging populations of wild Asian Elephants.

- The project aims to ensure long-term survival of viable populations of elephants in their natural habitats by protecting the elephants, their habitats.
 - Small forest patches protected by tribal communities due to religious sanctity. These have been free from all disturbances.
 - Sacred forests are located in Karnataka, Maharashtra, Kerala, Meghalaya.
 - Several water bodies as Khecheopalri lake in Sikkim, have been declared sacred by the people, leading to protection of aquatic flora and fauna
 - Many rivers are also considered sacred.
 - **Botanical gardens**- is a place where plants, especially ferns, conifers and flowering plants, are grown and displayed for the purposes of research and education.
 - **Zoological parks** have been looked upon essentially as centres of education about animal species and recreation.
 - They have also played an important role in the conservation of endangered animal species
 - Ex-situ collection and preservation of genetic resources is done through gene banks and seed banks
- **Cryopreservation:** (“freeze preservation”) is particularly useful for conserving vegetative propagated crops.
 - Cryopreservation is the storage of material at ultra low temperature of liquid nitrogen (-196⁰C) and essentially involves suspension of all metabolic processes and activities.
 - **Germ plasm** conservation at molecular level is now feasible and attracting attention.
 - Cloned DNA and material having DNA in its native state can all be used for genetic conservation.
 - The Wildlife Protection Act (1972) contains provisions for penalties or punishment to prevent poaching and illegal trade.
 - India is also a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (**CITES**).
 - The Convention entered into force on 1st July, 1975. In addition to this, India is also a signatory to Convention on Biological Diversity (CBD), which it signed on 29th December, 1993 at Rio de Janeiro during the Earth Summit.
 - Government of India have also passed the Biological Diversity Act, 2002,



Check Yourself

1. Species diversity includes:
 - a. Species richness
 - b. Species abundance
 - c. Phylogenic diversity
 - d. All the above
2. When was the wildlife Protection Act is introduced in India?
 - a. 1948
 - b. 1969
 - c. 1972
 - d. 1974
3. National Bureau of Fish Genetic Resources situated in:
 - a. Delhi
 - b. Kolkata
 - c. Lucknow
 - d. Karnal
4. Which one region of India has found richest biodiversity ?
 - a. North East India
 - b. Northern plain of India
 - c. South East India
 - d. Chotta Nagpur Plateau
5. Bandipur sanctuary is famous for:
 - a. Bison, elephant and langurs
 - b. Duck, deer and herons
 - c. Panda, tiger and lion
 - d. Mangrove, duck and wild dog

Ans: 1. d. 2.c 3.c 4.a 5.a



Stretch Yourself

1. Define ecosystem biodiversity.
2. What is cryopreservation?
3. Name the zones of biosphere reserve.
4. When was project tiger initiated in India?
5. When Government of India did introduce Biodiversity Act?



Test Yourself

1. Explain different levels of biodiversity with example.
2. Why biological diversity does is so important?
3. Describe ecosystem services with examples.
4. Differentiate between exotic and endemic species.
5. How does tribal community help to conserve forest and grooves? Explain with examples.