



Biodiversity and Conservation

Biodiversity

- ❖ Biodiversity or biological diversity is the variety and variability of life on Earth, popularised by the socio-biologist **Edward Wilson**.
- ❖ A conservative and scientifically sound estimate made by Robert May places the global species diversity at about 7 million.
- ❖ Among animals, insects make more than 70% of total, i.e., out of every 10 animals on this planet, 7 are insects.
- ❖ Although, India has only 2.4% of world's land area, its share of the global species diversity is an impressive 8.1 percent.

Patterns of Biodiversity

- ❖ Species diversity decreases as we move away from equator towards the poles.
- ❖ Species richness within a region increased with increasing explored area, but only upto a limit (Humboldt).
- ❖ The relation between species richness and area for a wide variety of taxa (angiosperms, birds, bats, freshwater fishes) is a rectangular hyperbola. On a logarithmic scale, it is a straight line .
- ❖ The value of Z lies in the range of 0.1 to 0.2 regardless of region or taxa.
- ❖ Slope of the line is much steeper in very large areas like the entire continents.

Importance of Species Diversity to the Ecosystem

- ❖ Communities with more species, tend to be more stable than those with less species.
- ❖ **David Tilman's** long-term ecosystem experiments using outdoor plots show that plots with more species showed less year-to-year variation in total biomass and increased diversity contributed to higher productivity.
- ❖ The '**rivet popper hypothesis**' of Paul Ehrlich states that loss of rivets on the wings (Key species, that drive major ecosystem functions) will be detrimental for the stability of the ecosystem (aeroplane). So, each species is important for the ecosystem.

Loss of Biodiversity

- ❖ The **IUCN red list (2004)** documents extinction of 784 species (including 338 vertebrates, 359 invertebrates and 87 plants) in the last 500 years.
- ❖ There were five episodes of mass extinction of species in the past, before humans appeared.
- ❖ The Sixth Extinction presently in progress is 100 to 1000 times faster than pre-human times and our activities are responsible for the faster rates.

Causes of Biodiversity Losses

- ❖ Habitat loss and fragmentation, over-exploitation, alien species invasions and co-extinctions are four major causes ('The Evil Quartet') of biodiversity losses.

Table 1: Loss of biodiversity

Cause	Loss
Habitat loss and fragmentation	Forests for soybean cultivation
Over-exploitation	Steller's sea cow, passenger pigeon
Alien species invasions	cichlid fish due to Nile Perch, carrot grass (<i>Parthenium</i>), <i>Lantana</i> and water hyacinth (<i>Eicchornia</i>), indigenous fishes due to <i>Clarias gariepinus</i>
Co-extinctions	Host fish and its parasites, plant-pollinator

Biodiversity Conservation

- ❖ The reasons for why should we conserve biodiversity can be grouped into three categories: narrowly utilitarian, broadly utilitarian, and ethical.

Narrowly Utilitarian Arguments

- ❖ Humans derive countless direct economic benefits from nature — food, firewood, fibre, construction material, industrial products and medicinal products.

Broadly Utilitarian Arguments

- ❖ Biodiversity plays a major role in many **ecosystem services** that nature provides.
- ❖ Pollination aesthetic pleasure etc.

Ethical Arguments

- ❖ We have a moral duty to care for their well-being.

Types of Biodiversity Conservation

In-situ Conservation.

- ❖ It is a type of conservation that performs inside the natural habitat it conserves biodiversity at all levels.
- ❖ Biodiversity hotspots are the regions with very high levels of species richness and high degree of endemism.
- ❖ Biodiversity hotspots and sacred groves are *in situ* conservation strategies.
- ❖ 14 biosphere reserves, 90 National Parks and 448 wild life sanctuaries provide legal protection in India.

Ex-situ Conservation.

- ❖ It is conservation of selected rare threatened plants/animals outside their natural habitat.

- ❖ Zoological Parks, Botanical gardens and wild-life Safari parks are included under *ex-situ* conservation.
- ❖ Plants can be propagated using tissue culture methods.
- ❖ Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks.
- ❖ Cryopreservation is a method to protect and preserve gametes of threatened species in viable and fertile condition.

International Efforts for Conserving Biodiversity

- ❖ The Earth Summit was held in Rio de Janeiro (1992) for biodiversity conservation and sustainable utilisation of benefits.
- ❖ World Summit on sustainable development held in 2002 in Johannesburg, South Africa, 190 countries pledged for significant reduction in current rate of biodiversity loss at global, regional and local levels by 2010.