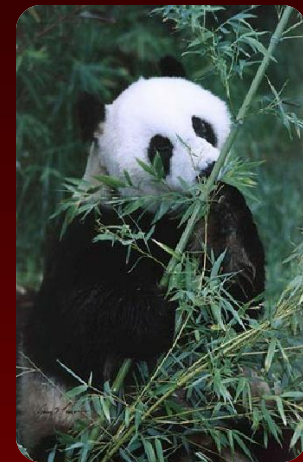


BIODIVERSITY AND ENVIRONMENTAL MONITORING

**Elective Course: MSc (Env Sc), Sem-2, Paper-2
(Natural Resources & their Management)**



PROF. AMRITESH C. SHUKLA
Dept of Botany, University of Lucknow
Lucknow- 226007, IN

Biodiversity - Definition



The variability among living organisms from all sources including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

Types of Biodiversity

Genetic diversity: Genetic **variability** or diversity within a species, i.e. between the individuals of a species

Example ; 5,000 recorded varieties of mango

88,000 recorded varieties of *Oryza sativa*



2. Species diversity **diversity** between different species

Example : *Felis tigris* *Felis domestica*



3. Ecosystem diversity – diversity within a region



Grassland



Shola forest

Facts related to Biodiversity

- Total Land Area of Earth –
510,065,284 sq.km
- Forest Cover – 38.7 m. sq.km
(26%)
- 40 % of Global Forest Land is
in South America, Africa,
and South Asia.



Facts related to Biodiversity contd..

- There are **5** million to 100 million species on earth.
- Only about 1.9 million species have been catalogued so far.
- There are **34** recognised “Hotspots” in the world.
- **44.4%** of Global Plant species and **35.3%** of Vertebrate species are present in Hotspots.



Facts related to Biodiversity contd..

Total land area of India - 143 million.ha

India occupies 2.47% of the World's geographical area and has only 1% of the forest

India has 16.1% of world human population and 15.1% of cattle population

Forest Cover in India –
23.57 %



Facts related to Biodiversity contd..

India is sharing **12.53 %** of world's biodiversity

India has **3.9 %** of grasslands, **2.0 %** of hot deserts, **4.1 m.ha** of wetland ecosystems.

India is the **7th** largest country in the world and one among the **17** mega diversity centers.



Facts related to Biodiversity contd..

India recorded :

- 45,000 + species of wild plants
- 89,000 + species of wild animals
- At least 320 species of wild relatives of crops have been originated here.



Facts related to Biodiversity contd..

In India:

1,39,000 species of plants, animals & microbes are recorded

More than **4 lakh** species are yet to be identified

There are **three** mega centers and **26** micro centers of endemism

Endemism is the ecological state of a species being unique to a defined geographic location, such as an island, nation, country or other defined zone, or habitat type; organisms that are indigenous to a place are not endemic to it if they are also found elsewhere.

PLANT SPECIES IN INDIA AND WORLD

Taxa	Species	
	India	World
Bacteria	850	4000
Viruses	unknown	4000
Algae	6500	40,000
Fungi	14,500	72,000
Lichens	2000	17,000
Bryophyta	2850	16,000
Pteridophyta	1100	13000
Gymnosperms	64	750
Angiosperms	17,500	250,000



ANIMAL SPECIES IN INDIA AND WORLD

Taxa	Species	
	India	World
Insects	60,000	8,00000
Mollusca	5000	100000
Fishes	2,500	23,000
Amphibians	190	4,520
Reptiles	400	6,550
Birds	1,175	8,400
Mammals	872	4,231



Hotspots

1. Endemism-

(0.5% or 1500 species of the world's 3 Lakh Plant species as endemics should be present)

2. Degree of Threat

Hotspots

1. Western Ghats
2. Eastern Himalayas
3. Indo-Burma region
4. Sundaland (Indonesia, Malaysia, parts of India especially Nicobar Islands)



International union for Conservation of Nature (IUCN) categories

Extinct

A species not definitely located in the wild and never sighted even once in the last 50 years

Threatened Species: The term is used in conservation context for species which are in one of the categories –

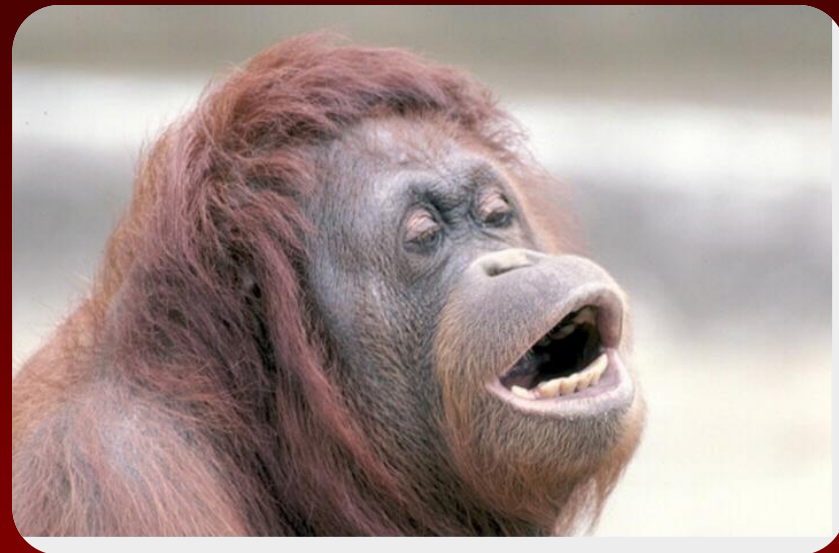
Endangered

Vulnerable

Rare

Indeterminate

RED DATA BOOK



Why Biodiversity is important?

Provides food, fodder, fruit, fuel, timber, medicine

1. Commercial value :

Oil, Fertilizers etc. extracted from species of plants and animals.

2. Biological value:

Pollination
Soil formation
Nutrient enrichment



3.Recreational Value:

Can not be measured in terms of money.

4. Aesthetic Value:

Art, Poetry, Literature.

5.Scientific Value:

Gene Pool, Evolution, Human Welfare, etc.,.



Value of a Tree

A tree that lives for 50 years generates:

- Rs. 5.3 lakhs worth of oxygen
- Facilitates Rs. 6.4 lakhs worth of soil erosion control
- Creates Rs. 10.5 lakhs worth of air pollution control
- Provides Rs. 5.3 lakhs worth of shelter for birds and animals



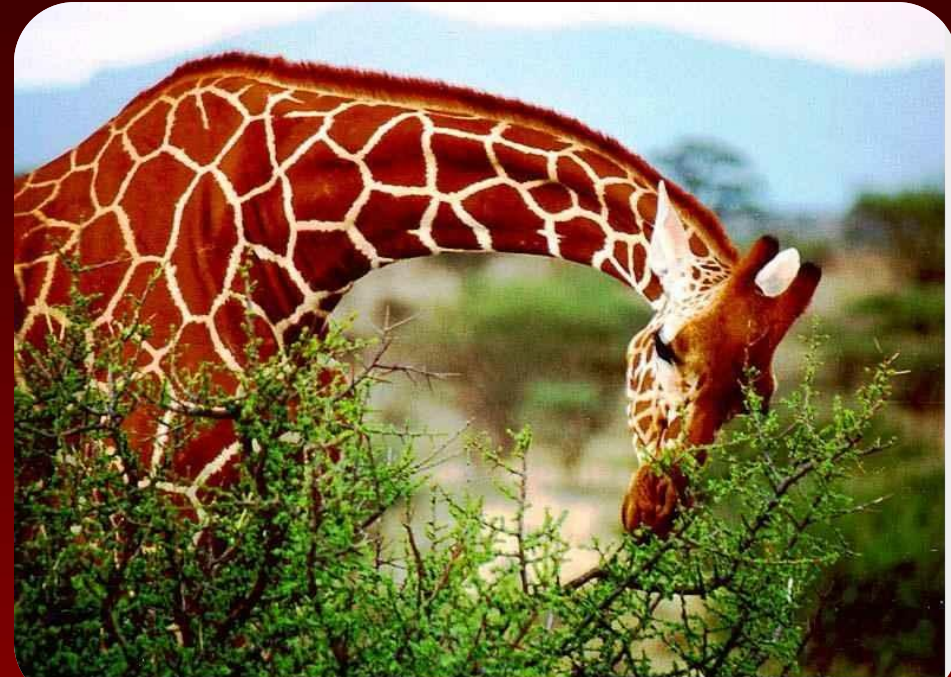
....Value of a Tree

- Recycles Rs. 6.4 lakhs worth of fertility
- Besides provide flower, fruits and timber
- When a tree is fell it is something worth more than Rs. 33. 9 lakhs.

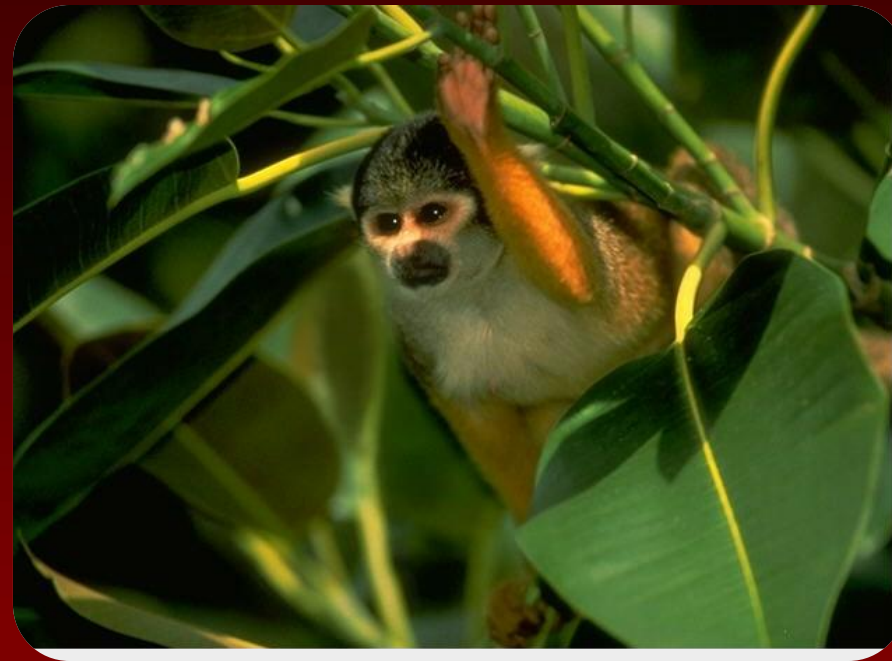


Threats to Biodiversity

1. Deforestation and overgrazing
2. Habitat destruction and fragmentation of the area.



3. Poaching and hunting for flesh, fur, skin, horn, nail and recreation.
4. Forest fires including smoking in the woods.
5. Over-exploitation of the resources.



6. Natural calamities like floods, high wind velocities, earthquakes, etc.,.
7. Pollution of various kinds and release of toxic substances.
8. Soil erosion and loss of soil nutrients.



9. Population pressure and unequal distribution of the resources

10. Agricultural expansion

11. Spreading urbanization and establishment of industries.

12. Construction of hydro electric power projects



13. Climatic changes like depletion of ozone, global warming, increased concentration of carbon dioxide, etc,

14. Mining activities and quarrying.

15. Lack of awareness.



Impact of Loss of Biodiversity

Global warming and climate change



Increased pollution

Soil erosion and loss of fertility

**Decomposition rate
by microbes is altered**

Nutrient cycling is altered



Reduces gene pool - affects speciation

Food chain is altered

Alteration in Hydrologic Cycle



Conservation Measures

- 1. Maintenance of the integrity of the habitat and improvement of habitat in productivity and quality for the desired species to grow and reproduce well.**



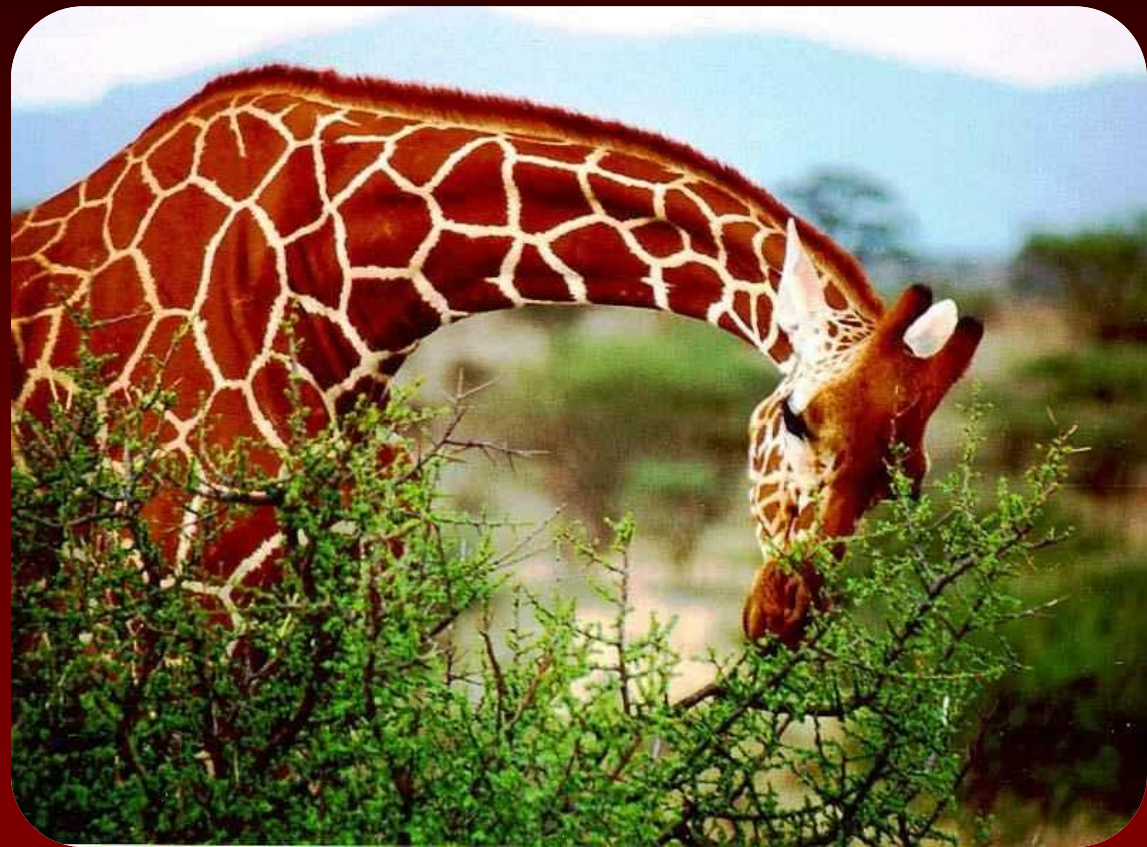
2 Prevention and control of forest fires. Burning of grasslands has to be controlled. By controlling the forest fire protection can be given to wildlife.

3 Excessive cutting should be eliminated and only mature trees should be harvested. New seedlings should replace the harvested trees.



4 Fragmentation of the forest area or wildlife habitat, which decreases the biological biodiversity (both genetic diversity and ecological diversity), should be minimised.

5 Wise management in the control of insects and disease that attack trees.



6 Measures to check the velocity of wind in deserted areas, planting 'wind breaks' across the direction of wind is helpful. Trees and shrubs may be planted in several rows to check the blowing away of the fertile top soil, which determines the vegetational growth.

7 One should not smoke in the woods. Camps fire and trash fires should be carefully tended and thoroughly extinguished.



8 Grasses such as *Cynodon dactylon* are utilised as erosion resisting plants. Conservation of many such types of grasses help in improving the soil fertility of the region for luxuriant growth of the plants.

9 Reforestation in degraded forest and agricultural wastelands with suitable strains of tree species, which are viable, genetically superior and disease resistant



10. Protection of forest from illicit felling and overgrazing

felling and

11. Establishment and maintenance of 'germplasm banks wild species for future genetic improvement and breeding programme



12. The maintenance and preservation of germplasm of vegetatively propagated species is often a difficult task.

Hence to conserve these 'gene-pool development of tissues culture techniques should be greatly emphasized.



13. Improvement of the heredity of trees and proper adoption of breeding techniques.

14. The Management of natural forests, which will ensure future productivity and environmental stability, should be practiced



15. If the principles and procedures of "Social Forestry are followed, the stress on the exploitation of renewable forest resources can be minimised.



16. Conservation of endangered and endemic species in natural forests, which are the “guardians of diversity”, should be given prime importance.

17. Proper utilization and management of non wood based resources & establishment of Energy Plantations



- 18. Implementation of effective and scientific methods to minimise the pollution of water, soil and air to ensure high productivity of the biomass in this region. Prevention of water pollution will protect the aquatic animal life**
- 19. Improper land degradation due to mining activities should be stopped.**



20. Sensible and wise use of forest products and the public awareness about the importance of forest wealth to mankind and ecosystem can promote the conservation

21. Control of soil erosion and establishment of vegetative cover will provide fruit or browse for wild animals.



22. Efforts should be intensified to curb the destructive activities of poachers.

23. Stabilization of water levels in pools, ponds and lakes should be undertaken so as to prevent seasonal destruction of aquatic life through evaporation.

24. Development of renewable resources in an area according to the need of organisms in the same area.



25. Prey - predator relation should be worked out based on the carrying capacity of the habitat. This will help in promoting the habitat improvement.

26. Conservation also includes restoration of those species, which can and should be restored.



27. Establishment of National Parks, National Sanctuaries are excellent areas for the preservation of natural biotic communities.

28. Establishment of Biosphere Reserves.



29. Development of electronics as a tool in the conservation of wildlife should be given prime importance as electronic devices are helpful in aerial photography, data collection of plants and animals, detection of forest fires, educational programmes and monitoring of animal movements.



30. Implementation of educational programmes to promote the knowledge of conservation and preservation of wildlife (including flora and fauna) should be done through literatures, scientific exhibitions, audio visual aids and conferences stressing upon environmental conservation



Summary...

- National Park
- Wildlife Sanctuaries
- Wetlands
- Mangroves
- Sacred Groves
- Protected Landscapes
- Ethnobiological Reserves
- Reserve and Protected Forests
- Preservation plots
- Biosphere Reserves



...are the important monitoring sources of biodiversity

THANK YOU ALL....

amriteshcshukla@gmail.com