Unit – II
Biodiversity Conservation

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Introduction

Biodiversity – The sum of all the species of plants, animals, fungi, and micro-organisms living on earth in either terrestrial or aquatic habitats

Recent Extinctions (India)

Pink headed Duck

Sumatran Rhinoceros

Javan Rhinoceros

warbler

Himalayan Quail

Asiatic cheetah

Biodiversity Conservation

- **Convention on Biodiversity (June, 1992)** – stressed on biodiversity conservation for sustainable development and perpetuation of human race on Earth.
- **Conservation** – Management of human use of biosphere for greatest sustainable benefit to the present generation and maintain potential to meet needs and aspirations of future generations.
- There are two approaches of biodiversity conservation:
  1. **In-situ** (natural habitat)
  2. **Ex-situ** (outside natural habitat)

In-situ Methods	Ex-situ Methods
Wildlife Sanctuary	Seed/ Gene bank
National Park	Botanical and Zoological Gardens
Biosphere reserve	Tissue culture
Sacred grooves	Storage of pollen
	Cryopreservation
	Recombinant DNA technology
	Home gardens

National Park	Wildlife Sanctuary	Biosphere Reserve
Habitat preservation of particular species e.g. Tiger, Lion, Rhino	**Species** conservation e.g. Pitcher plant, Great Indian Bustard	**Ecosystem** oriented
Not based on scientific principles	Not based on scientific principles	Based on sound scientific principles
0.04 – 3162 Km^2	**0.61 – 7818 Km^2**	**>5670 Km^2**
Boundaries circumscribed by state legislation	Limits are not sacrosanct	Boundaries circumscribed
No **biotic interference** except buffer zone	Limited biotic interference	No biotic interference except buffer zone
Tourism permissible and often encouraged	Permissible	Normally not permissible
Research and scientific management lacking	Lacking	Carried on

State	NP/ WS
Assam	Kaziranga NP, Manas WS
Gujarat	Gir NP, Wild Ass Sanctuary
Haryana	Sultanpur lake Bird Sanctuary
Karnataka	Silent Valley NP
Madhya Pradesh	Kanha NP
Manipur	Keibul Lamjao NP
Orissa	Chilka lake Bird Sanctuary
Rajasthan	Ranthambore NP, Sariska WS, Ghana Bird Sanctuary
Sikkim	Kanchenjunga NP
Uttrakhand	**Jim Corbett NP (1936)**, Rajaji NP
West Bengal	Sunderban NP

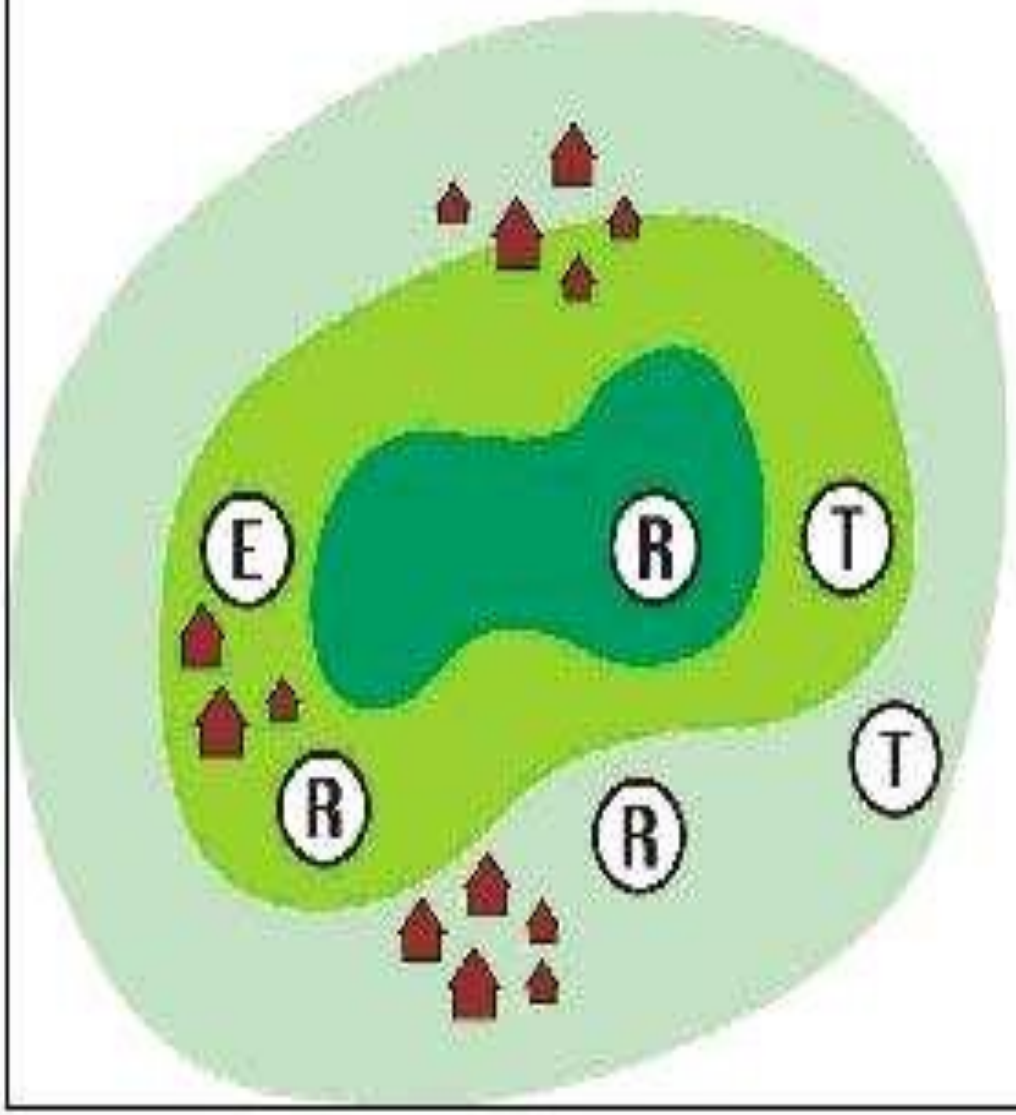
Biosphere Reserves

- Undisturbed natural areas for scientific study as well as areas in which conditions of disturbance are under control.
- **Established for**:
  - Ecological research
  - Habitat preservation
- Biosphere Reserve Network Programme was launched by **UNESCO in 1971** under **MAB** (Man and Biosphere Programme).
- **Objectives:**
  - ✔ Conserve biodiversity
  - ✔ Opportunity for environmental education and training.
  - ✔ Promote international cooperation.
  - ✔ Disseminate experience to promote sustainable

Biosphere reserve	State
Nilgiris (1986)	Tamil Nadu, Kerala, & Karnataka
Nanda Devi	Uttrakhand
Gulf of Mannar	Tamil Nadu
Kaziranga	Assam
Sunderbans	West Bengal
Thar Desert	Rajasthan
Mannas	Assam
Kanha	Madhya Pradesh
Little Rann of Kutch	Gujarat
Great Nicobar Island	Andamans & nicobar

Total Biosphere Reserves in India - 18

Structure of a model biosphere reserve.



Core Area

Buffer Area

Transition Area

Human Settlement

R Research

E Education / Training

T Tourism / Recreation

Protected Areas of India (July, 2019) NEW

	No.	Total Area (km^2)	Coverage % of Country
National Parks (NPs)	104	40501.13	1.23
Wildlife Sanctuaries (WLSs)	551	119775.80	3.64
Conservation Reserves (CRs)	88	4356.49	0.13
Community Reserves	127	525.22	0.02
Protected Areas (PAs)	**869**	**165158.54**	**5.02**

Geographical Area of India (http://knowindia.gov.in/) = 32,87,263 km^2

Forest cover of India (FSI, 2017) = 7,08,273 km^2

Percentage Area under Forest cover = 21.54 % of Geographical Area of India

What is World Heritage Sites

A UNESCO World Heritage Site is a place that is listed by the United Nations Educational, Scientific and Cultural Organization as of special cultural or physical significance.

Natural World Heritage Sites in India (As on July, 2016)

Sl. No.	Name of WH Site	State Location	Year of Notification	Area (sq.km)
1	Great Himalayan National Park Conservation Area	Himachal Pradesh	2014	905.4
2	Western Ghats	Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala	2012	7,953.15
3	Nanda Devi and Valley of Flowers National Parks	Uttarakhand	1988	630.00 87.50
4	Sundarbans National Park	West Bengal	1987	1,330.10
5	Kaziranga National Park	Assam	1985	429.96
6	Keoladeo National Park	Rajasthan	1985	28.73
7	Manas Wildlife Sanctuary	Assam	1985	391.00

Mixed World Heritage Sites in India (As on July, 2016)

Sl. No.	Name of WH Site	State Location	Year of Notification
1	Khangchendzonga National Park	Sikkim	2016

(Source: UNESCO World Heritage Convention: http://whc.unesco.org/en/statesparties/in-title=World)

Ex-situ Methods

- Cultivation of **rare plants** and holding of **threatened animals** species in botanical and zoological gardens or reserve them in the form of seeds in seed bank (Gene bank) or tissue culture.

Botanical Garden

Zoological Garden

Gene/ Seed Bank

- **Gene banks** conserve both seeds and vegetative materials.
- The **stored germplasm** safeguard species threatened with extinction but is also actively utilized by plant scientists and breeders to develop novel varieties.
- Seeds stored in metabolically suspended state.
- **Viability** can be extended by controlling:
  - **Moisture** – dried to 5% moisture
  - **Temperature** – (-10 to -20 ^{0}C/ -196 ^{0}C in Liq. N_2)
  - **Oxygen availability**

- **Orthodox Seeds** – Withstand reduction in moisture and temperature (Cereals & Legumes).

- **Recalcitrant Seeds** – Killed by drying and freezing (Jackfruit, Tea, Cocoa, Rubber, Palm, Litchi, and Coconut etc.)

Tissue Culture

Necessary under following conditions:

- Clone is to be conserved and maintained.
- Seed progeny highly variable
- Plants have recalcitrant seeds
- Seeds are altogether lacking – sugarcane, banana, and arvi

Shoot tip culture – more stable & easy to regenerate. A preferred material for international exchange of germplasm.

- ✔ Large number of genotypes can be stored in small area in culture vessels.
- ✔ Less costly to maintain culture in laboratory.
- ✔ Cultured - animal cells, spermatozoa, ovarian, and embryonic tissues etc.

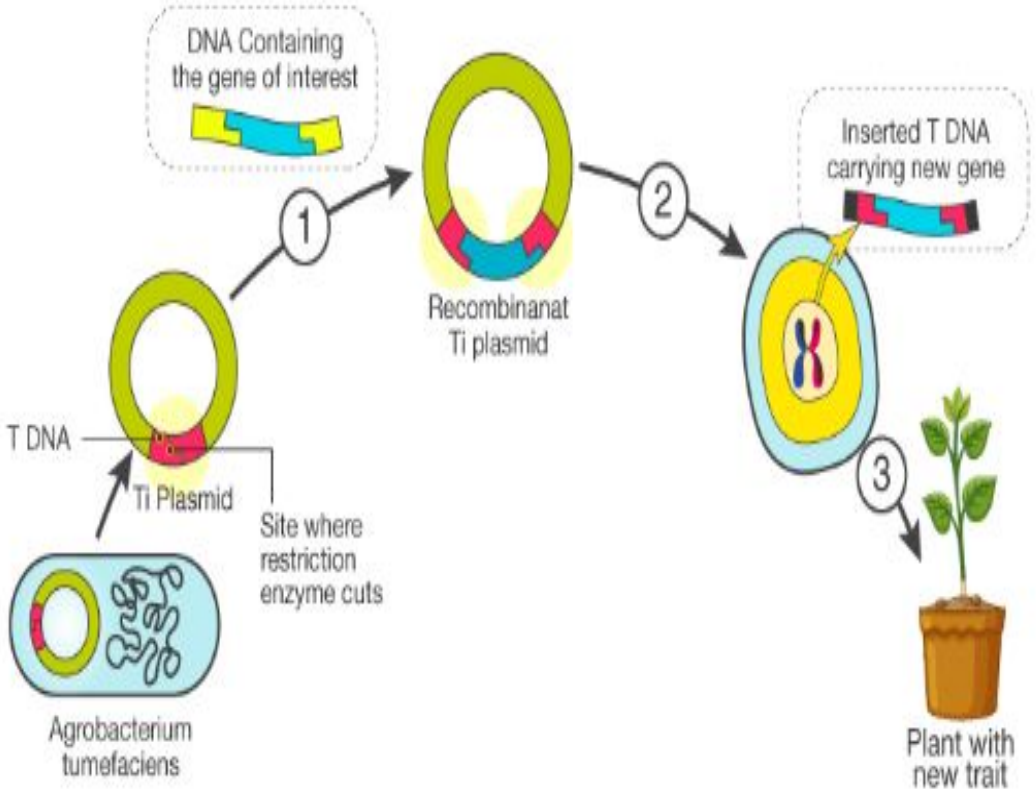
Seed/ Gene Bank

Tissue Culture

- **Pollen Storage** – short period storage.

- **Cropreservation** – Liquid temperature (-196 ^{0}C)

- **Recombinant DNA technology** – Clone DNA in Escherichia coli



Further Readings

- **Conservation and the race to save biodiversity,** https://www.khanacademy.org/science/high-school-biology/hs-ecology/hs-human-impact-on-ecosystems/v/conservation-and-the-race-to-save-biodiversity
- Why is it important to conserve Biodiversity?, https://www.youtube.com/watch?v=Hu5V5WJiptU
- Learning to protect biodiversity, https://www.youtube.com/watch?v=kHhspf5IfdE
- Types of Biodiversity, https://www.youtube.com/watch?v=pSUfsWzWbeg


Thank you for attention!!!