

**Course: Botany Honours (CBCS); Semester: IV**

**CORE COURSE-8: PLANT GEOGRAPHY, ECOLOGY AND EVOLUTION (BOT-A-CC-4-8-TH)**

**Topic: 4: Conservation of Biodiversity**

**Syllabus: 4.3. In- situ and ex-situ conservation, 4.4. Seed-banks, 4.5. Cryopreservation**

**Ex-situ and In-situ Conservation**

**Ex-Situ Conservation:**

**Ex-situ** conservation means maintaining living organisms out of their natural habitat, either as whole living organisms or as parts (cells, seeds etc.). *Ex-situ conservation* means literally, "off-site conservation". It is the process of protecting an endangered species of plant or animal outside of its natural habitat.

**Aims of Ex-Situ Conservation:**

1. Off-situ or ex-situ conservation is done to facilitate biodiversity conservation, public education and sustainable development.
2. Encouragement of the establishment of seed or gene bank of endangered species.
3. Development of cooperation between *in-situ* and *ex-situ* conservation, habitat restoration and habitat rehabilitation.
4. Encouragement of captive farming and breeding facilities for highly exploited areas of biological resources.

**Types of Ex-Situ Conservation:**

**Captive breeding:** Captive breeding is a unique approach to conserve endangered species where breeding is done in captive condition by copying the environmental conditions of their natural habitat.

**Cryopreservation:** It is the preservation at very low temperature (-196 °C) where there is little likelihood of any change, growth, cell division and mutations because all biological activities essentially cease. Cryopreservation or deep freeze preservation is used in storage of germplasm maintained through tissue culture, cultured animal cells, spermatozoa, ovarian tissues, embryonic tissues, embryos, human cell lines. Plant seeds etc. Through special technique, the cryopreserved materials can be revived and used in crossing and biotechnology activities.

**Botanic Gardens:** Although a satisfactory definition is still wanting, a botanic garden can be broadly defined as a place of collection of living plants grown for educational, recreational, economic, medicinal or scientific purpose. A botanic garden is the most important form of ex-situ conservation. The widely known function of botanic gardens is to assemblage and maintains a diversity of plant species in the open or green houses for reference and study.

Botanic gardens conduct or facilitate research in diverse aspects of plant science, especially in taxonomy.

The first recorded European botanic garden was probably the one established in 1545 at the University of Padua in northern Italy. There are more than 1500 botanic gardens throughout the world (UNEP, 1995). The largest Botanic Garden of Asia is Acharya Jagadish Chandra Bose Indian Botanic Garden, Shibpur, Howrah (Largest Herbarium of Asia: Central National Herbarium).

**Pollen Banks:** Pollen storage is very important as because the pollen required for crossing and breeding works, especially in breeding tree taxa. Since it is now possible, at least in a few taxa to raise whole plants as haploids from pollen grains, pollen banks have assumed additional importance. The major disadvantage of a pollen bank is that only parental material can be conserved and regenerated.

**DNA Banks:** A DNA bank may be defined as a gene library in which samples of DNA extract are stored. This provides a new option for accession of plant germplasm. The DNA samples are of three kinds: (i) total genomic DNA, (ii) DNA libraries and (iii) individual cloned DNA fragments including RFLP probes, mini and microsatellites etc.

**Seed banks:** A seed bank is a collection of seeds stored in a viable state for posterity. This term is also used in a different context, i.e., accumulation of un-germinated seeds usually found in the soil. A seed bank stores seeds as a source for planting in case seed reserves elsewhere are destroyed. It is a type of gene bank. The seeds stored may be food crops, or those of rare species to protect biodiversity.

**Zoological Parks:** Zoological parks are evolving into conservation-oriented institutions that increasingly contribute to the global conservation strategy embodied in the convention on biological diversity. The position of most modern zoos particularly those with scientific societies, is that they display wild animals primarily for the conservation of endangered species, as well as for research purposes and education, and secondarily for the entertainment of visitors. These parks serve a vital function in the preservation of options for future conservation and utilization of biological resources.

The abbreviation "zoo" was first used of the *London Zoological Gardens*, which opened for scientific study in 1828 and to the public in 1847.

### **In-Situ Conservation:**

In-situ conservation deals with the conservation of genetic resources in the natural ecosystems and also artificial or man-made eco-system. It is the best, easiest, most advantageous and most feasible method to conserve natural biodiversity. In-situ conservation includes a system of protected area of different categories, e.g., National Parks, Sanctuaries, Biosphere Reserves, National Monument, Cultural landscapes etc.

### **Aims of In-Situ Conservation:**

1. Consolidation of the network of protected areas for wild life to ensure the conservation of ecosystems and biogeographic unit.
2. Establishment of new protected areas based on utility, distinctiveness and endangerment of species.
3. Coordination of new and existing protected areas to facilitate gene flow and migration among populations and to ensure proper representation of species and habitats.

4. Minimisation or banning the activities like over-exploitation, pollution, poisoning and introduction of exotic species leading to loss of biodiversity including habitat destruction.

### **Types of In-situ Conservation:**

In India at present there are 89 National Parks, 500 wild life Sanctuary and 14 Biosphere Reserves, covering about 4.2% of the total geographical area.

1. **National Park:** A national park is an area which is strictly reserved for the betterment of the wildlife and where activities like forestry, grazing or cultivation are not permitted. In these parks, even private ownership rights are not allowed. There are about 89 National Parks spread over in India.
2. **Sanctuaries:** A sanctuary is a protected area which is reserved for the conservation of only animals. Human activities like harvesting of timbers, collection on minor forest products and private ownership rights are allowed so long as they do not interfere with the well-being of animals. In West Bengal there are 15 wildlife sanctuaries present.
3. **Biosphere Reserve:** A biosphere reserve is a specified area in which multiple use of the land is permitted by dividing it into certain zones, each being specified for a particular activity. There are some 243 biosphere reserves present in 65 countries, 14 of which are to be developed in India (8 already established with the first one being Nilgiri Biosphere Reserve in 1886). In West Bengal Sundarban and North Bengal Biosphere Reserve are the examples of Biosphere Reserve.

It is to be noted that absolutely undisturbed protected area is called *core zone* and surrounding area is the *buffer zone*.