

# Ex-situ Conservation -Issues & Opportunities

## **Sub Group 3**

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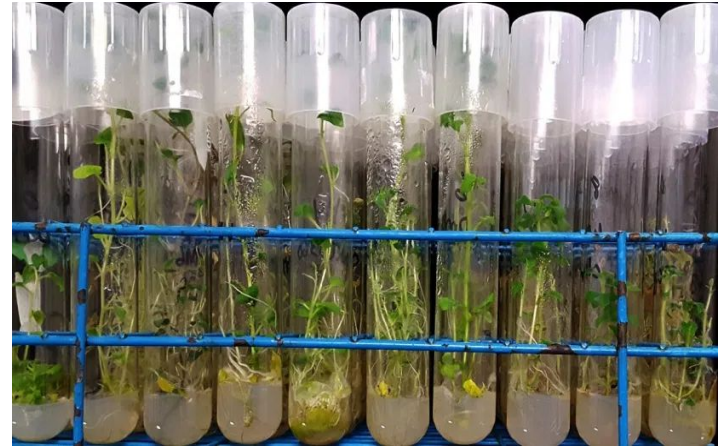
# **Ex Situ conservation**

# Definition of Ex-situ conservation

- Means “Off-site conservation”
- The process of protecting an endangered species of plant or animal outside of its natural habitat.

## Methods -

- Zoological park
- Aquaria
- Botanical garden
- Gene banks





## G.B Pant High Altitude Zoo

- Government Approval - 1980
- Construction started - 1984
- Zoo open for Visitors - 1st June 1995



- It covers an area of around 4.5 Hectare
- Elevation of about 2100 mtr
- Located on Sher Ka Danda hill in Nainital City
- The zoo is managed by “G. B Pant High Altitude Zoo & Biodiversity Conservation & Management Society, Nainital”

# Objectives :-

- Ex-situ conservation of wild Flora and Fauna.
- Rescue and re-habilitation of wild animals.
- Applications for preventive methods to cure the major and minor diseases among animals in captivity and in wild.
- Scientific Study, Research and Documentation regarding captive animals and plants.
- Recreation, Education and Outreach activities to enhance the awareness in general visitors, locals and tourists.
- To inspire people to learn, care and act for the conservation of endangered species.
- To maintain high standards for cleanliness and public welfare.

# WILD ANIMAL STOCK

- Total wild-life species -33
- Mammals Species -15
- Pheasant & Birds Species -18
- Total no. of Wild Animals -218





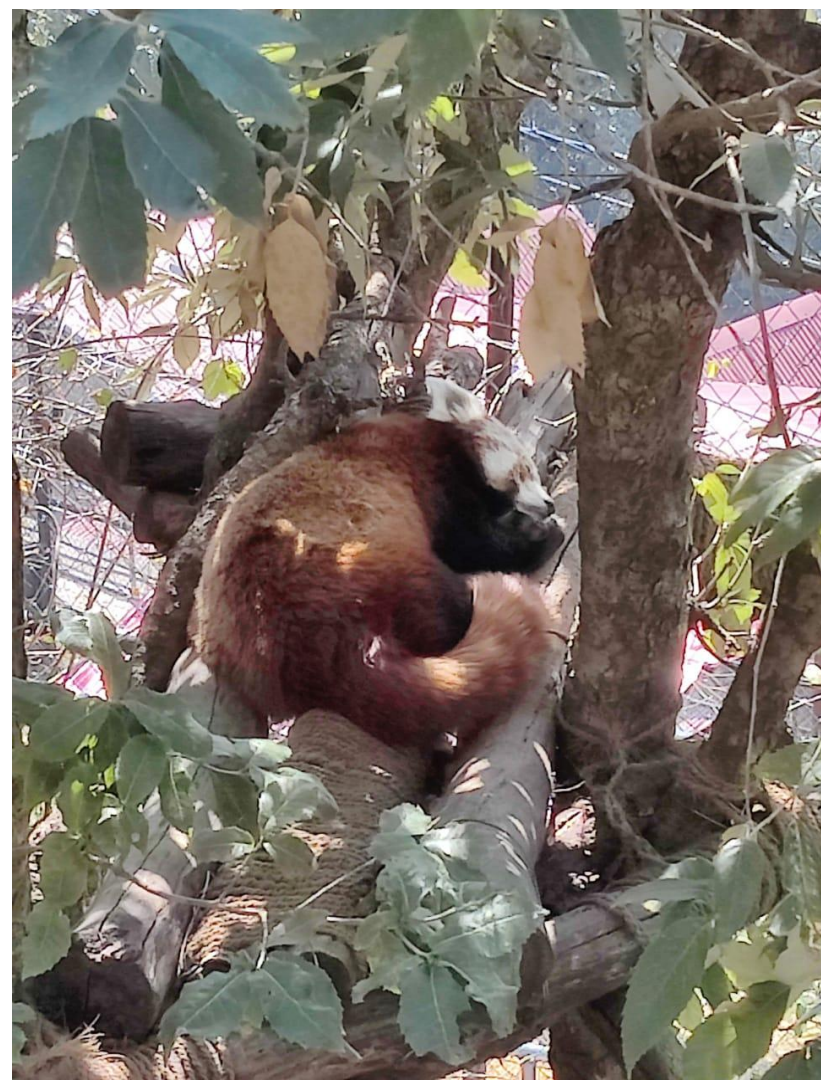
# Carnivore

- Bengal Tiger
- Leopard
- Himalayan Wolf



# Omnivore

- Himalayan Black Bear
- Red Panda
- Common Civet
- Himalayan Palm Civet
- Yellow Throated Himalayan Martem



# Herbivore

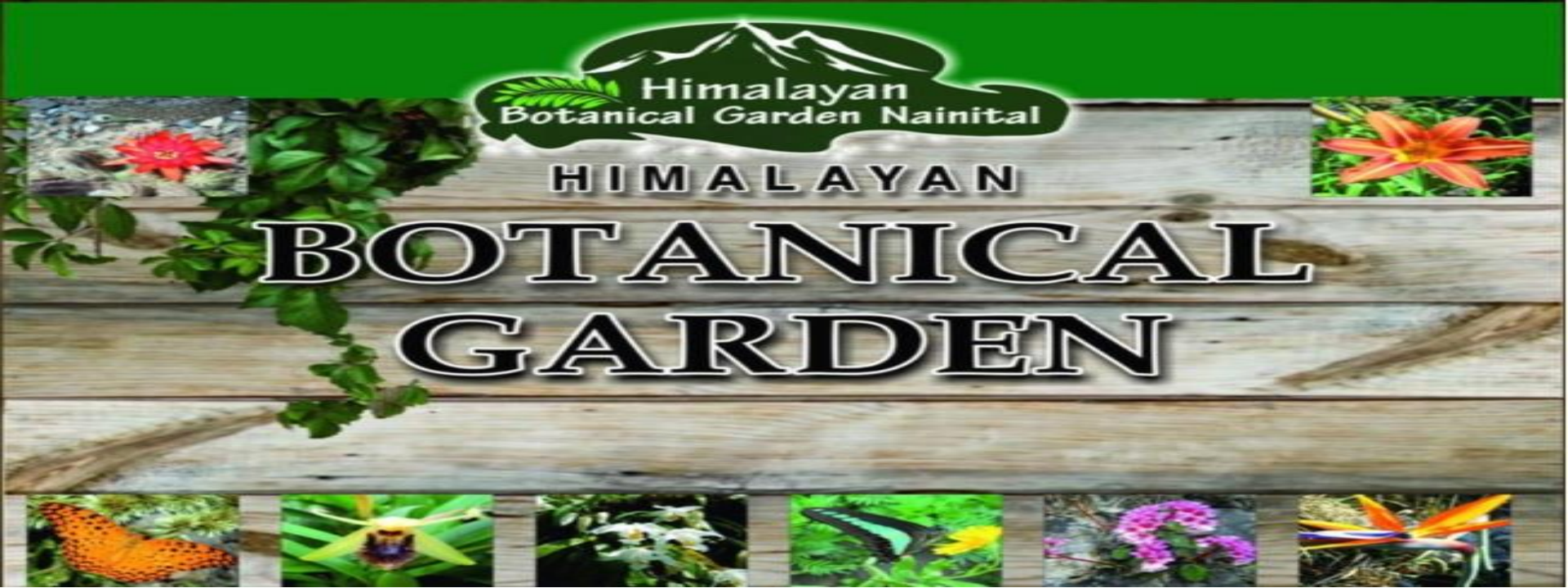
- Sambar Deer
- Barking Deer
- Spotted Deer
- Blue Sheep
- Markhor
- Goral



# Pheasant

- Edward Pheasant
- White peafowl
- Khalij Pheasant
- Red jungle Fowl, etc





A **botanical garden** or **botanic garden** is a garden dedicated to the collection, cultivation, preservation and display of a wide range of plants labelled with their botanical names.

# Himalayan Botanical Garden

- This garden is a unique CASE STUDY of ECO-RESTORATION.
- The aim of the project is Conservation, Propagation and Rehabilitation of some RARE, ENDEMIC and THREATENED Plant Species.
- This Botanical garden is the brainchild of IFS officer Shri Manoj Chandran (UK Cadre)
- The site where HBG has been established was a BARREN, HIGHLY DEGRADED, ABANDONED STONE QUARRY, prone to frequent landslides, just a few years ago.
- Through intensive protection, plantation and other eco-restoration efforts, this area has been converted into a BIO DIVERSITY PARK.

# **BASIC FACTS ABOUT HIMALAYAN BOTANICAL GARDEN**

- It is spread over an Area of 26.9 Hectares.
- It is situated at an Altitude of 1700-2100 metres above the sea level.
- It is managed by GB Pant High Altitude Zoo, Nainital.

## **ASSETS**

1. Collection of Rare Medicinal Plants
2. Butterfly Park
3. Fernery and Orchidarium
4. Geodesic Domes
5. Arboretum
6. Herbarium
7. Bird Watching & Wildlife Trail

## Collection of Rare Medicinal Plants

HBG houses more than 250 species of medicinal plants including many rare and endangered ones.

It also provides information on uses and methods of usage of these plants.





# FERNERY AND ORCHIDARIUM

- HBG has 70 species of ferns and 40 species of orchids from himalayas.
- Shade and Moisture are maintained 24 hours through use of green net and sprinklers to replicate the habitat of the Ferns.
- Both land based and Epiphyte type orchids are present.



# GEODESIC DOMES

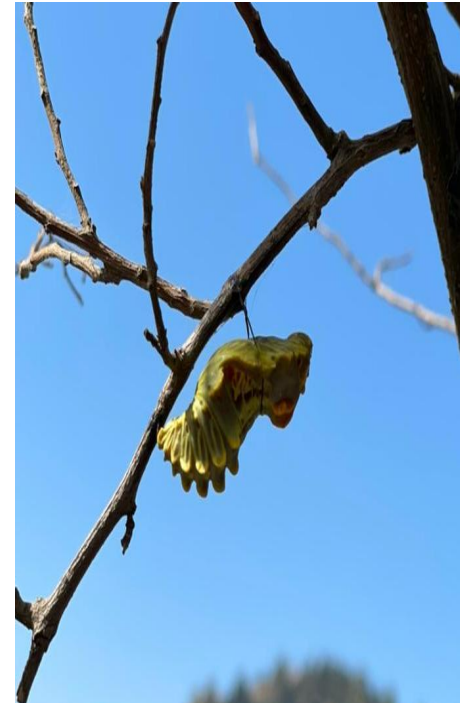


- The geodesic domes are engineered to gather maximum sunlight
- Inside the domes is Cactus garden.
- The environment within these domes replicates the natural habitat of the cactus.



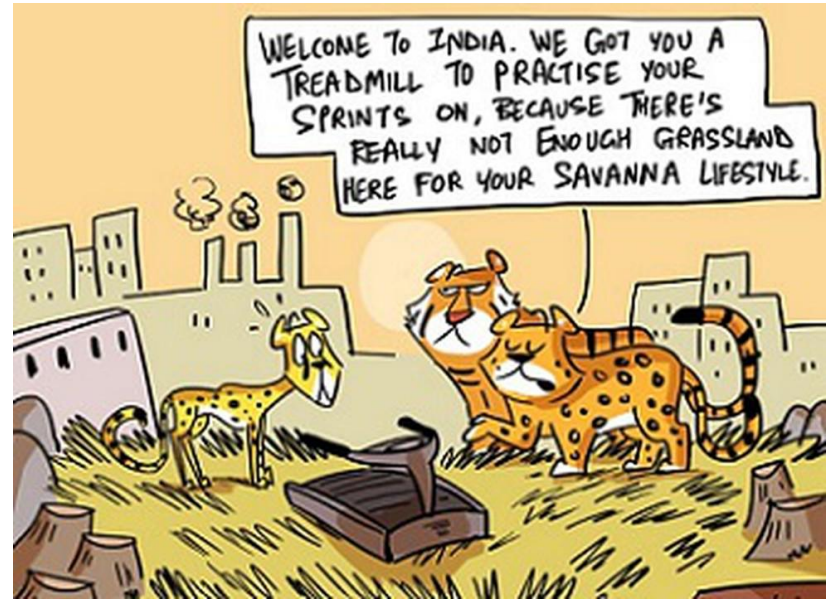
# BUTTERFLY PARK

An enclosed Butterfly park laced with Butterfly HOST PLANTS and NECTAR PLANTS has been designed to host more than 60 species of Himalayan Butterflies. Eg State Butterfly of UK (Common Peacock) breeds in *Zanthoxylum alatum* (Tumbru Tree)



# Issues related to Ex-Situ Conservation

- Ex- situ conservation cannot recreate the habitat as a whole
- Pests or diseases **foreign to the species** may cripple protected plants and/or animals as they have no natural defense against it
- Natural evolution and adaptation processes are either halted temporarily or altered
- Economic cost



Source: LaCONES

# Issues related to Botanical Garden

- Lower number of ex situ populations in most botanical gardens poses a fundamental problem for conservation
- Lack of genetic exchange in small populations make them susceptible to detrimental genetic effects
- Lack of information on source populations casts doubt over potential reintroductions

# Issues related to Himalayan Botanical Garden

- In High altitudes, we need to cover up the plants as it needs to survive the frost.
- Soil and humus are sourced from nearby area
- Regular Pest attacks e.g. Moth Caterpillar
- Habitat replication
  - Maintaining moisture
  - Shade
  - Temperature
- Tourists disturb and steal the plants
- Untrained staff



# Problems specific to Butterfly conservation:

- Damage to host plants can be critical for butterfly
- Birds, lizards and mentis are attracted towards butterfly, hence can damage the Conservation efforts
- Mountain rock egma and Garden Lizard





# Problem specific to cactus garden:

- Fungus
- Mountainous terrain, hence construction of Geodesic dome is difficult



# Issues related to Zoo

- Many zoo animals also became endangered or extinct due to
  - unfavorable climate
  - insufficient space .



# Issues related to Zoo

- Negative features of keeping animals in zoo as it causes pain, stress, distress, sufferings and evolutionary impacts.
- Animal welfare, education, conservation, research, and entertainment are major goals of modern zoos, but these can be in conflict. For example, t visitors often want to observe and interact with the animals in close proximity.



# Issues related to G.B. Pant High Altitude Nainital Zoo

- Due to Space Constraints, infighting between animals leading to injury or death



# Issues related to G.B. Pant High Altitude Nainital Zoo

- Finance issue due to fall in tourist footfall during COVID pandemic.
- Breeding is not allowed due to space constraints, leading to disturbance in life cycle and behaviour of animals
- Due to hilly terrain, there is no scope for expansion



# Issues related to G.B. Pant High Altitude Nainital Zoo

- Lack of use of technology such as, absence of online ticketing
- Description boards are either missing or misplaced. Ex: Macau Enclosure



# Issues of Ex-Situ Conservation

Reintroducing the species to the wild may cause the following problems:

- **Behavior:** captive-bred species lack the in-situ learning of their wild relatives
- **Genetic Races:** reintroduced populations may have an entirely different genetic make up to the original population
- **Habitat:** In cases of destroyed habitats, those areas had to be restored first to allow the captive populations to be reintroduced.



## Ex situ conservation - opportunities

### Why needed?

- Biodiversity on the verge of extinction due to
- Habitat destruction, over exploitation, pollution, invasive species, climate change
- Article 8,9 of CBD - ex situ conservation is complementary and not an alternative to in-situ conservation

### What happens in the absence of in-situ?

- Fragmented and isolated remnant population
- Inbreeding
- Susceptible to extinction



## Zoological parks:

- High footfall globally- 450mn visitors annually- need to increase in india
- Conservation, Recreational, educational and economic aspects
- Observing animal behaviour, research laboratories, gene banks of rare animals
- Repository for injured and rescued animals
- Shelter for man-eaters
- Source of food, shelter, mate etc
- Breeding in captivity for reintroduction
- Gain public and political support in conservation
- NGO collaboration with people easier than P-G collaboration- better conservation

### Captive breeding:

- Saves population on the verge of extinction
- Under expert care and surveillance
- Red panda, vulture, GIB, Gharial
- Arabian oryx, californian condor, Black footed ferret
- Northern white rhino- Audacious plan-IVF, Surrogacy

### Breeding management

- Maintaining the genetic variability and sustainability that depends on
  - Number of founders
  - Population growth rate
  - Effective population size
  - Duration of captive programmes

### Environmental enrichment

- Enclosure design, novel objects, sensory stimuli
- Appropriate social groupings,

## Challenges

- Removal of natural selection
- Managing translocation- Physiological, legal, logistical, etc
- Inbreeding depression- genetic mapping- mating design
- Prenatal stress- poor motor skills, learning, social and sexual behaviour
- Loss of biological integrity- Unnatural Morphology  
(Small enclosure, environmental homogeneity- inhibit mechanical stimuli) Ex: Black footed ferret. 5-10% smaller in size (poor bone development)
- Reintroduction, Acclimation, pre n post release training (Californian Condor), long term monitoring, habitat preservation and protection (Arabian oryx- Oman- 450 to 50)
- Spreading out breeding centres

## Botanical gardens- opportunities

- Conservation and aesthetical purpose
- Arboretum, orchidarium, fernery
- Annual flower show of Ooty can be emulated to draw attention and increase footfall.
- Diversification of species
- Research and educational- Conducting hackathons, species identification contests among school children- to increase awareness and environmental consciousness.
- restoration and recovery of rare and endangered plants into wild - method of species conservation
- Strengthening evaluation and utilization of economic important plants
- Gaining public and political support for conservation actions
- Retains ethnical value of biodiversity like traditional knowledge of indigenous plants

## Gene bank

- Seedbanks, invitro gene banks, cryopreservation, DNA banks
- Backup to traditional ex-situ conservation
- To maintain genetic diversity alive
- Genome 10K project
- Frozen arc project- 28,060 frozen DNA samples
- Doomsday vault- 930,000 varieties of agri crops.
- Indian seed vault- chang la, ladakh