Environmental Studies
Module - 4: Biodiversity and Conservation

Contents

- Levels of biological diversity :genetic, species and ecosystem diversity.
- Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots.
- India as a mega-biodiversity nation; Endangered and endemic species of India.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Bio-geographic Classification of India

- India can be divided into ten major regions based on the geography, climate and pattern of vegetation seen and the communities of mammals, birds, reptiles, insects.
- Each of these regions contains a variety of ecosystems such as forests, grasslands, lakes, rivers, wetlands, mountains and hills, which have specific plant and animal species.

- **India's Biogeographic Zones (10) :**
  - Trans Himalayas - The cold mountainous snow covered Trans Himalayan region of Ladakh.
  - Himalaya - The Himalayan ranges and valleys of Kashmir, Himachal Pradesh, Uttarakhand, Assam and other North Eastern States.
  - Desert - The Terai, the lowland where the Himalayan rivers flow into the plains.

22 MAY 2020
INTERNATIONAL DAY FOR BIOLOGICAL DIVERSITY
Our solutions are in nature

Biogeographic zones of India

Source: Implementation of India's National Biodiversity Action Plan an Overview 2019

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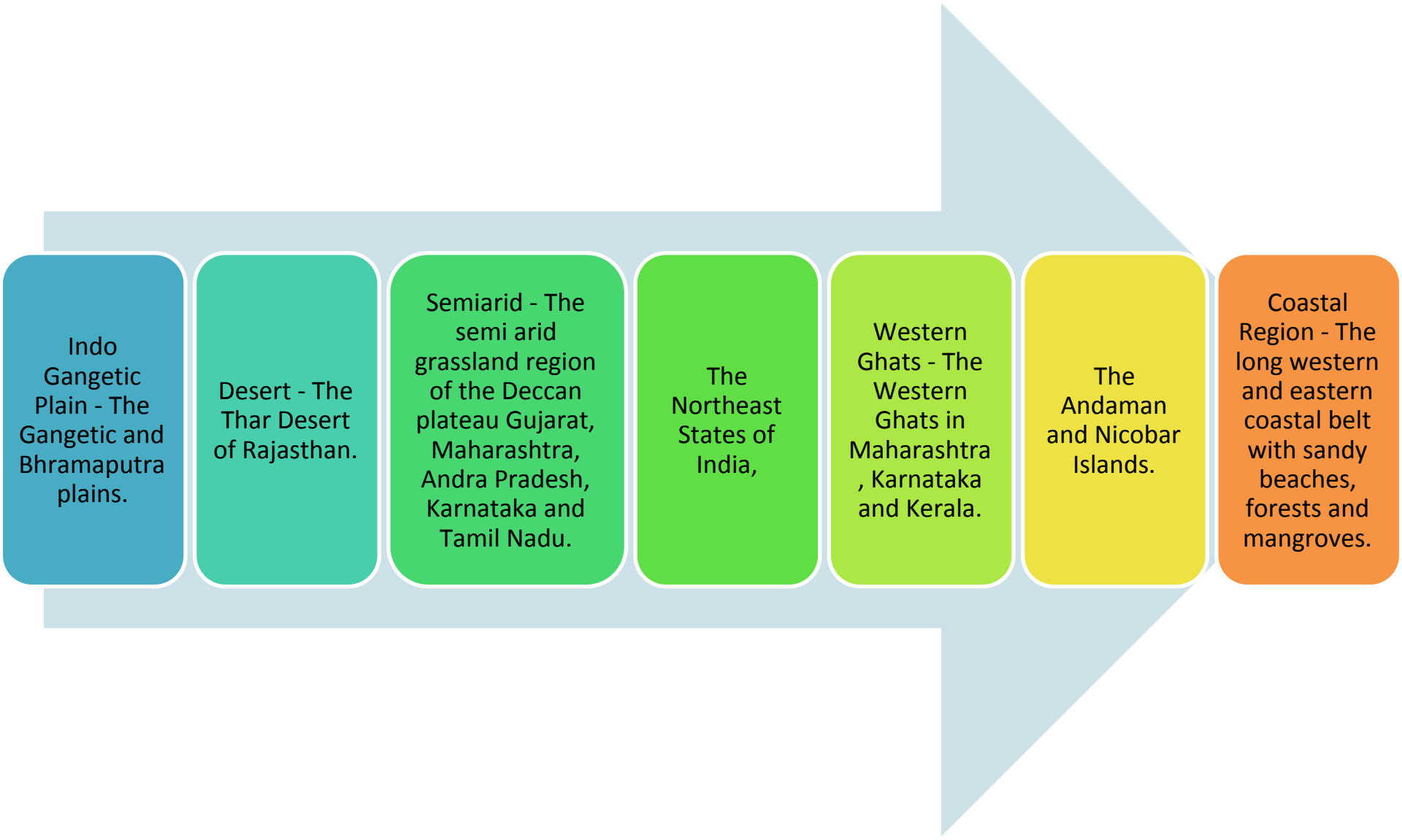
Biogeographic Region	%*
Andaman & Nicobar Island	0.3
Coastal region	2.5
North East Region	5.2
Gangetic Plains	10.8
Deccan Plateau	42
Western Ghats	4
Semi Arid Region	16.6
Indian Desert Zone	6.6
Himalayan Zone	6.4
Transhimalayan Region	5.6
Total	100
*Of total geographic area	

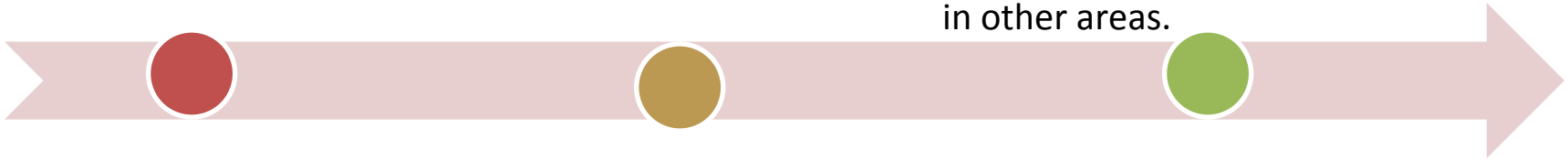
India's major biogeographic habitats

	Biogeographic Zone	Biotic Provinces
1.	Trans-Himalaya	Upper reaches of Himalaya
2.	Himalaya	North-west Himalaya, West Himalaya, Central Himalaya, East Himalaya
3.	Desert	Kutchh, Thar, Ladak
4.	Semi-arid	Central India, Gujarat Rajwara
5.	Western Ghats	Malabar Coast, Western Ghats Mountains
6.	Deccan Peninsula	Deccan Plateau, South Central Plateau, Eastern Plateau, Chhota Nagpur, Central High Lands
7.	Gangetic Plain	Upper Gangetic Plain, Lower Gangetic Plain
8.	North-East India	Brahmaputra Valley, North-Eastern Hills
9.	Islands	Andaman Islands, Nicobar Islands, Lakshadweep Islands
10	Coasts	West Coast, East Coast


Indo Gangetic Plain - The Gangetic and Bhramaputra plains.
Desert - The Thar Desert of Rajasthan.
Semiarid - The semi arid grassland region of the Deccan plateau Gujarat, Maharashtra, Andra Pradesh, Karnataka and Tamil Nadu.
The Northeast States of India,
Western Ghats - The Western Ghats in Maharashtra , Karnataka and Kerala.
The Andaman and Nicobar Islands.
Coastal Region - The long western and eastern coastal belt with sandy beaches, forests and mangroves.

Value of Biodiversity

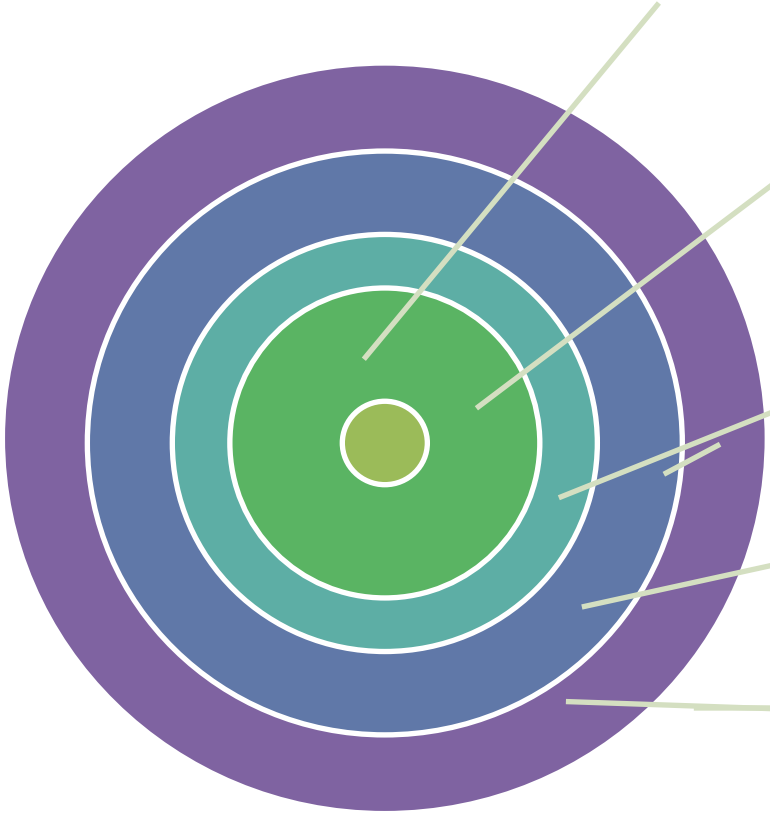
Environmental services from species and ecosystems are essential at global, regional and local levels. Production of oxygen, reducing carbon dioxide, maintaining the water cycle, protecting soil are important services.



The world now acknowledges that the loss of biodiversity contributes to global climatic changes.

Global warming is melting ice caps, resulting in a rise in the sea level which will submerge the low lying areas in the world. It is causing major atmospheric changes, leading to increased temperatures, serious droughts in some areas and unexpected floods in other areas.

Biological diversity is also essential for preserving ecological processes, such as fixing and recycling of nutrients, soil formation, circulation and cleansing of air and water, global life support (plants absorb CO2, give out O2), maintaining the water balance within ecosystems, watershed protection, maintaining stream and river flows throughout the year, erosion control and local flood reduction.



Food, clothing, housing, energy, medicines, are all resources that are directly or indirectly linked to the biological variety present in the biosphere.

Consumptive use value - The direct utilisation of timber, food, fuel, wood, fodder by local communities.

Productive use value - Marketable goods.

Social values - The consumptive and productive value of biodiversity is closely linked to social concerns in traditional communities. 'Ecosystem people' value biodiversity as a part of their livelihood as well as through cultural and religious sentiments.

Ethical and moral values - Ethical values related to biodiversity conservation are based on the importance of protecting all forms of life. All forms of life have the right to exist on earth. Man is only a small part of the Earth's great family of species. Apart from the economic importance of conserving biodiversity, there are several cultural, moral and ethical values which are associated with the sanctity of all forms of life.

Aesthetic value - Knowledge and an appreciation of the presence of biodiversity for its own sake is another reason to preserve it. Quite apart from killing wildlife for food, it is important as a tourist attraction.

Option value - Keeping future possibilities open for their use is called option value. It is impossible to predict which of our species or traditional varieties of crops and domestic animals will be of great use in the future.

Ways to Prevent Biodiversity Loss

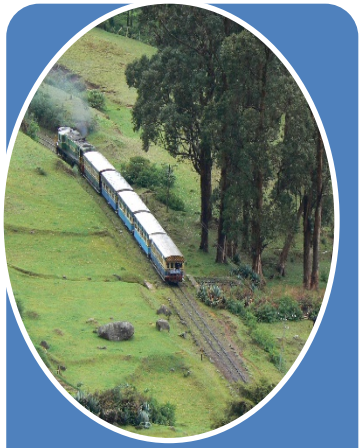
In situ conservation means conservation which takes place onsite.

The major aim of this type of conservation is to preserve natural areas of the organisms and maintain their number. This type of conservation includes designation, managing and supervise the target in the place they are present.

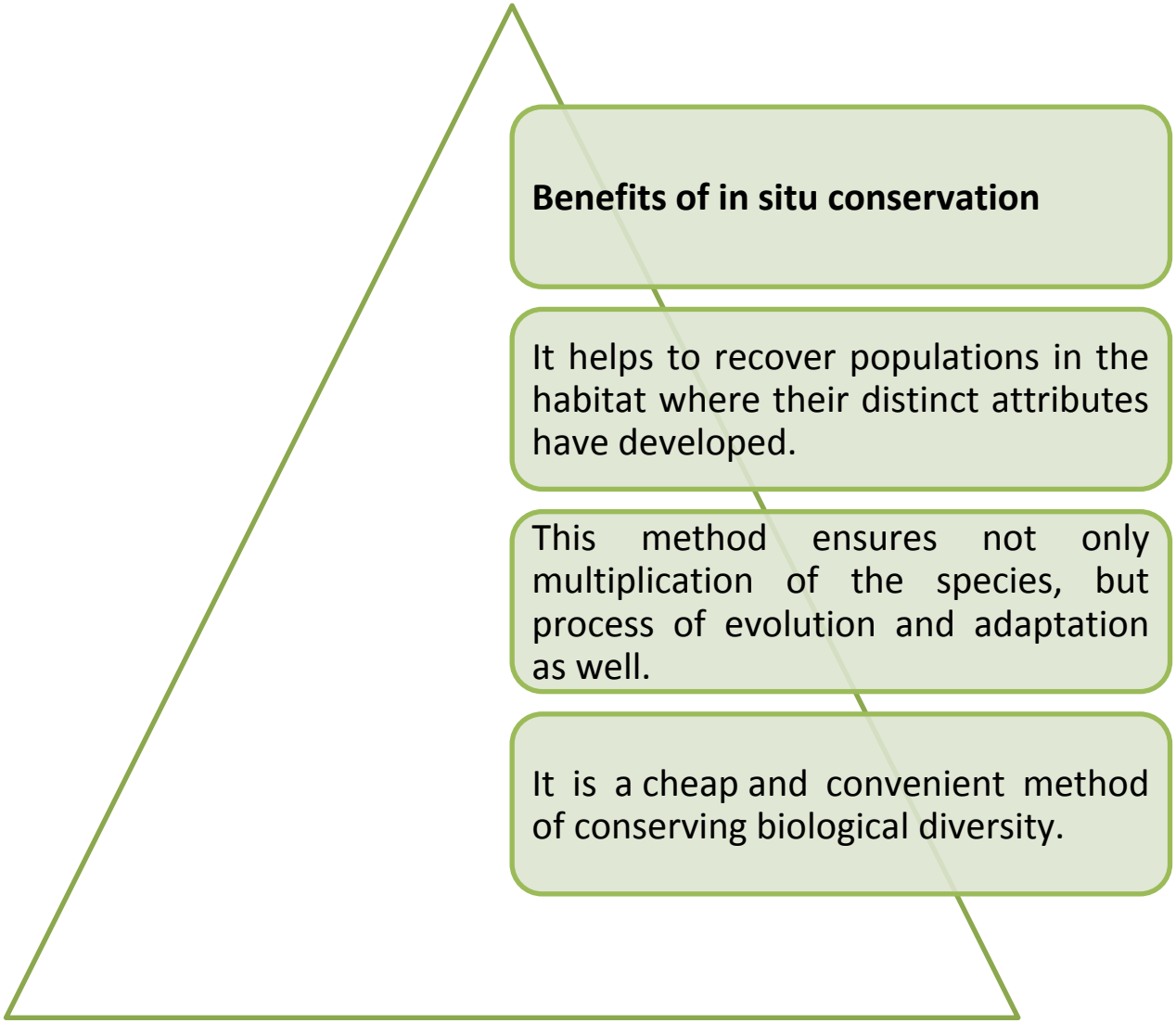
This method is beneficial for conservation of wild organisms and for animal breed material on farm. This method is considered to be more dynamic because it is carried out in the natural habitat itself.

Divided into three types :

- Protected area conservation
- Home garden conservation
- On-farm conservation



e.g. Nilgiri biosphere in India


Benefits of in situ conservation
It helps to recover populations in the habitat where their distinct attributes have developed.
This method ensures not only multiplication of the species, but process of evolution and adaptation as well.
It is a cheap and convenient method of conserving biological diversity.

Ex situ conservation means conservation which takes place off-site.

In this method of biological diversity conservation, sampling, shifting, storage and preservation of target is carried out outside the natural habitat of the organisms.

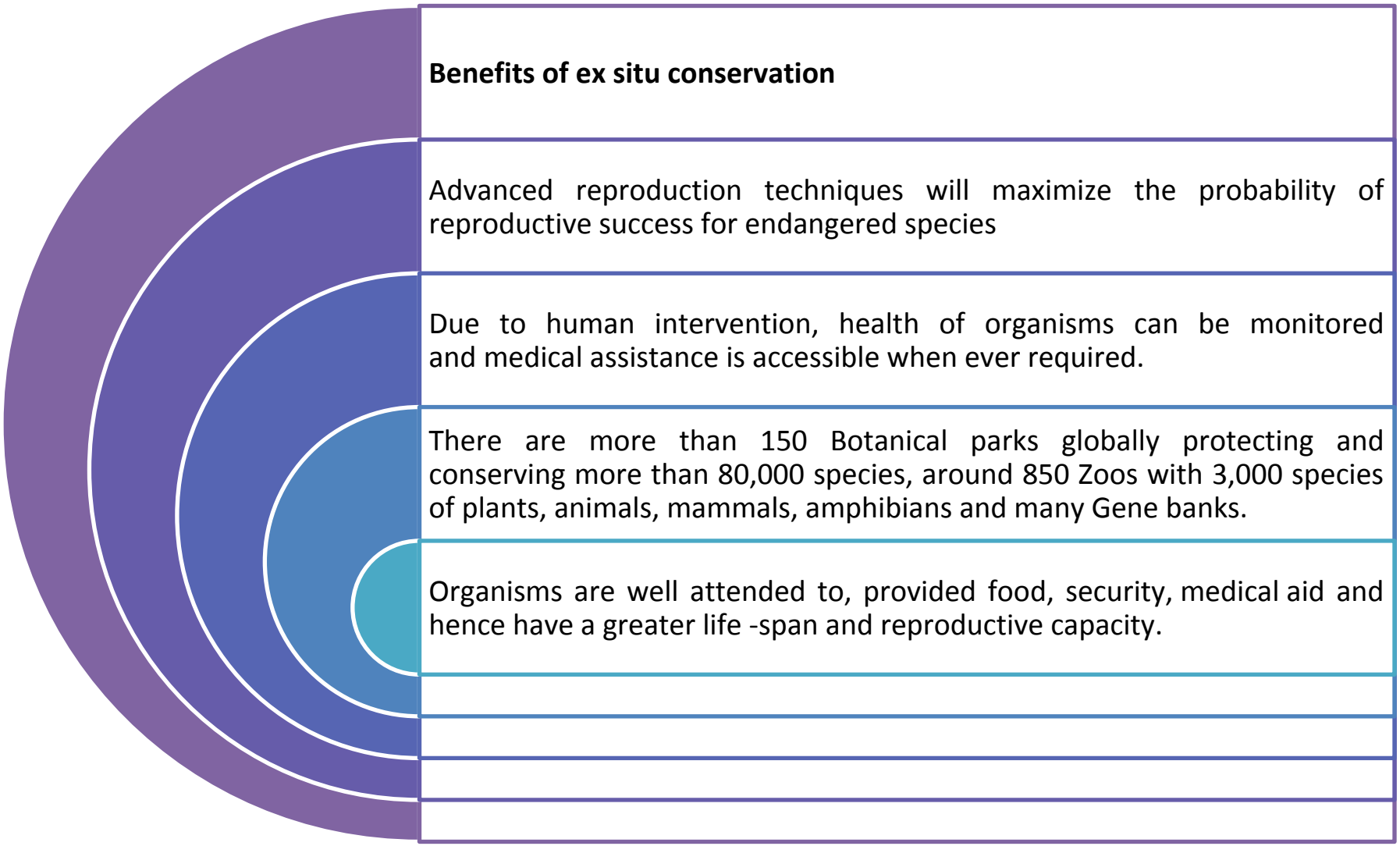
This method is more static and is quite suitable for conservation of several crops and their wild varieties. Various methods involved include in vitro storage, DNA storage, seed banks, pollen storage etc. Eg. Botanical parks and Zoos

Techniques for plant include:

- Tissue culture storage and propagation
- Field gene banking
- Cultivation collections

Techniques for animals include:

- Genetic management of captive populations
- Avoiding adaptations to captivity
- Minimizing mean kinship


Benefits of ex situ conservation
Advanced reproduction techniques will maximize the probability of reproductive success for endangered species
Due to human intervention, health of organisms can be monitored and medical assistance is accessible when ever required.
There are more than 150 Botanical parks globally protecting and conserving more than 80,000 species, around 850 Zoos with 3,000 species of plants, animals, mammals, amphibians and many Gene banks.
Organisms are well attended to, provided food, security, medical aid and hence have a greater life -span and reproductive capacity.

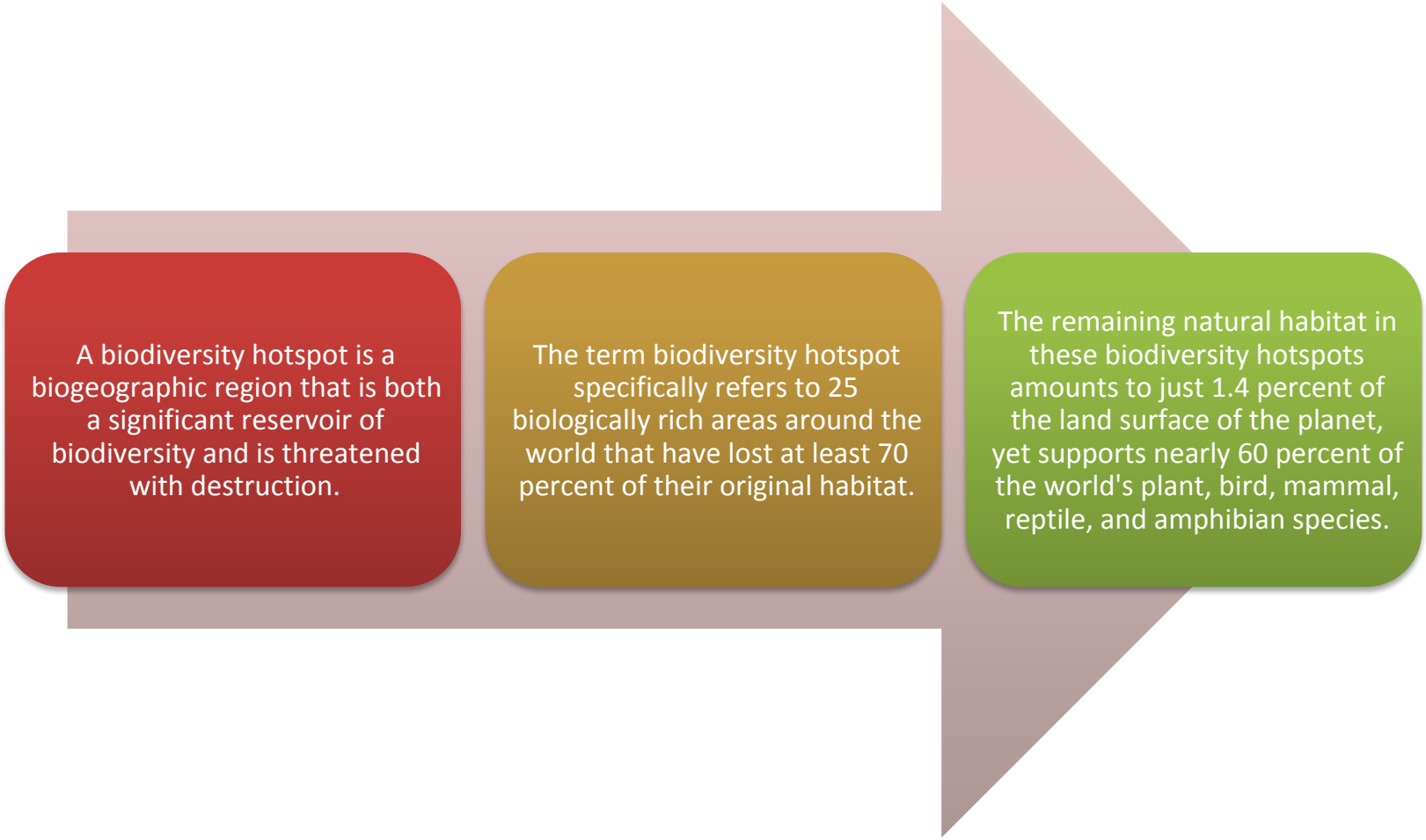
Projects

For the protection and conservation of certain animals there have been specific projects, like in India there have been, project tiger, Gir Lion Project, Crocodile Breeding Project, Project Elephant, Snow Leopard Project etc.

The Global Tiger Recovery Programme, a world-wide plan to bring the species back from the brink of extinction which was forged in November 2010 at an international tiger conservation meeting in St. Petersburg, Russia organized by Russian Prime Minister Vladimir Putin.

It marks the first formalized international initiative to save the tiger from extinction. Key NGOs and global partners in the GTRP(The Global Tiger Recovery Programme), include the World Bank's Global Tiger Initiative, the Global Tiger Forum, WWF (World Wildlife Fund)

Hotspots of Biodiversity



Hotspots of Biodiversity

Norman Myers wrote about the concept in two articles in “The Environmentalist” (1988), and 1990 revised after thorough analysis by Myers and others “Hotspots: Earth’s Biologically Richest and Most Endangered Terrestrial Ecoregions” and a paper published in the journal Nature.

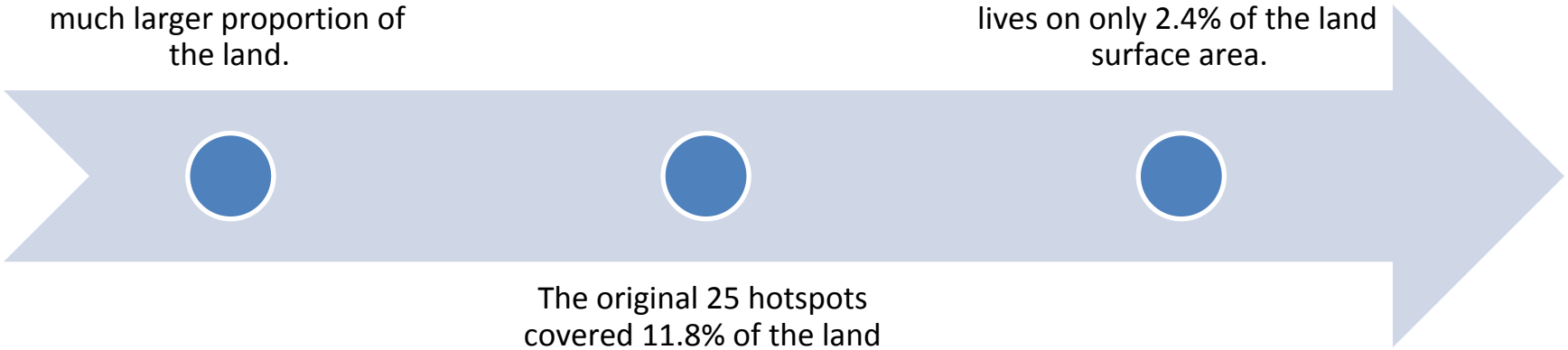
To qualify as a biodiversity hotspot on Myers 2000 edition of the hotspot-map, a region must meet two strict criteria: it must contain at least 0.5% or 1,500 species of vascular plants as endemics, and it has to have lost at least 75% of its primary vegetation.

Around the world, 36 areas qualify under this definition. These sites support nearly 60% of the world's plant, bird, mammal, reptile, and amphibian species, with a very high share of those species as endemics.

Some of these hotspots support up to 15,000 endemic plant species and some have lost up to 95% of their natural habitat.

Hotspots of Biodiversity

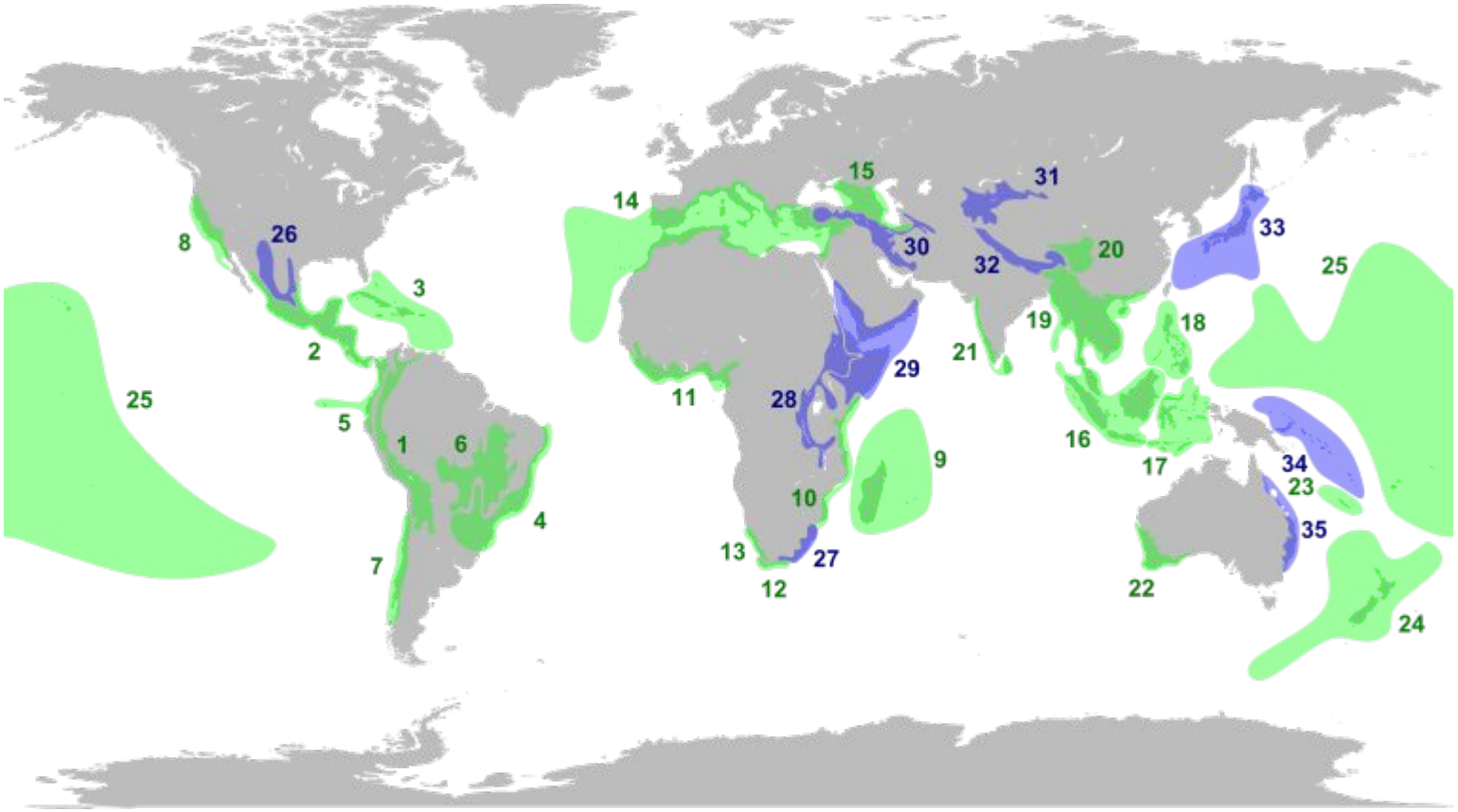
Biodiversity hotspots host their diverse ecosystems on just 2.4% of the planet's surface, however, the area defined as hotspots covers a much larger proportion of the land.



The original 25 hotspots covered 11.8% of the land surface area of the Earth. Overall, the current hotspots cover more than 15.7% of the land surface area, but have lost around 85% of their habitat.

This loss of habitat explains why approximately 60% of the world's terrestrial life lives on only 2.4% of the land surface area.

Hotspots of Biodiversity



Tropical Andes (1), Mesoamerica (2), Caribbean Islands (3), Atlantic Forest (4) Tumbes–Chocó–Magdalena (5), Cerrado (6), Chillian winter rainfall-Vildivian Forests (7), California Floristic province(8), Madagascar and the Indian Ocean Islands (9), Coastal Forests of Eastern Africa (10), Guinean Forests of West Africa (11), Cape Floristic Region (12), Succulent Karoo (13) etc….

Biodiversity Hotsposts

- **North and Central America**
  - California Floristic Province (8)
  - Madrean pine–oak woodlands (26)
  - Mesoamerica (2)
  - North American Coastal Plain (36)[
- **The Caribbean**
  - Caribbean Islands (3)
- **South America**
  - Atlantic Forest (4)
  - Cerrado (6)
  - Chilean Winter Rainfall-Valdivian Forests (7)
  - Tumbes–Chocó–Magdalena (5)
  - Tropical Andes (1)
- **Europe**
  - Mediterranean Basin (14)
- **Africa**
  - Cape Floristic Region (12)
  - Coastal Forests of Eastern Africa (10)
  - Eastern Afromontane (28)
  - Guinean Forests of West Africa (11)
  - Horn of Africa (29)
  - Madagascar and the Indian Ocean Islands (9)
  - Maputaland-Pondoland-Albany (27)
  - Succulent Karoo (13)
- **Central Asia**
  - Mountains of Central Asia (31)
- **South Asia**
  - Eastern Himalaya (32)
  - Indo-Burma, India and Myanmar (19)
  - Western Ghats and Sri Lanka (21)

Biodiversity Hotsposts

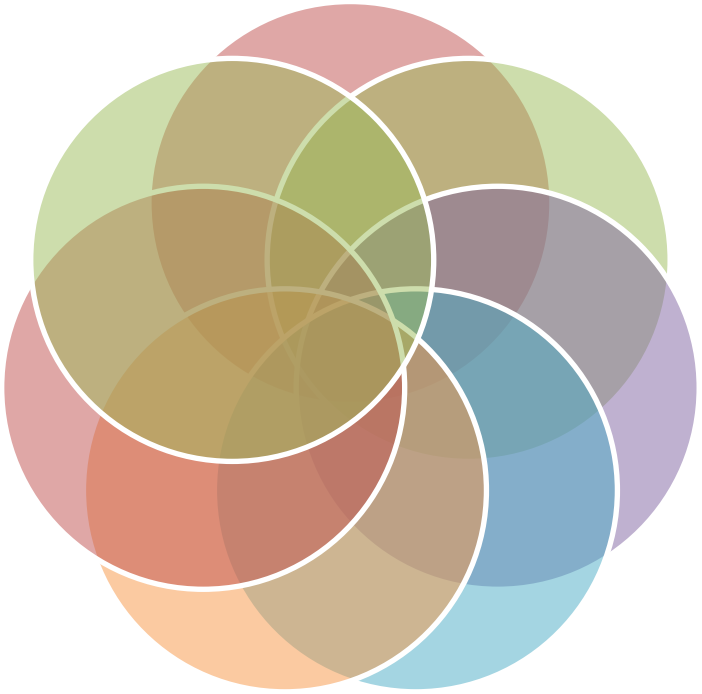
- **Southeast Asia and Asia-Pacific**
  - East Melanesian Islands (34)
  - New Caledonia (23)
  - New Zealand (24)
  - Philippines (18)
  - Polynesia-Micronesia (25)
  - Eastern Australian temperate forests (35)
  - Southwest Australia (22)
  - Sundaland and Nicobar islands of India (16)
  - Wallacea (17)
- **East Asia**
  - Japan (33)
  - Mountains of Southwest China (20)
- **West Asia**
  - Caucasus (15)
  - Irano-Anatolian (30)

Endangered and Endemic Species of India

The endangered species in the country are categorised as Vulnerable, Rare, Indeterminate and Threatened. Other species are found only in India and are thus endemic or restricted to our country. Some of these may have very localized distribution and are considered highly endemic.

Several plant and animal species in the country are now found in only one or a few Protected Areas.

Peepal, Banyan



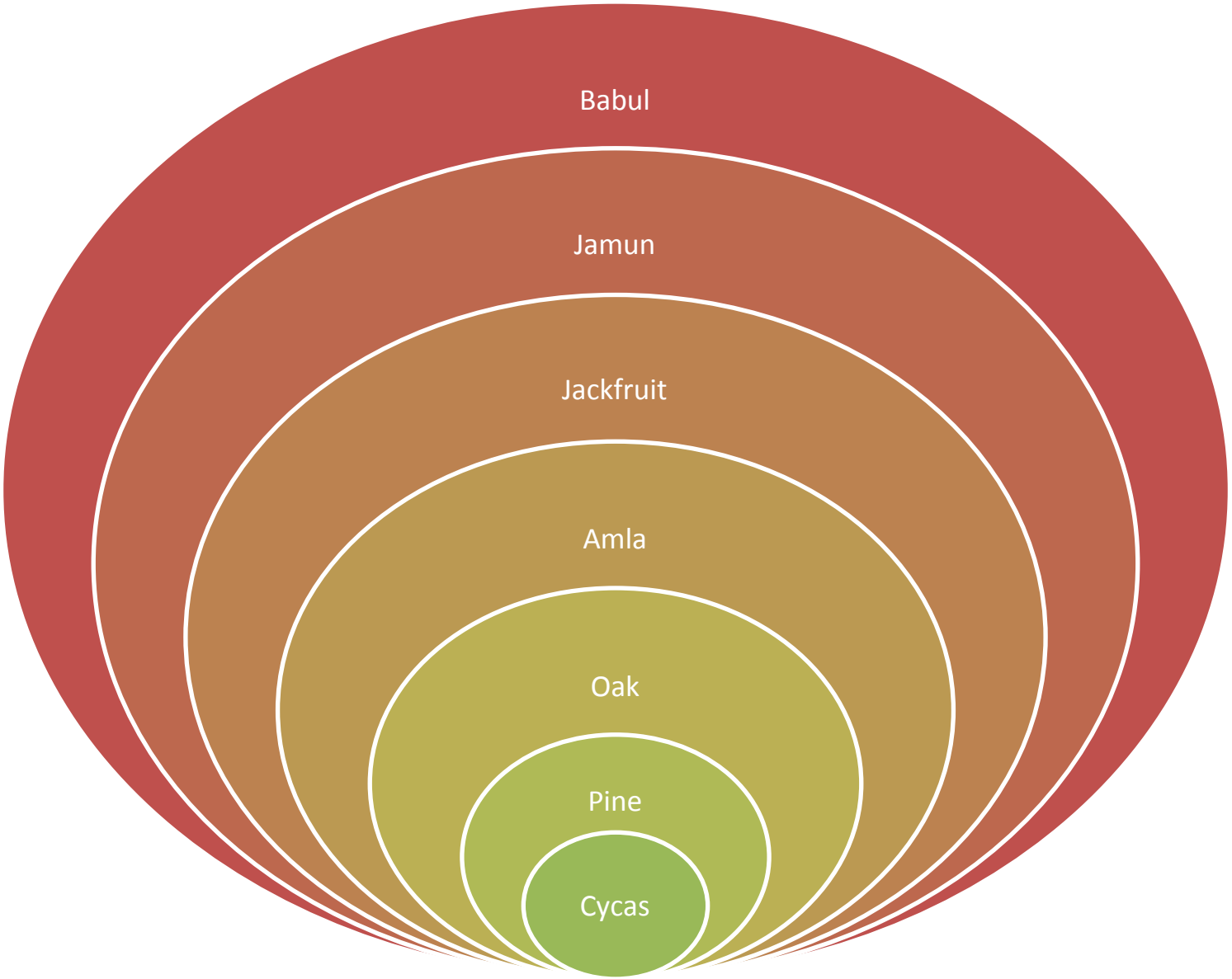
Mango

Common Plant species:

Sal

Teak

Endangered and Endemic Species of India




Common Animal species:
Mammals: cheetal, barasingha and barking deer, Hangul deer, Blackbuck, Nilgai, Chinkara
Indian Wild onager, Himalayan Tahr goat, Nilgiri Tahr
Rhinoceros, Wild Buffalo, Elephant, Tiger, lion, leopard, jungle cat, wolf, jackal, fox, wild dog

Kailadevi Wildlife Sanctuary – Sawai Madhopur, Rajashtan

- While conservation efforts are associated with conflicts between villagers and Forest Officials in most Protected Areas across the country.
- The Kailadevi Wildlife Sanctuary in Rajasthan was initiated in 1983, over 674 sq km forming a part of the 1334 sq km Ranthambore Tiger Reserve.
- It is located within the Karauli and Sapotra blocks of Sawai Madhopur district.

- Pressures on the sanctuary included migrant grazers known as the Rabaris, who came from the Mewar region of Rajasthan with herds of over 150,000 sheep.
- Other pressures were from exploitation of timber and fuel wood and mining.

- The use of forest resources for local use was monitored. The Forest Protection Committees (FPCs) were also successful in stopping the mining in the Sanctuary. Mining is now banned in the Sanctuary.

- The people not only protect their forests but also use their resources judiciously.