UNIT-II

Biodiversity

Biodiversity is the *Variety of Life on Earth*, it includes all organisms, species, and populations; the genetic variation among these; and their complex assemblages of communities and ecosystems.

Biodiversity can be studied at

1. Genetic diversity
2. Species diversity
3. Ecological/Ecosystem diversity

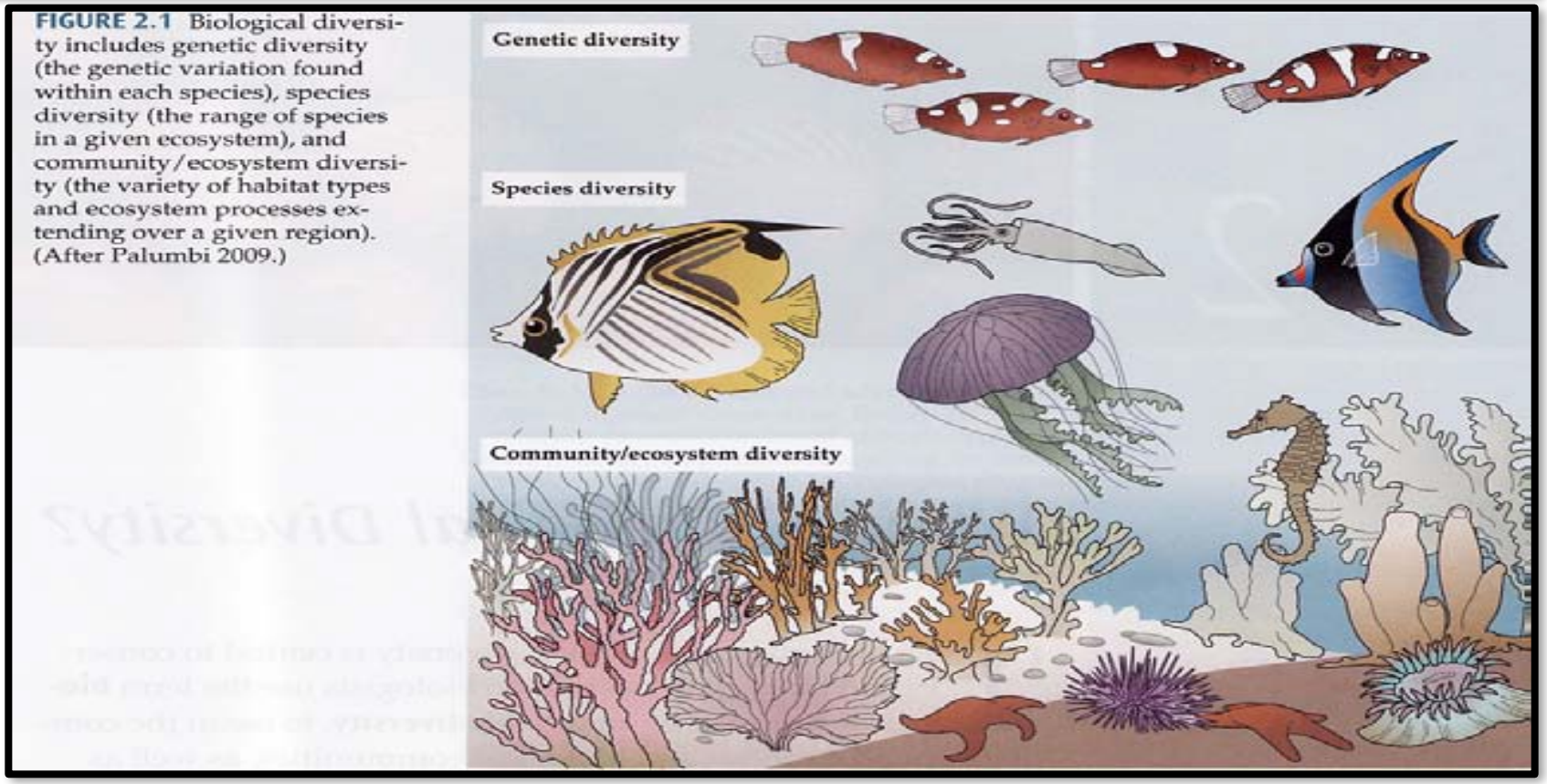


FIGURE 2.1 Biological diversity includes genetic diversity (the genetic variation found within each species), species diversity (the range of species in a given ecosystem), and community/ecosystem diversity (the variety of habitat types and ecosystem processes extending over a given region). (After Palumbi 2009.)

Genetic diversity

- **Genetic diversity is all the different genes present in all the living species including individual plants, animals, fungi and microorganisms.**

Species diversity

- The number of kinds of organisms within in a given area.
- An island with 2 bird species and 1 lizard species is more diverse than an island with 3 bird species.

Ecosystem diversity

Coniferous Forest meeting a meadow

Ocean meeting a beach

- **Ecosystem diversity is all the different habitats, biological communities and ecological processes as well as variation within individual ecosystems.**
- Lakes, Ponds, and Rivers are all Freshwater Ecosystems.
- Rocky coast, Estuary, Salt Marsh , Coral Reef are all Marine Ecosystems.

VALUE OF BIODIVERSITY

❑The value of biodiversity in terms of its commercial utility, ecological services, social and aesthetic value is enormous.

- ❑ We get benefits from other organisms in innumerable ways.
- ❑ Sometimes we realize and appreciate the value of the organism only after it is lost from this earth.
- ❑ The multiple uses of biodiversity or biodiversity value has been classified by **McNeely** in 1990 as follows:

i. Consumptive use value:

These are direct use values where the biodiversity product can be harvested and consumed directly e.g. fuel, food, drugs, fiber etc.

a. Food:

- ❑ Plants and animals as food.
- ❑ About 80,000 edible plant species
- ❑ Use of wild varieties for Research.
- ❑ Wild relatives usually possess better tolerance and hardiness.

b. Drugs and medicines:

- About 75% of the world's population depends upon plants or plant extracts for medicines.
- The wonder drug Penicillin used as an antibiotic is derived from a fungus called Penicillium.
- Quinine, the cure for malaria is obtained from the bark of Cinchona tree
- Digitalin is obtained from foxglove (Digitalis) which is an effective cure for heart ailments.

(ii) Productive use values:

- These are the commercially usable values where the product is marketed and sold.
- These may include the animal products like tusks of elephants, skin & claws of tiger, silk from silk- worm, wool from sheep, fir of many animals, all of which are traded in the market.
- Many industries are dependent upon the productive use values of biodiversity e.g.- the paper and pulp industry, Plywood industry, Railway sleeper industry, Silk industry, textile industry, ivory-works, leather industry, pearl industry etc




(iii) Social Value:

❑ These are the values associated with the social life, customs, religion and psycho-spiritual aspects of the people.

❑ Many of the plants are considered holy and sacred in our country like Tulsi (holy basil), Peepal, Mango, Lotus, etc.

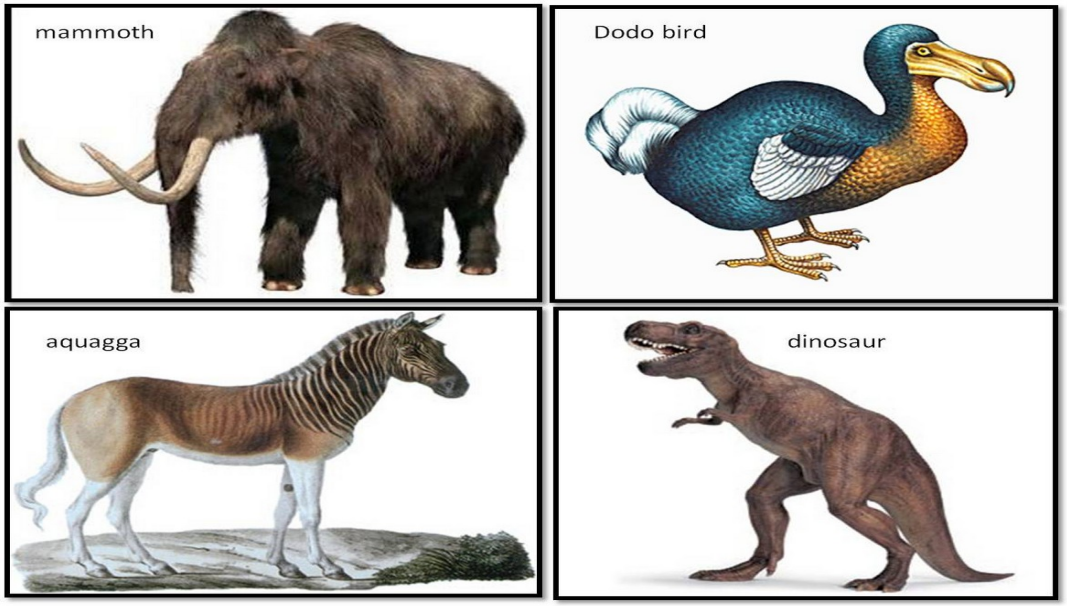
❑ The leaves, fruits or flowers of these plants are used in worship or the plant itself is worshipped.

❑ Many animals like Cow, Snake, Bull, Peacock, Elephant, Owl etc. also have significant place in our psycho-spiritual arena and thus hold special social importance.

(iv) Ethical and Moral value:

- ❑ It is also sometimes known as existence value.
- ❑ It involves ethical issues like "***All life must be preserved***"
- ❑ It is based on the concept of **"*Live and Let Live*"**
- ❑ If we want our human race to survive, then we must protect all biodiversity, because biodiversity is valuable.

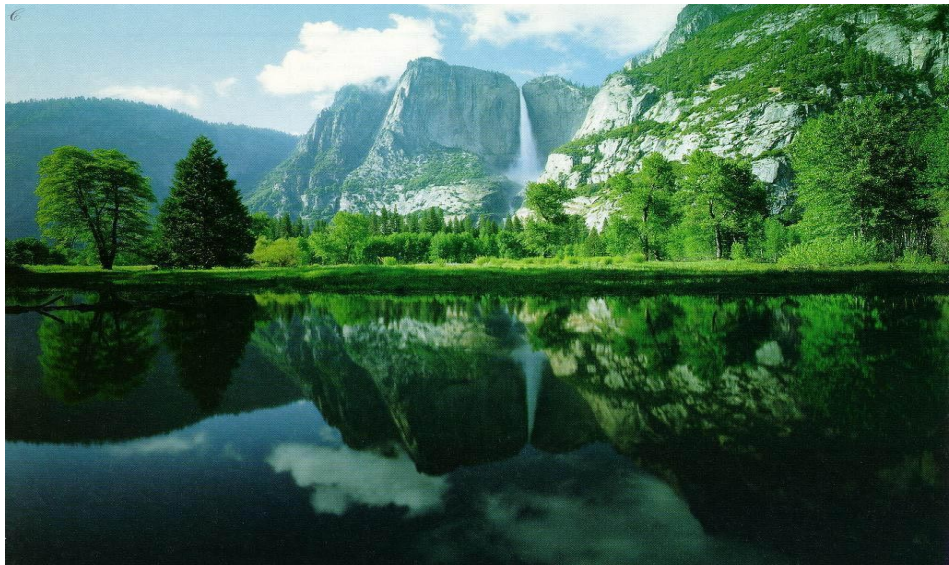
Each organism has right to exist on earth. While we don't have the right to kill the any organism .



Extinct animals

(v) Aesthetic value:

- Great aesthetic value is attached to biodiversity.
- No one of us would like to visit vast stretches of barren lands with no signs of visible life.
- People from far and wide spend a lot of time and money to visit wilderness areas where they can enjoy the aesthetic value of biodiversity and this type of tourism is known as Eco-tourism.
- Ecotourism is estimated to generate about 12 billion dollars of revenue annually, that roughly gives the aesthetic value of biodiversity.



(vi) Option values:

- These values include the potentials of biodiversity that are presently unknown and need to be explored.
- There is a possibility that we may have some potential cure for AIDS or cancer existing within the depths of a marine ecosystem, or a tropical rainforest.
- Optional value suggests that any species may prove to be a miracle species some day.

BIODIVERSTY STATUS IN INDIA

- India is one of the 12 mega-biodiversity countries of the world.
- It is estimated that 70%of the world's total flowering plants occur in India
- Indian gets 10th place in the world and 4th in Asia among these 12 mega-diverse countries
- India has 10 biogeographic zones. They are Trans-Himalaya, Himalaya, Desert, Semi-arid, Western ghats, Deccan peninsula, Gangetic plain, Coasts, North-East, Islands
- It is among top 10-15 nations of the world for its great diversity of plant life, especially flowering plants
- India is a source of traditional crop varieties ranking first amongest the 12 regions of diversty of crop plants and seventh in the contribution of agricultural species

India – Mega diversity Nation

- 170 countries in the world- 12 nations have 70% of world's planet biodiversity.
- Australia, Brazil, China, Colombia, Ecuador ,the United States, India, Indonesia, Madagascar, Mexico, Peru and Domestic Republic.
- India- 12th place.

Hot spots of biodiversity

- Biodiversity is not uniformly distributed across the geographical regions of the earth.
- **Mega diversity zones/hot-spots-** Certain regions of the world are the richest, rarest, endemic species and most distinctive natural areas in biodiversity,
- Among the 25 hot spots of the world, 2 are found in India namely western Ghats and Eastern Himalayas.
- The eastern Himalayan hot spot extends to the north – eastern India and Bhutan

Hot spots of biodiversity . . . . .

- The Western Ghats region lies parallel to the western coast of Indian in Maharashtra, Karnataka, Tamil Nadu and Kerala.

- These two areas of the country are exceptionally rich in flowering plants, reptiles, amphibians, butterflies and some species of mammals.

To qualify as a hotspot, an area must:

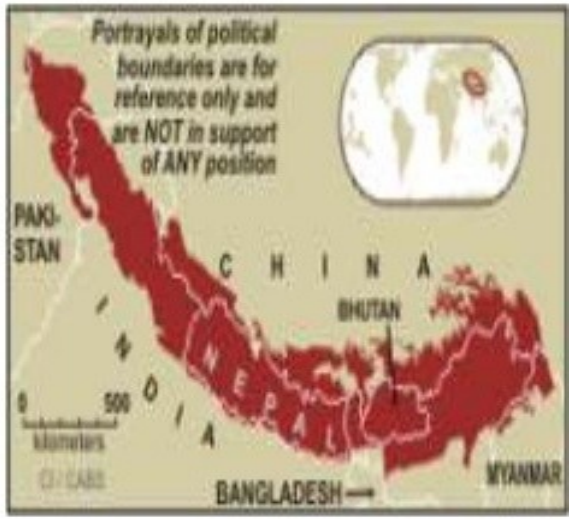
- At least contain 0.5% (or 1,500) of the world's 300,000 vascular plant species as endemics.
- Have lost at least 70% of its primary vegetation

Western Ghats

- on the fringes of the west coast of India.
- Extending-1500-1600 km.
- average elevation < 600 m.
- Six States viz. Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu.
- home for 50 million people.
- source of water for entire Peninsular India.
- influences monsoons.
- retains only 7% of original forest cover.
- world's hottest hotspots of biodiversity.

HIMALAYAN

- Includes the entire Indian Himalayan region (and that falling in Pakistan, Tibet, Nepal, Bhutan, China and Myanmar).
- The Himalaya Hotspot is home to the world's highest mountains.
- The hotspot is home to important populations of numerous large birds and mammals, including vultures, tigers, elephants, rhinos and wild water buffalo.



5 Threats of Biodiversity

- Habitat destruction
- fragmentation
- Invasive species
- Population growth
- Pollution
- Overconsumption

Habitat Destruction

- Changing a habitat to suit human needs…for housing, farming, etc.

- This displaces animals/plants. As the human population grows, so does habitat destruction!

Fragmentation

- Breaking up large habitats into smaller habitats.
- Some plants and animals cannot adapt to these changes.

Invasive Species

- Any organism that has been relocated somewhere other than its original habitat.

Oftentimes, invasive species out-compete native species resulting in disruption of the ecosystem and food chain. Many native organisms are becoming endangered by this!

Synonyms include:

Introduced species, non-native species, exotic species and alien species…

Zebra Mussel

Asian Beetle

Population growth of Humans

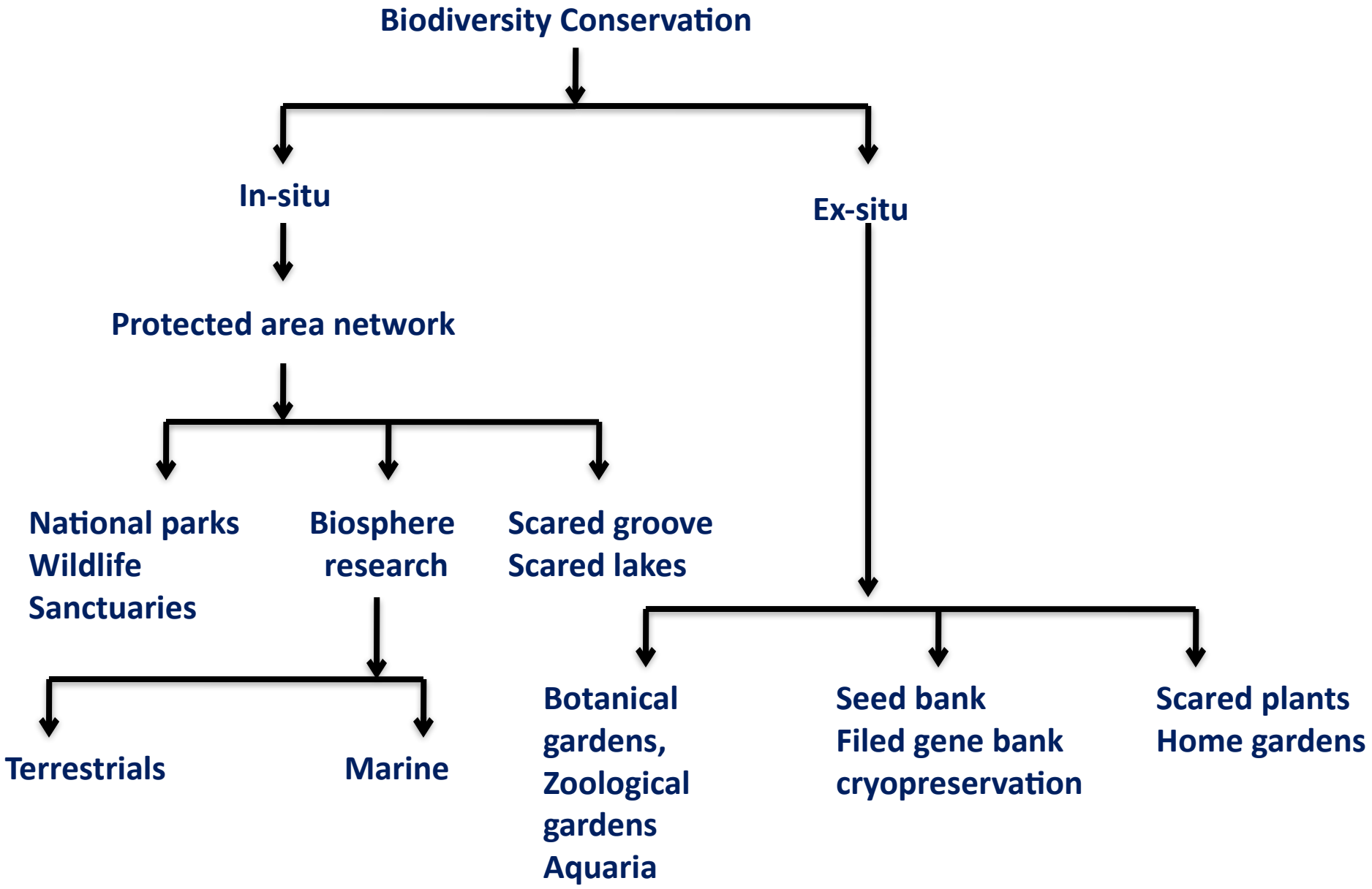
- Increasing population means greater demand for food, shelter, fuel and water.
- This leads to habitat loss, pollution, resource scarcity and over consumption

Conservation of Biodiversity

There are two basic approaches towards conservation of bio diversity:

In-situ conservation: Conservation of a species is best done by protecting its habitat along with all the other species that live in it in nature. This is known as in-situ conservation, which is conserving a species in its own environment by creating National Parks and Wildlife Sanctuaries.

Ex-situ conservation: Outside the natural habitat in a carefully controlled situation such as a botanical garden for plants or a zoological park for animals, where there is expertise to multiply the species under artificially managed conditions.


Biodiversity Conservation
In-situ
Ex-situ
Protected area network
National parks
Wildlife
Sanctuaries
Biosphere
research
Scared groove
Scared lakes
Terrestrials
Marine
Botanical
gardens,
Zoological
gardens
Aquaria
Seed bank
Filed gene bank
cryopreservation
Scared plants
Home gardens