

UNIT – 3

BIODIVERSITY & CONSERVATION

A. Very short type questions & answers (1 mark each)

Q1. Define Biodiversity.

Ans: Biodiversity refers to the diversified i.e. the diversity in terms of number, variety and variability of life forms available on the planet earth. The word “biodiversity” comprises of two words- “Bios” meaning “life/Life-forms” and “Diversity” meaning “Variety”. It includes all the varied life forms and their associated contents viz. genes they contain and the ecosystem they are a part of.

Q2. What are the different levels of Biodiversity?

Ans: The different levels of biodiversity are as follows:

- (i) **Genetic diversity** - which is based on the diversity of genes within a species.
- (ii) **Species diversity** - which is based on the diversity of species within a community.
- (iii) **Ecosystem diversity** - which is based on the diversity of habitats in which the organism dwells.

Q3. How many Biogeographic zones are there in India?

Ans: There are about Ten (10) Biogeographic zones in India

Q4. Mention the areas covered under Trans Himalayan Biogeographic Zone.

Ans: The areas covered under the Trans-Himalayan region includes the high altitude , cold and arid mountain areas of Ladakh, Jammu & Kashmir, North Sikkim, Lahaul and Spiti areas of Himachal Pradesh.

Q5. Mention the areas covered under the Biogeographic zone.

Ans: The areas covered under the Biogeographic zone includes the Trans-



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Himalayan, Himalayan, Desert, Semi-arid, Western-Ghats, Deccan peninsula, Gangetic-plain, Coasts, North-East and the Islands.



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Q6. How many Biodiversity Hotspots are there in the world?

Ans: There are Thirty-Six (36) Biodiversity Hotspots in the world.

Q7. How many National Parks and Wildlife Sanctuaries are there in India?

Ans: There are 104 National Parks and 544 Wildlife Sanctuaries in India.

Q8. Name two endangered species of animal in North-East India.

Ans: The One-Horned Rhinoceros & Bengal slow loris are two endangered species of animal in North-East India.

Q9. Mention the areas covered under the North-East Biogeographic Zone.

Ans: The areas covered under the North-East Biogeographic Zone includes the transition zone between the Indian, Indo-Malayan and Indi-Chinese bio-geographical regions, as well as the meeting point of the Himalayan mountains and peninsular India.

Q10. Name two Endemic plant species of North-East India.

Ans: *Nepenthes khasiana* - pitcher plant (Meghalaya) & *Bambusa cacharensis* - Bamboo plant (Assam) are two endemic plant species of North-East India.

B. Short type questions & answers (2 marks each)

Q1. Write a brief note on the different levels of biodiversity?

Ans: The variability of life forms can be discussed at three levels which are- The Genetic Diversity, The Species Diversity and The Ecosystem Diversity.

1. **The Genetic Diversity:** This level includes the diversity of genes within a species which is passed down the generations. It is this type of diversity that gives rise to different varieties. Some variations of which are visible (such as size or colour), some can be sensed (such as taste or flavor) and some are known only after susceptibility (such as various infections/diseases).

2. **The Species Diversity:** This level includes the diversity of species of plants and animals that are present in a region. Each species is distinct from every other species in terms of their lifestyle and behaviour. Species diversity is usually measured by the total number of species within a defined area.
3. **The Ecosystem Diversity:** This level includes the diversity in the set of life-forms interacting with the abiotic components within a region. It highlights the diversity of habitats that the different life-forms are dwelling, utilizing and exchanging resources within its environment.

Q2. Write a brief note on biodiversity patterns.

Ans: The Biodiversity pattern relates to the patterns observed in the occurrence of the variety of life-forms. Ecologists discovered two broad kinds of diversity pattern – Latitudinal gradient & Species-Area Relationships.

1. **Latitudinal Gradient:** According to this pattern, the species diversity follows a regular pattern as we move from the equator to the Polar Regions. The plant and animal diversity was observed to be maximum at the Equator and it decreases as we move towards the poles.

2. **Species-Area Relationships:** Alexander von Humboldt (German Geographer & Naturalist) observed the relation between an area and the species richness found within it. He found that as he increased the area of observation, the plant and animal diversity increased, but up to a certain level.

Mathematically, it can be explained by the equation;

$$\log S = \log C + Z \log A$$

Where,

S = Species richness, C = Y-intercept,

Z = regression coefficient & A = Area.

Q3. Write a brief note on Global Biodiversity Hot spots.

Ans: Hot spots refer to the zones of richest Biodiversity based on the numbers of endemic species and degree of threat. The concept of 'Hot Spots' was developed by Norman Myers in 1988. Global Biodiversity Hot Spots refers to the Hot Spots of the world. There are 34 Biodiversity Hot Spots in the world spread around North & Central America, The Caribbean, South America, Europe, Africa, Central Asia, South Asia, South East Asia & Asia-Pacific, East Asia and West Asia. Out of the 34 Global Biodiversity Hot Spots, two are in India – The Western Ghats & The Eastern Ghats.

Q4. Why is India considered as a Mega Biodiversity Nation?

Ans: India is considered as a Mega Biodiversity Nation due to the spectrum of Biodiversity it encompasses because of the presence of varied habitats ranging from tropical rainforests to alpine vegetation and from temperate forests to coastal wetlands.

The various zones provide a variant environmental conditions depending upon the amount of sunlight it receives. Some of the features of which are stated below:

- i. The tropical zone is very hot round the year & has no winters.
- ii. The subtropical zone remains hot most of the year and the winters are cool,
- iii. The temperate zones have warm summers and pronounced winters.
- iv. The artic or alpine zone has short summers and long severe winters.

India houses 33% of life forms found in the world and has 49219 species of flora and 81251 species of fauna. There are 104 National parks and 544 Wildlife Sanctuaries and 18 Biosphere Reserves in India.

India is also a signatory to the International conventions like Convention of Migratory Species and Convention of Internal Trade on Endangered Species.

Q5. Define Endemic species.

Ans: A species which is native and confined to a particular geographical region due to their specific ecological requirement and inability to disperse to other

regions/area. The endemic species are found to occur only in a specific region of the earth. Their dispersing ability is restricted to the specific region under natural means. However they are cultivated or reared in other places from their original habitat by application of artificial means for various scientific studies.

E.g. Assam Bush Frog, One Horned Rhinoceros (Assam), Pygmy Hog (Assam), Buff-bellied langur (Assam), Namdapa flying squirrel (Arunachal Pradesh), Khasian leaf nosed bat (Meghalaya), Nepenthes khasiana (Meghalaya), Siroi lily (Manipur), Bambusa cacharensis (Assam), Koala (Australia), Kangaroo (Australia), Giant Panda (China), Polar bear (Arctic), Giant tortoise (Galapagos) etc.

Q6. Define Endangered Species.

Ans: A species which is under a risk of extinction is termed as Endangered Species. It is represented by fewer number of individuals due to various natural and artificial factors, which includes Natural disasters like forest fire, floods, etc., as well as anthropological activities like hunting, bomb-explosions, large scale development projects, building of dams, deforestation, practices like shifting cultivation, etc.

E.g. Asiatic Lion, Indian Elephant, Indian Rhinoceros, Marbled cat, Asiatic cheetah, Wild Asiatic water Buffalo, etc.

Q7. Write a brief note on Habitat Loss.

Ans: Habitat refers to the dwelling or the living place of an organism. Habitat loss indicates about the loss of the favourable dwelling environment through means of large scale developmental projects like Industrial plants, hydroelectric projects, extension of urban areas, large scale deforestation, mining works, etc.

Projects such as construction of dams not only results in the submerge of large tracks of forest but also introduce human settlements and roads within the forest area leading to mass scale deforestation which leads to extensive habitat loss.

Q8. What do you mean by Biological Invasions?

Ans: The introduction of a non-native species also known as invasive, alien or exotic species, accidentally or deliberately which in turn affect the native species of



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that introduced area is termed as Biological invasion. It has been a serious threat to wildlife all around the globe.



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The introduced plant or animal species interfere with the food web, consume the nutrients, that otherwise would have been available for the native species, hampering the growth of the native species as well as restricting the growth of native species around it by secreting some toxins, etc. Since, they have minimum or no predators, their large numbers are found to affect the total community structure of that ecosystem in which the alien species is introduced.

One of the examples of biological invasion includes the Introduction of *Water hyacinth* (Native to South America) in aquatic bodies of India, leading to its massive propagation and spread in the aquatic bodies, resulting in the interference with native aquatic flora and fauna, hampering its survival.

[Other examples includes the introduction of *pet Burmese pythons* into the Everglades, Florida, *Grey squirrels* (of North America) into United Kingdom, *Brown tree snake* (from Solomon islands) into Guam, *Papaya Mealy Bug* (Native to Mexico and central America) destroyed huge papaya crops of Assam, *Parthenium grass* (Native to North America) is an aggressively colonizing common weed of cultivated fields, forests, overgrazed pastures, wastelands, and gardens, and is found throughout India].

Q9. Write a brief note on *Ex situ* Conservation.

Ans: *Ex situ* conservation implies to the conservation of species of flora and fauna outside their natural habitat. This type of conservation aims in preservation and protection of the species from getting threatened as a consequence of various natural and human interferences.

The species are mostly kept, nurtured, preserved and protected in Zoos, Botanical gardens, seed banks, gene banks, etc. Preservation by techniques of tissue culture and cryopreservation are nowadays a popular means of *Ex Situ* conservation. The species are provided with adequate environment outside their natural environment in replica as per their requirements in their natural environment. The growth, health and viability are monitored time to time to ensure their longevity.

Q10. Write a brief note on *In situ* Conservation.

Ans: *In situ* Conservation implies to the conservation of species of flora and fauna inside their natural habitat. This type of conservation aims in preservation and protection of the species from getting threatened as a consequence of various natural and human interferences.

The species are nurtured, preserved and protected in their natural environment, thereby protecting the ecosystem they are a part of. Preservation by means of area demarcation, protection from illegal activities like hunting, poaching, smuggling of valuable flora and fauna are strictly dealt as per the law. The favourable parameters required for the sustenance of the flora and fauna are monitored time to time to ensure safety and protection to the growing species.

C. Long type questions & answers (5 marks each)

Q1. Write about the important initiatives of *In situ* conservation in India.

Ans: Some of the important initiatives taken by the country for *In situ* conservation are discussed below:

- i. Networks of protected areas have been developed throughout the country to protect and preserve species and their habitats.
- ii. Highly protected areas called National Parks have been developed throughout the country for the conservation of wildlife. No human inhabitation, private land holding, hunting or traditional human activities viz. collection of forest products, farming, grazing of cattle, etc. are allowed within the park. At present, India has about 104 National Parks dedicated for the protection and conservation of wild flora and fauna.
- iii. Wildlife Sanctuaries are also protected areas, but certain types of human activities such as collection of firewood, plant products, grazing of cattle are allowed within these permitted areas. At present, there are 544 Wildlife Sanctuaries within the country.

- iv. Several special projects have been launched to save certain animal species which have been identified as under severe threat of extinction. The projects are specially designed to preserve, protect, increasing the number of that endangered species along with conserving its natural habitat. Project Tiger, Project Elephant, Project Rhino are some of these major initiatives.

Q2. Write about the important initiatives of *ex-situ* conservation in India.

Ans: Some of the important initiatives taken by the country for *In situ* conservation are discussed below:

- i. The Madras Crocodile Bank Trust (MCBT), the first crocodile breeding centre in Asia has been involved in Crocodile breeding and has supplied several thousand juvenile crocodiles and eggs to various state forest departments for stocking.
- ii. The Pygmy Hog conservation programme (PHCP), a joint initiative by the government and international groups ensures successful captive breeding of pygmy hogs and their release in the wild.
- iii. There is also a captive breeding centre for Rhinoceros in Assam state Zoo and successful attempts have been made in breeding them and then sent to the wild.
- iv. Institutions like National Bureau of Plant Genetic Resources (NBPGRs), National Bureau of Animal Genetic Resources (NBAGR) and National Bureau of Fish Genetic Resources (NBFGRs) are working at genetic level for the conservation of resources.

Q3. Write a note on Endemic species of North-East India with examples.

Ans: A number of species are endemic to north-east India due to its unique geography and climatic conditions. It includes both the flora and fauna which are described below;

230 species of amphibians are regarded as endemic (67.25%), to entire India and 54 (16%) are from north-east India. The endemic amphibians of NE-India constitute the highest endemism of all the vertebrate fauna found in India and

north-east India. Some of the examples include the Assam Bush Frog, Manipur Moustached Caecilian, etc.

A greatest number of 17 endemic species have been recorded in Assam, Sikkim and Arunachal Pradesh, followed by manipur-13 species, Nagaland-12 species, Meghalaya-8 species and Mizoram- 3 species. Some of the examples include One Horned Rhino (Assam), Red Panda (Sikkim), Rusty throated Wren Babbler (Arunachal Pradesh), Sangai Deer (Manipur), Clouded leopard (Meghalaya), Gaur (Nagaland), Hoolock Gibbon (Mizoram), etc.

Few mammalian species which are endemic to Northeast India includes the One Horned Rhinoceros (Assam), Pygmy Hog (Assam), Buff-bellied langur (Assam), Namdhapa flying squirrel (Arunachal Pradesh), Khasian leaf nosed bat (Meghalaya), Assam mole shrew (Assam), etc. 15 species of reptiles are unique to North-East India of which Orange lipped forest lizards, Assam Keelback are worth mentioning.

The endemic flora of North East India includes the Siroi lily (Manipur), *Nepenthes khasiana* - pitcher plant (Meghalaya), *Bambusa cacharensis* - a bamboo plant (Assam), *Thea assamica* – Tea Plant (Assam), *Aeschynanthus parasiticus* - large Flower Blushwort (Meghalaya), *Dendrobium palpebrae* – (Mizoram), *Vanda pumila* – (Sikkim), *Dendrobium assamicum* – Orchid (Assam), etc.

Q4. Describe the different Global Biodiversity Hot Spots.

Ans: Biodiversity hotspots are defined as regions “where exceptional concentrations of endemic species are undergoing an exceptional loss of habitat”. The concept was developed by Norman Myers in 1988. There are 34 areas around the world which are qualified as Biodiversity hotspots. These hotspots represent only 2.3% of the total Earth's land surface. These hotspots are important because Biodiversity underpins all life on Earth. Without species, there would be no air to breathe, no food to eat, no water to drink. There would be no human society at all. And as the places on Earth, where the most biodiversity is under the most threat, hotspots are critical to human survival. The different Biodiversity Hot Spots are present globally are as follows:

- i. **North and Central America:** It includes the California floristic province, Madrean pine-oak woodlands and Mesoamerica.
- ii. **The Caribbean:** It Includes the Caribbean island region.
- iii. **South America:** It includes the Atlantic Forest, Cerrado, Chilean winter Rainfall-valdivian forests, Tumbes-Choco-Magdalena, Tropical Andes areas.
- iv. **Europe:** It includes the Mediterranean basin.
- v. **Africa:** Cape Floristic Region, Coastal Forests of Eastern Africa, Eastern Afromontane, Guinean Forests of West Africa, Horn of Africa, Madagascar and the Indian ocean Islands, Maputaland-Pondoland-Albany, Succulent Karoo.
- vi. **Central Asia:** It includes the mountains of central Asia.
- vii. **South Asia:** includes the Eastern Himalayas, Nepal, Indo-Burma, Western Ghats, Sri-Lanka region. South East Asia and Asia-Pacific: East Malanesian Islands, New Caledonia, New Zealand, Philippines, Polynesia-Micronesia, Southwest Australia, Sundaland, Wallace.
- viii. **East Asia:** Japan, Mountains of south west China.
- ix. **West Asia:** Caucasus, Irano-Anatolian.

Q5. Describe the Andaman Nicobar Island and North East Biogeographic Zones of India.

Ans: The Biogeographic zones of the Andaman & Nicobar Island and North East regions are described below:

Andaman and Nicobar Islands

This constitutes 0.3 per cent of the total geographical area are one of the three tropical moist evergreen forests zones in India. The islands house an array of flora and fauna not found elsewhere. These islands are centres of high endemism and contain some of India's finest evergreen forests and support a wide diversity of corals. In India, endemic island biodiversity is found only in the Andaman and Nicobar Islands. Some of the endemic fauna of Andaman & Nicobar islands include *Narcondam hornbill*, South Andaman krait etc.

North East Region

North East Region constitutes 5.2 per cent of the total geographical area. This region represents the transition zone between the Indian, Indo-Malayan and Indo-Chinese bio-geographical regions as well as being a meeting point of the Himalayan mountains and peninsular India. The North-East is thus the biogeographical 'gateway' for much of India's fauna and flora and also a biodiversity hotspot (Eastern Himalaya). Many of the species contributing to this biological diversity are either restricted to the region itself, or to the smaller localized areas of the Khasi Hills.

Q6. Describe the Himalaya and Desert Biogeographic Zones of India.

Ans:

Himalayan Zone

It constitutes 6.4 per cent of the total geographical area includes some of the highest peaks in the world. The Himalayan zone makes India one of the richest areas in terms of habitats and species.

The alpine and sub-alpine forests, grassy meadows and moist mixed deciduous forests provide diverse habitat for endangered species of bovids such as Bharal (*Pseudois nayaur*), Ibex (*Capra ibex*), Markhor (*Capra falconeri*), Himalayan Tahr (*Hemitragus jemlabicus*), and Takin (*Budoreas taxicolor*). Other rare and endangered species restricted to this zone include Hangul (*Cervus eldi eldi*) and Musk Deer (*Moschus moschiferus*).

Indian Desert Zone

Indian Desert Zone, constituting 6.6 per cent of the total geographical area, includes the Thar and the Kutch deserts and has large expanses of grassland that supports several endangered species of mammals such as Wolf (*Canis lupus*), Caracal (*Felis caracal*), Desert Cat (*Felis libyca*) and birds of conservation interest viz., Houbara Bustard (*Chamidotis undulate*) and the Great Indian Bustard (*Ardeotis nigriceps*).

Q7. Describe the Trans-Himalaya and Gangetic Biogeographic Zones of India.

Ans: **Trans-Himalayan Region**

It constitutes 5.6 per cent of the total geographical area, includes the high altitude, cold and arid mountain areas of Ladakh, Jammu & Kashmir, North Sikkim, Lahaul and Spiti areas of Himachal Pradesh. This zone has sparse alpine steppe vegetation that harbours several endemic species and is a favourable habitat for the biggest populations of wild sheep and goat in the world and other rare fauna that includes Snow Leopard and the migratory Blacknecked Crane (*Grus nigricollis*). The cold dry desert of this zone represents an extremely fragile ecosystem.

Gangetic Plain

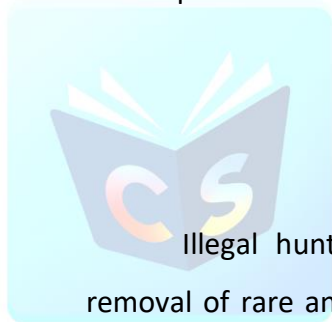
Gangetic plain constitutes around 10.8 per cent of the total geographical area. The Gangetic plain is topographically homogenous for hundreds of kilometers. The characteristic fauna of this region include Rhino (*Rhinoceros unicornis*), Elephant (*Elephas maximus*), Buffalo (*Bubalus bubalis*), Swamp Deer (*Cervus duvauceli*), Hog-Deer (*Axis porcinus*) and Hispid Hare (*Caprolagus hispidus*).

Q8. Describe Habitat Loss and Poaching as major threats to Biodiversity.

Ans: Threats to Biodiversity is a major concern as it not only affects the concerned species, but also affects the ecosystem which in turn leads to an ecological imbalance, posing a major threat to other dependent organisms as well. The increase in anthropogenic activities viz. urbanization, Industrialization, large-scale development projects, farming practices as well as overexploitation of natural resources has posed a serious threat to biodiversity. Two of the major threats are described below:

Habitat Loss

Large scale development projects like Industrial plants, hydroelectric projects, extension of urban areas, large scale deforestation, mining works, etc. have contributed substantially to the loss of biodiversity rich areas by affecting their dwelling place directly or indirectly, either by destroying their habitats through direct contact or through harmful by-products generated and released in the environment out of human activities. Projects such as construction of dams not only results in the submerge of large tracks of forest but also introduce human settlements and roads within the forest area leading to mass scale clearing of the vegetation cover, which leads to extensive habitat loss of wildlife. Natural calamities like floods, volcanic eruption, forest fires, etc., also leads to habitat loss. However, the activities carried out by humans, out of their desires, greed results in much more devastating scenario as compared to the natural causes of habitat loss.



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Poaching of wildlife

Illegal hunting, killing or capturing of wild species of animals or illegal removal of rare and endangered species of plants are termed as poaching. It is an environmental crime against the natural resources. Poaching is carried out with an intension of collecting and selling the plant or animal products such as ivory, horn, teeth, skin and bone for fulfilling human intensions. The consequence of which is the rapid decrease in the population of plant and animal species, thereby affecting the biodiversity. Various legal measures & provisions has formulated by the government under the the Wild Life (Protection) Act – 1972, amended time to time in order to deal with such crimes. The other major Central Acts relevant to biodiversity are: the Indian Forest Act, 1927; the Forest (Conservation) Act, 1980; and the Environment (Protection) Act, 1986 to counter the crimes against and maintain the sustenance of biodiversity.

Q9. Write a note on Endangered species of India.

Ans: Species which are at a risk of extinction as a consequence of diseases, natural disasters and/or human interferences are listed as Endangered species in the IUCN Red Data Book. The various negative factors impairs the favourable environmental conditions required for the growth and sustenance of the species thereby affecting its survival in its environment.

India contains 215 species of animals considered globally as threatened, some of which includes the Bengal fox, Asiatic cheetah, Marbled cat, Asiatic Lion, Indian Elephant, Asiatic Wild Ass, Indian Rhinoceros, Markhor, Gaur, Wild Asiatic Water Buffalo, etc.

Over 63,000 plant species are found in the country, out of which 20% of the plant species in India are categorized either as endangered or threatened, Some of which includes the *Amentotaxus assamica* (Assam catkin yew), *Ilex khasiana*, *Diospyros celebica* (Ebony), *Pterocarpus Santalinus* (Red Sandalwood), *Chlorophytum tuberosum* (Musli), *Kingiodendron Pinnatum* (Malabar Mahagony), *Actinodaphne lawsoni*, etc.

The One-Horned Rhinoceros, Hoolock Gibbon, Pygmy Hog, Hipsid Hare, Assam Roofed Turtle and Bengal slow lorries are some of the endangered species of North-East India, While the *Aquilaria malaccensis* (Eaglewood), *Cyathea gigantea* (Tree fern), *Taxus wallichiana* (Himalayan yew), *Hedychium coronarium* (White Ginger lily), Shiroi lily, etc. falls under the group of endangered plant species of North-East India.

Q10. Describe the Coastal and Western Ghat Biogeographic Zone of India.

Ans: **Coastal Region**

Coastal region constitutes 2.5 per cent of the total geographical area with sandy beaches, mangroves, mud flats, coral reefs and marine angiosperm pastures make them the wealth and health zones of India. The coastline from Gujarat to Sunderbans is estimated to be 5,423 km long. A total of 25 islets constitute the

Lakshadweep, which are of coral origin, and have a typical reef lagoon system, rich in



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biodiversity. However, the densely populated Lakshadweep islands virtually have no natural vegetation.

Western Ghats

It constitutes 4.0 per cent of the total geographical area. It is one of the major tropical evergreen forest regions in India and represents one of the two biodiversity 'hot spots'. Western Ghats are home to viable populations of most of the vertebrate species found in peninsular India, besides an endemic faunal element of its own.

Significant species endemic to this region include Nilgiri Langur (*Presbytis jobni*), Lion Tailed Macaque (*Macaca silenus*), Grizzled Giant Squirrel (*Ratufa macroura*), Malabar Civet (*Viverricula megaspila*), Nilgiri Tahr (*Hemitragus bylocrius*) and Malabar Grey Hornbill (*Ocyceous griseus*). The Travancore Tortoise (*Indotestudo forstem*) and Cane turtle (*Heosemys silvatica*) are two endangered taxa restricted to a small area in central Western Ghats.



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