

03 Biodiversity and Conservation

01. INTRODUCTION TO BIODIVERSITY

- Biodiversity is the term popularised by the sociobiologist Edward Wilson to describe the combined diversity at all the levels of biological organisation.



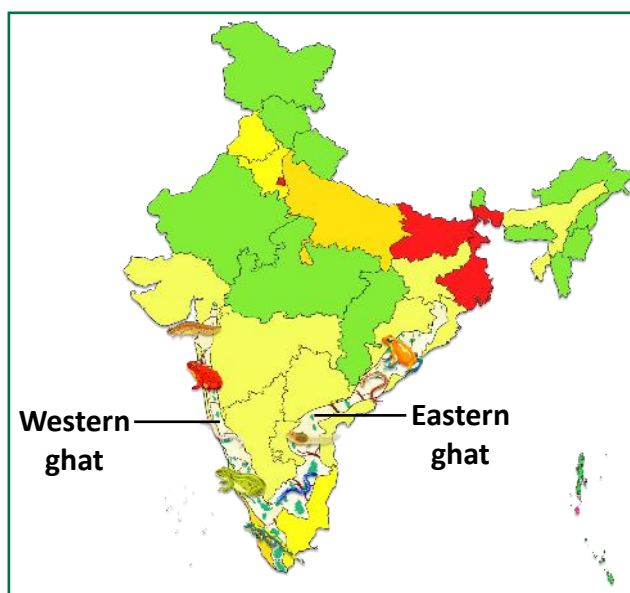
Edward Wilson

NCERT Question :

Name the three important components of biodiversity.

The most important of them are—

- Genetic diversity:** A single species might show high diversity at the genetic level over its distributional range. The genetic variation shown by the medicinal plant *Rauwolfia vomitoria* growing in different Himalayan ranges might be in terms of the potency and concentration of the active chemical (**reserpine**) that the plant produces. India has more than **50,000** genetically different strains of rice, and **1,000** varieties of mango.
- Species diversity:** The diversity at the species level. For example, the Western Ghats have a greater amphibian species diversity than the Eastern Ghats.



- (iii) **Ecological diversity:** At the ecosystem level, India, for instance, with its deserts, rain forests, mangroves, coral reefs, wetlands, estuaries, and alpine meadows has a greater ecosystem diversity than a Scandinavian country like Norway.

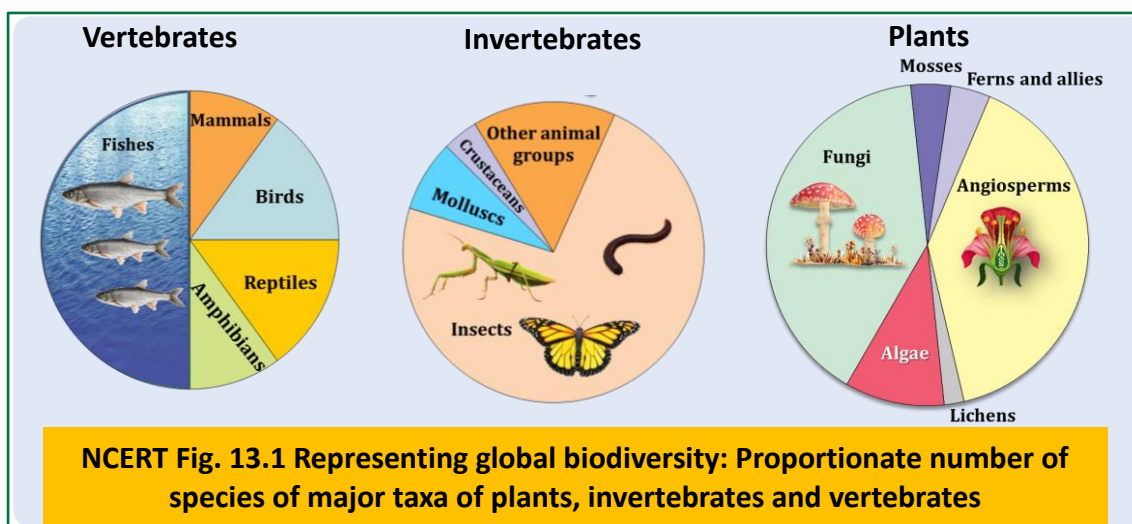
(A) HOW MANY SPECIES ARE THERE ON EARTH AND HOW MANY IN INDIA :

- According to the International Union for Conservation of Nature and Natural Resources (IUCN, 2004), the total number of plant and animal species described so far is slightly more than **1.5 million**, but a more conservative and scientifically sound estimate made by **Robert May** places the global species diversity at about **7 million**.

NCERT Question:

The species diversity of plants (22 per cent) is much less than that of animals (72 per cent). What could be the explanations to how animals achieved greater diversification?

- More than **70 per cent of all the species recorded are animals**, while **plants (including algae, fungi, bryophytes, gymnosperms and angiosperms)** comprise no **more than 22 per cent** of the total. Among animals, **insects are the most species-rich taxonomic group**, making up more than **70 per cent of the total**. That means, out of every 10 animals on this planet, 7 are insects. Again, **how do we explain this enormous diversification of insects?** The number of fungi species in the world is more than the combined total of the species of fishes, amphibians, reptiles and mammals. In following figure biodiversity is depicted showing species number of major taxa.



NCERT Question :

How do ecologists estimate the total number of species present in the world?

3. Although India has only **2.4 per cent** of the world's land area, its share of the global species diversity is an impressive **8.1 per cent**. That is what makes India one of the **12 mega diversity countries** of the world. Nearly 45,000 species of plants and twice as many of animals have been recorded from India. How many living species are actually there waiting to be discovered and named? If we accept May's global estimates, only **22 per cent** of the total species have been recorded so far.

It should be noted that these estimates do not give any figures for prokaryotes. Biologists are not sure about how many prokaryotic species there might be. The problem is that –

- (1) conventional taxonomic methods are not suitable for identifying microbial species and many species are simply not culturable under laboratory conditions.
- (2) If we accept biochemical or molecular criteria for delineating species for this group, then their diversity alone might run into millions.



BEGINNER'S BOX-1

INTRODUCTION TO BIODIVERSITY

1. Type of Biodiversity is/are :
 (1) Genetic diversity (2) Species diversity
 (3) Ecological diversity (4) All of these
BAC146
2. Active chemical in *Rauwolfia vomitoria* :
 (1) Terpene (2) Reserpine
 (3) caffeine (4) None of the above
BAC147
3. The _____ Ghats have a greater amphibian species diversity than the _____ Ghats.
 (1) Eastern, Western (2) Western, Eastern
 (3) Western, Southern (4) Eastern, Southern
BAC148
4. IUCN stands for _____.
 (1) International union for conservation of Natural resources
 (2) Indian union for conservation of Nature
 (3) Italian Union for conservation at Nature
 (4) International Union for conservation of Nature and Natural Resources
BAC149
5. India has only _____ present at the world's land area. Its share of the global species diversity is an impressive _____ Present.
 (1) 2.4, 8.1 (2) 8.1, 2.4 (3) 4.1, 8.2 (4) 8.4, 2.1
BAC150

- | | | | | | | |
|-----|---|-----------------------|-----------------------|--------------------------|-------------------------|---------------|
| 6. | How many species of birds found in India? | (1) 1500 | (2) 1400 | (3) 1200 | (4) 1700 | BAC151 |
| 7. | India has 1000 varieties of mango with different size, colour and taste due to: | (1) Genetic diversity | (2) Species diversity | (3) Ecological diversity | (4) Ecosystem diversity | BAC152 |
| 8. | Term biodiversity is popularised by: | (1) E. Wilson | (2) Chapmann | (3) Norman Mayer | (4) David Tilman | BAC153 |
| 9. | More conservative and scientifically sound estimate of global species diversity is made by: | (1) Jordan | (2) E.P. Odum | (3) Robert May | (4) David Tilman | BAC154 |
| 10. | Highest species diversity in world is shown by: | (1) Fungi | (2) Insect | (3) Fish | (4) Angiosperms | BAC155 |

(B) PATTERNS OF BIODIVERSITY :

(i) Latitudinal gradients :

The diversity of plants and animals is not uniform throughout the world but shows a rather uneven distribution. In general, **species diversity decreases as we move away from the equator towards the poles**. With very few exceptions, tropics (latitudinal range of 23.5° N to 23.5° S) harbour more species than temperate or polar areas. Colombia located near the equator has nearly 1,400 species of birds while New York at 41° N has 105 species and Greenland at 71° N only 56 species. **India, with much of its land area in the tropical latitudes**, has more than 1,200 species of birds. A forest in a tropical region like Ecuador has up to 10 times as many species of vascular plants as a forest of equal area in a temperate region like the Midwest of the USA. The largely tropical Amazonian rain forest in South America has the greatest biodiversity on earth, it is home to more than 40000 species of plants, 3000 of fishes, 1300 of birds, 427 of mammals, 427 of amphibians, 378 of reptiles and more than 125000 invertebrates.

NCERT Question :

Give three hypotheses for explaining why tropics show greatest levels of species richness.

What is so special about tropics that might account for their greater biological diversity?

Ecologists and evolutionary biologists have proposed various hypotheses; some important ones are:

- Speciation is generally a function of time, unlike temperate regions subjected to frequent glaciations in the past, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification,
- Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable. Such constant environments promote niche specialisation and lead to a greater species diversity.
- There is more solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity.

NCERT Question :

What is the significance of the slope of regression in a species – area relationship?

(ii) Species-Area relationships:

- German naturalist and geographer **Alexander von Humboldt** observed that **within a region species richness increased with increasing explored area, but only up to a limit.**

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

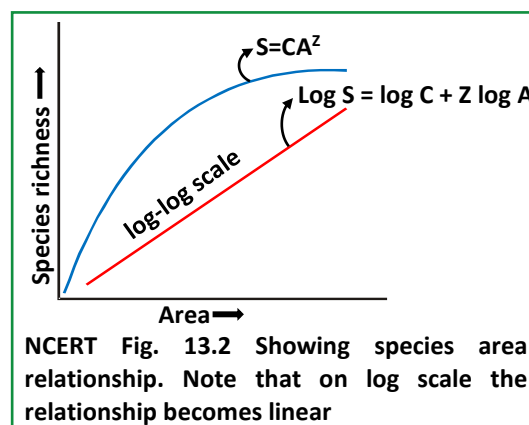
where

S = Species richness A = Area

Z = slope of the line (regression coefficient)

C = Y-intercept

- Ecologists have discovered for a small region (Britain, California, New York) the value of Z lies in the range of **0.1 to 0.2**, regardless of the taxonomic group.
- For very large areas like the entire continents the value of Z lies in the range of **0.6 to 1.2**. In the tropical forests of different continents for frugivorous (fruit-eating) birds and mammals value of Z found to be **1.15**.
- The **steeper slopes** in this context means more species richness.



NCERT Question :

How is biodiversity important for ecosystem functioning?

(C) THE IMPORTANCE OF SPECIES DIVERSITY TO THE ECOSYSTEM :

- For many decades, ecologists believed that communities with more species, generally, tend to be more stable than those with less species. What exactly is stability for a biological community?
 1. A stable community should not show too much variation in productivity from year to year;
 2. It must be either resistant or resilient to occasional disturbances (natural or man-made),
 3. It must also be resistant to invasions by alien species.
- We don't know how these attributes are linked to species richness in a community, but **David Tilman's long-term ecosystem experiments** using outdoor plots provide some tentative answers. Tilman found that plots with more species showed less year-to-year variation in total biomass. He also showed that in his experiments, increased diversity contributed to higher productivity.
- Although, we may not understand completely how species richness contributes to the well-being of an ecosystem, we know enough to realise that rich biodiversity is not only essential for ecosystem health but imperative for the very survival of the human race on this planet.
- At a time when we are losing species at an alarming pace, one might ask—Does it really matter to us if a few species become extinct? Would Western Ghats ecosystems be less functional if one of its tree frog species is lost forever? There are no direct answers to such naive questions but we can develop a proper perspective through an analogy (**the 'rivet popper hypothesis'**) **used by Stanford ecologist Paul Ehrlich**. In an airplane (ecosystem) all parts are joined together using thousands of rivets (species). If every passenger travelling in it starts popping a rivet to take home (causing a species to become extinct), it may not affect flight safety (proper functioning of the ecosystem) initially, but as more and more rivets are removed, the plane becomes dangerously weak over a period of time. Furthermore, which rivet is removed may also be critical. Loss of rivets on the wings (**key species** that drive major ecosystem functions) is obviously a more serious threat to flight safety than loss of a few rivets on the seats or windows inside the plane.
- The IUCN Red List (2004) documents **the extinction of 784 species (including 338 vertebrates, 359 invertebrates and 87 plants)** in the last 500 years. Some examples of recent extinctions include the **dodo (Mauritius), quagga (Africa), thylacine (Australia), Steller's Sea Cow (Russia) and three subspecies (Bali, Javan, Caspian) of tiger**. The last twenty years alone have witnessed the disappearance of 27 species. Careful analysis of records shows that extinctions across taxa are not random; some groups like amphibians appear to be more vulnerable to extinction. Adding to the grim scenario of extinctions is the fact that more than 15,500 species world-wide are facing the threat of extinction. **Presently, 12 per cent of all bird species, 23 per cent of all mammal species, 32 per cent of all amphibian species and 31 per cent of all gymnosperm species** in the world face the threat of extinction.

NCERT Question :

What are the major causes of species losses in a geographical region?

(D) CAUSES OF BIODIVERSITY LOSSES :

The accelerated rates of species extinctions that the world is facing now are largely due to human activities. There are four major causes ('**The Evil Quartet**' is the sobriquet used to describe them).

(i) Habitat loss and fragmentation:

This is the most important cause driving animals and plants to extinction.

The most dramatic examples of habitat loss come from tropical rain forests. Once covering more than 14 per cent of the earth's land surface, these rain forests now cover no more than 6 per cent. They are being destroyed fast. The Amazon rain forest (it is so huge that it is called the '**lungs of the planet**') harbouring probably millions of species is being cut and cleared for cultivating soya beans or for conversion to grasslands for raising beef cattle.



- Besides total loss, the degradation of many habitats by pollution also threatens the survival of many species. When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territories and certain animals with migratory habits are badly affected, leading to population declines.

(ii) Over-exploitation :

- Humans have always depended on nature for food and shelter, but when 'need' turns to 'greed', it leads to over-exploitation of natural resources. Many species extinctions in the last 500 years (**Steller's sea cow, passenger pigeon**) were due to overexploitation by humans. Presently many marine fish populations around the world are over harvested, endangering the continued existence of some commercially important species.

(iii) Alien species invasions :

- When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive, and cause decline or extinction of indigenous species. The **Nile perch** introduced into Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of **cichlid fish** in the lake.



- You must be familiar with the environmental damage caused and threat posed to our native species by invasive weed species like carrot grass (*Parthenium*), Lantana and water hyacinth (*Eichhornia*). The recent illegal introduction of the **African catfish (*Clarias gariepinus*)** for aquaculture purposes is posing a threat to the indigenous catfishes in our rivers.

(iv) Co-extinctions :

- When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate. Another example is the case of a coevolved plant-pollinator **mutualism** where extinction of one invariably leads to the extinction of the other.

Type of Extinction of species:

- (a) Natural extinction:** Due to change in environmental condition.
- (b) Mass extinction:** Due to catastrophe.
- (c) Anthropogenic extinction:** Due to human activities like hunting.

The characteristics of species particularly susceptible to extinction are :

Large body size, small population size, low reproductive rate, feeding at high trophic levels in the food chain, Fixed migratory routes and habitat and localized and narrow range of distribution.

(E) WHY SHOULD WE CONSERVE BIODIVERSITY:

There are many reasons to conserve biodiversity we can group them into three categories.

- (i) Narrowly utilitarian :-** It is concerned with direct economic benefits humans derive from nature food, firewood, fibre, construction material, industrial products and products of medicinal importance. More than **25 percent** of the drugs currently sold in the market world wide are derived from plants.

(ii) Broadly Utilitarian :-

It is centred with indirect benefits from nature, like, photosynthesis, pollination. This argument says that biodiversity plays a major role in many ecosystem services that nature provides. Amazon forest is estimated to produce **20% of the total oxygen** in the earth's atmosphere. Pollination is another service, ecosystem provides through pollinators.

(iii) Ethical :-

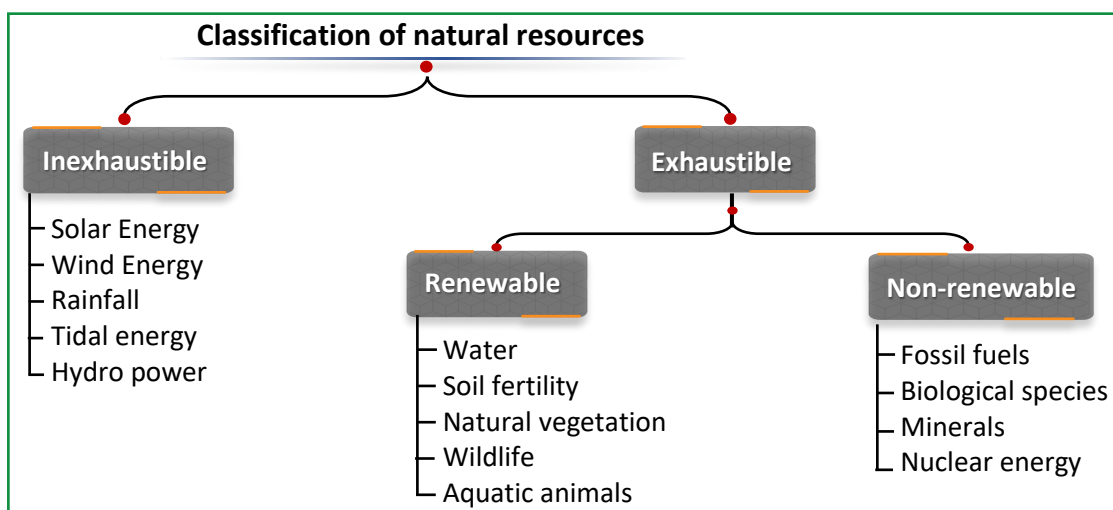
It is our moral duty to care for the well being of biodiversity and pass on our biological legacy in good order to future generations.

Note : Bioprospecting :- Exploring molecular, genetic and species level diversity for the products of economic importance.

02. NATURAL RESOURCES

- The materials or any component, that can be utilised by man and are necessary for welfare of life, which is available in the natural environment in Atmosphere, Hydrosphere, Lithosphere is called natural resources.

e.g. O₂, Land, Soil, Water, Forest, Animals, Soil, Microorganism

**Classification of natural resources :**

- 1. Inexhaustible resources (Non-conventional resources) :** Available in unlimited quantities, and the earth quantity may remain unchanged by human impact.

e.g. Solar Energy, Wind Power, Tidal power, Air, Geothermal Energy

Note : Its quality can be affected due to continuous increase in human population.

e.g. Air pollution

2. Exhaustible resources (Conventional resources) :

These are likely to be finished by human use or unsustainable uses.

It is further divided in two groups :

- (i) **Renewable resources** : Those which are being continuously consumed by man but renewed continuously by nature, always available if managed in a proper way, otherwise they may even get totally exhausted.

e.g. Biotic resources, forest, grazing animals, Rangeland, wild life, Agriculture crop system and fresh water yield, soil etc.

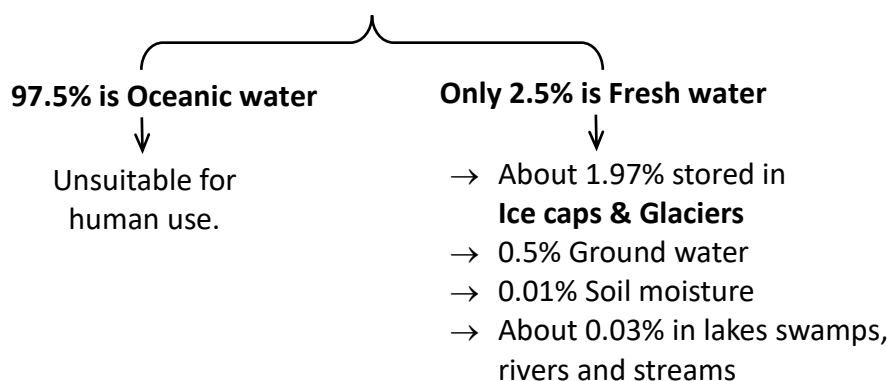
- (ii) **Non-renewable resources** : They are not renewable after use and are not replaced by nature, can not be regained.

e.g. Fossil fuel (Coal, Petroleum), Natural Gas, Nuclear energy, Biotic species, Minerals etc.

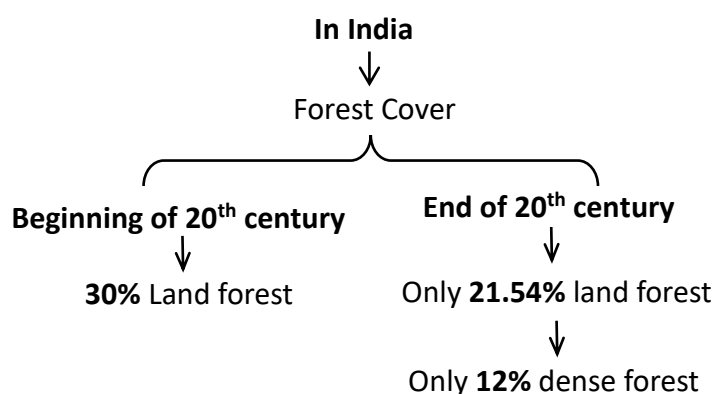
Note : Nuclear energy is non-renewable and unlimited resources.

Hydrosphere or Water Resources :

Total volume of water in hydrosphere = 1.4 billion km³



Land Resources :



03. FOREST CONSERVATION

It is conducted by two methods

1. **Protection or conservation forestry** : By Making national park and Bio-sphere Reserve.
2. **Production or commercial forestry** :

It is of two types :

- (i) **Social forestry** : To grow the trees and shrubs on unused farmland, road sides, Rail sides, community land etc.
- (ii) **Agro-forestry** : Woody species are grown in combination with herbaceous crops either at the same time or in time sequence.

Silent Valley : It is tropical evergreen forest in Kerela (Palghat) declared as National Reserve Forest. It is called silent valley because there is no noise in the forest during night, even that of cicadas, as they are not found there. **It is related to conservation of forest.**

CASE STUDY OF PEOPLE'S PARTICIPATION IN CONSERVATION OF FORESTS :

- In **1731**, the king of **Jodhpur in Rajasthan** asked one of his ministers to arrange wood for constructing a new palace. The minister and workers went to a forest near a village, inhabited by Bishnois, to cut down trees. The effort to cut down trees by the kings was thwarted by the Bishnois. A Bishnoi woman **Amrita Devi** showed exemplary courage by hugging a tree and daring king's men to cut her first before cutting the tree. Sadly, the king's men did not heed to her pleas, and cut down the tree along with Amrita Devi. Her three daughters and hundreds of other Bishnois followed her, and thus lost their lives saving trees.
- The Government of India has recently instituted the **Amrita Devi Bishnoi Wildlife Protection Award** for individuals or communities from rural areas that has shown extraordinary courage and dedication in protecting wildlife.
- You may have heard of the **Chipko Movement** of Garhwal Himalayas. In **1974**, local women showed enormous bravery in protecting trees from the axe of contractors by hugging them.
- **Chipko Movement** was born in March-1974 at Gopeshwar in Chamoli district. The movement had two leaders- Sundarlal Bahuguna of Silyara in Tehri and Chandi Prasad Bhatt of Gopeshwar. It was for plant conservation.
- Realising the significance of participation by local communities, the Government of India **1980s** has introduced the concept of **Joint Forest Management (JFM)** so as to work closely with the **local**

communities for protecting and managing get benefit of various forest products (**e.g.**, fruits, gum, rubber, medicine etc.) and thus the forest can be conserved in a sustainable manner.

04. HOW WE CONSERVE BIODIVERSITY

- When we conserve and protect the whole ecosystem, its biodiversity at all levels is protected - we save the entire forest to save the tiger. This approach is called in situ (on site) conservation. However, when there are situations where an animal or plant is endangered or threatened (organisms facing a very high risk of extinction in the wild in the near future) and needs urgent measures to save it from extinction, ex-situ (off site) conservation is the desirable approach.

(A) **IN-SITU CONSERVATION:**

- (1) **Hot Spot:** Norman Myers developed the hot spot concept in 1988. This is a mega diversity zone. Where large number of species are found. It is an area of the richest and the most threatened reservoirs of plant and animal life on the earth. Initially 25 biodiversity hot spots were identified in world, now **number of biodiversity hot spot in the world are 34 out of these 3 hotspots are found in India.**

(i) **Western Ghats and Sri Lanka**

(ii) **Indo-Burma**

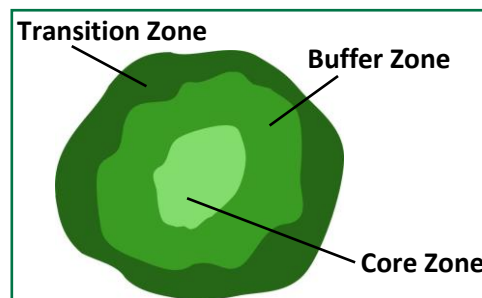
(iii) **The Himalayas**

Note :

- The key criteria for determining a hot spot are:
 - High level of species richness
 - High degree of endemism (that is, species confined to that region and not found anywhere else).
 - High degree of threat which is measured in terms of habitat loss (It means hot spots are regions of accelerated habitat loss).
 - Hot spot covers less than 2 percent (1.4%) of the earth's land area.
 - Although all the biodiversity hotspots put together cover less than 2 percent of the earth's land area, the number of species they collectively harbour is extremely high and strict protection of these hotspots could reduce the ongoing mass extinctions by almost 30 percent.
- (2) **Biosphere Reserves :** It is a specified protected area in which multiple use of the land is permitted.

There are 3 zones of Biosphere Reserve.

1. **Core Zone:** It lies at the centre where no human activity is allowed.
2. **The Buffer zone:** Where limited human activity is allowed.
3. **Manipulating zone or Transition zone:** Where a large number of human activities would go on.



Note : 408 Biosphere reserves are located in 94 countries out of which 14 sites are present in India.

In India following 14 sites have been identified as potential biosphere reserves together with their locations:

S.No.	Biosphere Reserve	State(s)
1.	Nanda Devi	Uttaranchal/Uttarakhand
2.	Nokrek	Meghalaya
3.	Manas	Assam
4.	Dibru Saikhowa	Assam (Smallest)
5.	Dehang Debang	Arunachal Pradesh
6.	Sunderbans	West Bengal
7.	Gulf of Mannar	Tamil Nadu
8.	Nilgiri	Kerala, Karnataka and Tamil Nadu (First)
9.	Great Nicobar	Andaman & Nicobar
10.	Simlipal	Orissa
11.	Kanchanjunga	Sikkim
12.	Pachmarhi	Madhya Pradesh
13.	Agasthyamalai	Kerala
14.	Achankamar	Madhya Pradesh, Chattisgarh

(3) National Park and Sanctuaries :

- In India, ecologically unique and biodiversity-rich regions are legally protected as biosphere reserves, national parks and sanctuaries. India now has **14** biosphere reserves, **90** national parks and **448** wildlife sanctuaries. India has also a history of religious and cultural traditions that emphasised protection of nature.

Some Important National Parks of India

S.No.	Name & Location	IMPORTANT ANIMALS FOUND
1.	Kaziranga National Park District Sibsagar (Assam)	Rhinoceros
2.	Sundarbans (Tiger Reserve) 24-Pargana (West Bengal)	Tiger
3.	Hazaribagh National Park Hazaribagh Jharkhand	Tiger
4.	Corbett National Park District Nainital (Uttaranchal)	Tiger
5.	Gir National Park District Junagarh (Gujarat)	Asiatic lion
6.	Kanha National Park Mandla and Balaghat (Madhya Pradesh)	Tiger, panther, chital, chinkara, four horned deer
7.	Tandoba National Park Chandrapur (Maharashtra)	Tiger
8.	Bandipur National Park District Mysore (Karnataka)	Elephant, tiger, leopard
9.	Desert National Park Jaisalmer, Barmer (Rajasthan)	Great Indian Bustard, Black buck, Chinkara.
10.	Nanda Devi - Uttaranchal/Uttarakhand (Chamoli District)	Snow leopard
11.	Kuno National Park – Sheopur (Madhya Pradesh)	Cheetah (brought from Namibia)

Some Important Sanctuaries of India

S.No.	Name & Location	Important Animals Found
1.	Keoladeo Ghana Bird Sanctuary Bharatpur (Rajasthan) Famous for birds	Siberian crane
2.	Annamalai Sanctuary Coimbatore (Tamil Nadu)	Tiger, Elephant
3.	Dachigam Sanctuary Srinagar (Jammu & Kashmir)	Hangul or Kashmir stag, Musk deer
4.	Nagarjuna Sagar Sanctuary Guntur Kamool and Nalgonda (Andhra Pradesh)	Tiger, Panther
5.	Periyar Sanctuary (Kerala)	Elephants, Leopard, Hornbill
6.	Chilka Lake Bird Sanctuary Balagaon (Orissa) (Largest brackish water lagoon in Asia)	Water fowls, Ducks, Cranes
7.	Manas Wildlife Sanctuary Kamrup (Assam)	Tiger, Panther

NCERT Question :

What are sacred groves? What is their role in conservation?

(4) Sacred Groves :

- In many cultures, tracts of forest were set aside, and all the trees and wildlife within were venerated and given total protection. Such **sacred groves** are found in **Khasi and Jaintia Hills in Meghalaya, Aravalli Hills of Rajasthan, Western Ghat regions of Karnataka and Maharashtra and the Sarguja, Chanda and Bastar areas of Madhya Pradesh**. In Meghalaya, the sacred groves are the last refuges for a large number of rare and threatened plants.

(B) EX-SITU CONSERVATION :

- In this approach, threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care. The protection of wild life in zoos and botanical gardens. Other e.g., of Ex-situ conservation are **gene banks, germ plasm bank, seed bank. Zoological parks, botanical gardens** and **wildlife safari parks** serve this purpose. There are many animals that have become extinct in the wild but continue to be maintained in zoological parks.
- In recent years ex situ conservation has advanced beyond keeping threatened species in enclosures. Now gametes of threatened species can be preserved in viable and fertile condition for long periods using **cryopreservation techniques**, eggs can be fertilised in vitro, and plants can be propagated using tissue culture methods. Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks.
- Biodiversity knows no political boundaries and its conservation is therefore a collective responsibility of all nations. The historic Convention on Biological Diversity ('The Earth Summit') held in Rio de Janeiro in 1992, called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilisation of its benefits.
- In a follow-up, the World Summit on Sustainable Development held in 2002 in Johannesburg, South Africa, 190 countries pledged their commitment to achieve by 2010, a significant reduction in the current rate of biodiversity loss at global, regional and local levels.

Some Important Informations :

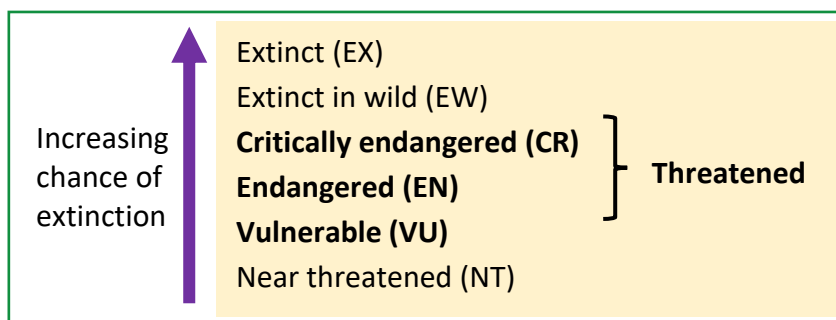
- (i) **National Forest Policy – 1988**
- (ii) Biodiversity act of India was passed by the Parliament in the year-2002
- (iii) Forest Act–1927
- (iv) Biosphere Reserve Scheme– 1986
- (v) **Wildlife protection act 1972 (Revised in 1991)**

About Wildlife :

- **Red Data Book :-** This book contains also a record of **animals & plants** which are known to be in danger. This Book is maintained by the **IUCN** [International Union for Conservation of Nature and Natural Resources].

Concept of threatened species :

A threatened species is any species which is vulnerable, endangered, or critically endangered.



(C) CRITERIA FOR A THREATENED SPECIES :

some of them are :

1. Population size decline
2. Number of mature individuals
3. Geographic range of distribution

05. IMPORTANT DAYS ABOUT ENVIRONMENT

22-Apr	—	Earth Day
05-Jun	—	World Environment Day
11-Jul	—	World population Day
16-Sep	—	World Ozone day

★ **Golden Key Points** ★

- Most important levels of biodiversity are genetic, species and ecological diversity.
- Conservative and scientifically sound estimate made by Robert May places global species diversity at about 7 million.
- There are two methods of conservation –
- *In situ* (conservation in natural habitat) and
- *Ex situ* (conservation outside natural habitat)
- In general, species diversity decreases as we move away from the equator towards poles. Also, within a region species richness increases with increasing explored area, but only up to a limit.
- The four major causes of biodiversity loss "the evil quartet" includes habitat loss and fragmentation, over exploitation, Alien species invasion and co-extinction.
- Joint forest management was launched in 1980s.

**BEGINNER'S BOX-2****BIODIVERSITY AND CONSERVATION**

1. Species extinct in the wild are maintained in which of the following conservation site ?
 (1) Zoological parks (2) Biosphere reserves
 (3) Hot spot (4) National parks
BAC156
2. Which of the following is broadly utilitarian role of ecosystem ?
 (1) Dyes (2) Medicines (3) Oxygen (4) Fire wood
BAC157
3. Who popularised the term biodiversity ?
 (1) David Tilman (2) Edward Wilson
 (3) Paul Ehrlich (4) Alexander Von Hombolt
BAC158
4. Which taxonomic group is more vulnerable to extinction ?
 (1) Amphibian (2) Mammal (3) Aves (4) Fishes
BAC159
5. More species in community, tends to more stability than communities with less species.
 It was supported by–
 (1) David Tilman (2) Paul Ehrlich
 (3) Humboldt (4) Both (1) and (2)
BAC160

6. Which of the following species is/are extinct in the last 500 years due to over-exploitation of natural resources?
 (1) Stellar's sea cow (2) Passenger pigeon
 (3) Water hyacinth (4) Both (1) & (2)
BAC161
7. Sacred grove are useful in :
 (1) Preventing soil erosion
 (2) Year around flow of water in river
 (3) Generating environment awareness
 (4) Conserving rare and threatened species
BAC162
8. In a biosphere reserve, the area surrounding the core zone is called :
 (1) Buffer zone (2) Transition zone
 (3) Peripheral zone (4) Development zone
BAC163
9. Which of the following is considered in broadly utilitarian arguments for biodiversity conservation.
 (1) Fire wood (2) Tannins (3) Pollination (4) Dyes
BAC164
10. First biosphere reserve established in India:
 (1) Nanda devi (2) Nilgiri (3) Sunder bans (4) Simlipal
BAC165

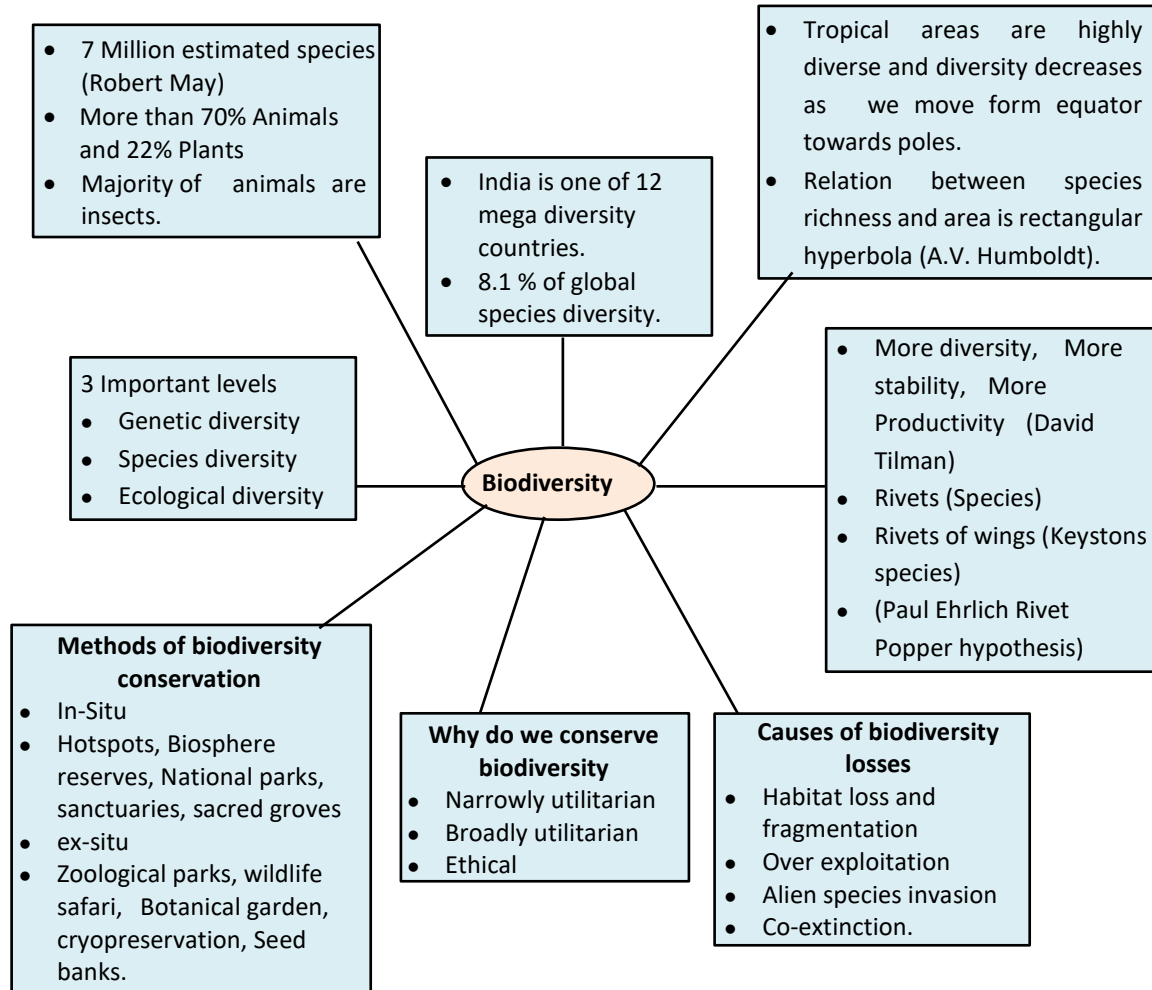


BEGINNER'S BOX

ANSWERS KEY

BEGINNER'S BOX-1	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	4	2	2	4	1	3	1	1	3	2

BEGINNER'S BOX-2	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	1	3	2	1	1	4	4	1	3	2



NCERT SUMMARY

Since life originated on earth nearly 3.8 billion years ago, there had been enormous diversification of life forms on earth. Biodiversity refers to the sum total of diversity that exists at all levels of biological organisation of particular importance is the diversity at genetic, species and ecosystem levels and conservation efforts are aimed at protecting diversity at all these levels.

More than 1.5 million species have been recorded in the world, but there might still be nearly 6 million species on earth waiting to be discovered and named. Of the named species, > 70 per cent are animals, of which 70 per cent are insects. The group Fungi has more species than all the vertebrate species combined. India, with about 45,000 species of plants and twice as many species of animals, is one of the 12 mega diversity countries of the world.

Species diversity on earth is not uniformly distributed but shows interesting patterns. It is generally highest in the tropics and decreases towards the poles. Important explanations for the species richness of the tropics are: Tropics had more evolutionary time; they provide a relatively constant environment and, they receive more solar energy which contributes to greater productivity. Species richness is also function of the area of a region; the species-area relationship is generally a rectangular hyperbolic function.

It is believed that communities with high diversity tend to be less variable, more productive and more resistant to biological invasions. Earth's fossil history reveals incidence of mass extinctions in the past, but the present rates of extinction, largely attributed to human activities, are 100 to 1000 times higher. Nearly 700 species have become extinct in recent times and more than 15,500 species (of which > 650 are from India) currently face the threat of extinction. The causes of high extinction rates at present include habitat (particularly forests) loss and fragmentation, over-exploitation, biological invasions and co-extinctions.

Earth's rich biodiversity is vital for the very survival of mankind. The reasons for conserving biodiversity are narrowly utilitarian, broadly utilitarian and ethical. Besides the direct benefits (food, fibre, firewood, pharmaceuticals, etc.), there are many indirect benefits we receive through ecosystem services such as pollination, pest control, climate moderation and flood control. We also have a moral responsibility to take good care of earth's biodiversity and pass it on in good order to our next generation.

Biodiversity conservation may be *in situ* as well as *ex situ*. In *in situ* conservation, the endangered species are protected in their natural habitat so that the entire ecosystem is protected. Recently, 34 'biodiversity hotspots' in the world have been proposed for intensive conservation efforts. Of these, three (Western Ghats-Sri Lanka, Himalaya and Indo-Burma) cover India's rich biodiversity regions. Our country's *in situ* conservation efforts are reflected in its 14 biosphere reserves, 90 national parks, > 450 wildlife sanctuaries and many sacred groves. *Ex situ* conservation methods include protective maintenance of threatened species in zoological parks and botanical gardens, *in vitro* fertilisation, tissue culture propagation and cryopreservation of gametes.