BIODIVERSITY AND CONSERVATION

I. Biodiversity:

Biodiversity: The totality of genes, species, and ecosystems of a region is called Biodiversity.

The term Biodiversity is popularised by (Edward Wilson)

1. Diversity at the genetic level over its distributional range is called Genetic diversity: nil plant Rauwolfia vomitoria of Himalayan range produces active chemical reserpine shows genetic variation. Medici-
2. Diversity at species level is called Species diversity. e.g.: Western ghats have greater amphibian species diversity than Eastern Ghats
3. Diversity at the ecosystem level is called (Ecological diversity) e.g: India has desert, rain forest, mangroves, coral reef, wetlands, estuaries etc.

II. Number of species on Earth

1. According to IUCN 2004, no of plants and animals species described are more than 1.5 million.
2. Extreme estimates range from 20 to 50 million species on earth.
3. Robert May places global species diversity at about 7 millions of species on earth.
4. More than 70 percent of all the species recorded are animals.
5. All plants constitute about 22 percent of species on earth.
6. Among animals insects constitute 70 percent of species on earth.
7. Out of every 10 animals 7 are insects.

III. Number of species in India

1. India has only 2.4 percent of the world's land area.
2. India shares of global species diversity is an impressive 8.1 percent.
3. India is considered one of the 12 mega diversity countries of the world.
4. 45,000 species of plants and twice as many of animals have been recorded from India.
5. More than 1,00,000 plants species and more than 3,00,000 animal species yet to be discovered and described from India.

IV. Patterns of Biodiversity:

1. Latitudinal gradients explain species diversity decreases as we move away from the equator towards the pole.
2. Tropic (23.5° N to 23.5°S) harbours more species than temperate and pole
3. Colombia located near the equator has nearly 1,400 species of birds.
4. New York at 41°N has 105 species of birds
5. Greenland at 71°N has 56 species of birds.
6. India in the tropical latitudes has more than 1,200 species of birds.
7. The largely tropical Amazonian rain forest in South America has the greatest biodiversity on earth: 427 species of mammals, 40,000 species of plants, 3000 species of fishes, 1300 of birds, 427 amphibians, 378 reptiles, more than 1, 25,000 invertebrates.

V. Tropical rain forest has greater Biodiversity than temperate

1. Temperate regions are subjected to frequent glaciations in the past, Tropical latitudes have remained relatively undisturbed for millions of years, thus had a long evolutionary time for species diversification.

2. Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable, promotes niche specialization and lead to greater species diversity.
3. There is more solar energy available in the tropics, which contribute to higher productivity.

VI. Species area relationship:

1. ALEXANDER VON HUMBOLDT observed within a region species richness increased with increasing explored area but only up to a certain limit.
2. The relation between species richness and area for a wide variety of taxa turns out to be a rectangular hyperbola.
3. On a logarithmic scale the relationship is a straight line described by the equation Log S = log C + Z log A, Where S = species richness, A = Area, Z=slope of the line (regression coefficient), C=Y-intercept.
4. Z lies in the range of 0.1 to 0.2 regardless of the taxonomic group or the region.
5. Z for a very large area like the entire continent the slope of the line is steeper, Z values lies in the range of 0.6 to 1.2.

VII. Importance of species diversity to the Ecosystem:

1. Community with more species generally tends to be more stable than those with less species.
2. A stable community should not show too much variation in productivity from year to year it must be resistant or resilient to occasional disturbances (natural or man-made)
3. Stable community must be resistant to invasion by alien species.
4. David Tilman's long-term field experiment finds that plots with more species showed less year to year variation in biomass.
5. Increased diversity contributed to higher productivity.
6. The rivet popper hypothesis proposed by stand ford ecologist (Paul Ehrlich)
7. In an airplane (ecosystem) all parts are joined together by thousands of rivets (species).
8. If every passenger starts popping a rivet to take home (species extinct), it may not affect flight safety initially but as more and more rivets are removed the plane becomes dangerously weak.
9. Furthermore, which rivet is removed may also be critical.
10. Loss of rivets on the wings (key species) is obviously a more serious threat to flight safety than loss of a few rivets on the seats or windows inside the plane.

VIII. Loss of Biodiversity:

1. The IUCN Red List (2004) documents the extinction of 784 species.
2. Recent extinction includes Dodo (Mauritius), Quagga (Africa), Thylacine (Australia), Steller's cow (Russia), Three subspecies of tiger (Bali, Java, Caspian).
3. The 'sixth Extinction' is different from the previous five extinctions is due to the current extinction rate is 100 to 1000 times faster.
4. All others are pre-human period; this one is anthropogenic.
5. Effect of biodiversity loss cause decline in plant production, Lowered resistance to environmental perturbations such as drought.
6. Increased variability in certain ecosystem processes such as plant productivity, water use, and pest and disease cycle.

IX. Causes of biodiversity loss:

1. The present loss is all due to human activity (anthropogenic)
2. There are four major causes "The Evil Quartet" are as follows:
3. The habitat loss includes Amazonian rain forest is called as 'lungs of the planet 'is being cut cleared for cultivating soya beans.
4. Degradation of many habitats by pollution is also threatens the loss of diversity.
5. Large areas are broken into fragments also the cause of diversity loss is called fragmentation.
6. Over-exploitation explains when need' turns to 'greed' it leads to over-exploitation of natural resources.
7. Many species extinctions in the last 500 years (Steller's cow, passenger pigeons) exploitation. were due to over

8. The alien species became invasive and cause decline or extinction of indigenous species.
9. Nile perch introduced into Lake Victoria in east Africa led to extinction of 200 species of cichlid fish in the lake.
10. Parthenium, (carrot grass), Lantana, and water hyacinth (Eichhornia) posed a threat to indigenous species.
11. African catfish Clarias Garie Pinus for aquaculture purpose is posing a threat to indigenous catfishes in our rivers.
12. Co-extinction explains when a species becomes extinct, the plant and animal species associated with it an obligatory way also become extinct.
13. Extinction of host species leads to extinction of the parasite also.
14. Co-evolved plant-pollinator mutualism where extinction of one invariably lead to the extinction of the other.

X. BIODIVERSITY CONSERVATION:

1. Reason for conservation biodiversity is grouped into three categories.
   * Narrowly utilitarian.
   * Broadly utilitarian
   * Ethical
2. Narrowly utilitarian: The Human derive countless direct economic benefits from nature are called Narrowly utilitarian.
3. Food (cereals, pulses, fruits), firewood, fibre, construction material.
4. Industrial products (tannins, lubricants, dyes, resins, perfumes)
5. Products of medicinal importance.
6. Bioprospecting: exploring molecular genetics and species-level diversity for products of economic importance is called bioprospecting.
7. Broadly Utilitarian explains Amazonian Forest along produce 20% of oxygen during photosynthesis.
8. Pollinator bees, bumblebees, birds and bat that pollinate the plant without which seed cannot be produced by plants.
9. Aesthetic pleasure we get from the biodiversity.
10. Ethical argument: We have moral duty to care for there are wellbeing and pass on our biological legacy to next generation.

XI. Types of conservation of biodiversity

1. We conserve and protect the whole ecosystem, its biodiversity at all levels is protected is called (in situ/onsite conservation).
2. Biodiversity hot spot: The regions with very high levels of species richness and high degree of Endemism and accelerated habitat loss are called Biodiversity hot spots.
3. Species confined to that region and not found anywhere else is called_____ (Endemism).
4. Out of 34 hot spots in the world, three hot spots located in India are, Western Ghats and Sri Lanka, Indo-Burma region and Himalaya.
5. Other protected area under in situ conservations are 14 biosphere reserve, 90 national park and 448 wild life sanctuary.
6. The Tracts of forest were set aside, and all the trees and wildlife within were venerated and given total protection are known as Sacred groves.
7. 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 is called Ex situ conservation.
8. Zoological Park, Botanical Garden, Wildlife safari, Conservation of gamete by cryopreservation, Genetic strains are preserved in seed bank are example for Ex situ conservation.

XII. Convention on Biodiversity:

1. "The Earth Summit" held in Rio de Janeiro in 1992 called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilization of its benefits.
2. World Summit on Sustainable development held in 2002 in Johannesburg, South Africa, 1992. 190 countries pledged their commitment to achieve by 2010. A significant reduction in the current rate of biodiversity loss at global, Regional and local level.