Biotic Resources & Biodiversity

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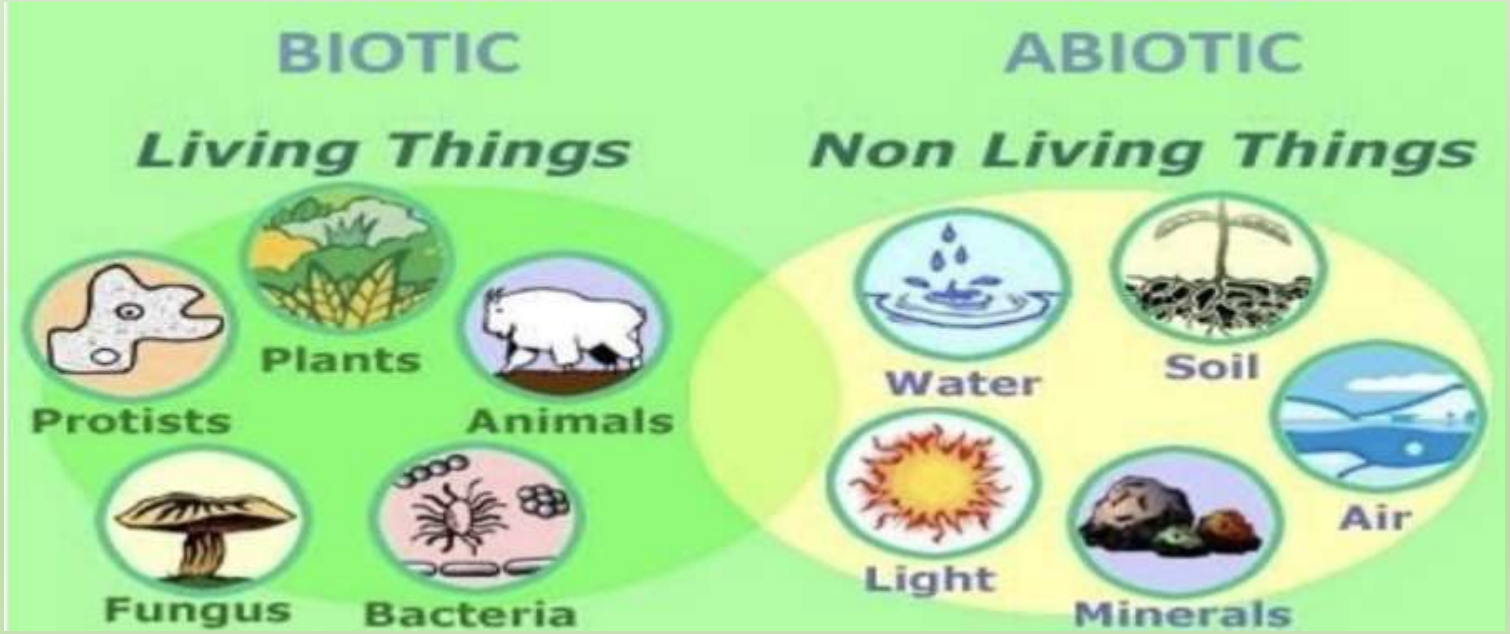
Natural Resources

- Materials that occur in nature under different environmental conditions, can be used to fulfill our needs - natural resources.
- On the basis of origin can be categorized in- biotic resources and abiotic resources



Abiotic vs Biotic Resources

- Abiotic resources are non-living physical and chemical elements within the ecosystem.
- Abiotic resources are usually obtained from the atmosphere, lithosphere, and hydrosphere.
- Abiotic resources include air, water, sunlight, soil, and minerals.

- Biotic resources comprise all living organisms (Producers, Consumers and Decomposers)
- Biotic resources are obtained from the biosphere.
- Examples of biotic resources are forests, animals, birds, fish, and marine organisms.

Importance of Biotic Resources

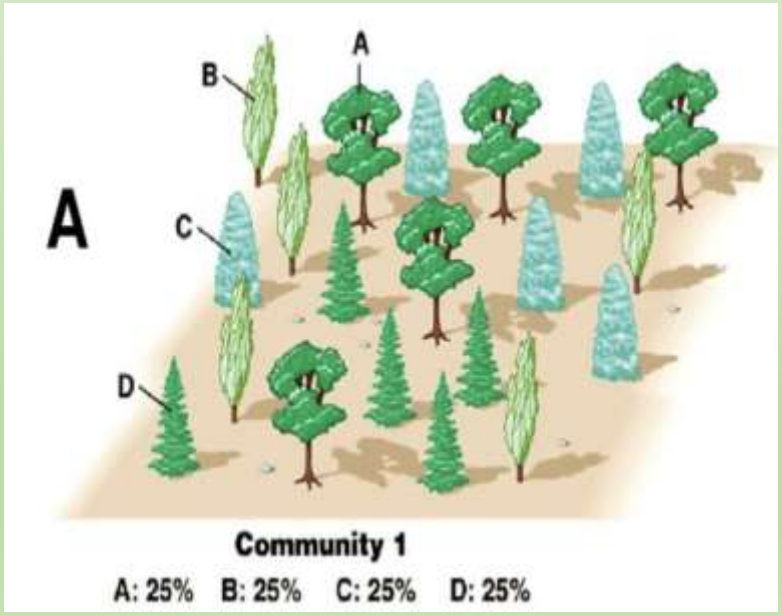
- Affects the socio-economy of a community.
- Provides foods- crops, fruits, fish, meat, eggs
- Medicines- herbs, medicinal plants
- Timber
- Fossil fuels
- Beneficial microbes
- Livestock
- Ecological importance

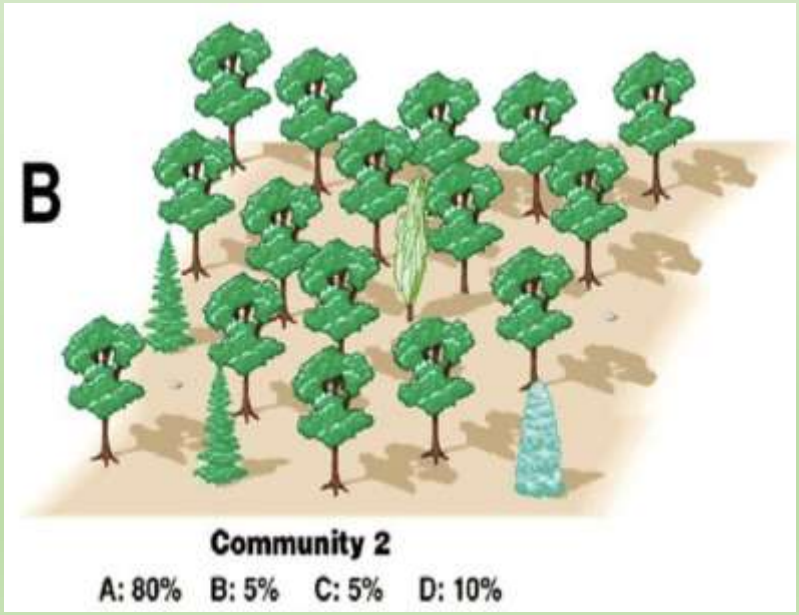
Biological diversity/ biodiversity

- The term "biological diversity" was given by Thomas Lovejoy (1980)
- The term "biodiversity" was given by Walter G. Rosen (1985)
- Variation is the law of nature.
- The variations take place at micro levels.
- The variety and variability of organisms and ecosystems is referred to as biological diversity.
- Convention of Biodiversity (CBD, 1992)
- United Nation Environment Programme (UNEP, 1992)

Biodiversity

- Total number and diversity of species, ecosystem and the genetic variability they comprise.
- Biodiversity includes various ecosystems, species, genes and their comparative abundance.

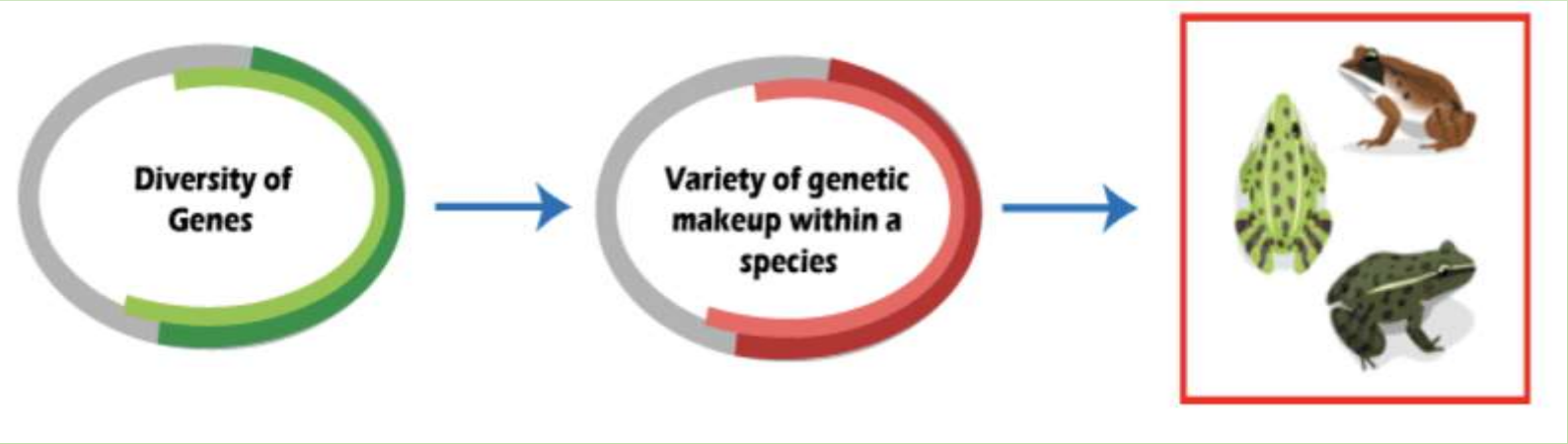




Levels of Biodiversity

1. Genetic diversity

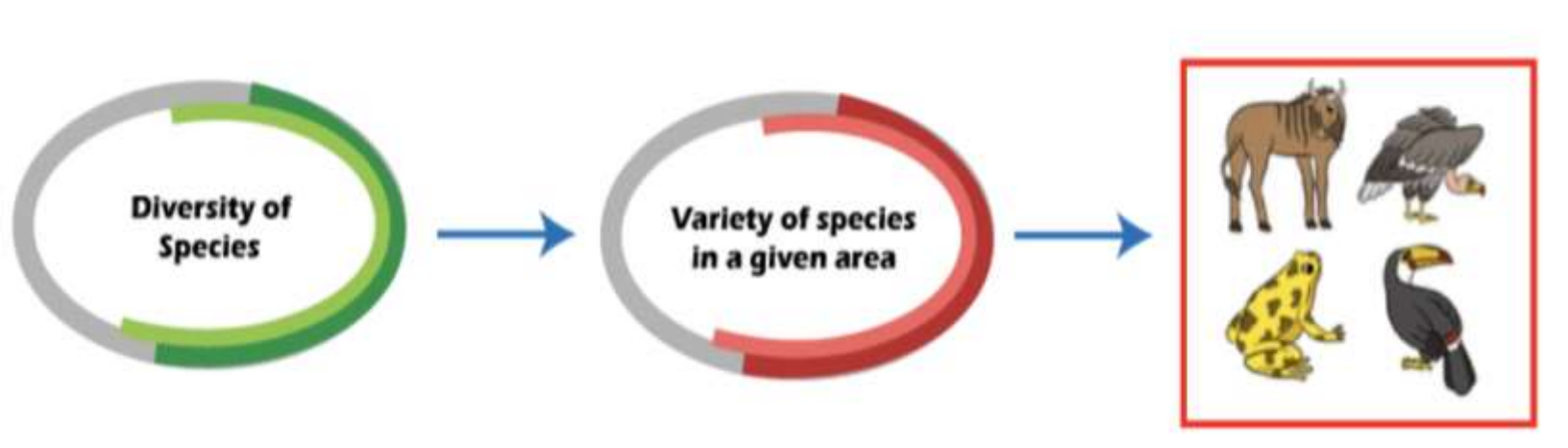
- It refers to the variation of genes within the species.
- This constitutes distinct populations of the same species or genetic variation within a population or varieties within a species.



Levels of Biodiversity (contd..)

2. Species diversity

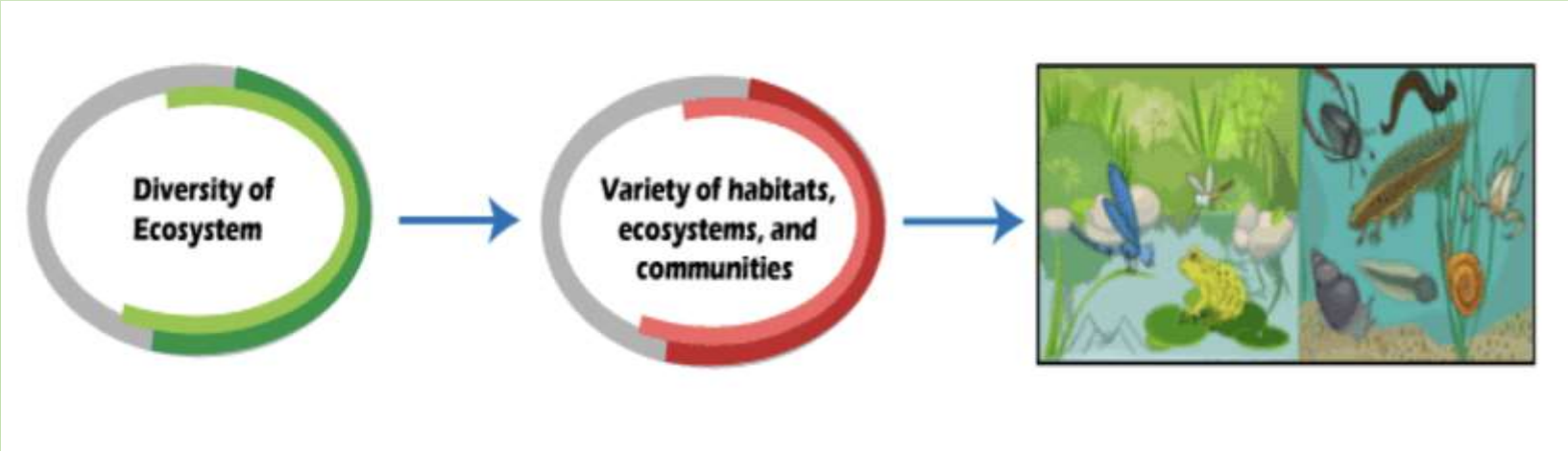
- It refers to the variety of species within a region.
- Species diversity could be measured on the basis of the number of species in a region.



Levels of Biodiversity (contd..)

3. Ecological or Ecosystem diversity

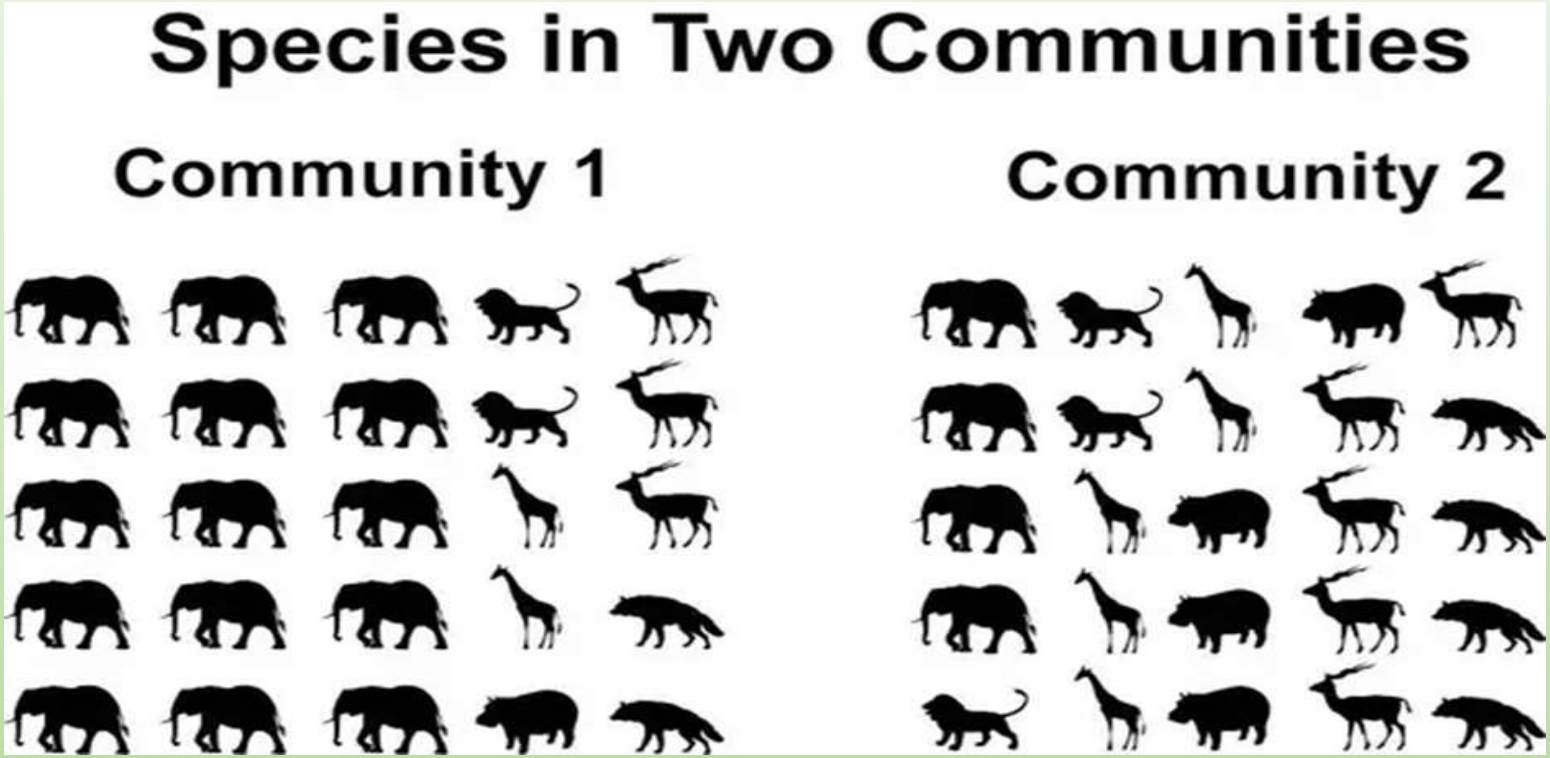
- It refers to the intricate network of different species present in the local ecosystem and the dynamic interplay between them.
- An ecosystem consists of organisms from many different species living together in a region that is connected by the flow of energy, nutrients, and matter.



Measures of Biodiversity (Diversity Indices)

- **Alpha (α) Diversity:**
- The number of species found in a small, homogeneous area.
- Usually expressed by the number of species in that ecosystem
- Species diversity within a community or habitat comprises two components *i.e.* species richness and evenness.
- **Species richness-** number of species within a defined region**.**
- **Species evenness-** distribution of abundance across the species in a community

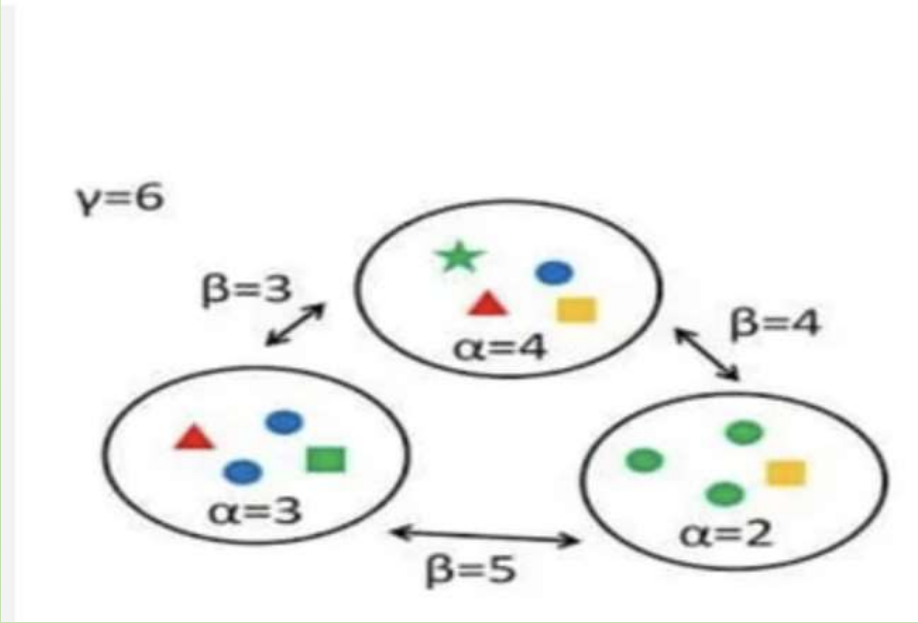
Species richness and species evenness



Species Richness= ?? Species Evenness=?? Biodiversity=??

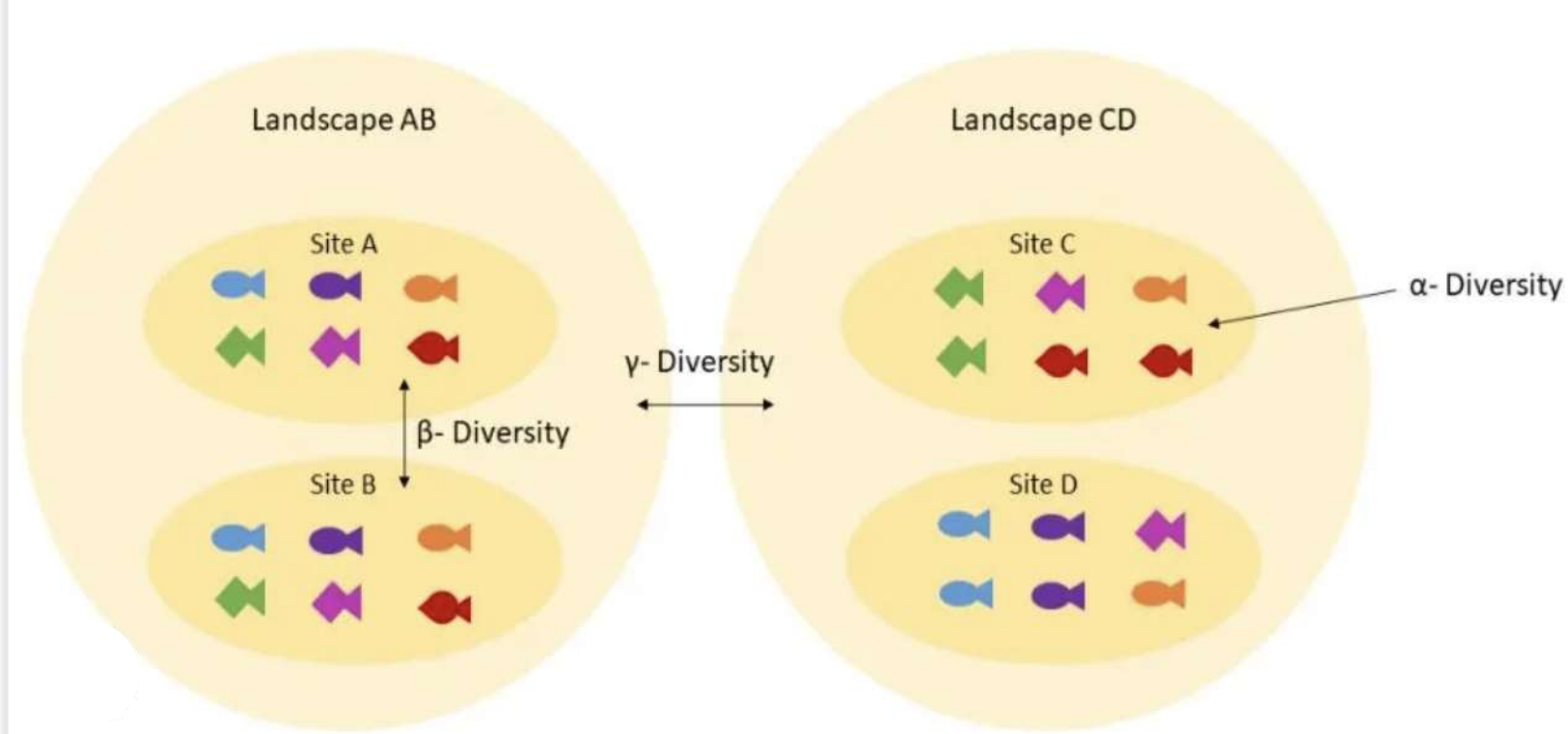
2. Beta (β) Diversity :

- β diversity is the inter community diversity expressing the rate of species turnover per unit change in habitat.
- The number of species unique to each environment between two nearby ecosystem.

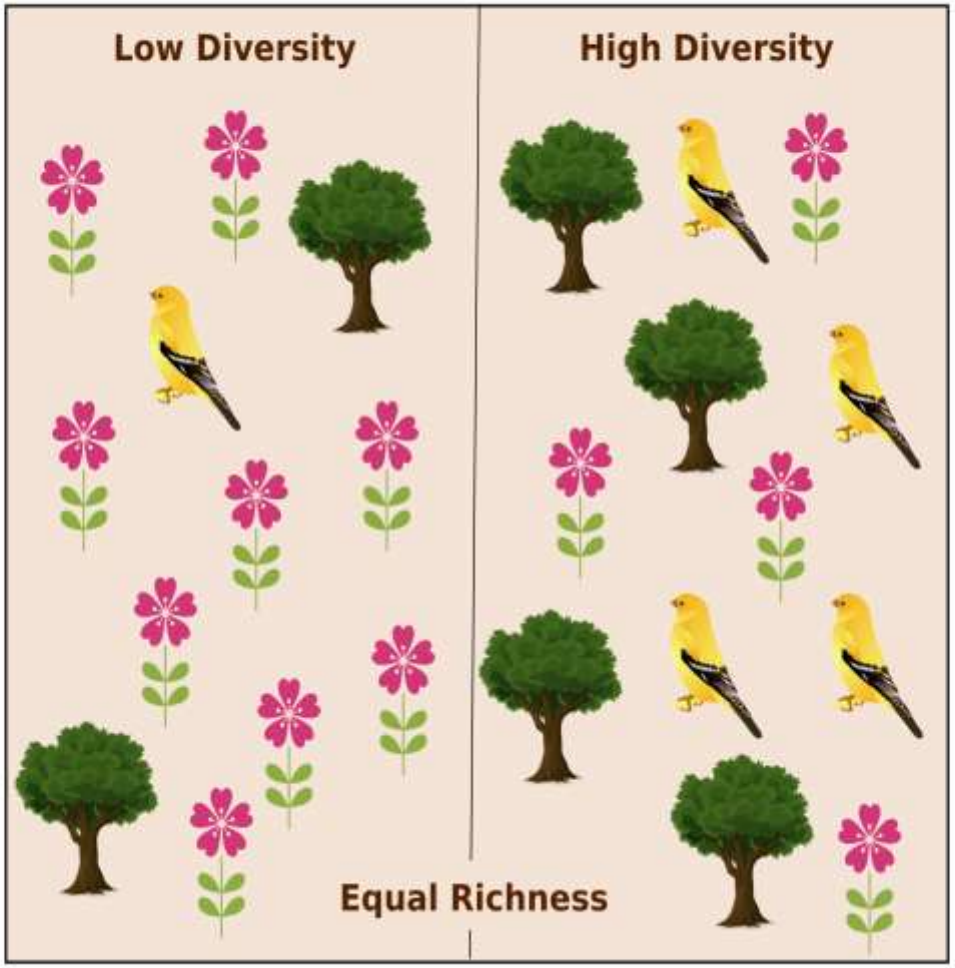


3. Gamma (γ) Diversity:

- Gamma diversity is the overall diversity at landscape level includes both α and β diversities.



Richness vs. Diversity



IMPORTANCE OF BIODIVERSITY

- Genetic diversity
- Protect freshwater resources
- Speed recovery from natural disasters
- Maintaining balance of the ecosystem
- Sustainability and growth

- Provision of food security
- Adaptation to different habitats
- Provision of biological resources
- Promote soils formation and protection
- Maintain food chain in the nature

Values of Biodiversity

1. Direct Value-
   a) Consumptive use
   b) Productive use
2. Indirect Value
   a) Social
   b) Ethical
   c) Aesthetic
   d) Option
   e) Environment service

Consumptive use

- The product of biodiversity can be consumed directly without passing through a market.
- Examples- fuel, food, drugs and medicines, etc.
- High consumptive use values of resources may lead to some problems like
  - Over-exploitation of wildlife
  - Loss of traditional controls on hunting
  - Loss of wildlife populations at productive levels

Productive use

- Can be useful to yield products that are commercially sold in the market.
- Examples- Timber, construction materials, eatables (fish, mushrooms, fruits, etc.), animal products (silk, wool, etc.).
- Have a major impact on national economy
- Many industries are dependent on biodiversity for productive use- pearl industry, leather industry, pharmaceutical industry, etc.

Indirect Values

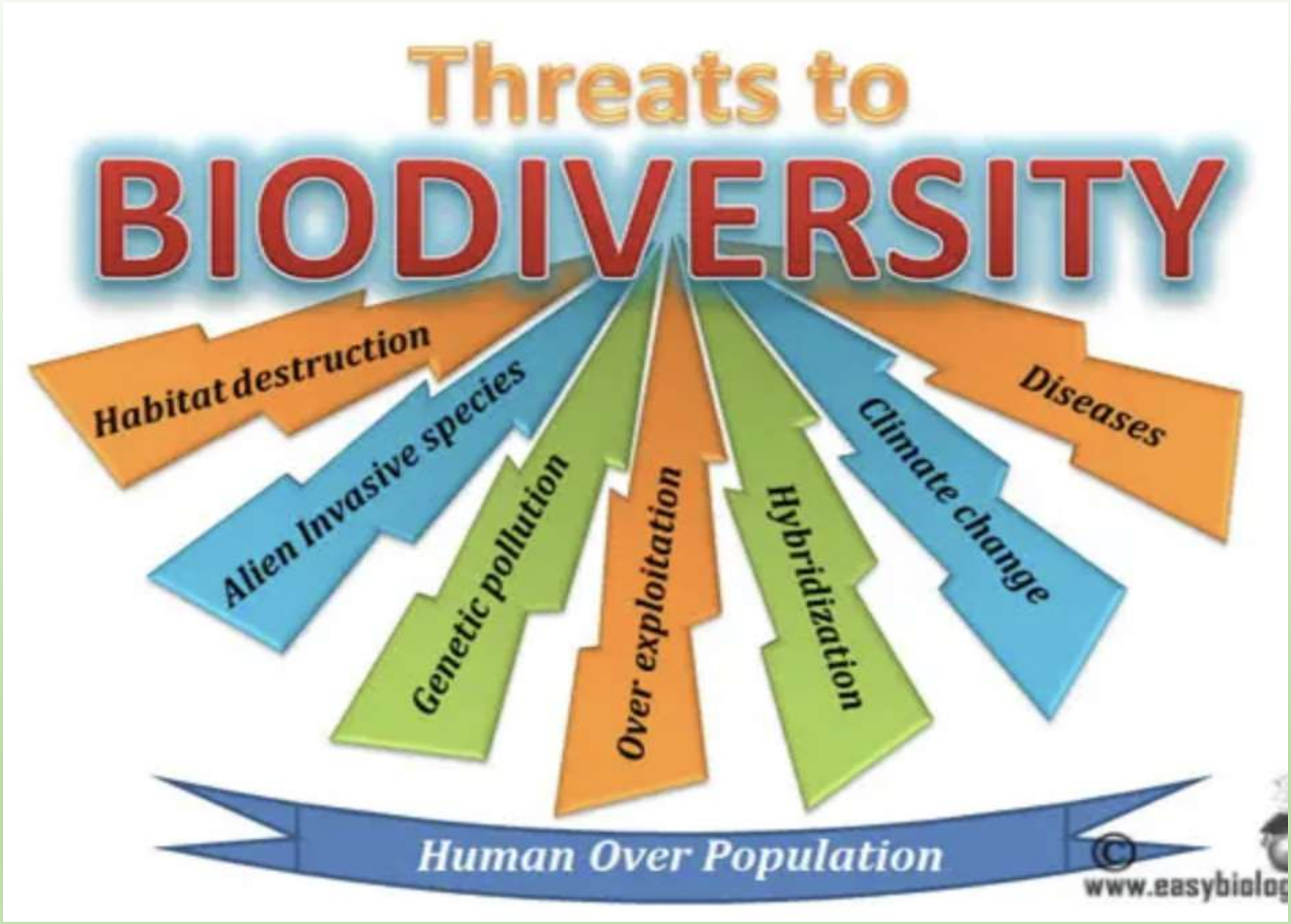
a) Social- used in customs, religion and spiritual aspects. E.g.- sacred and holy plants, flowers and fruits

b) Ethical- Based on the “Live and let live”.- preserve all forms of life

c) Aesthetic- Tourist attraction (botanical gardens, national parks, etc.) or heritage value (Tigers, lotus, etc.)

d) Option- Includes possible use of biodiversity in future.

e) Environmental- provides balance in ecosystem. E.g. Forest


Threats to
BIODIVERSITY
Habitat destruction
Alien Invasive species
Genetic pollution
Over exploitation
Hybridization
Climate change
Diseases
Human Over Population
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Threats to biodiversity (Major issues)

1. Habitat loss and habitat fragmentation
2. Overexploitation
3. Exotic species
4. Pollution
5. Climate change
6. Hunting and poaching
7. Niche preference
8. Loss of forest land
9. Loss of keystone species
10. Tourism
11. Disease outbreak
12. Man-wildlife conflict

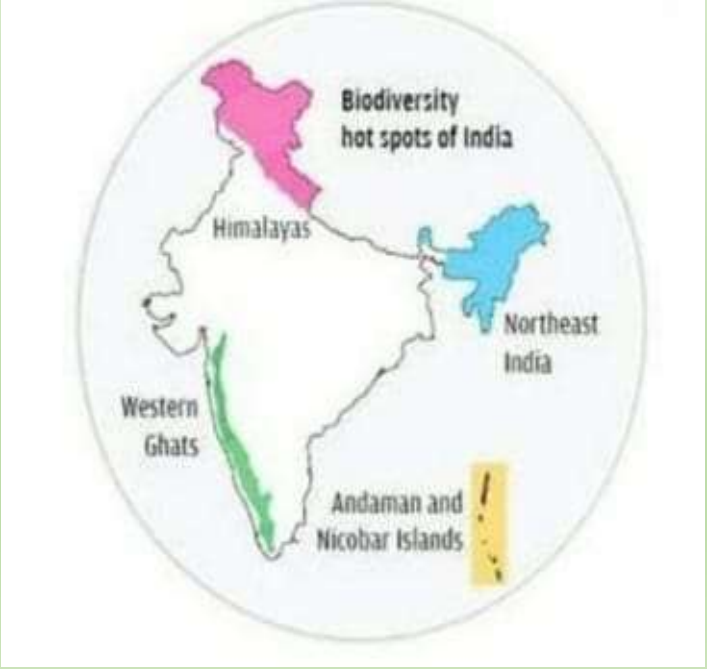
Biodiversity hotspot

A region must fulfill the following criteria to qualify as a hotspot:

A) The region should have at least 1500 species of vascular plants i.e., it should have a high degree of endemism.

B) It must contain 30% (or less) of its original habitat, i.e. it must be threatened (lost at least 70% of native vegetation) .

1. Eastern Himalayas
2. The Indo-Burma
3. Western Ghats
4. Sundaland



Conservation of biodiversity

1. **In-Situ Conservation-**
   - Refers to the protection and maintenance of organisms in their natural habitat.
   - E.g.- Santuaries, National Parks and Biosphere Reserves

2. **Ex-Situ conservation-**
   - The conservation of components of biological diversity outside their natural habitats
   - E.g.- Zoological gardens, Botanical gardens, gene banks, etc.

Advantages of in-situ conservation

- It is a cost-effective and convenient method of conserving biodiversity.
- A large number of living organisms can be conserved simultaneously.
- Since the organisms are in a natural ecosystem, they can evolve better and can easily adjust to different environmental conditions.

Wildlife Sanctuaries

- These are the regions where only wild animals are found.
- Human activities such as timber harvesting, cultivation, collection of woods and other forest products are allowed here as long as they do not interfere with the wildlife.
- Also, tourists visit these places for recreation.
- E.g. Dalma Wildlife Sanctuary, Jaldapara Wildlife Sanctuary, etc.

National parks

- These are small reserves maintained by the government.
- Its boundaries are well demarcated and human activities such as grazing, forestry, habitat and cultivation are prohibited.
- Exploitation of habitat or wildlife is banned.
- For e.g., Corbet National Park, Kanha National Park, Bandipur National Park, etc.

Biosphere reserves

- Biosphere reserves are multi-purpose protected areas where the wildlife, and domesticated plants are protected. E.g.- Sunderban, Nanda Devi, etc.
- Tourist and research activities are permitted (in defined zones) here.
- A) **Core zone-** legally protected with absolutely no disturbance
- B) **Buffer zone-** for research and education with limited activities
- C) **Transition zone-** outer most part includes croplands, human settlements, etc.

Number of protected areas in India-

- Biosphere reserves- 18
- National Parks- 104
- Wildlife sanctuaries- 543
- **In Jharkhand ?????**
- **In-situ vs. Ex-situ conservation ???**

Thank you