INTRODUCTION, TYPES, CHARACTERISTIC FEATURES, STRUCTURE AND FUNCTION OF DIFFERENT ECOSYSTEM

Introduction

- The living community of plants and animals in any area together with the non-living components of the environment such as soil, air and water, constitute the ecosystem.
- Types of Ecosystems

•Types of ecosystem
  •terrestrial
    •Forest, grassland, semi arid areas, desert, mountain and island

  •aquatic
    •Pond, lake, wetland, river, delta and marine

Ecosystem goods and services

- **Direct Values**: These are resources that people depend upon directly and are easy to quantify in economic terms.
- Consumptive Use Value - Non-market value of fruit, fodder, firewood, etc. that are used by people who collect them from their surrounds.
- Productive Use Value - Commercial value of timber, fish, medicinal plants, etc. that people collect for sale.
- **Indirect Values**: These are uses that do not have easy ways to quantify them in terms of a clearly definable price.
- Non-consumptive use value - scientific research, bird-watching, ecotourism, etc.
- Option value - maintaining options for the future, so that by preserving them one could reap economic benefits in the future
- Existence value - ethical and emotional aspects of the existence of wildlife and nature

Terrestrial ecosystems
1. Forest ecosystem

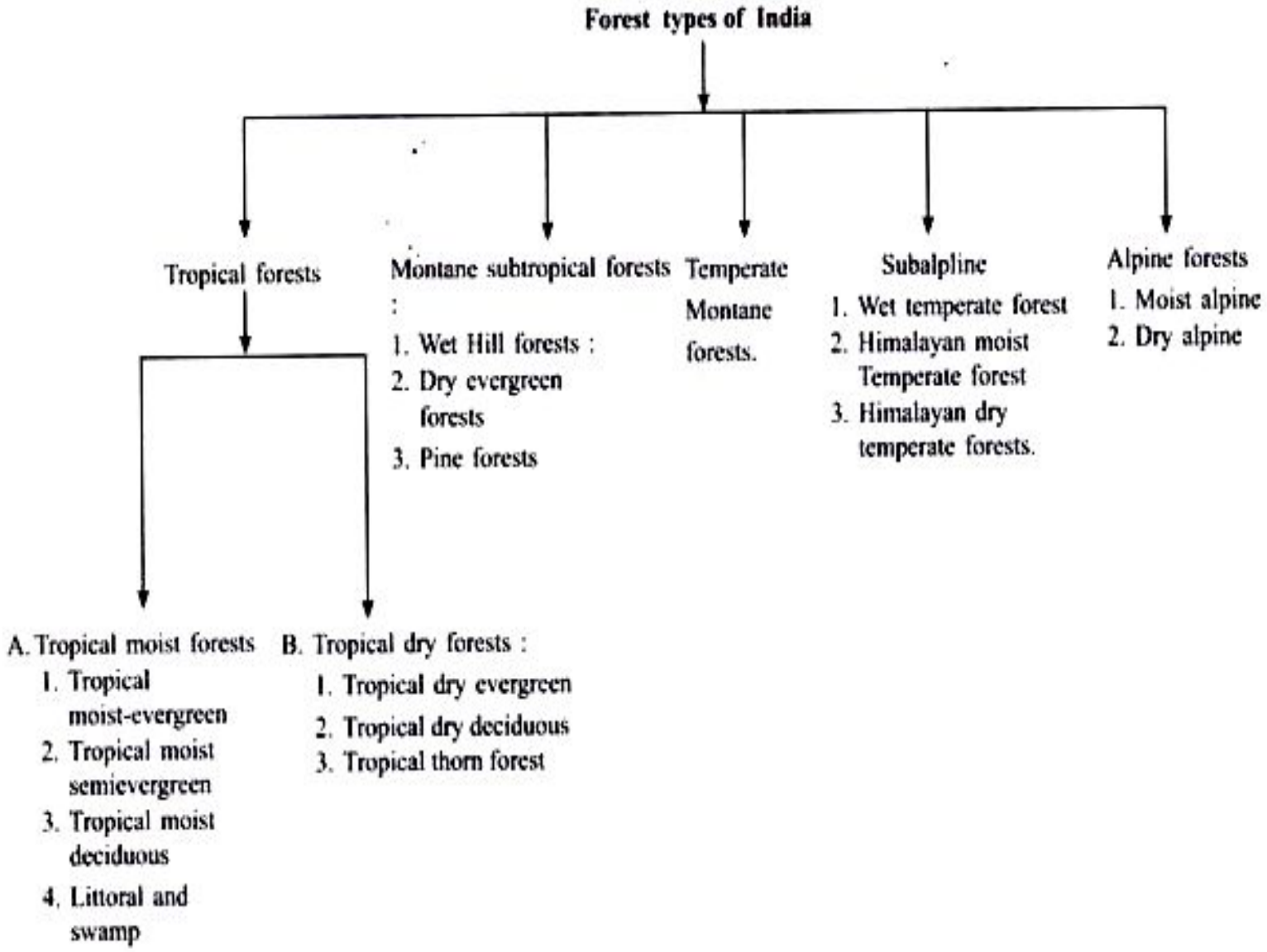
1 Forest ecosystem

Forests are formed by a community of plants which is predominantly structurally defined by its trees, shrubs, climbers and ground cover

Forest types in India

- The forest type depends upon the abiotic factors such as climate and soil characteristics of a region. Forests in India can be broadly divided into Coniferous forests and Broadleaved forests
- They can also be classified according to the nature of their tree species – evergreen, deciduous, xerophytic or thorn trees, mangroves, etc. They can also be classified according to the most abundant species of trees such as Sal or Teak forests.
- In many cases a forest is named after the first three or four most abundant tree species.

Forest types in India



Forest utilization

Forest products

Direct uses of forest products

Fruits – mango, jamun, awla

Roots – Dioscoria

Medicine – Gloriosa, Foxglove

Fuel wood – many species of trees and shrubs Small timber for building huts and houses Wood for farm implements Bamboo and cane for baskets Grass for grazing and stall feeding livestock

Indirect uses of forest products

Building material for construction and furniture for the urban sector

Medicinal products collected and processed into drugs

Gums and resins processed into a variety of products Raw material for industrial products and chemicals

Paper from bamboo and softwoods

Forest utilization

- **Forest services**
- control of the flow services of water in streams and rivers.
- Forest cover reduces surface runoff of rainwater and allows ground water to be stored.
- Forests prevent erosion of soil.
- Forests regulate local temperature.
- Most importantly, forests absorb carbon dioxide and release oxygen that we breathe.
- The wild relatives of our crop plants and fruit trees have special characteristics in their genes which are used to develop new crops and newer varieties of fruit.

2 Grassland ecosystem

2 Grassland ecosystem

- A wide range of landscapes in which the vegetation is mainly formed by grasses and small annual plants
- Grasslands cover areas where rainfall is usually low and/or the soil depth and quality is poor

Grassland Types in India

1. The **Himalayan pasture belt** Himalayan pasture belt extends upto the snowline
2. The **Terai** consists of patches of tall grasslands interspersed with a Sal forest ecosystem. The patches of tall elephant grass, which grows to a height of about five meters, are located in the low-lying waterlogged areas
3. The **Semi-arid plains** of Western India, Central India and the Deccan are covered by grassland tracts with patches of thorn forest
4. The **Shola grasslands** consist of patches on hillslopes along with the Shola forests on the Western Ghats, Nilgiri and Annamalai ranges

Function of grassland ecosystem

- Grasslands are the grazing areas of many rural communities
- Grass is also used to thatch houses and farm sheds
- The thorny bushes and branches of the few trees that are seen in grasslands are used as a major source of fuel wood
- Grasslands have diverse species of insects that pollinate crops
- There are also predators of these insects such as the small mammals like shrews, reptiles like lizards, birds of prey, and amphibian such as frogs and toads.

3 Desert ecosystem

- Deserts and semi arid areas are located in Western India and the Deccan Plateau.
- The climate in these vast tracts is extremely dry.
- Has sand dunes.
- There are also areas covered with sparse grasses and a few shrubs, which grow if it rains

Function of desert ecosystem

- Areas of scanty vegetation with semi-arid scrubland have been used for camel, cattle and goat grazing
- Areas that have a little moisture, such as along the watercourses, have been used for growing crops such as jowar, and bajra.
- The natural grasses and local varieties of crops have adapted to growing at very low moisture levels. These can be used for genetic engineering and developing arid land crops for the future

Aquatic ecosystem 1.The Pond ecosystem

- The pond is the simplest aquatic ecosystem to observe
- When a pond begins to fill during the rains, its life forms such as the algae and microscopic animals, aquatic insects, snails, and worms come out of the floor of the pond where they have remained dormant in the dry phase. Gradually more complex animals such as crabs frogs and fish return to the pond.
- The vegetation in the water consists of floating weeds and rooted vegetation on the periphery which grow on the muddy floor under water and emerge out of the surface of the water

2. Lake ecosystem

3.Stream and River ecosystems

- A lake ecosystem functions like a giant permanent pond.
- A large amount of its plant material is the algae, which derives energy from the sun.
- This is transferred to the microscopic animals, which feed on the algae
- Streams and rivers are flowing water ecosystems in which all the living forms are specially adapted to different rates of flow

4.Marine ecosystem

- The Indian Ocean, the Arabian Sea and the Bay of Bengal constitute the marine ecosystems around peninsular India
- The producer in this ecosystem vary from microscopic algae to large seaweeds.
- There are millions of zooplankton and a large variety of invertebrates on which live fish, turtles and marine mammals

Function of aquatic ecosystem

- the clean freshwater on which life is completely dependent.
- Marshes and wetlands are of great economic importance for people who live on their fish, crustacea, reeds, grasses and other produce

Biodiversity and its conservation

Definition

BIODIVERSITY - DEFINITION

- The number and variety of plants, animals and other organisms that exist in an ecosystem is known as biodiversity
- It is a measure of the variety of organisms present in different ecosystems
- The richness of biodiversity depends on the climatic conditions and area of the region
- Biodiversity is the result of 3.5 billion years of evolution

Types of biodiversity

- There are 3 types of biodiversity :
- GENETIC diversity: genetic variability or diversity within a species
- SPECIES diversity:diversity between different species
- Ecosystem diversity:diversity betweem different region

GENETIC DIVERSITY

- **Genetic diversity** is the amount of variation in genetic material (DNA) within a species or within a population. The magnitude of variation in genes of a species increases with increase in size and environmental parameters of the habitat.
- **Genetic diversity has the following importance:**
- (i) It helps in speciation or evolution of new species;
- (ii) It is useful in adaptation to changes in environmental conditions;
- (iii) It is important for agricultural productivity and development

SPECIES DIVERSITY

- It describes the variety in the number and abundance of the species within a region
- To accurately determine species diversity, both the **species richness**, which is the number of different species, and the **relative abundance**, which is the number of individuals within each species, must be considered
- The species richness depends largely on climatic conditions.
- When a species is confined entirely to a particular area, it is termed as **endemic species**

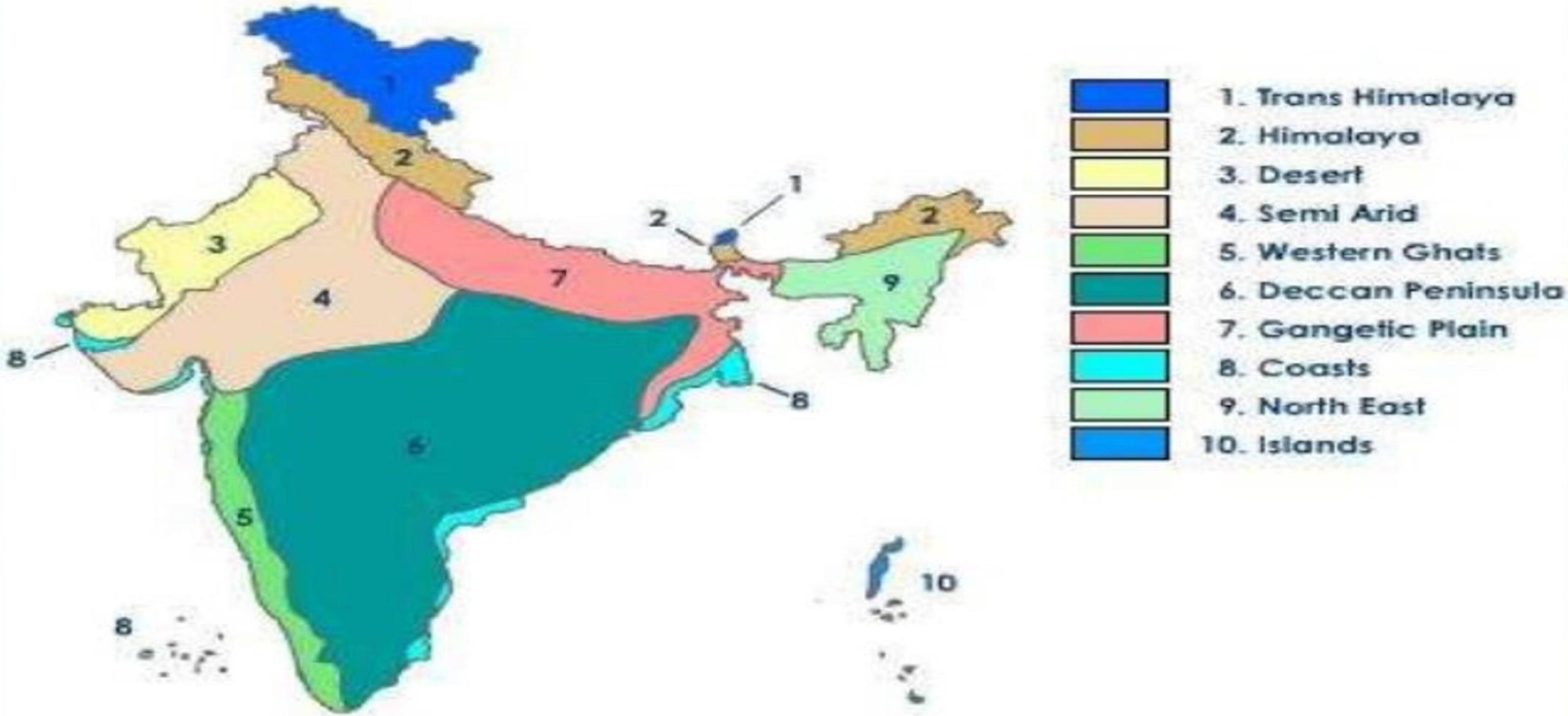
ECOSYSTEM DIVERSITY

- It describes the assemblage and Interaction of spices living together and the physical environment of a given area
- It relates varieties of habitats, biotic communities ecological processes in biosphere. It also tells about the diversity within the ecosystem.
- For example, the landscapes like grass lands, deserts, mountains etc. show ecosystem diversity
- The ecosystem diversity is due to diversity of niches, trophic levels and ecological processes like nutrient cycling, food webs, energy flow, role of dominant species and various related biotic interactions.
- Such type of diversity can generate more **productive and stable ecosystems** or communities capable of tolerating various types of stresses e.g. drought, flood etc.

Bio-geographical classification of India

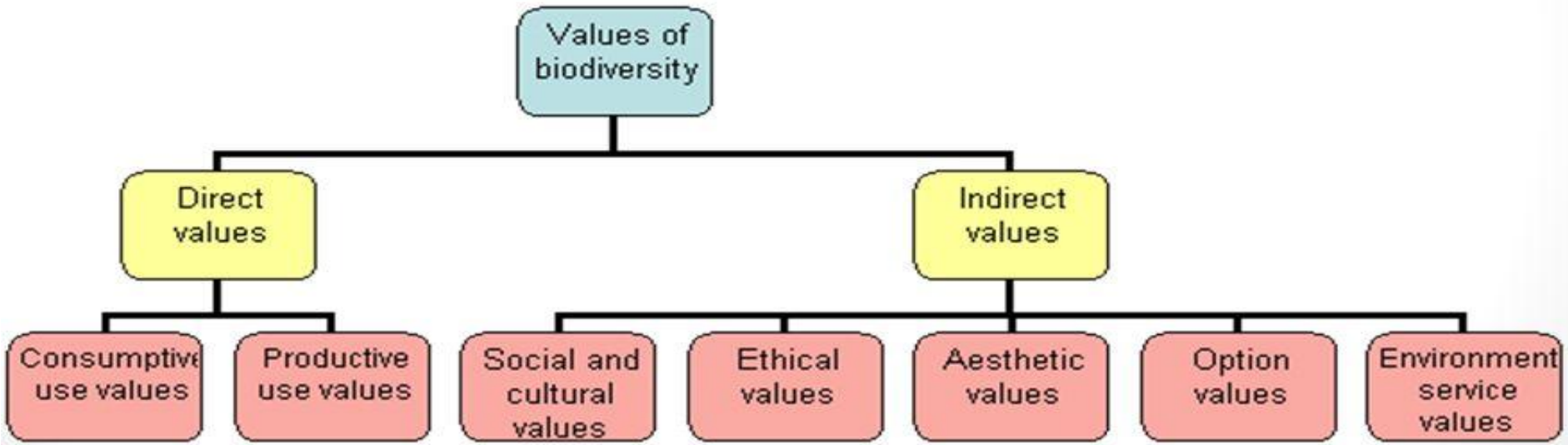
- Our country can be conveniently divided into ten major regions
- this classification is based on the geography, climate and pattern of vegetation seen and the communities of mammals, birds, reptiles, amphibia, insects and other invertebrates that live in them
- Each of these regions contains a variety of ecosystems such as forests, grasslands, lakes, rivers, wetlands, mountains and hills, which have specific plant and animal species

10 Biogeographic Zones of India



Values of Biodiversity…

- It is in terms of commercial utility, ecological services, social & aesthetic Values
- Given by McNeely et al. 1990.



CONSUMPTIVE VALUE

- The value of Nature's Products that are consumed directly such as firewoods , fodder and meat.
- In other words the products which are consumed directly without passing through the market
- Consumptive use value seldom appear in National income accounts.

Consumptive use Values:

- The most important point of consumptive use is that some rural communities closest to the forests or other natural areas can prosper through the sustainable harvesting of wildlife species.

- Hunting, direct-consumption (e.g. collection of berries, mushrooms, herbs, plants) are all "consumptive uses"

PRODUCTIVE USE

- Products that are commercially harvested for exchange in formal markets
- Each species is valuable to humans.
- The global collection of genes , species , habitats and ecosystems is a resource that provides for human needs now.
- It is also essential for human survival in the future.
- This is often the only value of biological resources that is reflected in the income accounts

PRODUCTIVE USES

- Products such as animal skins,ivory, medicinal plants,honey,beewax,fibers, gums,ect……,

SOCIAL VALUE

- Biodiversity in INDIA, particularly ,is important for its religious,spiritual and other cultural uses.
- Many plants and animals have ritual significance
- The entire ecosystem is utilized for cultural and spiritual purposes.

SOME EXAMPLES

- Among auspicious flowers offered in temples are *HIBISCUS offered to the goddess Kali*
- *Datura flowers to siva*
- *Gujarat Sami (Prosopis spicigera)is used in sacrificial fires*
- *Sacred value was attached to patches of forest believed to be the abode of gods and ancestors, and utilized only for prayer and related rituals.*
- *A network of such sacred groves is still in evidence in some parts of India*

ETHICAL VALUES

- Although economic arguments can be advanced to justify the protection of biological diversity, there are also strong ethical arguments for doing so.
- Protecting biological diversity can be justified on ethical grounds as well as on economic grounds.
- Ethical arguments assert that humans have a duty to protect species based on their intrinsic value, unrelated to human needs

- People do not have the rights to destroy species and should take action to prevent their extinction
- The loss of one species have far-reaching consequences to biological community and human society.
- People must learn to live within the ecological constraints of the planet.
- Must learn to minimize the environmental damage and take responsibility for their action
- People also have responsibility to future generations of humans to keep the Earth in good condition.

AESTHETIC VALUES

- Regardless of our own material self-interest , we should treat nature respectfully.
- Enlightened self interest, arguing that preserving biodiversity and developing our knowledge of it will make us better and happier people.
- Nearly everyone enjoys wildlife and joy makes our lives good lives.
- A loss of biodiversity could very well limit the creative energies of people in the future and thus restrict the development.

SOME EXAMPLES

- The beauty of wildflowers in Glacier National Park .
- Hiking , canoeing and mountain climbing are physically intellectually and emotionally satisfying.
- People spend tens of billons of dollars annually in these pursuits, proof enough of their value.

OPTION VALUE

- The intangible Values of biodiversity .
- That is keeping options for the future and simply knowing that certain species exist .
- A species potential to provide an economic benefit to human society at some point in the future is its option value.
- As the needs of the society change , so must the methods of satisfying those needs.
- The option value of species could be only recently utilized by human beings

SOME EXAMPLES

- Health agencies and pharmaceutical companies are making a major effort to collect and screen species for compounds that have the ability to fight cancer.
- In some cases well known species have been found to have exactly those properties needed to deal with a significant human problem