Biological Invasion
*a global threat to Biodiversity*

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**What is Biodiversity**

Biodiversity means the variety of life on Earth.

It is measured as the variety within species—or genetic diversity—the variety between species, and the variety of ecosystems.

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**Importance of Biodiversity**

- Diversity is the key to ensuring the continuance of life on earth
- Evolved through millions of years of evolution
- Higher the diversity = greater stability !!
- Provides Invaluable Ecosystem services

It is the essence of life on earth.

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**Ecosystem services**

- Oxygen and water
- Detoxification and decomposition of wastes
- Conserve soils and their fertility
- Pollination of flowers & Dispersal of seeds
- Protection from the ultraviolet rays
- Maintenance of biodiversity
- Moderation of weather extremes and their impacts
- Provision of aesthetic beauty and intellectual and spiritual stimulation for the human spirit

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**Biodiversity Global**

- No. of total species - ????
- estimated total at about 5 million - 30 million
- The number of described species 1.4 million;
- It has taken 3.5 billion years for this biodiversity to evolve,
- We are rapidly destroying it.

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**India - Biodiversity**

- 8.1% of all biodiversity in 2.4% of worlds area
- Origin of 50,000 cultivated Plants
- 6,33,000 km2 of forest cover (~19% of the land)
- 4.5% of area of India is protected
- 84 National Parks and 447 WLS
- 12 BRs and 23 Tiger Reserves
- High endemicity (5150 species (33%) of plants are endemic)
**India – biodiversity**
- 45,000 plant species (15,000 flowering plants)
- 75,000 species of animals, including
  - 50,000 insects
  - 4,000 molluscs
  - 2000 fish
  - 420 reptiles
  - 140 amphibians
  - 1200 birds and
  - 340 mammals

**Medicinal plants**
- India has 2,500 medicinal plants
- Of these, 2,000 to 2,300 species are used in traditional medicines
- Only around 150 species are used commercially (Tulsi, Neem Turmeric, etc.)

**Every single day ….**
- **We are losing**
  - 300 km² of rainforest, (1 acre / second)
  - 40 to 100 species

- **Already lost 1 million species,**
  - Natural rate of extinction - 1 species/ year,
  - The present rate is 1 species/hour (10,000 times higher)

**Endangered Indian Wildlife**

**Why to Conserve ?**
- Every one has a right to live on this planet
- Every species has its own role to play in the ecosystem
- Values of many sp. (and even the species itself) are still unknown!
- Every single species is an integral part of the vast chain of life
  - No chain is stronger than its weakest link!

**Biodiversity - threats**
- **Habitat Degradation**
  - All Natural habitats are under threat from human activities
  - Over-exploitation, deforestation, reclamation, Pollution
- **Biological Invasion**
  - Biological invasion by alien species is another major threat to native species and ecosystems
  - as alien species flourish at the cost of local species
Alien Species (exotic/introduced)

- Alien species are those that occur outside their natural range.
- Alien species those threaten the existence of native plants and animals or other aspects of biodiversity are termed alien invasive species.
- Alien invasive species occur in all groups of plants and animals.

As competitors, predators, pathogens and parasites, they have invaded almost every type of native ecosystem, and caused hundreds of extinctions.

How they get introduced

Deliberately
- imported ornamental species, Lantana, Eichhornia
- Introduced pests and pathogens for biological control
  (some agents attack non target species, and it is very difficult to remove the exotic species once it is established).

Unintentionally/accidentally
- trade and international transport
- Parthenium with wheat from US

Introduced species

*Lantana camara*, native of South America
- invaded protected forests, fallow land

*Parthenium hysterophorus*, native of America
- Road sides, fallow land, agricultural land

*Eichhornia crassipes*, native of America, terror of Bengal
- an aquatic weed, lakes, rivers, has choked the canal system of Bhakra

*Lantana camara*

*Chromolaena odorata*
**Introduced species: Rabbits of Australia**

Rabbits of Australia caused havoc in Australian economy
24 rabbits were introduced for hunting (from Europe)

**Successful colonization**
- Can thrive in variety of climatic conditions
- Reproduce fast
- No natural enemy in new habitat (no Foxes)

Rabbits were competing for pasture for sheep and cattle
Poison, fences, gun nothing worked.
Virus myxomatosis was introduced to kill them
10 to 20% survived. Several became resistant. Number is up again.

**Introduced species**

Similiar case in India: Spotted Deer, introduced in the Andaman Nicobar island by Britishers
Number has proliferated, no predator except crocodiles
There large number is affecting forest regeneration as they overexploit certain plant species

The little fire ant, Native to South America, (Wasmannia auropunctata) was accidentally introduced throughout the tropics.
This tiny but highly invasive ant, forms vast super colonies. Some super-colonies are so large that they cover the territory of an entire country

**Impact on native species**

A research study conducted in Nilgiri Biosphere Reserve revealed that
in invasive weed infested areas, species richness and density of native species were severely affected.

- The predatory brown tree snake, introduced in cargo from the Admiralty Islands, has eliminated ten of the eleven native bird species from the forests of Guam.

- North American gray squirrels are driving native red squirrels to extinction in Great Britain and Italy by foraging for nuts more efficiently than the native species.
Human disturbance and weed invasion

During the similar study it was also noticed that invasion of exotic species was comparatively more in disturbed areas than undisturbed areas.

Seeds get carried away along with people
Exotic weeds prefer open spaces

Addressing the problem globally

Internationally, the Rio Convention of Biological Diversity (1992) recognized the threat and called for action to limit it. A Global Invasive Species Program, formed by the United Nations and other international organizations, is beginning to answer this call with a series of programs designed to deal with particular sorts of introduced species.

IUCN has identified the problem of alien invasive species as one of its major global initiatives and recently finalized the IUCN Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species.

Addressing the problem: Locally

Forest Management

• Integrated management strategy:
  • Mechanical
  • Biological
  • Chemical
• Early detection and prevention of new invasive species
• To curb human disturbance

Thank You