Course Code:MCC102A
Course Title:Environmental Studies

Lecture No: 12

Title: Conservation of biodiversity

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Lecture-12
Intended Learning Outcomes

At the end of this lecture, students will be able to

- Identify methods used to conserve biodiversity

- Describe two classes of natural resources

- Explain two techniques used to restore biodiversity

- Discuss Bioremediation and Biological augmentation

Conserving Biodiversity

Insitu Conservation

- *Conserving the animals and plants in their natural habitats is known as in situ conservation*

- Biodiversity at all its levels, genetic species and as intact ecosystems, can be best preserved in-situ by setting aside an adequate representation of wilderness as 'Protected Areas'

- These should consist of a network of National Parks and Wildlife Sanctuaries with each distinctive ecosystem included in the network

Insitu Conservation

| SI. No.	Year	Name	Location	State	Area (km²)
		National Parks of India			
1	1988	Nanda Devi Biosphere Reserve	Nanda Devi mountain	Uttarakhand	5860.69
2	1981	Hemis National Park	Leh	J & K	4100
3	1980	Desert National Park	Jaisalmer	Rajasthan	3162
4	1983	Namdapha National Park	Changlang district	Arunachal Pradesh	1985.23
5	1969	Sanjay National Park	Borivali	Mumbai	104
5	1981	Sanjay National Park	Sidhi	Madhya Pradesh	466.88
6	1977	Khangchendzonga National Park	Chunthang	Sikkim	1784
7	1989	Gangotri National Park	Gangotri	Uttarakhand	1552.73
8	1984	Sundarbans National Park	Sundarbans	West Bengal	1330.1
9	1981	Indravati National Park	Dantewada district	Chhattisgarh	1258.37
10	1955	Kanha National Park	Mandla	Madhya Pradesh	940
11	1974	Bandipur National Park	Gundlupet	Karnataka	874.2
12	1980	Simlipal National Park	Mayurbhanj district	Odisha	845.7
13	1983	Rajaji National Park	Haridwar	Uttarakhand	820.42
14	1984	Great Himalayan National Park	Kullu district	Himachal Pradesh	754.4
15	1987	Pin Valley National Park	Spiti	Himachal Pradesh	675
16	1988	Nagarhole National Park	Kodagv	Karnataka	643.39
17	1987	Kudremukh National Park		Karnataka	600.32
18	1981	Satpura National Park	Pachmarhi	Madhya Pradesh	585.17
19	1975	Pench National Park	Seoni	Madhya Pradesh	292.85
19	1975	Pench National Park		Maharashtra	257.26
20	1973	Panna National Park	Panna	Madhya Pradesh	542.67
21	1936	Corbett National Park	Nanital	Uttarakhand	520.82
22	1990	Manas National Park		Assam	500
23	1977	Dudhwa National Park	Lakhimpur Kheri	Uttar Pradesh	490.29
24	1986	Mouling National Park		Arunachal Pradesh	483
25	1990	Govind Pashu Vihar	Uttar Kashi	Uttarakhand	472.08
26	1974	Kaziranga National Park	Golaghat	Assam	471.71
27	1982	Bandhavgarh National Park	Umaria	Madhya Pradesh	448.85
28	1992	Campbell Bay National Park	Great Nicobar	Andaman & Nicobar	426.23
29	1981	Kishtwar National Park	Kishtwar	J & K	400
30	1980	Ranthambore National Park	Sawai Madhopur	Rajasthan	392

Ex-situ Conservation

- There are situations in which an endangered species is so close to extinction that unless alternate methods are instituted, the species may be rapidly driven to extinction.

- This strategy is known as ex-situ conservation

Natural Resources

- An increase in human population growth increases the need for natural resources to supply the basic needs of the population

- The consumption rate of natural resources is not evenly distributed
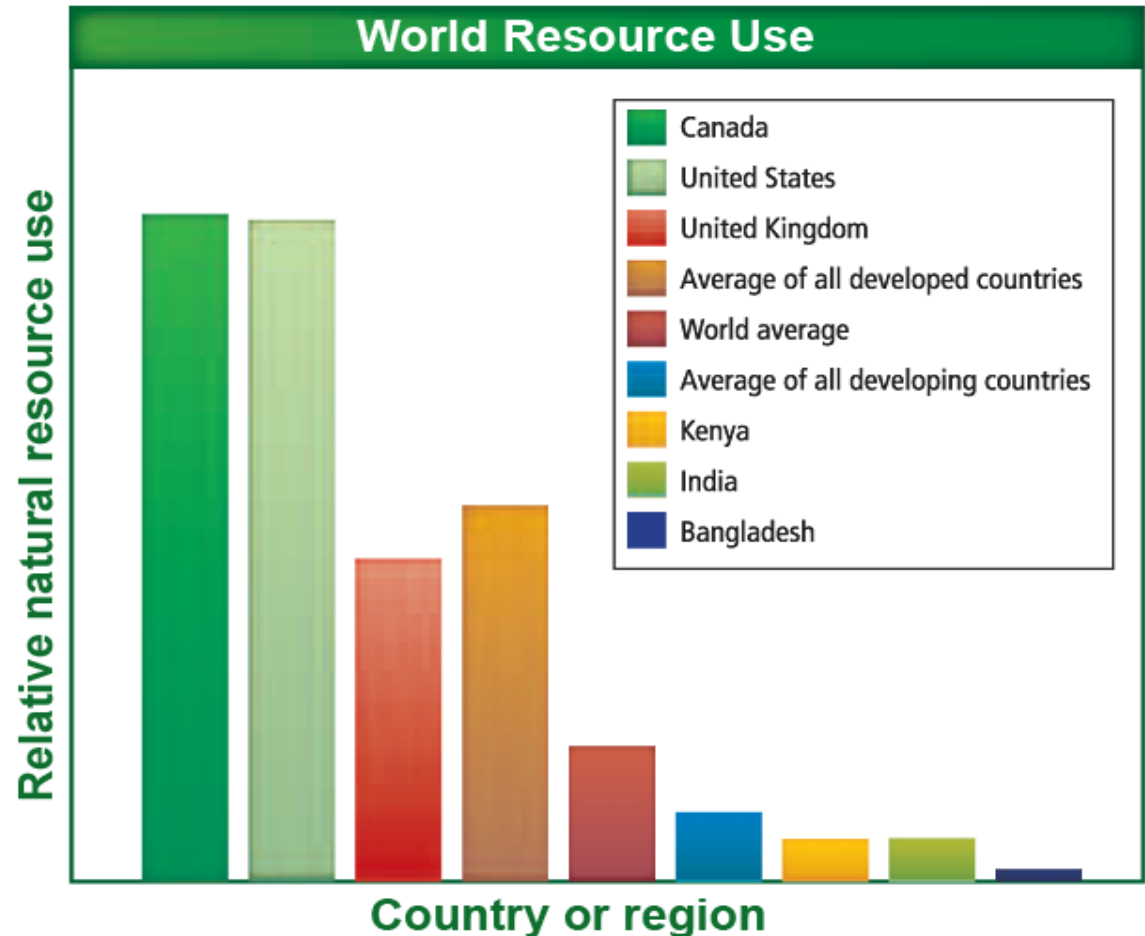
Natural Resources

- Resources that are replaced by natural processes faster than they are consumed are called renewable resources.
  - Solar energy, agricultural plants, animals, clean water, and clean air
- Resources that are found on Earth in limited amounts or those that are replaced by natural processes over extremely long periods of time are called nonrenewable resources.
  - Fossil fuels, mineral deposits and radioactive uranium

Sustainable Use

- Sustainable use means using resources at a rate in which they can be replaced or recycled while preserving the long-term environmental health of the biosphere

- Conservation of resources includes
  - Reducing the amount of resources that are consumed
  - Recycling resources that can be recycled
  - Preserving ecosystems, as well as using them in a responsible manner

Protecting Biodiversity

- Many efforts are underway worldwide to slow the loss of biodiversity and to work toward sustainable use of natural resources

- Currently, about seven percent of the world's land is set aside as some type of reserve

- The United Nations supports a system of Biosphere Reserves and World Heritage sites

Biodiversity Hot Spots

- Locations around the world that are characterized by exceptional levels of endemic species
  - Species that are only found in that specific geographic area and critical levels of habitat loss
  - At least 1500 species of vascular plants are endemic
  - The region must have lost at least 70 percent of its original habitat

- Approximately ½ of all plant and animal species are found in hot spots.
  - These hot spots originally covered 15.7 percent of Earth's surface, however, only about a tenth of that habitat remains

Corridors between Habitat Fragments

- Improve the survival of biodiversity by providing corridors, or passageways, between habitat fragments

- Advantage - creates a larger piece of land that can sustain a wider variety of species and a wider variety of genetic variation

- Disadvantage – Disease can easily pass from one area to the next and the edge effect increases

Restoring Ecosystems

- Given time, biological communities can recover from natural and human-made disasters

- The length of time for recovery is not related directly to whether the disaster is natural or human-made
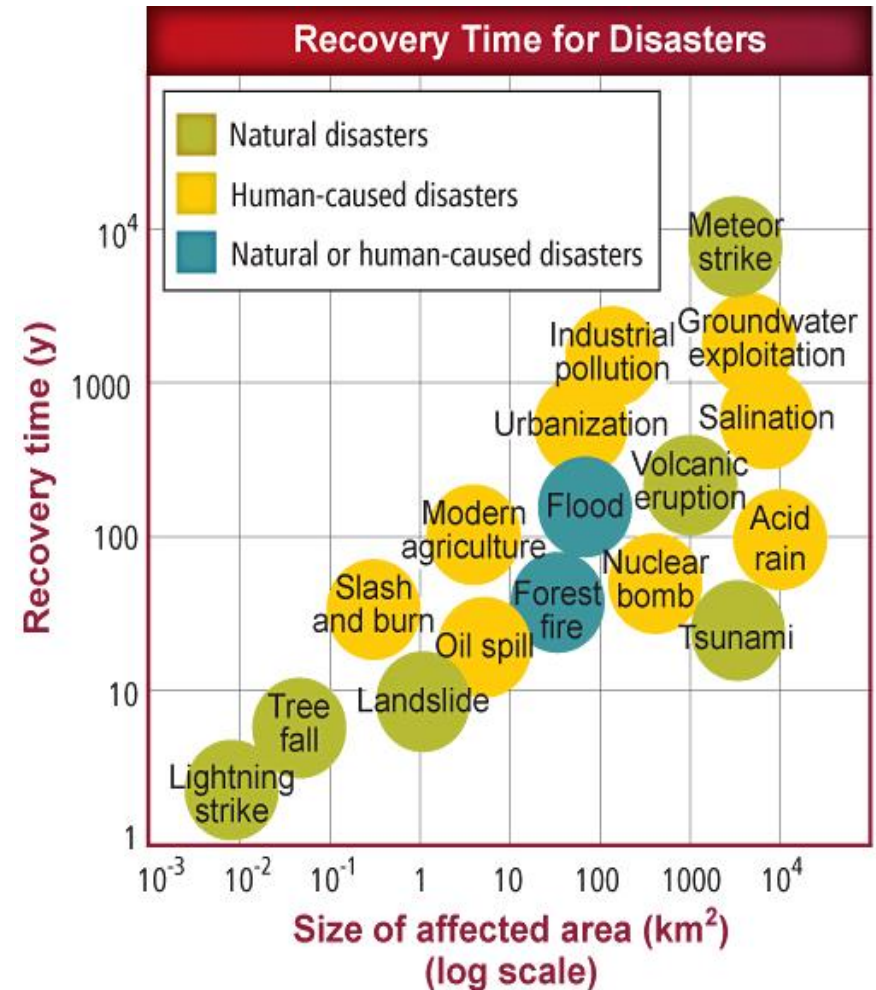
Restoring Ecosystems

- The size of the area affected and the type of disturbance are determining factors for recovery time.

- Ecologists use two methods to speed the recovery process of these damaged ecosystems
  - Bioremediation
  - Biological Augmentation
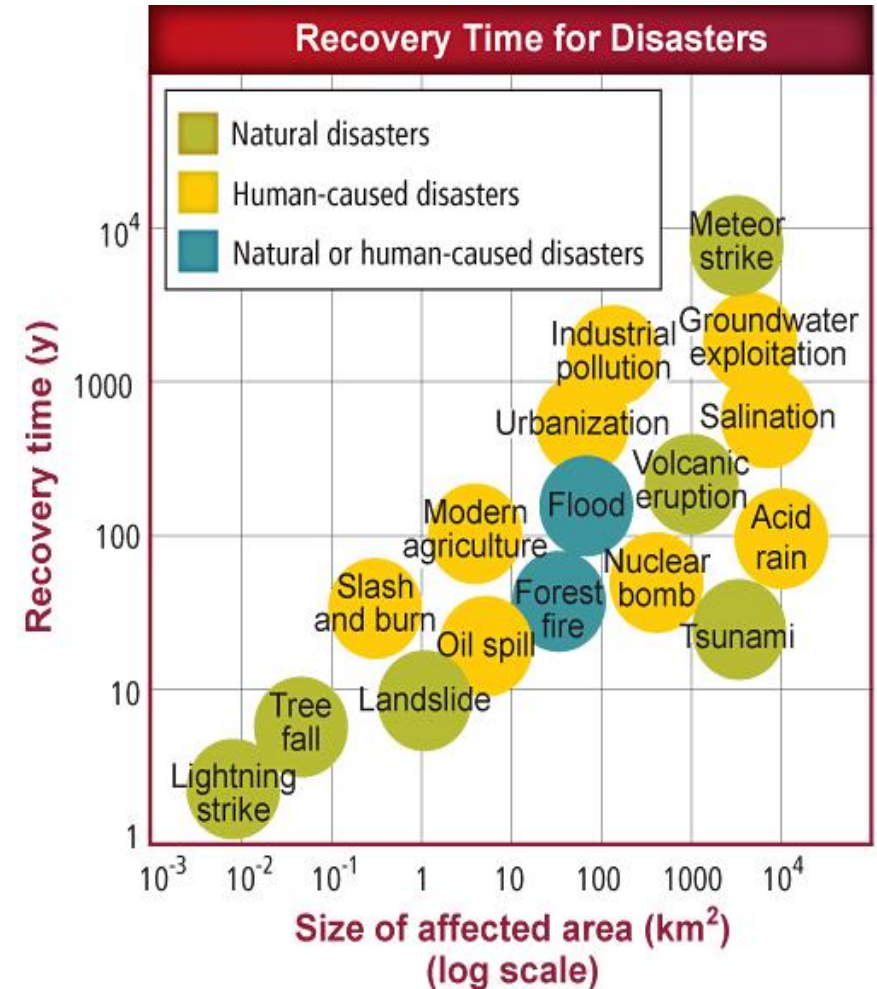
Bioremediation

Microorganisms

- Aerobic bacteria:
  - Examples include: *Pseudomonas, Alcaligenes, Sphingomonas, Rhodococcus*, and *Mycobacterium*
  - Shown to degrade pesticides and hydrocarbons; alkanes and polyaromatics
  - May be able to use the contaminant as sole source of carbon and energy.
- Methanotrophs:
  - Aerobic bacteria that utilize methane for carbon and energy
  - Methane monooxygenase has a broad substrate range
    - active against a wide range of compounds (e.g. chlorinated aliphatics such as trichloroethylene and 1,2-dichloroethane)
- Anaerobic bacteria:
  - Not used as frequently as aerobic bacteria
  - Can often be applied to bioremediation of polychlorinated biphenyls (PCBs) in river sediments, trichloroethylene (TCE), and chloroform
- Fungi:
  - Able to degrade a diverse range of persistent or toxic environmental pollutants

The use of living organisms, such as prokaryotes, fungi, or plants, to detoxify a polluted area is called bioremediation.

- Microorganisms can be used in ecosystems to remove toxins from soils that are contaminated by accidental oil or fuel spills.
- Some species of plants are being used to remove toxic substances such as zinc, lead, nickel, and organic chemicals. From damaged soils.

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Biological Augmentation

- Adding natural predators to a degraded ecosystem is called biological augmentation.

- Ladybugs can be introduced into an ecosystem to control aphid populations.

Legally Protecting Biodiversity

- During the 1970's, a great deal of attention was focused on the destruction to the environment and maintaining biodiversity.

- Laws were enacted in countries around the world and many treaties between countries were signed in an effort to preserve the environment.

- Since the 1970's, many more laws and treaties have been enacted and signed with the purpose of preserving biodiversity for future generations.

Summary

- The use of living organisms, such as prokaryotes, fungi, or plants, to detoxify a polluted area is called bioremediation

- Adding natural predators to a degraded ecosystem is called biological augmentation

- Biodiversity at all its levels, genetic species and as intact ecosystems, can be best preserved by setting aside an adequate representation of wilderness as 'Protected Areas' is Insitu Conservation