Paper - XIV
Gr. B

CONSERVATION BIOLOGY

Conservation → The planning and management of resources in a way so as to secure their wider use and continuous supply, maintaining their quality, value & diversity.

Introduction :— India is a unique country with a great cultural diversity, associated with all kinds of climates and rich flora and fauna.

Conservation of wildlife involves the protection, preservation, perpetuation and judicious control of rare species of animals and plants in their natural habitats. The protection and management of wildlife is important not only for maintaining the scenic beauty of the environment but also for keeping the balance of nature, which is essential for the survival of the human race.

Popular interest in protecting the world's plant and animal species has intensified during the last 20 years. Around the globe, biological communities that took millions of years to develop are being devastated by human activity. The main cause of the present extinctions is habitat destruction by man, such as clear cutting of forest, overgrazing grasslands, draining wetlands, and polluting the ecosystem. and also overharvesting of plants and animals especially when done by moder technology.

"A new multidisciplinary science that has developed to deal with the crisis confronting biological diversity is the Conservation biology."

It has two goals —:

(I) to investigate human impacts on biological diversity
& (II) to develop practical approaches to prevent ~~extin~~ extinction of species.

What is biological diversity?

→ According to the U.S. office of Technology Assessment (1987), biological diversity is "the variety and variability among living organisms and the ecological complexes in which they occur."

This concept can be subdivided into three levels as follows :—

Genetic diversity → At finer levels of organisation, biodiversity includes the genetic variation within species, both among geographically separated populations and among individuals within single population.

II. Species diversity → Biodiversity at its most basic level includes the full range of species on earth, from microorganisms such as viruses, bacteria and protists through the multi-cellular kingdoms of plants, animals and fungi.

Community / Ecosystem diversity → On a wider scale, biodiversity includes variations in the biological communities in which species live, the ecosystem in which communities exist, and the interactions among these level

Keystone Species

Within biological communities, some species may be important in determining the ability of large no. of other species to persist in the community. These crucial species have been termed Keystone speci (Paine, 1966; Terborgh, 1986; Howe, 1984). To protect keystone species is a priority for conservation efforts, because if a keystone species is lost from a

Conservation ~~one~~, numerous other species might be lost as well. For example ~~the~~ the severe decline and extinction of many species of pteropid bats, or flying foxes, in the old world tropics had a dramatic effect upon many important plant species in the islands of the Pacific and Indian oceans. Some biologist fear that the loss of flying fox species in ~~the~~ such an ecological disaster ~~that~~ could ~~indirectly~~ ~~affect~~ human societies in these regions. About 65 species of the genus Pteropus are concentrated in the islands of the South Pacific where they are often the only pollinators and seed dispersers for literally hundreds of species of tropical plants. Extinction of flying foxes is thus potentially devastating for these but dependent plant species of economic value to local and international markets. Such plants species include important timber species like ebony (Diospyros melanoxylon) and mahogany (calophyllum), medicinal plants, and plants yielding fibres, dyes, and other products.

Among the most obvious Keystone species are top predators, since they are often important in controlling herbivore populations. In many localities gray wolves, deer population have exploded. The loss of ~~these~~ many herbaceous plant species was detrimental to the deer & to other herbivores, including the insect community that fed on the plants.

The importance of a keystone species may hinge on highly specialised relationships between the keystone species and other organisms. In many tropical forests, figtrees and fig vines (Ficus spp) appear to be keystone species in the functioning of vertebrate communities.

The identification of keystone species has several important ~~new~~ implications

for conservation biology.
→ The elimination of a keystone species from a community may precipitate the loss of many other species.
→ In order to protect a species of particular interest, such as a monkey, it may be necessary to protect the keystone species on which it depends either directly or indirectly such as fig trees and dung beetles.

If the few keystone species of a community can be identified, these could be carefully protected or even encouraged if the area is being affected by human activity. For ex- during selective logging, figs and other important fruit trees should be protected, ~~non keystone species trees~~ while non keystone trees could possibly be reduced in abundance with little loss of biodiversity.

Measurement of biodiversity

At its simplest level, diversity can be defined as the number of species found in a community, a measure known as species richness. Diversity is "a single statistic in which the number of species and evenness are compounded". Many methods of calculating diversity have been proposed that combine these two types of information. Mathematical indices of biodiversity have also been developed to connote species diversity at different geographical scales as follows:-

(1) Alpha diversity → This refers to number of species in a single community. This diversity comes closest to the popular concept of species richness and can be used to compare the no. of species in different ecosystem types.

threat to majority of vertebrates currently facing extinction. More than 50% of the wildlife habitat has been destroyed in 49 out of 61 old world tropical countries (Iucn, unep, wcmc)

In tropical Asia, fully 65% of the wildlife habitat has been lost, with particularly high rates of destruction in Bangladesh (95%), Hong Kong (91%) Sri Lanka (82%), Vietnam (80%) and India (78%)

In many cases, the factors causing habitat destruction are the large industrial & commercial activities, associated with a global economy, such as mining, cattle ranching, commercial fishing, forestry, plantation, agriculture, manufacturing, and dam construction, initiated with the goal of making a profit. Huge amounts of habitat are lost each year as the world's forests are cut down. Rainforests, tropical dry forests, wetlands, mangroves, and grasslands are threatened habitats and, leading to desertification.

[II] HABITAT FRAGMENTATION :- Habitat fragmentation is the process, where a large, continuous area of habitat is both, reduced in area and divided into two or more fragments. These fragments are often isolated from one another by a highly modified or degraded landscape. It differs from the original habitat in two ways, —

(i) fragments have a greater amount of edge for the area of habitat.

(ii) the centre of each habitat fragment is closer to an edge.

Habitat fragmentation may limit the potential of species for dispersal and colonisation, ~~[illegible]~~ it also reduces the foraging ability of animals. It causes such edge effects as microclimatic changes in light, temp., wind etc.

[III] HABITAT DEGRADATION AND POLLUTION :-

Some activities may not affect the dominant species in the community, but other species are greatly affected by such habitat degradation.

For example, Physical degradation of forest habitat by uncontrolled ground fires, might not kill the trees, but the rich Perennial wild plant community and insect fauna on the forest floor would be greatly affected. Boating and diving in coral reef areas degrade the fragile species. The most subtle form of habitat degradation is environmental pollution, the most common causes of which are pesticides, industrial chemicals and wastes, emissions from factories and automobiles, and sediment deposit from eroded hill sides.

Effects of Pesticide pollution, water pollution and air pollution on environment are well known. Problems of acid rains and global climate change are also well known and of global concern.

[IV] INTRODUCTION OF EXOTIC SPECIES

Habitat destruction, fragmentation, and degradation have obvious harmful effects on biodiversity, But even when biological communities are intact, significant losses can be taking place due to changes caused by human activities.

Three such changes are the introduction of exotic species, increased levels of diseases, and excessive exploitation of particular species by People. Three chief factors responsible for introduction of exotic species are, European Colonisation, horticulture and agriculture, and accidental transport.

Some successful exotic species may kill or eat native species to the point of extinction, or may so alter the habitat that many natives are no longer able to persist. The effect of exotic species is maximum on islands.

[V] DISEASE :-

Human activities may increase the incidence of disease in wild species. The extent of the disease increases when animals are confined to a nature

rather than being able to disperse over a large area. Also animals are more prone to infection when they are under stress. Animals held in captivity are also more prone to higher level of disease.

vi] OVEREXPLOITATION :-

In traditional societies, there existed some controls to prevent overexploitation in several ways. In contrast to this, in much of the world today resources are exploited as widely as possible. Overexploitation of resources also occurs when commercial market develops for a previously unexploited locally used species. The best example is found in fish. Threatens about one-third of the endangered vertebrates in the world, as well as other species. Growing rural poverty, increasingly efficient methods of harvesting and the globalisation of the economy combine to exploit species to the point of extinction. Even if a species is not completely eliminated by overexploitation the population size may become so low that the species is unable to recover.

vii] SHIFTING OR JHUM CULTIVATION :-

Some rural people destroy biological communities and hunt endangered species because they are poor and have no land of their own. In many countries there is extreme inequality in the distribution of wealth, with the majority of wealth (money, good farm land, timber resources etc) owned by a small percentage of the population. Local People are quite distinct from settlers who have arrived more recently and not closely linked to the land. In fact tropical areas of the world have had particularly a long association with human societies, since the tropics have been free of glaciation and are particularly amenable to human settlement.

A common pattern in many countries of the developing world is that local farmers are forced off their land by large landowners and business interests, often backed up by the government, the Police, and the army. The local farmers often have no choice except to move to remote undeveloped areas and attempt for their livelihood through shifting cultivation.

This commonly practiced agricultural system, known also as Swidden agriculture, slash-and-burn agriculture, and Jhum cultivation greatly affects forest structure and species composition by creating a mosaic of forest patches of different ages.

In shifting cultivation, plots of natural tree vegetation are burnt away and the cleared patches are formed for two or three seasons, after which their fertility goes down to a point where adequate crop production is no longer possible. After two or three harvests, the nutrients are washed out of soil by the rain. The farmers then abandons this patch and cuts down a new patch of forest trees elsewhere for crop production.

This system also called Jhum cultivation in North-eastern India is practiced in these areas because the farmers are unwilling to spend the time and money required to develop more permanent forms of agriculture on land that they do not own and may not occupy for very long.

This system works well and doesn't degrade environment much as long as human population density is low and there is abundant forest land available, Political instability, lawlessness, and war also force farmers off their land and move to remote, undeveloped areas where they feel more safe.

II Beta diversity → This refers to which species composition changes along an environmental gradient. It is high for ex— If the species composition of moss communities changes at successively higher elevations on a mountain slope, but is low if the same species occupy the whole mountain side.

III Gamma diversity → This applies to larger geographical scales and defined as "the rate at which additional species are encountered as geographical replacements within a habitat type in different localities. Thus gamma diversity is a species turnover rate with distance between sites of similar habitat or with expanding geographic areas"