The idea of the biosphere reserve was initiated by UNESCO in 1974 under the Man and Biosphere Programme (MAB). The objective of the programme was to obtain international cooperation for the conservation of the biospheres. In the first council meeting, the idea of a biosphere reserve was mooted to conserve biodiversity.

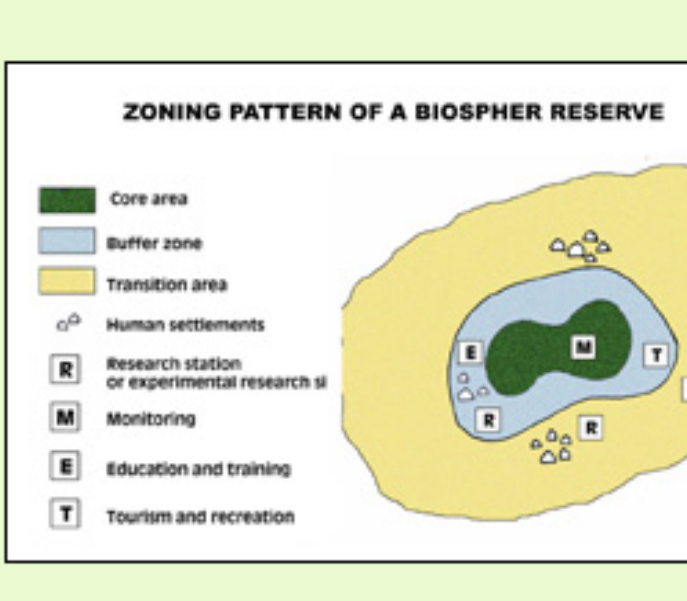
DEFINITION

A Biosphere Reserve is a unique and representative ecosystem of terrestrial and coastal areas which are internationally recognized, within the framework of UNESCO's Man and Biosphere (MAB) programme. The biosphere reserve should fulfill the following three objectives:

- In-situ conservation of biodiversity of natural and semi-natural ecosystems and landscapes
- Contribution to sustainable economic development of the human population living within and around the Biosphere Reserve.
- Provide facilities for long term ecological studies, environmental education and training and research and monitoring.

In order to fulfill the above objectives, the Biosphere Reserves are classified into zones like the core area, buffer area. The system of functions is prescribed for each zone.

Zonation of the Biosphere Reserves

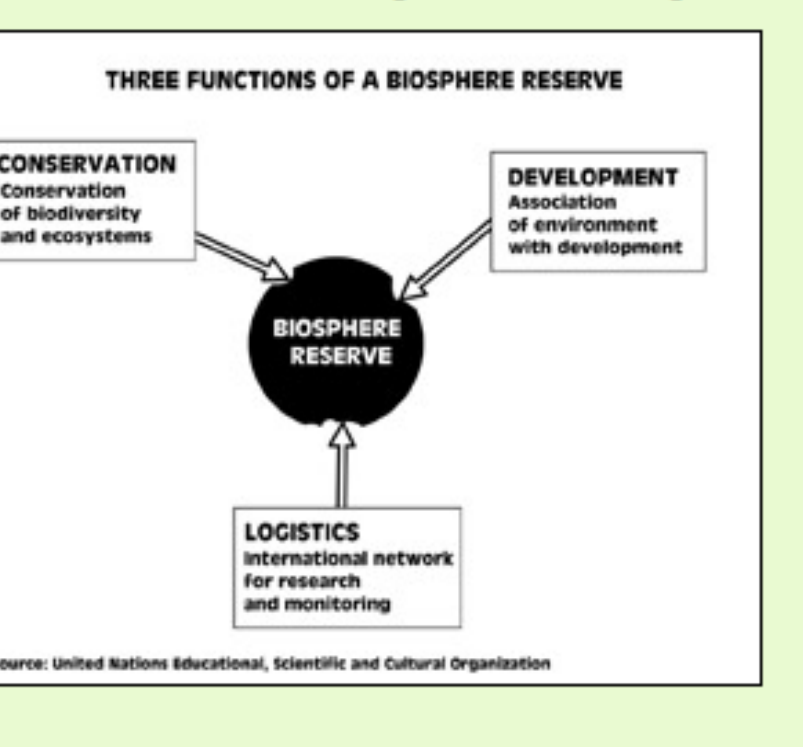


One or more core zones: Securely protected sites for conserving biological diversity, monitoring minimally distributed ecosystems and undertaking non-destructive research and other low-impact uses (such as eco-tourism and education)

A well defined buffer zone(s): Usually surrounds or adjoins the core zones and is used for cooperative activities compatible with sound ecological practices, including environmental education, recreation and applied and basic research.

A flexible transition area or area of cooperation: May contain a variety of agricultural activities, settlements and other uses and in which local communities, management agencies, scientists, non-governmental organizations, cultural groups, economic interests and other stakeholders work together to manage and sustainably develop the area's resources.

To fulfill the main objectives of a Biosphere Reserve, the local people's support is essential. In 1994, UNESCO recommended 10 important points for this purpose. They are:


THREE FUNCTIONS OF A BIOSPHERE RESERVE
CONSERVATION
Conservation of biodiversity and ecosystems
DEVELOPMENT
Association of environment with development
BIOSPHERE RESERVE
LOGISTICS
International network for research and monitoring
Source: United Nations Educational, Scientific and Cultural Organization

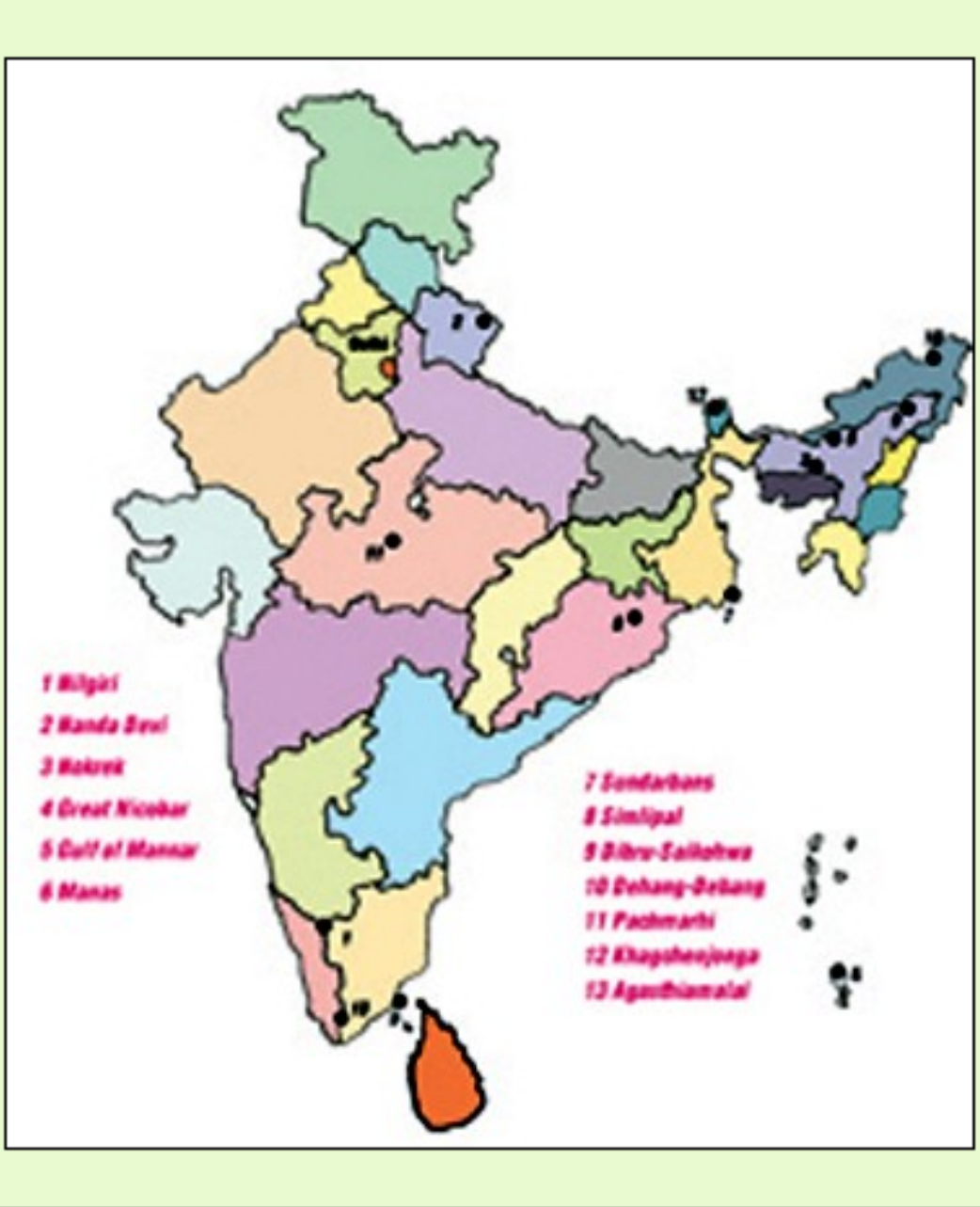
- Recognize that local support is fundamental to the long-term conservation and sustainable use of biodiversity
- Ensure that local populations participate as true partners in designing and managing conservation programmes.
- Allow local populations to identify their own socio-economic needs.
- Ensure that people who bear the costs of conservation projects (e.g. restrictions on fishing) also receive a huge proportion of benefits (e.g. tourist revenues).
- Initiate research activities that identify options for sustainable use of biodiversity
- Use indigenous knowledge to manage protected areas to the extent possible
- Ensure that local populations have maximum stewardship over local resources (rather than government agencies at the regional and national levels).
- Offer income-earning activities and/or services (e.g. improved access too markets, low interest credit, controlled access to resources) to local populations and others with a stake in conservation-development projects.
- Provide local population with the skills and resources needed to make life-style changes necessitated by conservation measures.
- Educate local populations about the rationale for conservation and the relationship between conservation actions and benefits.

BIOSPHERE RESERVE NETWORK

The first Biosphere Reserve Congress was held at Minsk (Belarus) in 1983 and reported 226 Biosphere reserves in 62 countries around the world. The second Congress was held at Seville in 1995 and reported 324 Biosphere Reserves in 82 countries. Presently there are 425 Biosphere Reserves are existing in 95 countries.

Biosphere Reserve Network in India

The Government of India constituted a committee of experts in 1979 to identify the potential areas for recognition as Biosphere Reserves as per the guidelines of UNESCO (MAB). The experts identified 14 sites to be declared as Biosphere Reserves. Out of 14 sites, 13 have been declared as Biosphere Reserves.



Name of Reserve	Date of Establishment	Area (in Sq.hm)	State
Nilgiri	01-09-1986	5,520	Karnataka, Kerala & Tamil Nadu
Nanda Devi	18-01-1988	5,860	Uttaranchal
Nokrek	01-01-1988	80.00	Meghalaya
Great Nicobar Islands	06-01-1989	885	Andaman & Nicobar Islands
Gulf of Mannar	18.02.1989	10,500	Tamil Nadu
Manas	14-03-1989	2,837	Assam
Sunderbans	29-03-1989	9,630	West Bengal
Simlipal	22-06-1994	4,374	Orissa
Dibru-Saikhowa	28-07-1997	765	Assam
Dehang-Debang	02-09-1998	5,111	Arunachal Pradesh
Pachmarhi	03-03-1999	4,926	Madhya Pradesh
Khangchendzonga	07-02-2000	2,619	Sikkim
Agasthyamalai	12-11-2001	1,701	Kerala

AGASTHIAYAMALAI BIOSPHERE RESERVE

State : Kerala
Area : 1,701sq. km.
Endemic Flora : Rudraksha tree, Black plums, Gaub tree, Wild dhaman
Endemic Fauna : Lion-tailed macaque, Slender loris, Great pied hornbill

The forest tracts of Neyyar, Peppara, Shendumey wildlife Sancturias and Achencoil, Thenmala, Konni, Punalur, Thiruvananthapuram Divisions and Agasthyavanam Specil Division are included in the this reserve. This reserve is likely to be extended to parts of Kanyakumari and Tirunelveli districts of Tamilnadu, the Mundanthurai Tiger Reserve and Kalakkadu wildlife sanctuary. Forest type includes thorn, moist deciduous and semi-evergreens. The area is rich in plant and animal diversity.

This Biosphere Reserve harbors the most diverse eco-systems in Peninsular India. The forests, falling both in Tamil Nadu and Kerala, have many endemic species of plants unique to Peninsular India. As many as 35 of these plants are threatened or endangered species. Forests occur in the altitudinal range of less than 300 metres to more than 2,800 metres around Agasthyakudam.

Flora

So far, 2000 species of flowering plants have been reported. 30 new plant species are recorded from this region, about 100 endemic and 50 rare. A few examples are Aristolochia (Snake root), Cardiospermum (Faux persilo), Ceropegia (Taper vine), Dioscorea (Wild yam), Gloriosa (Glory lily), Rauvolfia (Serpentine wood) and Smilax (Laurel leaf greenbrier)

Fauna

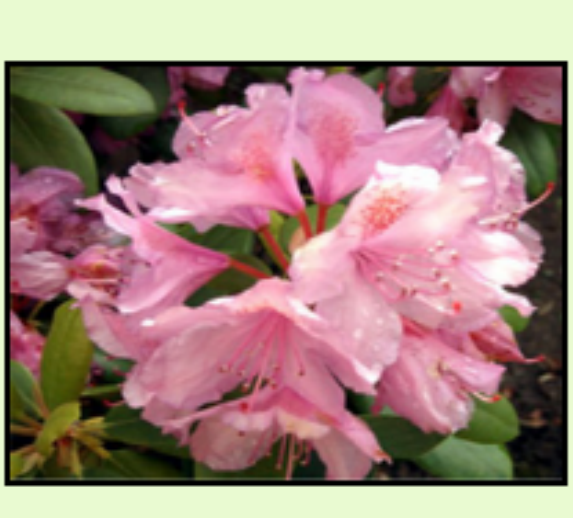
Threatened animal species found in this reserve are tiger, lion-tailed macaque, great pied hornbill and slender loris.

Threats

The main threats are several settlements in the existing hydel and irrigation projects, cultivation of plantation crops and increase in the number of pilgrims to Agastyakudam area.

DIHANG – DIBANG BIOSPHERE RESERVE

State : Arunachal Pradesh
Area : 5,111 sq. km.
Endemic Flora : Cyathea(tree fern), Begonia, Lady's slipper orchid
Endemic Fauna : Red panda, Himalayan black bear, Green pit viper, Takin



The Dihang-Dibang Biosphere Reserve is situated in the districts of West Siang, Upper Siang and Dibang valley of Arunachel Pradesh. This reserve is almost totally forested, having villages and cultivated lands located on lower slopes and terrace edging the major river systems. **The reserve is the last stronghold for many Himalayan species.** A population of above 10,000 people who live in the reserve are primarily of the Adi, Buddhist and Mishmi tribes.

Flora

The vegetation types that occur in the Reserve are sub-tropical broad-leaved, sub-tropical pine, temperate broad-leaved, temperate conifer, sub-alphine woody shrub, alpine meadow (monton), bamboo brakes and grassland. The Reserve forms a part of the world's "Biodiversity Hot Spots". About 1500 flowering plants occur in this Biosphere Reserve. The rare orchid Vanda and 50 species of Rhododendron are found here. It is a shelter for saprophytes like Monotropa uniflora (Indian pipe) and Epipogium spp. (Widerbart) parasitic plants are found here. Some plants listed in "primitive" families are seen here and include Magnolia Compbellii (Charles raffill), Holboelli latifolia (Ribbonwood), and various species of rare and endangered species in the Reserve include Cyathea sp. (Rough tree fern) and Coptis teeta (Indian goldthread).

Fauna

About 45 species of insects, including moths and butterflies have been reported. There are about 195 species of birds, including, the pale-capped pigeon, a globally threatened species, others include Purple cochoa, Nepal cutia and pale blue flycatcher. **The Wedged billed wren-babbler, one of the rarest members of the Laughing thrush and babbler family (Timaliidae), has been found here.** New species such as the water pipit, Japanese bush warbler, isabeline wheatear are reported here.

Mammals include leopard, snow leopard, golden cat, jungle cat, marbled cat and leopard cat. The critically endangered musk deer also lives at these elevations but it is confined to thick forest areas. Other mammals include gaur, serow, Himalayan black bear, sloth bear, Indian wild dog, red fox, deer, Assamese macaque, otter, squirrel and civet.

Threat

There are not many conservation problems except for poaching and collection of medicinal plants.

DIBRU-SAIKHOWA BIOSPHERE RESERVE

State : Assam
Area : 765 sq. km.
Endemic Flora : Rauvolfia (Sarpagandhi), Benteak, Livistona (orchid)
Endemic Fauna : White winged wood duck, Hollock-gibbon, Wild buffalo

This reserve is situated in the south bank of the river Brahmaputra in the extreme east of Assam state and includes Dibru- Saikhowa wildlife sanctuary and Dibru- Saikhowa National Park. Bio-geographically, the area exhibits the properties of both the Indian and the Malayan sub-regions. The annual rainfall ranges from 2300 mm to 3800 mm. There are around 38 villages in the buffer zone of the reserve. The forest types of the reserve comprises of semi-evergreen, deciduous, littoral and swamp forest and patches of wet evergreen forest.

The entire reserve is flat terrain, situated on the flood plain of Brahmaputra.. There are a large number of perennial and seasonal channels namely Kolomi, Salbeel nala, Dadhia nala, Chabru nadi, Laikajan, Ananta nala, Hatighuli nala, Dimoruhola and Ajukhanala.

Flora

Major tree species of biosphere reserve are: Salix terasperma (India willow), Bishcofia javanica (Blume javanese bishopwood), Dillenia indica (Hondapara tree), Bombax ceibe (Red silk cotton tree), Lagerstromia parviflora (Landia), Anthoephalus cadamba (Indian seasde oak), Artocarpus chaplasa (Taungpienne), Mesua ferrea (Indian rose chestnut), Dalbergia sissoo (Sissoo) and Ficus spp.

Commonly found orchids of the Reserve are Rhynocostylis retusa (Blume saccolabium blumei Lindley), and Pholidota articulate (Rattlesnake-tail orchid). Grassess such as Aurondo donax (Giant reed), Phragmities karka (Flute reed), Imperata cylindrica (Japanese blood grass) and Saccharum sp. are found in the Reserve. Threatened and endangered medicinal plants of the Reserve are Rauvalfia serpentine (serpentine wood), Hydnocarpus kurizii (Chaulmoogra tree), Holarrhen antidysenterica (Conessi tree), Costus speciosus (Spiral ginger), Dioscorea alata (Winged yam)and Dioscorea bulbifor (Air potato vine).

Fauna

36 species of mammals are recorded from the Reserve. Of these, 12 belong to Schedule I of the Indian Wildlife Protection (Act) 1972. Royal Bengal tiger, leopard, clouded leopard, jungle cat, sloth bear, golden jackal, dole, Small Indian civet, small Asian mongoose, common mongoose, common otter, Malayan giant squirrel, Pallas' squirrel, Himalayan hoary bellied squirrel, common giant flying squirrel, Indian hare, pangolin, Himalayan mole, ground shrew, Gangetic dolphin, slow loris, capped langur, hoolock gibbon, Asian elephant, feral horses, wild boar, sambar, hog deer, barking deer and Asiatic water buffalo are the larger mammals found in the Reserve.

There are two species of monitor lizards, eight species of turtles and eight species of snakes. The turtles such as Malayan box turtle, Asian leaf turtle, spotted pond turtle, brown roofed turtle, Assam roofed turtle, Indian tent turtle, Indian soft-shell turtle and narrow headed soft-shell turtle, besides 62 species of fish have been recorded.

About 350 resident as well as migratory birds have been recorded. These include great crested grebe, spot billed pelican, white bellied pelican, lesser adjutant stork, white winged duck, Bayer's pochard, greater spotted eagle, Bengal florican, pale capped pigeon, great pied hornbill, marsh babbler, Jordon's babbler, black breasted parrot bill, etc.

Threats

The annual floods cause a crisis for the wildlife. Grazing and siltation are also changing the habitat quality.

GREAT NICOBAR BIOSPHERE RESERVE

State : Andaman & Nicobar Islands
Area : 885 sq. km.
Endemic Flora : Screw pine, Nipa palm, Ceylon iron wood
Endemic Fauna : Crab eating macaque, Nicobar megapode, Giant robber crab,Nicobar serpent eagle

The Great Nicobar reserve with a total geographic area of 1044 sq.km. is the southern-most island of Andaman and Nicobar Archipelago and also the southern-most part of India. The area between the Alexandra River (West Coast) and Chengrappa Bay forms the Core zone-I and area in the southern part between Sahni and Anti Range of hills forms the Core zone-II. The core zone is kept absolutely undisturbed except for already existing settlements.

The Island presents varied natural panorama covered with virgin lush evergreen dense tropical forests extending from seacoast to the tip of the hills. This area is the home for the most endangered species, megapode as well as the edible-nest swiftlet (Collocalia fuciphaga). The area is the home of the Shomphens, one of the most primitive tribes of India

Flora

The Great Nicobar Reserve represents the topical rain forests. About 85 per cent of the forest in this Reserve is still in its virgin condition and rich in species content. Important species include 5 species of Ficus, 2 species of Terminalia (Gallnut), Pandanus tinctoria (Screw pine), Pinanga costata (Blume areca), Pterygota alata (Buddha's coconut) Ipomeoea spp. (Morning glory), Casuarina sp., (Beafwood) Nypa fruticans (Nipa palm), Albizia procera (White siris), Canarium euphyllum(Makok fan), Calophyllum spp (Lagarto caspi). Syzygium cumini(Indian blackberry) , Eleocarpus sphaericus (Rudhrakhsa tree), Manilkara littoralis (Sea mohwa), Rhizophora spp., (Red mangrove), Bruguiera spp., (Large-leaved orange mangrove), Cerips tagal (Tagal mangrove), bamboo and canes. The charsteristic Tree fern (Cyathea albosetacea) as well as the beautiful ornamental orchid, the Phalanopsis (Phalaenopsis speciosa)are confined to this southern most island.

Fauna

The unique fauna of this Reserve include Crab eating macaque (Macaca fascicularis), Salt water crocodile (Crocodylus porosus), Giant leather back turtle (Dermochelys coriacea), Malayan box turtle, Nicobar tree shrew , Nicobar megapode, reticulated python and the Giant robber crab (Birgus lactro). Other species are Andaman wild boar, palm civet, fruit bat, Nicobar pigeon, white bellied sea eagle, Nicobar serpent eagle, parakeets, Nicobar parakeets, water and monitor lizard.

Threats

The area around the reserve is inhabited by the aboriginal tribes of Shomphens and Nicobaris who are given rights under Section 65 of Wildlife (Protection) Act, 1972. These tribes hunt wild animals, particularly the Andaman wild boar and also collect other forest and wildlife produce. Hunting of Andaman wild boar is reported to have affected the population of this endemic and endangered species. Poachers from neighbouring countries frequently visit the reserve and the nearby islands mainly for collection of sea cucumber, nests of edible-nest swift let and for poaching crocodiles, turtles and other wildlife.

GULF OF MANNAR BIOSPHERE RESERVE

State : Tamil Nadu
Area : 10,500 sq. km.
Endemic Flora : Morning glory, Jatropha, Halophila grass
Endemic Fauna : Sea Cow, Sea Anemone, Sea fans

The Gulf of Mannar reserve is the first marine Biosphere Reserve established in India and is situated along the southern coast of Tamilnadu. The Biosphere Reserve includes the Gulf, the adjoining coasts and also the small islands dotting the gulf. The reserve also includes a Marine National Park.

Flora

About 160 species of algae have been recorded here of which some 30 species are edible seaweeds. The area is also rich in sea grasses which provide food for sea mammals, particularly the dugong. The mangrove vegetation of the islands consists of species of Rhizophora (Red mangrove), Avicennia (Black mangrove) , Bruguieria (Large-leaved orange mangrove), Ceriops (Tagal mangrove) and Lumnitzera (Sandy mangrove). About 46 species of plants are endemic to Gulf of Mannar.

Fauna

The Gulf area has beautiful coral reefs that harbour a wide variety of marine vegetation and animals. Productive beds of pearl oysters, prawn species, edible bivalves, sea anemones, ascidarians and the sea cow (Dugong dugon) occur in the Reserve.

Among the fauna, the invertebrates are represented by 280 species of sponges, 92 species of corals, 22 species of sea fans, 160 species of polychaetes, 35 species of prawns, 17 species of crabs, 7 species of lobsters, 17 species of cephalopods and 103 species of echinoderms.

Threats

Illegal coral mining for cement industries and indiscriminate collection of sea grass is the main threat to the reserve. 65% of the existing coral reefs in the area are dead, mostly due to human interference.

KHANGCHENDZONGA BIOSPHERE RESERVE

State : Sikkim
Area : 2,619 sq. km.
Endemic Flora : Anemone, Uvaria, Sikkim Rhododendron, Sikkim Mahonia
Endemic Fauna : Tibetan sheep, Musk deer, Monal pheasant, Snow patridge

Khangchendzonga is bounded in the North by Khangchendzonga National Park and Lungnakla ridge, by the Teesta River in the East, and by reserve forests in the South and West Forest Divisions.

This reserve is one of the high altitudes reserve of the Indian continent as Khangchendzonga Peak, the third highest peak in the world exists within the reserve. The reserve covers 70 per cent of the northern forest area and 30 per cent of the geographical area of the State, a total area of 2619 sq.km. It contains lofty, picturesque and beautiful peaks of heights ranging from 5825m and above. Glaciers and high altitude lakes constitute one of the world's highest ecosystems.

The reserve is surrounded by a number of tiny villages. The population consists of Lepcha, Bhutia and Nepalese.

Flora

The forest types of the Reserve are sub-tropical broad leaved hill forest, Himalayan wet temperate forest, and temperate broad leaved forest, mixed coniferous forest, sub-alpine a forests and dry alpine forest. Dominant species of the temperate forests are Phalat, Shrub live oak, Ghoge champ, and Cinnamon. The mixed coniferous forests occur in higher altitude with fir, East Himalayan fir, Maple, Spruce, Juniper and Rhododendron. In the Alpine scrub and grasses, the common shrubs and herbs found are Primrose, Rhododendron, bottled gentian and stagger weed. There are many medicinal herbs in the Reserve like Aconite., Kutki root, Spikenard, Rhubarb and Ginseng.

Fauna

The high altitude alpine and plateau regions harbours rare and endangered species of animals. The snow leopard of the alpine land holds the position at the apex of the biological pyramid. Himalayan red panda, musk deer, nayan or the Tibetan sheep, bharal or blud sheep, Himalayan tahr, marco polo sheep, marmots and monkeys are a few animals are found here.

This reserve also harbours many species of birds. The pheasants include monal, trogopan and blood pheasant. The other species are Tibetan snow cock, Himalayan snow cock, snow partridge, Lammergier, forest eagle owl, Tibetan horned eagle, owl, eagles, falcons, hawks, snow and rock pigeon.

Threats

Landslides are one of the important factors causing hindrance to the conservation of bio-resources, resulting in the loss of soil as well as restrictions in the movement of wildlife during migration.

MANAS BIOSPHERE RESERVE

State : Assam
Area : 2,837 sq. km.
Endemic Flora : Catechu tree, Sissoo, White siris
Endemic Fauna : Pygmy hog, Golden lungur , Assam roofed turtle

Manas gets its name after the serpent Goddess 'Manasa' (Durga). The unique location of Manas at the confluence of the Indian, Ethiopian and Indo-Chinese realm along with hot and humid climate makes this reserve a treasure of immense diversity and endemism of the flora and fauna. It is a unique representation of tropical, humid "Bengal Rain Forests" in the Indo-Malaya realm. The reserve extends along the Himalayan forest hills to the north of Brahmaputra valley. The Manas River is the largest Himalayan tributary of the Brahmaputara River. Manas was described a World Heritage site by UNESCO in 1985.

Flora

Two major biomes are represented in Manas: the grassland biome (Savannah and Teri) and the forest biome (Bengal rain forests). A total of 543 plants species have been recorded from the core zone. Of these, 30 are Pteridophytes and Gymnosperms, 139 are monocots, and 37 are dicots.

Fauna

61 species of mammals, 327 birds, 2 reptiles, 7 amphibian and 54 species of fishes are recorded. Hispid hare, pigmy hog and golden langur are some of the rare species of animals found in the park, apart from tigers, elephants, rhinoceros, wild buffalo, wild boar, sambhar, swamp deer, and hog deer. During winter Manas is full of migratory birds like the riverchats, forktails, cormorants and ducks like the Ruddy Shell-Duck. Regular woodland birds like the Indian Hornbill. And the Pied Hornbill also found here.

The pygmy hog, hispid hare and golden langur are endemics among the animals. In fact the only viable population of the smallest and rarest wild suid, the pygmy hog, exists in Manas and nowhere else in the world. In 1988, the Assam roofed turtle, perhaps the least known of the species was found in Manas and listed under the IUCN Action Plan for Conservation.

The Bodo communities are traditionally dependent on the forests for fodder, timber, firewood, thatch, wild vegetables and fruit, and fish. The other threats to the Reserve are soil erosion, weed infestation and trans-border management

NANDADEVI BIOSPHERE RESERVE

State : Uttaranchal
Area : 5,860 sq. km.
Endemic Flora : Salep Orchid, Silver weed, Fairy candelabra, Fairy Primrose
Endemic Fauna : Himalayan tahr, Brown bear, Koklas pheasant

The Nanda Devi reserve includes Nanda Devi National Park and Valley of Flowers National park in the core zone. Nanda Devi reserve represents the Himalayan zone of the bio-geographic zonation of India. Nanda Devi National Park was included in the list of World Heritage Site during 1991. It includes Nanda Devi and several other major peaks like Danagiri, Changbang, Trishul, etc. The reserve includes parts of Chamoli, Pithoragarh and Bagheswar districts in Uttaranchal. The main portion of the reserve falls in Chamoli district of Garhwal Himalayas. All the households depend entirely on the forests for fuel, fodder, timber and leaf litter for organic manure. Many plant species are used in traditional health care systems.

Flora

The major forest types of the Reserve are temperate forest, sub-alpine forest and alpine land. Botanical Survey of India has identified 800 species of plants. A few important species are: Potenlilla sp.,(Silver weed), Androsac sp.,(Fairy candelabra), primula sp., (Fairy primrose) Orchis latifolie (Salep orchid) and Rhododendron sp.(Satsuki azalea).

Fauna

The Biosphere Reserve has a rich fauna. The various surveys conducted by Zoological Survey of India and others have shown the presence of 18 mammals and nearly 200 birds in the area. Of these, seven mammals and eight birds are endangered species. Mammals include Snow leopard, Black bear, Brown bear, Musk deer and Himalayan tahr . Endangered bird species include the monal pheasant, koklas pheasant, western tragopan, snow-cock, golden eagle, steppe eagle, black eagle and bearded vulture.

Cultural Heritage of the Area

The people of the Biosphere Reserve are very poor. Land holdings are very small and the literacy rate is very low due to the remoteness. They have their own culture, tradition and religious beliefs. The principal occupation is agriculture and sheep rearing. Prior to 1962, Bhutias had a barter trade system with the Tibetans and were masters of Trans-Himalayan trade.

Threats

The major threats to the ecosystem are collection of endangered plants for medicinal use, forest fires, poaching and visits by pilgrims.

NILGIRI BIOSPHERE RESERVE

State : Karnataka, Kerala and Tamil Nadu
Area : 5,520 sq. km.
Endemic Flora : Vanda, Liparis, Bulbophyllum, Spiranthes , Thrixspermum
Endemic Fauna : Nilgiri tahr, Nilgiri langur, Lion – tailed macaque

The Nilgiri Biosphere Reserve was the first Biosphere Reserve in India. It is located in the Western Ghats and includes 2 of the 10 bio-geographical provinces of India. Wide ranges of ecosystems and species diversity are found in this region. Thus, it was a natural choice for the premier Biosphere Reserve of the country. The Nilgiri Biosphere Reserve falls under the biogeographic region of the Malabar rain forests. The Mudumalai Wildlife Sanctuary, Wyanaad Wildlife Sanctuary, Bandipur National Park, Nagarhole National Park, Mukurthi National Park and Silent Valley are the protected areas present within this reserve.

Vegetation

The forest types found in the Nilgiris are thorn scrub forest, dry deciduous forest, moist deciduous forest, wet evergreen forest, shoals, grasslands, marshes and swamps. Woody climbers and epiphytes are also found here.

Flora

The reserve is very rich in plant diversity. About 3,300 species of flowering plants can be seen here. Of the 3,300 species 132 are endemic to the Nilgiri Biosphere Reserve. The genus Baeolepis is exclusively endemic to the Nilgiris. Some of the plants entirely restricted to the Nilgiri Biosphere Reserve include species of Calacanthus (Carolina allspice), Baeolepis (Dogbanes), Arodina and Wagatea (False Thorn) etc. Of the 175 species of orchids found in the Nilgiri Biosphere Reserve, 8 are endemic to the Nilgiri Biosphere Reserve. These include endemic and endangered species of Vanda, Liparis (Lily-leaved), Bulbophyllum (Medusa's head orchid) Spiranthes (October ladies-tresses) and Thrixspermum (Chi-tou wind orchid). Some of the common trees found here are sandal, Indian rosewood, jackfruit, jamun, ironwood, rhododendron, hill gooseberry, etc. Many varieties of orchids and the unique kurinji shrub that produces a blue coloured flower to which the Blue Mountains owe their name are also found here. Climbers like the black pepper and numerous herbs thrive here.

Fauna

The fauna of the Nilgiri Biosphere Reserve includes over 100 species of mammals, 350 species of birds, 80 species of reptiles and amphibians. 300 species of butterflies and innumerable invertebrates, 39 species of fish, 31 amphibians and 60 species of reptiles endemic to the Western Ghats also occur in the reserve. Fresh water fish such as Danio neilgheriensis (Pearl danio), Hypselobarbus dubuis and Puntius bovanicus are restricted to the reserve. The Nilgiri tahr, Nilgiri langur, slender loris, blackbuck, tiger, gaur, Indian elephant and marten are some of the animals found here.

People

Tribal groups like the Todas, Kotas, Irullas, Kurumbas, Paniyas, Adiyans, Edanadan Chettis, Cholanaickens, Allar, Malayan, etc. are native to the reserve. Except for Cholanaickens who live exclusively on food gathering, hunting and fishing, all the other tribal groups are involved in their traditional occupation of agriculture.

Threats

The Nilgiri Biosphere Reserve has been enduring human interference for a very long time through development projects such as hydroelectric power projects, agriculture, horticulture, intensive felling, monoculture, grazing, forest fires, development and construction activity and unplanned tourism have brought about substantial change in the ecology of the area. Environmental problems are noticed in different parts of the reserve.

NOKREK BIOSPHERE RESERVE

State : Meghalaya
Area : 80 sq. km.
Endemic Flora : Grand rasamala, White meranti, Lali, Chempaka, Wild lemon
Endemic Fauna : Stump tailed macaque, Pig tailed macaque, Giant flying squirrel

Nokrek Biosphere Reserve is situated in the western part of Meghalaya State. The reserve covers parts of three districts, East Garo Hills, West Garo Hills and South Garo Hills. Nokrek National Park with an area of 47.48 sq.km is the core zone of the reserve. This reserve is an important source of many perennial rivers and streams. The important river systems which originate from the area are Simsang river, Ganol river, Bugi river, Dareng river and Rongdik river.

The area of the national park as well as the entire ridge of Tura Range is very important from the conservation point of view because of its richness in floral and faunal diversity and more importantly, due to the fact that the area forms the primary catchments of all the major rivers and streams in the three districts of Garo Hills. Another special feature of the area is the abundant natural occurrence of Citrus indica and other species of Citrus. Therefore, it constitutes an important gene pool for future hybridization programmes for evolving disease- resistant Citrus plants.

Vegetation

The vegetation of the reserve can be broadly classified into the tropical and sub-tropical types based on the altitude. The tropical vegetation covers areas up to an elevation of about 1000 m and above. The species are of evergreen, semi-evergreen, moist deciduous types, including bamboo thickets, grasses and riverine forests. Important plant species are Altingia excelsa (Grand rasamala), Shorea assamica (White meranti) , Bambusa pallida (Bamboo), Amoora wallichi (Lali) and Michelia insignis (Chempaka).

Fauna

Nokrek Reserve supports a wide variety of plants and animals. Detailed scientific studies of the flora and fauna are not available. The area also harbours many rare, endangered and endemic faunal species like hoolock gibbon, binturong, stump tailed macaque, pig tailed macaque, Himalayan black bear, tiger, leopard, elephant, Giant flying squirrel, etc.

The area consists of 128 villages with a population of about 40,000; the entire population consists of the Garo community. Jhum (shifting) cultivation is the main means of livelihood of the people. **16.4 per cent of the total Reserve comes under Jhum cultivation resulting in soil erosion and loss of topsoil.**

PACHMARHI BIOSPHERE RESERVE

State : Madhya Pradesh
Area : 4,926 sq. km.
Endemic Flora : Sal tree, Selaginella fern, Palimorpha bamboo
Endemic Fauna : Barasinga, Wild buffalo, Red jungle fowl

Pachmarhi reserve covers three districts of Hoshangabad, Betul and Chindwara. This reserve encompasses three wildlife conservation units viz. Bori Sanctuary, Pachmarhi Sanctuary and Satpura National Park. This reserve has 510 villages. Patalkot, a small adivasi hamlet inside the reserve, is an anthropologist's paradise. The general configuration of the area is hilly, undulating terrain. The scientific management and conservation of forests in India started in 1862 by demarcating Bori Reserve Forest, which lies in the Bori Sanctuary of this reserve. This also resulted in the establishment of the Forest Department in India.

Flora

The most important timber species of the Biosphere Reserve are teak and sal. About 30 species of Thallophytes, 83 species of Bryophyte, 56 genera, 71 species of pteridophytes, 7 species of Gymnosperms belongs to 633 genera are reported. Pachmarhi plateau is a botanist's paradise. There are rare and endemic species, which are observed and considered to be a 'gene bank' of rare species of this locality. Out of 71 species of pteridophytes, 48 species belong to ferns. Several rare angiosperm plants are also observed in this reserve. Species such as Whisk Fern, , Sandbar willow, stalked adder's tongue fern and Tree fern are found here. A few clumps of rare and endemic species like bamboo occur in the moist teak forest of Bori Reserve.

Fauna

About 50 species of mammals, 254 species of birds and 30 species of reptiles are reported. The steep vertical scarps are home to numerous raptors like honey buzzard, serpent eagle and black eagle. Common birds found in the reserve are red jungle fowl, Malabar pied hornbill, Malabar whistling thrush and paradise flycatcher. The reptilian population include geckos, skinks, etc. Several species like rhesus monkey, Indian giant squirrel and flying squirrels are endemic to the area.

Archaeological heritage

There are a large number of cave shelters of great archaeological interest, with rock paintings of several thousands years old. The paintings are of different styles and periods. At present these has been scattered and almost no effort has been made to conserve them.

The hills around Pachmarhi are sacred because of Mahadeo or Lord Shiva. There are two important Hindu festivals observed in this locality: Nagpanchami in Shravan (July-August) and Maha Shivaratri in March. More than 12,000 pilgrims come to attend these festivals.

Threats

The major threats to the reserve are collection of rare, endemic and medicinal plants by various groups, proliferation of lantana and poaching.

SIMILIPAL BIOSPHERE RESERVE

SIMILIPAL BIOSPHERE RESERVE

State : Orissa
Area : 4,374 sq. km.
Endemic Flora : Coix grass
Endemic Fauna : Red breasted falconet, Slender billed scimitar babbler, Ruddy mongoose

Similipal is situated in the northern region of Orissa and includes the Eastern Plateau, Chotangpur Plateau, Lower Gangetic Plain and the Coastline biotic areas. It is the richest watershed in Orissa, giving rise to many perennial rivers like the Buydhabalanga, Khadkeri, Khairi, Bhandan, West Deo, Saltandi, East Deo, Somja and Palpala. These rivers are the lifeline for the people of Mayurbhanj Keonjhar, Balasore and Bhadhrak districts. The vegetation types are tropical semi evergreen, tropical moist deciduous hill forest, grassland and savannah. The reserve stands as link between the flora and fauna of Southern India and Sub-Himalayan North -East India. The reserve has about 7 % of the flowering plants, 8 % of the orchids, 7 % of the reptiles 20 % of the birds and 11 % of the mammals reported so far from India.

Flora

There are about 1170 flowering plant species in the Reserve, including 94 species of orchids (2 species of orchids are endemic), 8 species are endangered, 8 species are vulnerable and 34 species are rare. The important plant species are Terminalia arjuna (Myrobalan), Dalbergea sisso (Sissoo), Michelia champa (Champak), Shorea robusta (Sal tree) and Madhuca sp.(India butter tree).

Fauna

The fauna includes 12 species of amphibians, 29 species of reptiles, 260 species of birds and 42 species of mammals. The important species are elephant, tiger and leopard, fishing cat, four horned antelope, rudy mongoose, red breasted falconets and grey headed fishing eagle.

Tribal population

There are 1265 villages in Similipal, of which four are in the core area, 61 in the buffer and 1200 in the transitional area. There are about 4.5 lakhs of people in these villages, of which 73.44 per cent are tribes.

Threats

The high dependency of tribal people on the reserve for their livelihood is a problem for sustainable management of the reserve. The other threats are forest fire, firewood collection, poaching and akhand shikar (annual poaching festival by tribes).

SUNDARBANS BIOSPHERE RESERVE

State : West Bengal
Area : 9,630 sq. km.
Endemic Flora : Sundari, Passur, Nypa
Endemic Fauna : Bengal tiger, Bengal monitor lizard, Salvator lizard

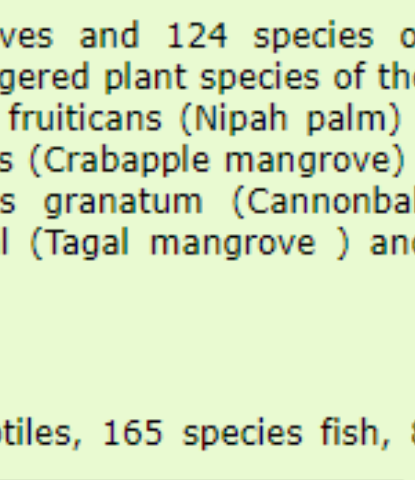
Sunderban is the largest contiguous mangrove area in the world and one of the World Heritage Sites of India designated by the World Heritage Convention. This biosphere reserve is located in the vast Delta of the Ganges, south of Calcutta. **It is the largest and only mangrove reserve in the world inhabited by tigers**. This reserve includes the Royal Bengal Tiger Reserve, Sundarban National Park and three wildlife sanctuaries, viz Sajnekhali wildlife sanctuary, Lothian Island wildlife sanctuary and Holiday Island wildlife sanctuary.

Flora

Tropical humid forest and mangroves are the major ecosystem types of the reserve. Mangrove species such as Avicennia alba, Bruguiera gymnorrhiza, Ceriops tagal and Rhizophora apiculata are the major species. Tropical semi-evergreen forest, agro-ecosystems, silviculture, pisiculture, prawn culture are the major habitats of the reserve.

About 120 species of algae, 25 species of mangroves and 124 species of Angiosperms have been recorded here. Rare and endangered plant species of the reserve are Acanthus volubilis (Acanthe molle) , Nypa fruiticans (Nipah palm) , Sonneratia alba (Mangrove apple), Soneratia casaeolaris (Crabapple mangrove) , Aegialtis rotundifolia (Nilar ixora manila), Xylocarpus granatum (Cannonball mangrove) , Heritiera fomes (Sundari) , Ceriops tagal (Tagal mangrove) and Lumnitzera recemosa (Sandy mangrove)

Fauna



There are about 163 species of birds, 40 species of mammals, 56 species of reptiles, 165 species fish, 8 species of prawns, 67 species of crabs and 23 species of molluscs are reported. Animal species include Tiger (Pathera tigris tigris), Saltwater crocodile (Crocodilus porasus), Fishing Cat (Felis viverrina), Indian Leopard cat (Felis bengalesis), Yellow monitor (Varanus flaveseens), Olive ridley sea turtle (Lipidochelys olivacea), Hawksbill sea turtle (Ertmochetys imbricate) and Green sea turtle (Chelonia myrdus).

Threats

People living within the biosphere reserve depend on forest and forest-based resources. The main threats include excess fishing, aquaculture practices and harvesting of timber and firewood.

> *"So long as this earth is full of nature, the human race is going to flourish"*
>
> ***Charakasamhita***

> *" Man does not have the right to destroy what he cannot create.*
> *The human being is not an alien to exploit it"*
>
> ***Guru Granth Sahib***

The materials and illustrations used in this publication have been taken from the following:

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