Notes

15

FORESTS AND BIODIVERSITY

Forest refers to an area covered with trees or a dense growth of trees and underbrush covering a large tract. The Latin word 'Foris' means the outer part of settlements. The importance of forests for our survival is of many folds - from air we breathe to the timbre from wood we use. Forests provide habitats for wildlife and livelihoods for humans. Forests also offer watershed protection, prevents soil erosion and landslides and helps in mitigating climate change. In this lesson you will learn about the importance of forests, distribution of forest resources, methods of forest conservation etc.

OUTCOMES

After studying this lesson, learner:

- describes the importance and use of forest resources and their distribution;
- explains the flora and fauna and biodiversity hotspots;
- analyses the methods of forest conservation and
- appreciates community development initiatives with special reference to joint forest management strategies.

15.1 FOREST RESOURCES

Forest resources are of paramount importance for all living beings.Forests provide us with food, shelter, livelihood, fuel security and water. Over 2 billion people rely on forests either directly or indirectly in the world. Major parameters used for measuring forest resources are forest cover, species composition, timbre and non-timber products, annual increment, growing stock, biodiversity etc.

Notes

DO YOU KNOW?

The International Day of Forests (World forest Day) is celebrated every year on 21st March to spread awareness about the environment. Since 2013, Government of India observes 11th September as 'National Forest Martyrs Day' to pay tribute to the valour and sacrifice made by forest personnel to protect the forests and wildlife of India.

Significance of forest

Forest have very significance role on the earth. You can find its significance as:

- Forests are the world's second largest storehouse of carbon after oceans. They are also the source of oxygen. They provide services like absorbing greenhouse gases, protecting watersheds and reducing or slowing the soil erosion etc.
- Forests are like giant sponges where trees and soil help in ground water recharge; and feeds rivers, ponds, lakes and springs; reduces runoff and chances of floods. Forests regulate precipitation; they also emit biological particles like pollen and fungal spores which act as condensation nuclei for raindrop formation.
- Forests are natural cooling systems as trees use solar energy to evaporate moisture and have a cooling effect on the environment. They help in slowing global warming as they act as carbon sinks and also purify air from carbon monoxide, sulphur dioxide, nitrogen dioxide and fine dust. Forests near urban settlements help in reducing the 'heat island' impact of urban activities and transportation.
- Forests control many disasters like controlling river floods especially flash floods and Mangrove forests act as wind breakers in cyclone prone areas. They also help in reducing risk from landslides, avalanches and sand storms. It helps in preventing droughts.
- Forests provide habitats to diverse animal species. They are home for more than 80% of world terrestrial biodiversity and livelihood for different types of settlements including 60 million indigenous people.
- Forests are of great economic value worldwide; it is estimated at 16.2 trillion dollars. Forests create jobs for 13 million people in the world. Forests play an important role in tourism. Third of the world's population still depends on forests and trees for their daily needs, especially for heating and cooking.
- Forests are also vital for health; they provide a treasury of medicinal plants and pharmaceutical ingredients and fresh air for oxygen-rich walks.

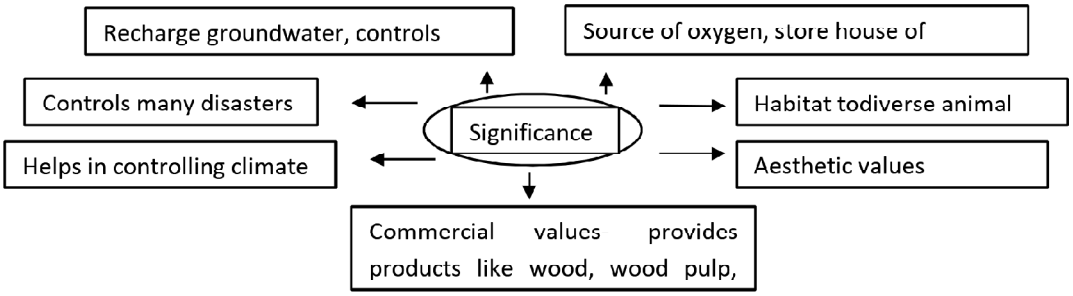


Fig 15.1 Significance of forests

15.2 FOREST OF INDIA

As in any other part of the world, forests of India are determined by climate, physiographic condition and soil types. Factors affecting different types of forest are temperature, precipitation, gradient of land, slope aspect, depth and texture of soil etc. Having great variation in all these factors, India has great diversity of forests. The forests of India can be broadly divided into the following groups:

A Tropical Evergreen Forests

B Tropical Deciduous Forests

(a) Tropical Moist Deciduous

(b) Tropical Dry Deciduous

C Thorn Forests

D Tidal Forests and Littoral and Swamp forests

E Himalayan Forests and southern Montane forests

A. Tropical Evergreen and Semi evergreen forests

Trees in these forests remain green all the year round as the climate of the region is warm and wet throughout the year. A large number of species spread over this region. No specie dominates large areas along with under growing climbers. Different species shed their leaves in different seasons. Hence, the forest looks evergreen throughout the year. These forests are found in the areas having more than 200 cm of rainfall with a short dry season. The mean annual temperature remains above 20° C in this region. The trees reach a height up to 60 metres or even more. The forest has a dense and mixed vegetation of all kinds including trees, shrubs, climbers, creepers, epiphytes and ferns giving it a multilayered structure. Hence, their economic exploitation is not viable. The number of species of trees is very large in a small area. Rosewood, ebony, mahogany, rubber, jack wood, kail, white cedar and bamboo are the important species of trees

Notes

Notes

found in Tropical Evergreen Forests. In India, this type of vegetation is found in the areas of heavy rainfall in western slope of Western Ghats, upper parts of Assam and hills of north eastern regions and islands of Lakshadweep and Andaman and Nicobar. Hardwood from these forests is used for furniture, handicraft etc. They prevent landslides and soil erosion. Some forest areas are cleared for plantations crops like tea, coffee and rubber

B. Tropical Deciduous Forests

Broadly, divided into two categories of Tropical Moist Deciduous and Tropical Dry Deciduous. Trees in these forests shed their leaves once a year. That is why they are called tropical deciduous forests. These are the most widespread forests of India. These forests are found in the areas receiving annual rainfall between 75 to 200 cm and many times called 'Monsoon forests'. As far as the physical distribution of this type of forests is concerned, they are found in the entire country excluding some parts of Deccan Plateau, North-Eastern Region, Western Ghats and Eastern coast. One species of trees found in large numbers together making them most viable for economic exploitation. The deciduous forests are the most economically exploited forest types in India. These forests have been subject to extensive clearance by humans for the purpose of cultivation. Still some patches of natural vegetation are found along the foothills of Himalayas, hilly regions of peninsular and central part of the country. On the basis of the availability of rainfall these forests are further divided into moist deciduous and dry deciduous.

(a) The moist deciduous forests are found in the areas receiving 100 to 200 cm of rainfall. These are distributed mainly in the eastern parts of the country, North eastern states along the foothills of Himalayas, Jharkhand, Odisha and Chhattisgarh, and eastern slopes of Western Ghats. Teak, Bamboo, Sal, Shisham, Sandalwood, Khair, Kusum, Arjun, Mahua, Jamun and Mulberry are the important species of trees found in these forests.

(b) The dry deciduous forests are spread in the areas receiving annual rainfall between 75 to 100 cms annually. These forests are found in the interior parts of the peninsular plateau and the plains of Uttar Pradesh, Madhya Pradesh and Bihar. Tree species of this forest are Teak, Sal, Tendu, Bel, Amaltas, Peepal, and Neem. In the dry season most trees shed their leaves completely and the forest looks like vast grasslands. Dry grass sometimes catches fire either due to natural causes or by human negligence.

C. Thorn Forests

The areas with less than 75 cm of annual rainfall are characterised by the natural vegetation of thorny trees and bushes. Climate of this part is mainly dry with occasional wet periods,

Notes

so it does not support dense vegetation. They are mainly found in North-Western India, interior parts of the Peninsular India including semi arid areas of Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Haryana, Karnataka, Andhra Pradesh and Maharashtra. Vegetation of these forests is widely distributed in the form of small trees and bushes with deep roots. The stems are succulent to conserve water. Leaves are mostly thick and small to minimise evaporation and many plants and trees have thorns to preserve water and reduce evaporation. Acacia, euphorbias, babul, cacti, khair, date and palms are common variety of trees in this type of vegetation among grasses. Tussocky grasses have roots which can go down to 2 m deep are also seen abundantly growing in thorn forests.

D. Tidal or Mangrove Forests

As suggested by the name, tidal forests are found in tidal creeks and swamps influenced by the tides and wetland topography. These areas are characterised by mud, silt and water accumulated on the surface. Roots and branches of the trees are submerged under water for a specific period of time. They are also called mangrove forests. Mangroves are practically evergreen with thick leathery leaves. Such types of forests are found in the deltas of Sundarbans, Mahanadi, the Godavari, Krishna, Kaveri rivers and in the Andaman and Nicobar Islands. Mangrove or Sundari is the common tree in Sundarbans while palm, coconut, keora, and agar are other important species of tidal forest. Mangrove spread over 6,740 sq. km accounting for 7 percent of world's mangrove forests. It is interesting to know that this type of forest has remained away from large -scale commercial exploitation. These forests are located along the coasts. They provide protection against cyclones.

Along with tidal forests other similar types of forest are Littoral and Swamp forests which have an abundant variety of wetland habitats. Such forest areas witnessed 70% land use conversion into paddy cultivation. Wetlands sites are identified as Ramsar sites.

E. Montane Forest

These forests are mainly found in the Himalayas. The decreasing in temperature and increasing in altitude lead to varied types of vegetation. Other important factors like slope of the mountain and sun facing side of the slope influence the vegetation. The ecosystem is highly fragile. Himalayan forests have been exploited in many ways in recent decades. Areas with relatively low altitude up to 1000 metres, warm climate and good amount of rainfall are characterised by dense vegetation cover. These areas look like tropical forest. Sal and Bamboo are main species in these areas. Between the elevation of 1000 to 2000 metres, evergreen broad leaves Oak and Chestnut are the common species found in these forests. In easternHimalayas the same elevation is

Notes

occupied by subtropical Pine forests. Chir is common species found in this part. Moist temperate forests in Himalayas are found between the elevation 1500 to 3500 metres which receives annual rainfall in the range of 100 to 250 cm. Oak, laurel, chestnut, cedar, Silver, Firn, spruce rhododendron and deodar are the main species found in this part of Himalayas. They have been widely exploited for their timber.Alpine forest found in Himalayas at the height of 3000 to 3800 mts with large and extensive highland grassland and sparsely distributed pine, birch, sliver, fir and rhododendron trees.

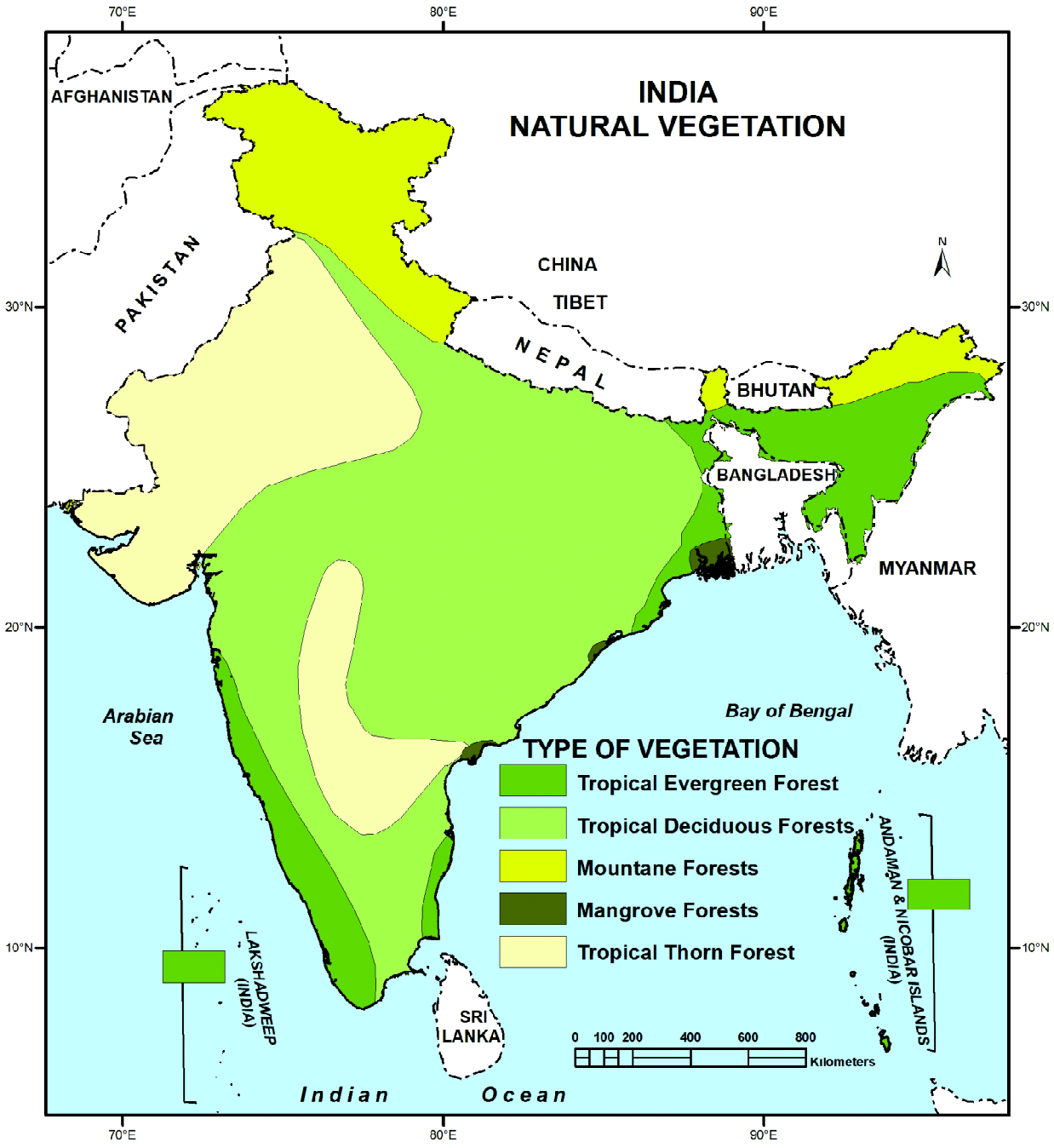


Fig. 15.2 India: Natunal Vegetation

Notes

Montane forests are also found in the southern part of India. The three distinct areas of Peninsular India where these forests are found are:

(a) The Vindhyas including Satpura and Maikal ranges (Madhya Pradesh, Chhattisgarh, and the Chota Nagpur region): These are generally moist deciduous forest zones with sal and teak.Patches of dry deciduous forests or scrubs are also found.

(b) Nilgiris (Nilgiris, Anaimalai and Palani hills): The temperate forests in Nilgiris are called 'Sholas'. Major trees species found are laurel, magnolia, wattle, cinchona and others which have great economic importance

(c) The Western Ghats or the Sahyadris (Kerala, Tamil Nadu And Karnataka):The areas have temperate vegetation in higher regions and sub- tropical in lower elevations.

According to state records, 23.28 per cent of the total land area of India is under the forest cover. The better indicator to get the correct picture of the actual forest cover is by assessing the area with canopy cover. According to India State of Forest report 2011, the actual forest cover in India is 21.05 per cent. The share of dense forest is 12.29% and open forest is 8.75%. Lakshadweep has zero forest area whereas Andaman and Nicobar have 86.93 % of land area covered by forests. The north and north western states have less than 10% area under forest cover.They are Gujarat, Punjab, Rajasthan, Haryana and Delhi. Large areas of Punjab and Haryana are under cultivation, so these states have very less forest cover. Tamil Nadu and West Bengal have 10-20 % land under forest cover. Except for Tamil Nadu, Goa and UT of Dadra and Nagar Haveli most of peninsular India has 20-30 % of land under forest. The North- eastern states have more than 30% of land area under forest. Good rainfall and varied terrain supports good forest growth in this region of the country.

The Forest Survey of India (FSI) have classified the forest areas into 4 broad classes as following

Very dense	All forest with tree cover (including mangrove cover) of canopy density 70% and above
Moderately Dense Forest	All forest with tree cover (including mangrove cover) of canopy density 40% and 70%
Open forest	All forest with tree cover (including mangrove cover) of canopy density 10% and 40%
Scrub	All forest lands with poor tree growth mainly of small or stunted trees having canopy density less than 10 percent
Non forest	Any area not included in above classes

Notes

The classification of the forest area into dense and open forests is based on internationally adopted norms of classification. Mangroves are separately classified because of their characteristic tone and texture and unique ecological functions.

15.3 FLORA AND FAUNA OF INDIA

India has 2.4% of the world's total land area, accounting for 7-8% of all recorded species, including species of animals and plants. Due to India's unique geographical position, it is endowed with rich reserves of flora and fauna as there are varied terrain, climate, soils, water resources etc.

India has rich flora ranking 10th in the world and 4th in Asia in regard to its diversity. Many plants synthesise substances that are useful for the maintenance of health in humans and other animals. The Botanical Survey of India (BSI), Kolkata have surveyed 70% of the geographical area of India and have identified 47,000 species of plants. Out of total 35% are native (endemic) to India has not been reported anywhere in the world. There are 15,000 flowering plants. About 1,336 plant species are considered vulnerable and endangered. The BSI brings out inventory of endangered plants in form of a publication titled 'Red Data Book'

Wildlife of India is a great natural heritage.There are 89,451 animals' species, accounting for 6.5 % of world's fauna. These include 372 mammals, 1,230 bird species, 440 reptiles, 2,456 fish species, 60,000 insect species and 200 amphibians and 500 molluscs (animals having soft bodies with no spine and covered with shells like snails, oysters). In India livestock diversity is high as there are 40 breeds of sheep, 22 of goats and 27 of cattle.

INTEXT QUESTIONS 15.1

1. Name five major types of forest found in India
2. Name four classes of Forest cover given by Forest Survey of India.
3. At which height the alpine forest in the Himalayas are found?
4. Name the famous mangrove tree species found in Sundarbans delta.
5. What is the Annual Rainfall range in dry and wet (moist) deciduous forest?
6. What is the rank of India in flora ranking of the world?
7. How many percent of world's fauna is found is Indias?

Notes

15.4 METHODS OF FOREST CONSERVATION IN INDIA

Forest is vital resources for all life forms to exist. It is important to conserve, protect and nurture forests for future generations. There are various methods adopted in India to conserve forest.

Following are various methods and steps to conserve forests in India:

1. Controlling forest fires
2. Afforestation and reforestation
3. Regulated and planned cutting of trees

Controlling forest fires - Forest fire causes destruction and loss of forests and many a limes forest fires become uncontrollable. Forest fires in forests and parks caused major destruction in Australia in December 2019-January 2020. More than 110,000 sq km or 27.2 million acres were burned. Indian forests have not yet been exposed to fires of real significance like other parts of the world. In India there were 37,059 fires in 2018 as detected by MODIS (Moderate Resolution Imaging Spectro- radiometer) sensor. According to forest inventory records about 54% of forests are exposed to occasional fire episodes, 7% to moderately frequent fires and 2% to high incidence while 35% of India's forests are not exposed any real significance. Forest fires are caused either due to natural processes by lightning or friction between trees in summer during high wind speed. It is also caused by human negligence (intentionally or unintentionally) like leaving bonfires unattended or leaving burning cigarettes or beedis on forest floors.

Geographical Information System (GIS) and Satellite based remote sensing technology are important tools which have been effective in better prevention and management of forest fires. Early warning in forest fires prone areas, monitoring fires in real time basis and estimation along with assessment of burn scars are possible with the help of advanced Remote Sensing and GIS technologies. Latest technologies in firefighting along with trained staff, Dome techniques like developing 3 metre wide fire lanes around the periphery of the fires, arrangement to water spray, fire redundant chemicals, help of helicopters are few of the techniques to control forest fires.

Afforestation and reforestation- The areas which witness partial or total clearing of forest areas (deforestation) or due to mining or fire must be reforested. The process can take place naturally by keeping the forest area untouched or fallow so that degraded forests naturally grow back. Afforestation and reforestation can be done artificially by sapling of trees, plants and seeds. New plantations and afforestation programmes not only help in increasing forest cover but also help in making a healthy eco- balance. The tree species used for afforestation should be native and suitable to local geographical conditions. The young trees and plants during their initial growth should be taken care of.

Notes

The Ministry of Environment, Forest and Climate Change (MoEFCC) plays an important role in afforestation plantation schemes with a participatory approach. Joint Forest Management Committees (JFMC) are major implementing agencies after assessing the needs, ecological conditions of the forest area.

Three strategies for conservation and development of forests are adopted.

a. Afforestation through natural/ artificial regeneration

b. Protection

c. Management

Major schemes of forest conservation and development are-

i. National Afforestation Programme (NAP) aims to do afforestation of degraded forest lands. Ecological restoration of degraded forests develops forest resources with local people's participation.

The overall objective of the National Afforestation Programme (NAP) scheme is ecological restoration of degraded forests and to develop the forest resources with peoples' participation, with focus on improvement in livelihoods of the forest-fringe communities, especially the poor. NAP aims to support and accelerate the on-going process of devolving forest conservation, protection, development, and management functions to the Joint Forest Management Committees (JFMCs) at the village level, which are registered societies. The scheme is implemented by a three tier institutional setup through the State Forest Development Agency (SFDA) at the state level, Forest Development Agency (FDA) at the forest division level and JFMCs at village level.

The major components of the scheme include afforestation under Seven plantation models, maintenance of previous years plantations and Ancillary Activities like soil and moisture conservation activities (SMC), fencing, overheads, monitoring and evaluation (M&E), micro-planning, awareness raising, Entry Point Activities (EPA) etc.

ii. National Mission for a Green India Mission (GIM) focuses on improving the quality of forest and increasing forest cover along with cross sectoral activities on a landscape basis.

iii. Forest Fire Prevention and Management Scheme (FFPM)takes measures towards forest fire prevention and management.

Notes

INTEXT QUESTIONS 15.2

1. Identify various methods and steps to conserve forests

   i)……..ii)……..iii)……

2. Name the major schemes adopted for afforestation in India

   i)……..ii)……..iii)……

3. Name the three strategies for conservation and development of forests.

   i)……..ii) ……iii) …….

4. Full form of following abbreviations

   (i) SMC

   (ii) JFMC

   (iii) FDA

   (iv) SFDA

15.5 BIODIVERSITY

Biodiversity is a short form of biological diversity. In simple terms biodiversity is the total number of genes, species and ecosystems of a region. Biodiversity broadly means the variability among organisms from all sources including-terrestrial, marine and other aquatic ecosystems and ecological complexes also including the diversity within species, between species and ecosystems. You can find more details on biodiversity is lesson 10. India falls in the category of mega diversity nation.

Plants and animals constitute only a small component of biodiversity. Do you know that invisible micro-organisms constitute a large component of biodiversity? lets know some important term related to biodiverisity.

Genes- The basic biological unit of heredity. Genes of an individual belongingto the same species are similar and genes control the characteristics of particularspecies.

Gene pool- The total amount of genetic material found within a freely interbreeding population at a given time.

Species- A group of very similar genes having some common characteristics or qualitiesand capable of interbreeding.

Habitat- Habitat means the place or type of site where an organism or population naturally occurs.

Biosphere- Biosphere is the part of the earth system comprising all ecosystems and living organisms, in the atmosphere, on land, in inland water bodies or in the oceans and seas. It also includes derived dead organic matter, such as litter, soil organic matter and oceanic detritus etc.

Protected area- A geographically defined area which is designated or regulated and managed to achieve specific objectives.

Indigenous or native species- A species or lower taxon living within its natural range both past and present including the area which it can reach and occupy using its natural dispersal systems.

DO YOU KNOW?

Taxon- A taxon or taxonomic unit, is a unit of any rank (i,e,. class, Kingdom, order, family, species etc) designating an organism or group of organisms.

Fig. 15.3 Biodiversity

A Significance of Biodiversity

Biodiversity is fundamental to the existence and prosperity of life on the earth. Its importance cannot be underestimated. The varieties of living species are interrelated and interdependent and form an ecosystem. Any disturbance in this very important balance by humans or natural calamities can lead to loss of biodiversity either partially or totally. Human beings are also an important component of biodiversity. Any negligence due to over exploitation of biotic resources by deforestation or wildlife poaching etc leads to imbalance in the system and affects everyone in the chain , even humans. Biodiversity indicates variations of life forms in species, ecosystem and biome. Biodiversity is essential for consistency of climatic features, soil maintenance, ecological balance, pollination of plants, water recycling, recycling nutrients etc. Biodiversity has many direct and indirect uses

Biodiversity increases as we move from the poles towards the equator. India is located between 8°4 North and 37°6' North latitudes and 68°7 East and 97°25 East longitude. Due to this position India has such rich biodiversity.

B Causes of Loss of Biodiversity

Increasing population and changing lifestyle leads to extensive commercial exploitation of the natural resources. The major causes of loss of Biodiversity are invasive species, habitat destruction, global warming and climate change, environmental and genetic pollution, overpopulation and natural calamities. This results in loss of biodiversity. Consequently, it is adversely affecting the ability of nature to continue delivering the goods and services for human existence. The loss of biodiversity affects not only the physical environment but also the social, cultural, religious and spiritual well being of human life. The United Nations has proclaimed the year 2010 as the 'International Year of Biodiversity.

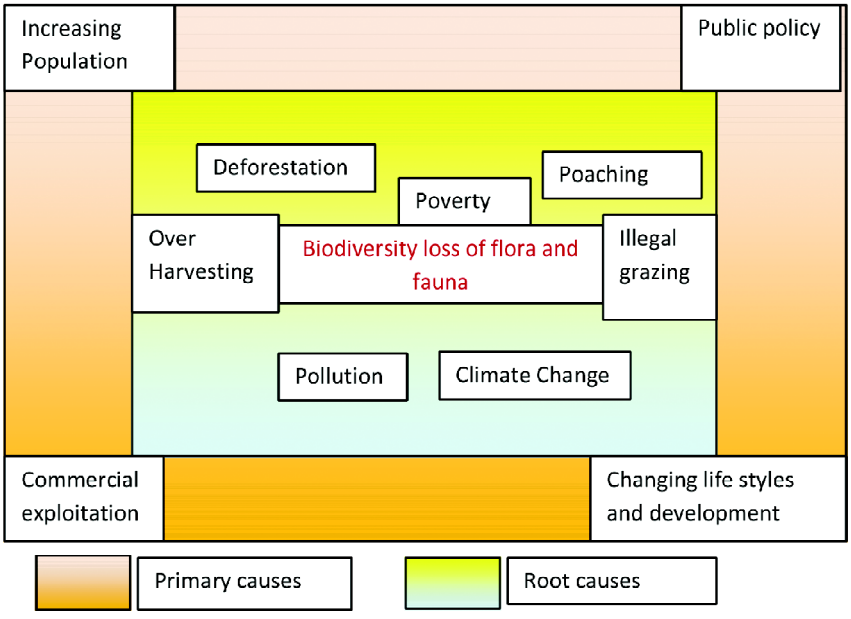


Fig. 15.4 Causes of Biodiversity loss

Notes

C Biodiversity conservation

Biodiversity can be conserved broadly by two methods-

i. **In-situ conservation-** Biodiversity conservation of species takes place within their natural habitat. Large numbers of floral and faunal species are conserved together which is a cost effective and convenient method. The natural ecosystem is maintained and protected without any locational shock to living organisms. For example, national parks, biosphere reserves and wildlife sanctuaries.

ii. **Ex-situ conservation-** In this conservation method breeding and maintenance of endangered species is practised in botanical gardens, zoos, gene banks, nurseries. The species of both plants and animals are bred in enclosed and under the vigil of trained personnel and suitable environments. Later on, species are introduced or reintroduced to natural environments through rehabilitation programmes. For endangered species gene pools are made and genetic techniques are used for preservation of endangered species.

INTEXT QUESTIONS 15.3

1. Define Species diversity
2. Mention the three uses of Biodiversity.
3. Mention Two methods of biodiversity conservation

15.6 BIODIVERSITY HOTSPOTS AND CONSERVATION OF WILDLIFE IN INDIA

The term 'Biodiversity Hotspot' was given by Norman Myers (1988) with the identification of 10 tropical forest hotspots which have witnessed high levels of habitat loss. According to the Critical Ecosystem Partnership Fund (CEPF), by 2016, there are 36 recognized biodiversity hotspots in the world. The international organisation has identified two strict criteria for biodiversity hotspots-

1. The hotspot region at least contains 1,500 species of vascular plants which are found nowhere else on the earth; they are called "endemic" species.
2. The region has lost at least greater or equal to 70 percent of its primary native (indigenous) vegetation.

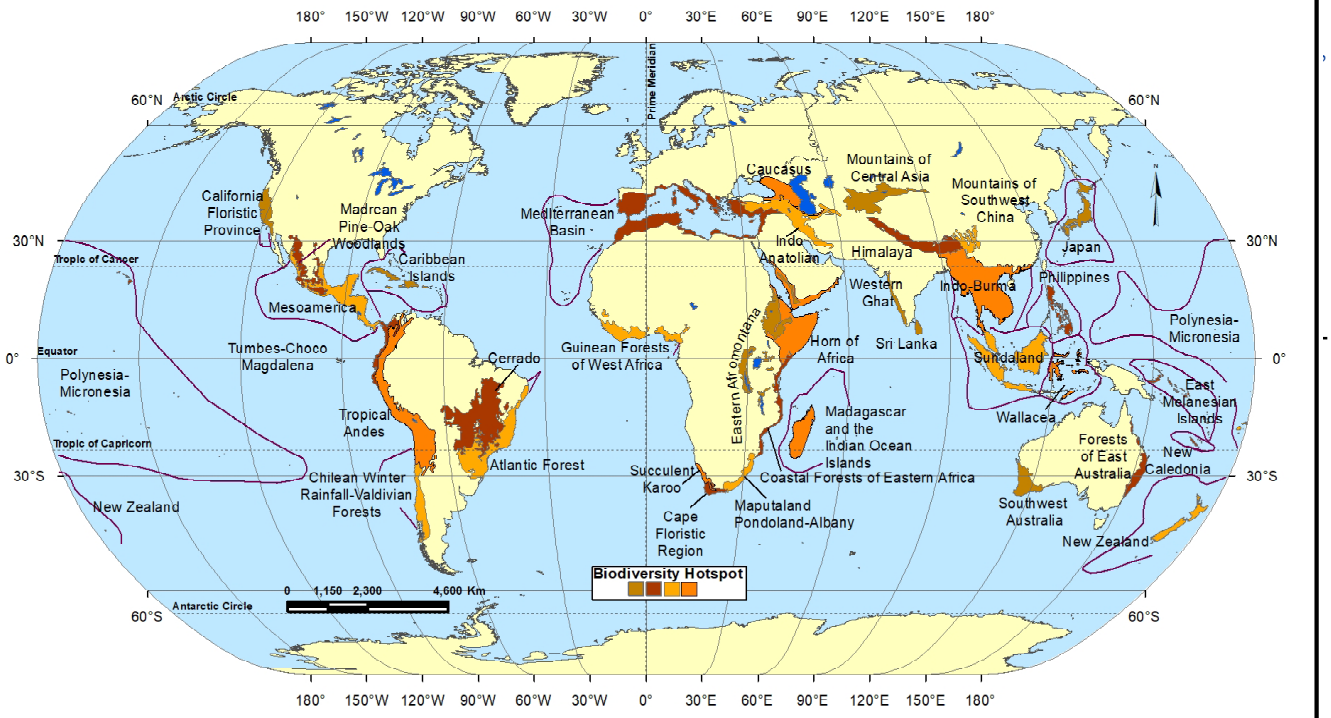


Fig. 15.5 Biodiversity hotspots of the world

A Biodiversity hotspots and various measures adopted by government to preserve biodiversity in India

Having diverse physical features (relief/ terrain, water bodies, soils etc) and climatic conditions (precipitation and temperature), our country has varied ecosystems such as wetlands, forests, grasslands, coastal, marine, desert etc. These ecosystems can sustain and harbour a large variety of species and varied biodiversity and also contribute to human wellbeing. There are 4 major hotspots in India:

Name of the Hotspot	Locations in India
The Himalayas-	Areas of Jammu and Kashmir, Himachal Pradesh, Sikkim, Uttarakhand, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Meghalaya, Tripura and hill regions of West Bengal and Assam come in this zone.
The Western Ghats and Sri Lanka-	Western Ghats include regions in states of Maharashtra, Gujarat Kerala, Karnataka, Tamil Nadu and Goa.
Indo- Burma-	Northeastern India including states of Manipur, Nagaland, Meghalaya, Mizoram and Tripura. It also includes Andaman group of Islands
Sundaland-	Nicobar group of Islands

Notes

Important initiatives taken by Indian government for safeguarding these hot spots are:

a. Survey, Inventory generation, taxonomic (classification of living things) validation, threat assessment of floral and faunal resources

b. Designing Biosphere reserves for conservation of representative ecosystems.

c. Establishment of Protected Area Network of National Parks, Wildlife Sanctuaries, Conservation and Community reserves

d. Assessment of forest cover to develop an accurate database for planning and monitoring

e. Species oriented programmes like 'Project Tiger', 'Project Elephant' etc

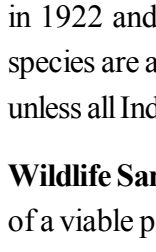
f. Complemented with ex-situ conservation efforts (meaning conserving biodiversity outside their natural habitats through different techniques like captive breeding, zoos, botanical gardens, aquarium and gene banks etc.

Biological Diversity Act was enacted in 2002 with an aim to conserve biological resources of the country.

B Measures to protect wildlife

In recent decades, human encroachment has posed a threat to India's wildlife. In response to this, the system of National parks, Wildlife sanctuaries and protected areas, first established in 1935, has substantially expanded through wildlife protection Act 1972. Efforts are being made to protect and preserve the biological diversity of our country under various programs. India has preserved vast tracts of natural habitats, birds and plants in its 553 existing wildlife sanctuaries covering an area of 119,776 km2, which accounts for 3.64% of the geographical area of the country (National Wildlife Database, March, 2019). 218 sanctuaries are proposed in Protected Area Network Report covering area of 16,829 km2. There are 101 existing national parks covering an area of 40,564 km2 which accounts for 1.23% of geographical area of the country (National Wildlife Database, March, 2020). 75 additional National Parks are proposed for future in Protected Area Network Report. There are 86 Conservation Reserves in country with an area of 3858.25 km2 accounting for 0.12% of the geographical area. There are 163 existing Community Reserves covering area of 833.34 km2. (National Wildlife Database, March, 2020).

Besides this, there are 35 Botanical Gardens (the oldest and largest is Acharya Jagadish Chandra Bose Indian Botanic Garden in West Bengal), 275 Zoological Parks, Deer Parks, Safari Parks, Aquaria etc. to make people aware conservation of threatened and endangered wildlife species in their respective areas. In India, for the purpose of effective conservation of natural habitat of wildlife, special schemes like Project Tiger 1973 to save the endangered species at the onset 9 reserves were made. There are 53 tiger reserves currently (2022)



Notes

accounting for 2.4% of total geographical area of India. Project Elephant have been launched in 1922 and there are 32 elephant reserves in 2010. These are very important as many species are at the brink of extinction. However, none of these efforts will be truly successful unless all Indians recognize their role in conserving biodiversity.

Wildlife Sanctuaries: The main objective of the wildlife sanctuaries is to ensure maintenance of a viable population of wildlife and their desired habitat. There are 553 existing wildlife sanctuaries in India covering an area of 119,776 km2 which accounts for 3.64% of geographical area (National Wildlife Database, March 2019). Another 218 sanctuaries are proposed in the Protected Area Network Report covering an area of 16,829 km2.

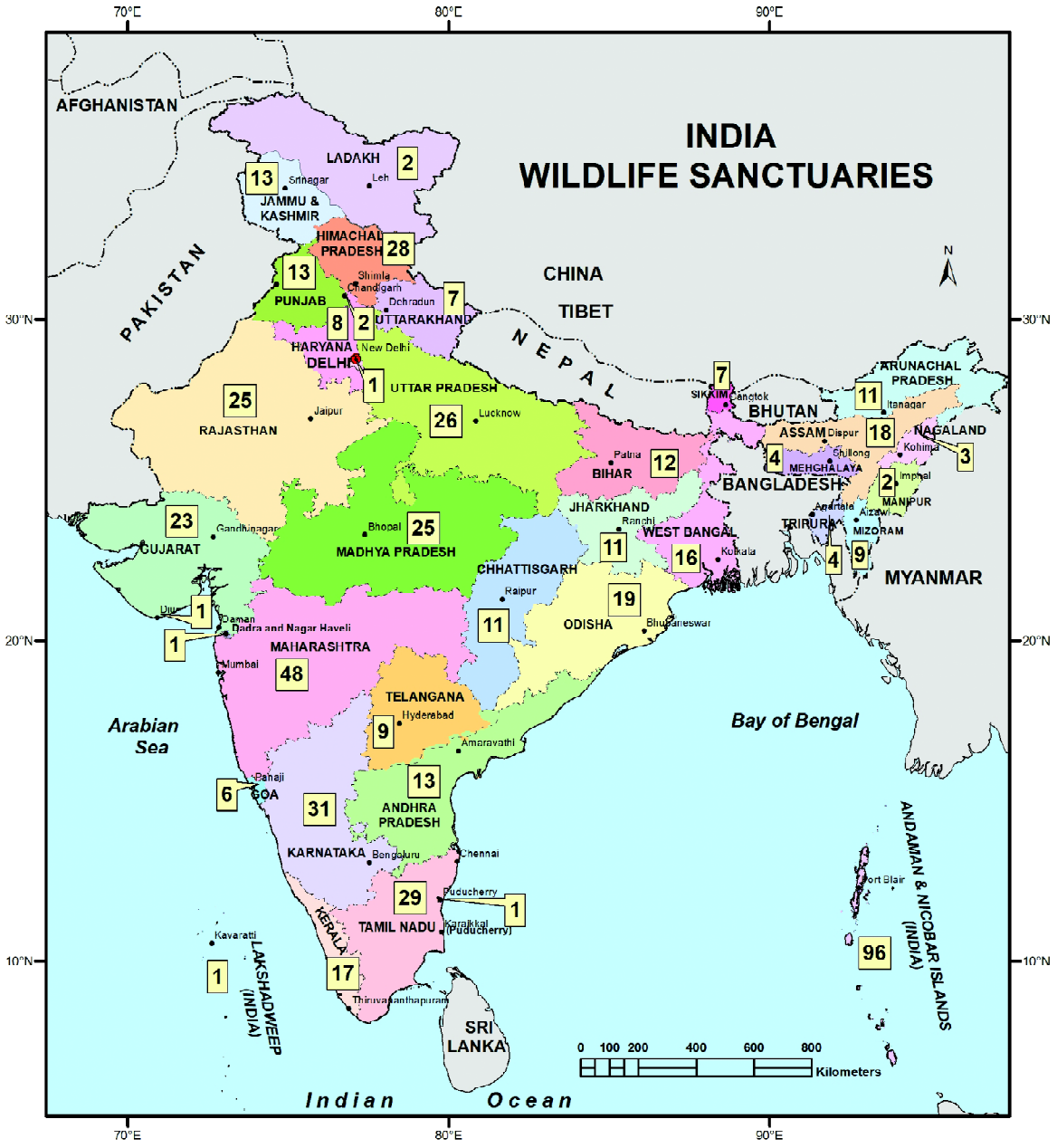


Fig. 15.6 State wise break up of sanctuaries in India

Success story of Panna National Park- Tiger reserve

By year 2009 the Panna national lost all its majestic tigers due to poaching. T1 tigress from Bandhavgarh national park was introduced on 3rd March, 2009. Over the next decade the efforts to restore the past glory of the Panna national park the founder 7 tigers (5 females and 2 males) have mated more than 30 times to produce 80 cubs by 2019.

The Panna National Park is rare success story of very positive initiatives adopted in aspect of wildlife conservation. Still there are challenges remaining along with poaching. Other issues like water scarcity, rocky terrain, rising temperature etc., also puts stress to tiger population.

Ramsar wetland sites

A wetland is an area of land where soil is saturated with moisture either permanently or seasonally. These areas may be partially or completely by shallow pools of water.

Ramsar is a city in Iran and the International treaty for conservation and sustainable use of wetlands was signed in 1971 in this city. So, the wetland sites are named as Ramsar convention sites. The mission of the convention is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world". The main aim was to halt worldwide loss of wetlands and build international cooperation, policy making, capacity building and technology transfer.

The convention's focal theme is to maintain the ecological character of wetlands. The list of internationally important wetlands is based on botanical, zoological, ecological, limnological (study of inland water bodies like lakes) or hydrological importance.

The Ramsar Convention is focused on conservation and sustainable utilisation of wetlands and recognizing the fundamental ecological functions of wetlands and their cultural, economic, scientific and recreational value. These are total 75 Ramsar sites (2022) in India.

INTEXT QUESTIONS 15.3

1. How many Hotspots are identified in the world.
2. Name the Hotspots found in India.

   i)……ii) ……iii)……iv)…….
3. How many biosphere reserves are in India?

Notes

15.7 JOINT FOREST MANAGEMENT (JFM)

The state of West Bengal is pioneer in implementation and attaining successful achievements of Joint Forest Management. The model was first introduced in Arabari Reserve Forest Range in west Medinipur district which is commonly Known as 'Arabari Model' introduced in 1971.

The concept of JFM was introduced by the Government of India through the National forest policy of 1988. It involves both the forest departments, and local communities in natural forest management. The village communities are required to form forest protection committees, forest conservation and development societies. Each of the committees has an executive committee to manage its day to day affairs. Under Joint forest management, the Government along with village communities are entrusted with the protection and management of nearby forests. In return to services provided by village communities, they get the benefit of using minor non- timber products. With the involvement of importance of stakeholders, the forest can be conserved in a sustainable manner. Joint Forest Management helps in building a strong setup of state government with participatory approach among local communities. The local community helps in building a strong base at grassroots level of development.

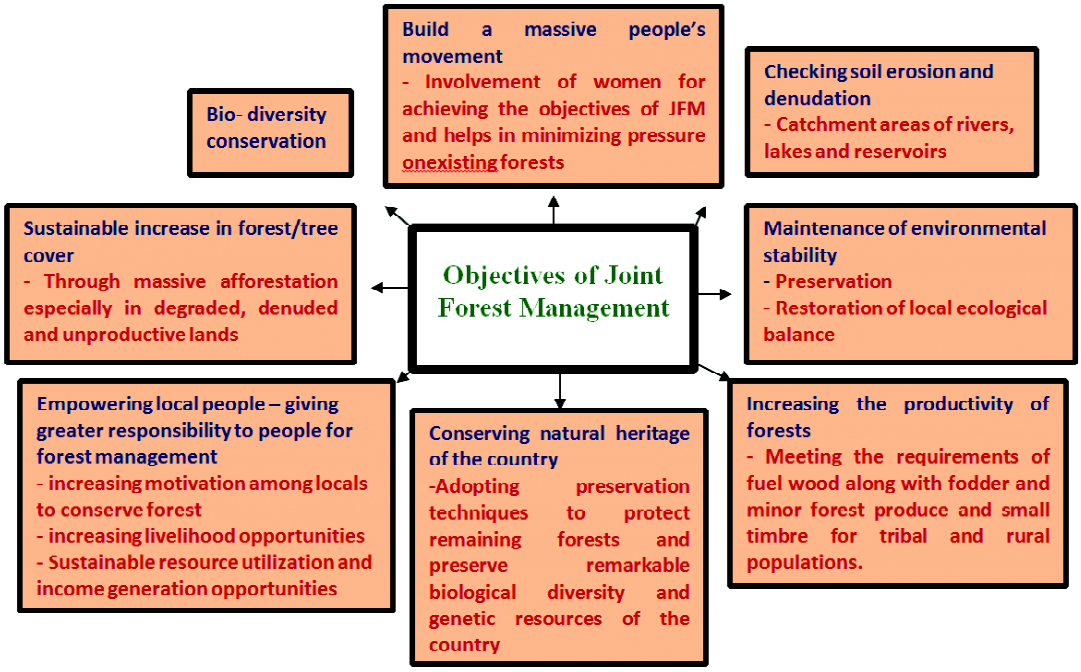


Fig. 15.7 Objectives of Joint Forest Management

a Following are main components of JFM functioning

1. The Joint Forest Management is a generic term for partnership which involves forest management jointly with the state forest department and local communities.

2. The local village committees enter into Memorandum of Understanding (MoU) with the forest department to manage the forest area jointly.

Notes

3. The JFM committees have democratic constitution with representation to weaker sections of the society and enhance the role of women in the decision making process. In many JFM committees women are appointed as Chairpersons. In states like Odisha the member secretary is also an elected representative.

4. The nomenclature of JFM is different in some states like Vana SamrakshanaSamities (VSS) in Andhra Pradesh, Van Panchayats in Uttarakhand etc.

5. The resolutions are formed by the state government in accordance with local conditions regarding composition of village institutions. The nature of forest areas taken under JFM with rights and responsibilities of partners and usufructs (it means legal rights are granted to a person or party which grants a temporary right to derive/use income or benefit from forest property which is owned by the government as a natural resource).

6. There are 1,18,213 JFM as of March 2011 in 29 states and 8 UT. Madhya Pradesh has the largest number of 1,228 JFMCs who manage a forest area of 6.69 million hectares.

7. Centrally sponsored schemes like National Afforestation Programme (NAP), other externally aided projects and schemes of Centre and State governments are implemented through the JFM approach.

8. The concept of JFM including livelihood concerns along with conservation management of forests is gaining importance. It includes checking on degradation of forests and provision of employment for the people.

9. The JFM with other institutions plays a vital role. Green India Mission (GIM) proposed to increase the quality of forest cover in 5 million ha and to increase forest cover in another 5 million ha.

b. Strengthening JFM

i. **Legal backup to the JFM committees-** All the state governments register the JFM or village committees under the Societies Registration Act, 1860. All adults of the village should be eligible to become members of the JFM committees.

ii. **Women play an important role in the committees-** Suggested guidelines say that at least 50% of the JFM general body members should be women and at least 33% members of management/ executive committee should be filled by women.

iii. **JFM should be extended in good forest areas-** the programmes aim to cover both the degraded and good areas (crown cover of 40%). The implementation of JFM in good forest shall be done in planned manner on plot basis. The plots

Notes

should be monitored and feedback a success should be assessed and before allowing plot basis use of good degraded forest in the locality should be taken care simultaneously.

iv. **Micro plan in JFM areas-** Flexible guidelines should be evolved for preparation of local need based micro plans for the area in overlapping circles. The micro plans should be prepared by Forest officers and Village Forest Protection Committees while keeping in mind the consumption and livelihood utilising indigenous knowledge along with needs of local communities and as well as attaining them sustainably. The micro planning should be done with due regards to environmental productive and functional potentials of the forests along with carrying capacity of the forest.

v. **Evaluating conservation and biodiversity values of nature-**The micro plan should take into consideration and provide suitable advice for species to be planted in community lands and other Government notified areas outside forest areas including district council areas of North east. The Eco development and infrastructure should have separate entity funding under micro plan through concerned development agencies.

vi. **Identification and recognition of Self-initiated groups-** Community groups in many states like Andhra Pradesh, Gujarat, Odisha, Bihar and Karnataka for regeneration and protection of the forests need to be identified, recognized and registered with JFM.

vii **Conflict resolution-** In order to have harmony and resolve conflicts among all functionaries of JFM the State governments may constitute divisional or state level representative forums including NGOs participation.

viii. **Contribution for regeneration of resources-** To maintain long term sustainability not less than 25% of revenue earned from final harvest should be deposited in village development funds. There should be transparent mechanisms to compute income and sharing benefits among different stakeholders.

ix. **Monitoring and Evaluation-** continuous monitoring of progress and performance taken at Division and State level. The evaluation should be planned after 3 and 5 years at Division and State level respectively.

Some success stories and initiatives of JFM

Gujarat- Gender Equity and Joint Forest Management- Women play an important role in forest management as they do bulk of work for commercial and domestic use, of resources like, fodder, fuel and non-timbre forest produce.

Notes

The JFM has been initiated in around 60 villages covering around 3000 hectares through village institutions like Gram Vikas Mandal (GVM) where both men and women can be members, Mahila Vikas Mandal (MVM) where only women are involved.

Odisha- In Odisha there are 2373 Van Samrakshan Samiti (VSS) are protecting 25% of the total degraded forests in the state. There are 5000 Self- Initated Forest Protection Groups (SIFPG's) are also protecting and regenerating forests adjoining their habitation. Kesharpur village in the foothills of Odisha's Nayagarh district villagers guarded the forest from timbre smugglers and stray grazing. Similar efforts are initiated in 28 districts of Odisha. Nowadays local communities have been protecting degraded forests driven by economic needs.

Andhra Pradesh- Behroonguda is a hamlet in Andhra Pradesh. There were 97 families belonging to Naikpod and Gond tribes themselves formad forest protection groups in 1990. In 1998 the state government recognized their efforts an referred them as Vana Samarakshana Samithi (VSS). JFM has allotted 500 hectares of degraded forest of whose cost they have to borne and benefits they derive from it. The residents began to derive usufruct benefits from the forest. TheVSS is widely regarded as being successful. There are now 6580 Vana Samarakshana Samithis (VSS) have been formed. Degraded forest area of 16.58 lakh hectares has been brought under JFM. The Samithis have been successful in upliftment of tribals and bringing them into the mainstream. Like increasing availability of fuel and fodder, reduction in incidences of fire, smuggling illegal grazing, employment for villagers, increase in water table, increase in non timbre products etc.

INTEXT QUESTIONS 15.5

1. The first step towards Joint Forest Management is called as ……..model introduced in state of…….. in year……

2. The concept of JFM was introduced by the Government of India through National forest policy in that year.

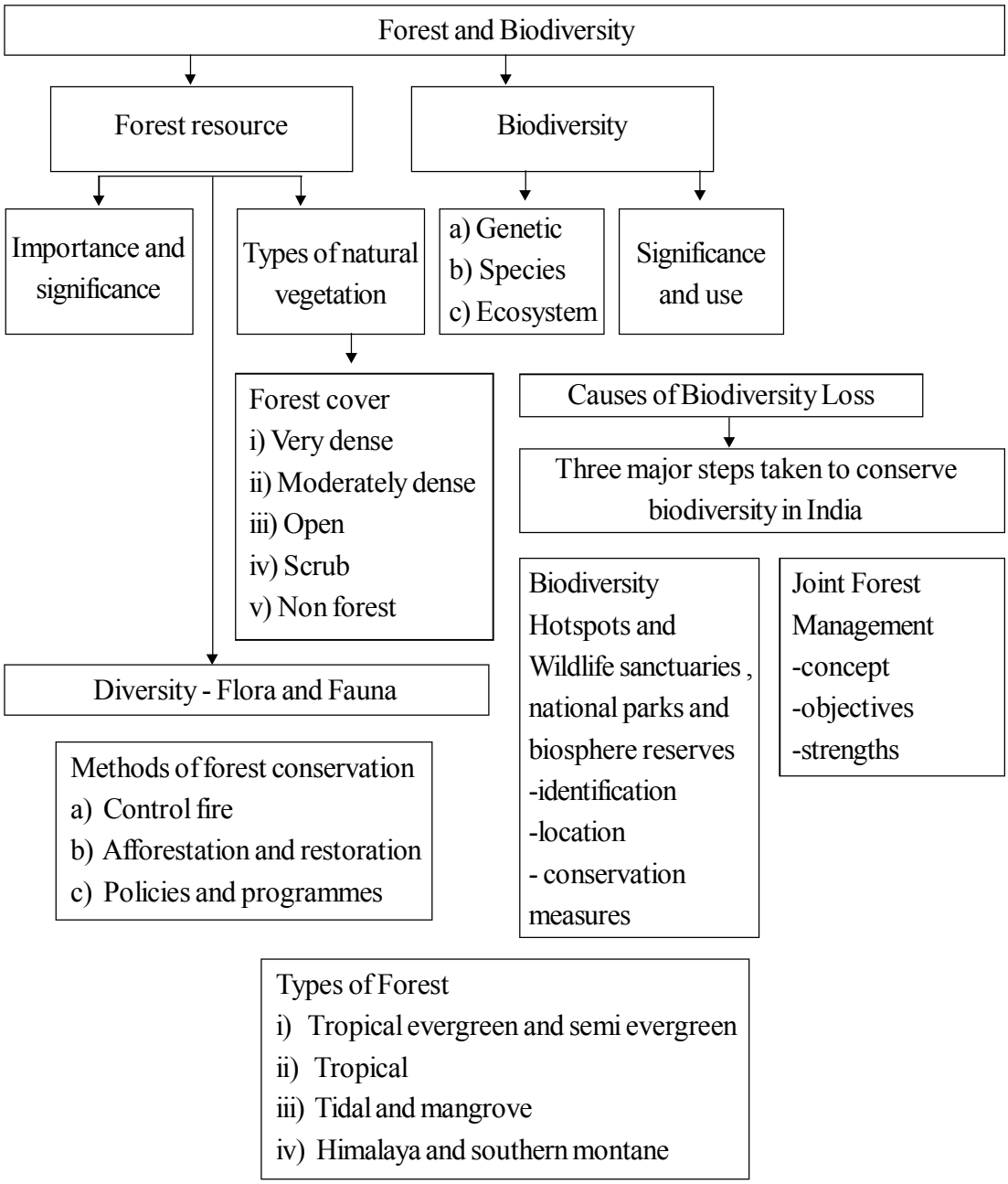
3. Which state in India has the largest number of JFMC's and the size of area managed under the JFM scheme.

4. Two example of nomenclature of JFM

   i)…… ii) ……

5. What are various ways through which strengthening JFM is practised in India?

WHAT YOU HAVE LEARNT



TERMINAL QUESTIONS

1. Write a note on the significance of forests.
2. Explain major five types of forest types in India? Describe their distribution and their tree species.
3. Major causes of biodiversity loss, with the help of a diagram.
4. Describe various steps adopted to preserve wildlife in India.

Notes

5. Explain vegetation found in southern mountains.
6. Describe various initiatives adopted by the Indian government to safeguard biodiversity hotspots.
7. Name and location of Biodiversity hotspots in India.
8. Discuss measures adopted to protect wildlife in India.
9. Describe the significance and use of Biodiversity with a suitable flow chart.
10. Elaborate on various methods adopted for forest conservation in India.
11. What are Ramsar Wetland sites and how many are located in India?
12. With the help of flow diagrams show objectives of Joint Forest Management.
13. Discuss main components for smooth functioning of Joint Forest Management.
14. Highlight (any five) initiatives taken for strengthening the Joint Forest Management.

ANSWERS TO INTEXT QUESTIONS

15.1

1. Five major types of forest found in India-
   - (i) Tropical Evergreen Forests
   - (ii) Tropical Deciduous Forests
   - (iii) Thorn Forests
   - (iv) Tidal Forests and Littoral and Swamp forests
   - (v) Himalayan Forests and southern Montane forests
2. Name four classes of Forest cover given by FSI (Forest Survey of India)
   - (i) Very dense
   - (ii) Moderately Dense Forest
   - (iii) Open forest
   - (iv) Scrub
3. Alpine Forest found in Himalayas at the height of 3000 to 3800 mts
4. Sundari
5. (i) Dry deciduous forests receive 70 to 100 cm of rainfall annually.
   - (ii) Moist deciduous forests receives100 to 200 cm of rainfall annually.

Notes

6. India has rich flora ranking 10th in world
7. India is accounting for 6.5 % of world's fauna

15.2

1. (i) Control Forest fires ii) Regulated and planned cutting of trees iii) Proper utilisation of forests products and forests Iv) Protection of forests
2. (i) National Afforestation Programme (NAP) ii) National Mission for a Green India (GIM) iii) Forest Fire Prevention and Management Scheme (FFPM)
3. (i) Afforestation through natural/ artificial regeneration ii) Protection iii) Management
4. (i) SMC- soil and moisture conservation
   (ii) JFMC-, Forest Development Agency
   (iii) FDA- , Forest Development Agency
   (iv) SFDA- State Forest Development Agency

15.3

1. Species diversity covers the full range of species on earth. includes all species, viruses, bacteria, microbes to animals.
2. Three uses of Biodiversity
   (i) Production
   (ii) Consumption
   (iii) Indirect
3. (i) In- situ
   (ii) Ex- situ

15.4

1. 36
2. (i) The Himalayas
   (ii) The Western Ghats and Sri Lanka
   (iii) Indo- Burma
   (iv) Sundaland
3. There are 553 existing wildlife sanctuaries in 2019, India covering an area of 119,776 km2 which accounts for 3.64% of geographical area.

Notes

4. 15

5. (i) The hotspot region at least contains 1,500 species of vascular plants which are found nowhere else on the earth; they are called "endemic" species.

   (ii) The region has lost at least greater or equal to 70 percent of its primary native (indigenous) vegetation.

15.5

1. Ramsar is a city in Iran and the International treaty for conservation and sustainable use of wetlands was signed in 1971 in this city.
2. 41
3. Sundarbans wetland and 4320 sq km

15.6

1. The first step towards Joint Forest Management is called as Arabarimodel introduced in state of West Bengal in year 1971
2. 1988
3. Madhya Pradesh has the largest number of 1,228 JFMC's and forest area 6.69 million hectares.
4. (i) Vana Samrakshana Samithi (VSS)

   (ii) Van Panchayats

5. (i) Legal backup to the JFM committees

   (ii) Women plays an important role in the committees

   (iii) JFM should be extended in good forest areas

   (iv) Micro plan in JFM areas

   (v) Evaluating conservation and biodiversity values of nature

   (vi) Identification and recognition of Self- initiated groups.