Notes

6

NATURAL ECOSYSTEM

Whenever you travel long distance you come across changing patterns of landscape. As you move out from your city or village, you see croplands, grasslands, or in some areas a forests, desert or a mountainous region. These distinct landscapes are differentiated primarily due to the type of vegetation in these areas. Physical and geographical factors such as rainfall, temperature, elevation, soil type etc. determine the nature of the vegetation. In this lesson you will learn about the natural ecosystems with their varied vegetation and associated wildlife.

OBJECTIVES

After completing this lesson, you will be able to:

- *list the various natural ecosystems;*
- *describe the various terrestrial ecosystems;*
- *describe the various aquatic ecosystems (fresh water, marine and estuarine);*
- *recognize ecotones, their significance and the edge effect.*
- *list the major Indian ecosystems;*
- *list the threatened ecosystems-mangrove, wetlands, coastal ecosystems and islands;*
- *explain the need and methods of conservation of natural ecosystems.*

6.1 WHAT ARE NATURAL ECOSYSTEMS

A **natural ecosystem** is an assemblage of plants and animals which functions as a unit and is capable of maintaining its identity such as forest, grassland, an estuary, human intervention is an example of a natural ecosystem. A natural ecosystem is totally dependent on solar energy. There are two main categories of ecosystems.

Notes

(1) Terrestrial ecosystem: Ecosystems found on land e.g. forest, grasslands, deserts, tundra.

(2) Aquatic ecosystem: Plants and animal community found in water bodies. These can be further classified into two sub groups.

(i) Fresh water ecosystems, such as rivers, lakes and ponds.

(ii) Marine ecosystems, such as oceans, estuary.

INTEXT QUESTIONS 6.1

1. What is a natural ecosystem?

   _____

2. Which are the main categories of natural ecosystems?

   _____

3. Give examples of terrestrial ecosystems.

   _____

4. Give examples of fresh water ecosystems.

   _____

6.2 TERRESTRIAL ECOSYSTEMS

Terrestrial ecosystems are (a) forests (b) grasslands, (c) deserts and (d) tundra

(a) Forests

Forests are large areas supporting rich growth of trees. Depending on the climate and type of trees they are generally grouped into:

(i) Tropical rain forests

(ii) Temperate deciduous forests

(iii) Boreal or north coniferous forests

(i) Tropical rain forest

- **Distribution:** These are found in the high rain fall areas on either side of the equator. Such forests are found in the western coast of India, scattered in south east Asia, some parts of Africa and south America.
- **Flora and fauna:** Tropical rainforests occur in areas by having high temperature and high humidity and receives above 200 cm of rainfall per year. Soil is rich in humus.

These forests have a very rich biodiversity e.g. Brazilian tropical rain forests have more than 300 species of trees in an area of 200 square kilometer. Trees are tall growing upto 50 to 60 m. These forests also support epiphytes, like vines, creepers, woody creepers and orchid etc. These forests are rich in tree dwelling animals such as monkeys, flying squirrels, snails, centipedes, millipedes, and many insect species are common on the forest floor.

(ii) Temperate deciduous forests

- **Distribution:** They occur mostly in northwest, central and eastern Europe, eastern north America, north China, Korea, Japan, far eastern Russia and Australia. Trees of deciduous forests shed their leaves in autumn and a new foliage grows in spring.
- **Climate:** These forests occur in the areas of moderate climatic conditions such as temperature ranging but 10 to 20^{o}C with a 6 month long winter and an annual rainfall between 75 to 150 cm. They have its brown soils which are rich in nutrients.
- **Flora and fauna:** Common trees are oak, beach, heath, chest nut, birch, pine. These forests also show stratification and have a under storey of saplings shrubs and tall herbs. Prominent grazers include deer, bison and rodents. Rodents play a very important role in these forests. They feed on seeds, fruits and tree leaves. Black bear, raccoons, wild cat, wolves, fox and skunks are the omnivores found in these forests. Hibernation or winter sleep during winter is a common feature of animals found in these forests. Invertebrate fauna comprises green flies, aphids, certain moths and butterflies.

(iii) Boreal or north coniferous forests:

- **Distribution:** Coniferous forests are also known as 'Taiga'. They extend as a continuous belt across north America and north Eurasia below the arctic tundra. There is no counterpart of these forests in southern hemisphere as there is no land at this latitude. Climate is cold with long, harsh winter, with mean annual temperature below 0^{0}C. The soils are acidic and poor in nutrients.
- **Flora and fauna:** Coniferous forests are characterized by evergreen, drought resistant and woody. Conifers (gymnosprerms) e.g. spruce, fir and pine trees which bear naked seeds in cones. The animals found in these forests, are red squirrel, deer, goat, mule, moose etc. The carnivores which feed upon them are timber wolves, lynxes, bear. Some common birds are crossbill, thrushes, warblers, flycatchers, robin and sparrow.

(b) Grasslands

- **Distribution:** Grasslands are areas dominated by grasses. They occupy about 20% of the land on the earth surface. Grasslands occur in both in tropical and temperate regions where rainfall is not enough to support the growth of trees. Grasslands are known by various names in different parts of the world.

Notes

Place	Name of the grassland
North America	Prairies
Eurasia (Europe and Asia)	Steppes
Africa	Savanna
South America	Pampas
India	Grassland, Savanna

Grasslands are found in areas having well defined hot and dry, warm and rainy seasons.

Tropical grasslands are commonly called Savannas. They occur in eastern Africa, South America, Australia and India. Savannas form a complex ecosystem with scattered medium size trees in grass lands.

- **Flora and fauna:** Grasses are the dominating plants with scattered drought resistant thorny trees in the tropical grasslands. Badgers, fox, ass, zebra, antelope are found grazing on grasslands support the dairy and leather industries. Grasslands also support large population of rodents, reptiles and insects.

(c) Deserts

- **Distribution:** Deserts are hot and low rain areas suffering from water shortage and high wind velocity. They show extremes of temperature. Globally deserts occupy about $1/7^{th}$ of the earth's surface.
- **Flora and fauna:** *Cacti, Acacia, Euphorbia* and prickly pears are some of the common desert plants. Desert animals include shrew, fox, wood rats, rabbits, camels and goat are common mammals in desert. Other prominent desert animals are, reptiles, and burrowing rodents insects.
- **Adaptations:** Desert plants are hot and dry conditions.

(i) These plants conserve water by following methods:

- They are mostly shrubs.
- Leaves absent or reduced in size.
- Leaves and stem are succulent and water storing.
- In some plants even the stem contains chlorophyll for photosynthesis.
- Root system well developed spread over large area.

(ii) The animals are physiologically and behaviorally adapted to desert conditions.

- They are fast runners.
- They are nocturnal in habit to avoid the sun's heat during day time.

- They conserve water by excreting concentrated urine.
- Animals and birds usually have long legs to keep the body away from the hot ground.
- Lizards are mostly insectivorous and can live without drinking water for several days.
- Herbivorous animals get sufficient water from the seeds which they eat.

Camel is known as the ship of the desert as it can travel long distances without drinking water for several days.

(d) Tundra

The word tundra means a "barren land" since they are found in those regions of the world where environmental conditions are very severe. There are two types of tundra- **arctic** and **alpine.**

- **Distribution: Arctic tundra** extends as a continuous belt below the polar ice cap and above the tree line in the northern hemisphere. It occupies the northern fringe of Canada, Alaska, European Russia, Siberia and island group of arctic ocean. On the south pole **Anatarctica tundra** in the south pole is very small since most of it is covered by ocean .

  Alpine tundra occurs at high mountains above the tree line. Since mountains are found at all latitudes therefore alpine tundra shows day and night temperature variations.

- **Flora and fauna:** Typical vegetation of arctic tundra is cotton grass, sedges, dwarf heath, willows, birches and lichens. Animals of tundra are reindeer, musk ox, arctic hare, caribous, lemmings and squirrel.

Most of them have long life e.g. *Salix arctica* that is arctic willow has a life span of 150 to 300 years. They are protected from chill by the presence of thick cuticle and epidermal hair. Mammals of the tundra region have large body size and small tail and ear to avoid the loss of heat from the surface. The body is covered with fur for insulation. Insects have short life cycles which are completed during favourable period of the year.

INTEXT QUESTIONS 6.2

1. What are deciduous trees?

   _____

2. Explain two common characteristics of the desert.

   _____

Notes

3. How are the animals and plants of deserts adapted to heat and drought?

_____

4. Where are Prairies and Steppes are found?

_____

6.3 AQUATIC ECOSYSTEMS

Aquatic ecosystems refers to plant and animal communities ocuring in water bodies. Aquatic ecosystems are classified on the basis of salinity into following two types:

(i) Freshwater

(ii) Marine

(i) Fresh water ecosystem

Water on land which is continuously cycling and has low salt content is known as fresh water and its study is called limnology.

(i) Static or still water (Lentic) e.g. pond, lake, bogs and swamps.

(ii) Running water (Lotic) e.g. springs, mountain brooks, streams and rivers.

Physical characteristics: Fresh waters have a low concentration of dissolved salts. The temperature shows diurnal and seasonal variations. In tropical lakes, surface temperature never goes below 40^0C, in temperate fresh waters, never goes above or below 4^0C and in polar lakes never above 4^0C.

- In temperate regions, the surface layer of water freezes but the organisms survive below the frozen surface.
- Light has a great influence on fresh water ecosystems. A large number of suspended materials obstruct penetration of light in water.
- Certain animals float upto water surface to take up oxygen for respiration Aquatic plants use carbon dioxide dissolved in water for photosynthesis.
- Lakes and ponds are inland depressions containing standing water. The largest lake in the world is lake Superior in North America. Lake Baikal in Siberia is the deepest. Chilka lake of Orissa is largest lake in India.

Three main zones can be differentiated in a lake:-

- Peripheral zone (littoral zone) with shallow water.
- Open water beyond the littoral zone where water is quite deep.
- Bentic zone (bottom) or the floor of the lake.

Aquatic organisms can be floating in water or free swimming or sedentary (fixed), depending on their size and habit. Microscopic floating organisms such as algae, diatoms, protozoans and larval forms are called **plankton.** Rooted aquatic plants, fish, mollusk and echinoderms are bottom dwellers. (Recall from lesson-5, Fig. 5.1)

Wetlands are areas that periodically get inundated with water and support a flourishing community of aquatic organisms including frog and other amphibians. Swamps, marshes and mangroves are examples of wetlands.

(ii) Marine ecosystem: Pertains to the seas and oceans including marine organisms.

• **Distribution:** Marine ecosystem covers nearly 71% of the earth's surface with an average depth of about 4000 m. Fresh water rivers eventually empty into ocean. Different kinds of organisms live at different depths of the sea or ocean.

Salinity of open sea is 3.6% and is quite constant.

The range of temperature variation is much less in the sea than on the land. Hydrostatic pressure due to water column increases with depth in oceans. It is 1 atm near the surface and 1000 atm at greatest depth. Animals in the deeper layers are adapted to the high pressure. Some marine organisms such as sperm whales and certain seals can dive to the great depths and swim back to the surface without difficulty. Tides, due to gravitational pull of the moon are a common feature of marine ecosystems.

• **Flora and fauna:** Biodiversity of the marine ecosystems is very high as compared to terrestrial ecosystems. Almost every major group of animals occurs in the sea. Insects and vascular plant are completely absent in marine ecosystem. Maximum diversity of marine organisms is found in the tidal zone that is near the shore. Diatoms, algae, dinoflagellates and jelly fishes are some of the free floating life forms in oceans. Large crustaceans, molluscs, turtles and mammals like seals, porpoises, dolphins and whales are free swimming animals that can navigate. Bottom dwellers are generally sessile (fixed) organisms like sponges, corals, crabs and starfish.

• **Adaptations:**

- Light weight animals and plants float in water and move with the water currents.
- Animals and plants in ocean are tolerant to high concentration of salts (osmoregulation). Osmoregulation is the process by which a constant osmotic pressure is maintained in blood.
- Swimming animals have streamlined body. Their body is laterally compressed.
- Deep sea forms show bioluminescence (they emit light).
- They are dependent for their food on the upper sea zones.

Notes

INTEXT QUESTIONS 6.3

1. What is plankton?

   _____

2. What is aquatic ecosystem?

   _____

3. Name two plants and two animals which found in marine ecosystem.

   _____

6.4 ECOSYSTEMS OF INDIA

India is a vast country and possess many types of natural ecosystems.

(a) Terrestrial

1. Forests
   - (i) Tropical rain forests
   - (ii) Tropical deciduous forests
   - (iii) Temperate broad leaf forests
   - (iv) Temperate needle – leaf or coniferous forests
   - (v) Alpine and tundra forests
2. Grasslands
3. Deserts
   - (i) Thar deserts
   - (ii) Rann of Kutch
4. Mountains — The Himalayas
5. Ghats

(b) Aquatic

1. Fresh water ecosystem
2. Marine ecosystem

6.4.1 Terrestrial ecosystem in India

Forests

Forests in India can be classified in different ways, according to their position, atmosphere, weather condition etc. Some of the common characteristics of various types of natural vegetation in India includes:

- tropical rain forests,
- tropical deciduous forests,
- temperate broad leaf forests.
- temperate needle leaf or coniferous forests
- alpine and tundra forests, etc.

Apart from these, there are also some other types of forests are found in India like **tidal forests, Himalayan vegetation, rain forests of southern India, desert region,** etc.

(i) Tropical rain forests

The tropical rain forests are playing an important role in natural vegetation in India. These types of forests include the tropical evergreen forests and tropical semi-evergreen forests and they are mostly found in places where there is plenty of rainfall and sunshine throughout the year. Growth of the trees is usually at its best where rainfall is in surplus of 200 cm, with a short dry season. Such types of forests are found within rainy slopes of the Western Ghats, plains of West Bengal and Orissa and north-eastern India. Trees grow very briskly in these forests and attain heights of about 60 m and above. The number of species in these forests is too vast and too assorted to utilise each one of them commercially. Ebony, mahogany and rosewood are the main trees of these forests.

(ii) Tropical deciduous forests

Tropical deciduous forests are also known as deciduous (whether it is moist or dry)forests because they cast leaves for about six to eight weeks in summer. They are also called the monsoon forests with all their grandeur and beauty. This is so because they form a natural cover approximately all over India, especially within regions having 200 and 75 cm of annual rainfall. Most of the tropical deciduous forests are found in the state of Kerala in India. Apart from Kerala, these forests can be found in the eastern slopes of Western Ghats and also in the north eastern parts of the peninsular plateau and in the valleys of the Himalayas. The tropical deciduous forests are pretty substantial, cost- effective and they demand a lot of maintenance, as they are less resistant to fire. These forests can be divided into moist and dry deciduous forests. The moist deciduous forests are most commonly found on the eastern slopes of the Western Ghats. They are also found in the region of Chhotanagpur plateau, covering east Madhya Pradesh, south Bihar, and west Orissa, Shiwaliks in the northern India. Important trees of these forests are teak, sal, and sandalwood.

(iii) Temperate broad leaf forests

It mainly occur between 1500-2400 m altitudes in western Himalayas. Several species of Oak (Quercus) are found in these forests. Oak species are ever green in the Himalayan

Notes

region. These species show peak leaf fall during summer but never become leafless. Height of the trees may be 25-30 m. Trees canopy is dense, herbaceaus layer is least developed and grasses are generally lacking. The Oak forests are often rich in epiphytic flora.

(iv) Temperate needle leaf or coniferous forests

This type of forests are found in the Himalaya over 1700 to 3000 m altitude. These forests contain economically valuable gymnospermous trees like pine (Pinus wallichiana) deodar (Cedrus deodara), Cypress (Cypressus torulosa), Spruce (Picea simthiana) and siver fir (Abies pindrow). Coniferous forests are taller 30-35 m and possess evergreen canopy of long needle like leaves. Canopy of these trees always remains green. In many species, it is cone-shaped.

(v) Alpine and Tundra forests

The alpine and tundra forests is another kind of natural vegetation in India. Vegetation growing at altitudes above 3600 m is usually known as alpine vegetation and it can be noticed that with the increment of the altitude, the plants show stunted growth. The trees like silver fir, pine, juniper and birch belong to this category. The alpine grasslands are mainly found at higher altitudes in this region. The people belonging to the tribal groups like Gujjar and Bakarwal make extensive use of this region. The vegetations like lichen and mosses are also found in high altitudinal regions.

• The **tidal forests** provide another variety of natural vegetation in India. They can be found along the coasts and rivers and they are enshrouded by mangrove trees that can live in both fresh and salt water. Sundari is a renowned mangrove tree, mainly found in the tidal forests and it is after this tree that the name Sundarban has been entitled to the forested parts of the Ganga-Brahmaputra delta.

• The **Himalayan vegetation** is one of the major kinds of natural vegetation in India. The thick tropical forests in the eastern region of India have a sharp distinction with the pine and coniferous woodlands of the western Himalayas. Chir pine (*Pinus roxburghii*) grows throughout the northwest Himalayas, with the exception of Kashmir. Chilgoza (pine nut), oak, maple, ash (*Fraxinus xanthoxyloides*), etc also grow abundantly in the eastern Himalayas.

• The **rain forests of Southern India** are contributing hugely to the natural vegetation in India. The most luxuriant rain forests lie on the southwestern coast, in the state of Kerala. Here the lagoons are canopied by coconut trees and lead to the longest uninterrupted stretch of rain forests in the country. The Andaman and Nicobar Islands and the state of Arunachal Pradesh are some of the other regions with well preserved rain forests in India. Apart from that, dense sandal, teak and sisoo (*Dalbergia sissoo*) forests also flourish on the wet Karnataka plateau.

• The **Thar Desert** presents a wonderful picture of natural vegetation in India. The trees in this desert are short and stout, and stunted by the scorching sun. Cacti, *reunjha* (Acacia leucophloea), khejra (*Prosopis spicigera*), kanju (*Holoptelia integrifolia*), Oak (*Calotropis gigantea*) etc are common plants in this region. All the above mentioned varieties of forests and areas are contributing hugely to the natural vegetation in India (Fig. 6.1).

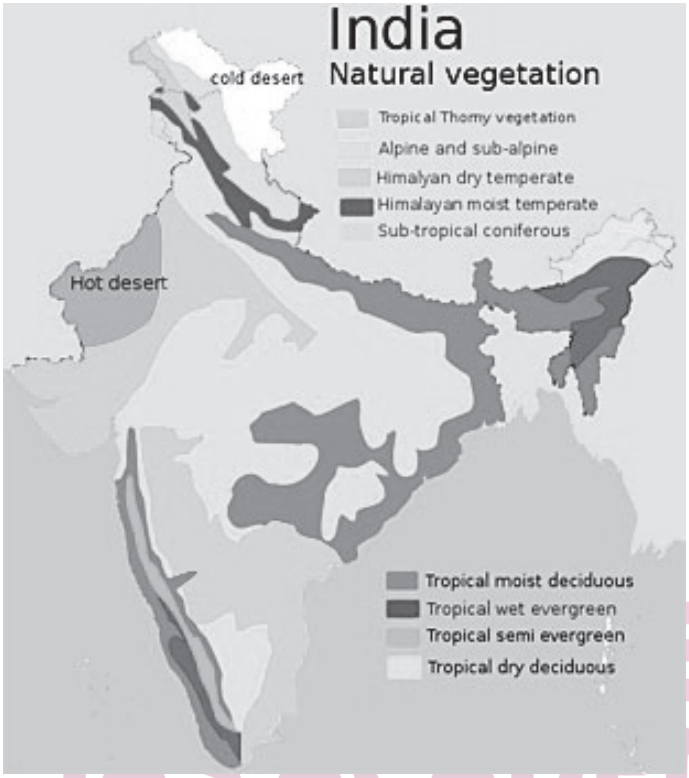

***Fig. 6.1** Natural Vegetation*

(2) Grasslands

Grasslands are one of the intermediate stage in ecological succession and cover a part of the land on all the altitudes and latitudes at which climatic and soil conditions do not allow the growth of trees. In India, grasslands are found as village grazing grounds (Gauchar) and extensive low pastures of dry regions of western part of the country an also in Alpine Himalayas . Perennial grasses are the dominant plant community. In some regions grasslands also support a variety of other herbaceous plants like sedges, legumes and members of the sunflower family

Grasslands support a large number of herbivores from minute insects to very large mammals. Rats, mice, rodents, deer, elephant, dog, buffalo, tiger, lion, ferrets are some common mammals of grasslands. In the north east India, one horned rhinoceros is amongst the threatened animal of grassland is this region. A large number of avian fauna makes the grassland colourful.

Notes

(3) Deserts

The Thar desert in Rajasthan is an extension of the Sahara deserts through Arabian and Persian deserts. They extend from Punjab, Haryana, Rajasthan to Gujarat state.

Indian deserts are divided into four main types:

- hills,
- plains with hills,
- marshes and
- plains with sand dunes.

The distinct Rann of Kutchch–Bhuj in Gujarat forms a separate zone with in Thar deserts due to its different climatic conditions. It represents vast saline flats. The region of sand dunes is most spectacular and covers an area of 100,000 sq. km nearly. It extends into Pakistan. The dunes are highly sandy and contain 0.12–0.18 mm size grain, 1.8 to 4.5 % of clay and 0.4–1.3% of silt.

Since heat and light intensity are very high and sand dunes are shifting, these deserts can not support vegetation. There are only some thorn forests and dry open grasslands. Indira Gandhi canal which carries water through Punjab and Haryana enters into Rajasthan supports some vegetation. The main crops of desert are bajra, millet, wheat, barley, maize, jowar, guwar. Medicinal plants found here are mehndi, hak, isabgole and gugal.

Indian deserts support many threatened species of birds and mammals, such as Asiatic lion, wild ass, bats, scaly ant eater, desert fox, Indian gazzel, four horned antelope , white browed Bushchat, Great Indian Bustard, Cranes and Sandgrouse. Gulf of Kuchch is distinguished by the presence of living corals, pearl oyster, sea turtles and a large number of migratory birds like kingfisher, cranes ibis and herons.

(4) Mountains – The Himalayas

Distribution: The Himalaya is a great range of mountains that spreads over a west-northwest to east- southeast over a distance of about 2500 km covering Afganistan , Pakistan, India, Nepal, Bhutan and China. In India, it extends from the Indus trench below Nangaparbat in the west to Yarlungtsangpo- Brahmputra George below Namchebarwa peak in east.

The Himalayas lying within India occupy nearly 5,31,250 sq. km area

They cover about 16.6% of India's total geographical area and are spread partially or completely over 12 states namely: Jammu and Kashmir, Himachal Pradesh, Uttaranchal, Sikkim, West Bengal, Arunachal Pradesh, Assam, Nagaland, Manipur, Tripura, Mizoram and Meghalaya.

Himalayas are geographically divided into:

(i) the Eastern Himalayas or the Assam Himalayas: Out of the above the Eastern Himalaya has a greater diversity of ecosystems like, forests, grasslands, marshes, swamps,

lakes streams and rivers Eastern Himalayas consists of nearly 8000 species of the flowering plants. It has many primitive as well as many endemic plant species. Eastern Himalayas is known as centre of origin of cultivated plants . Many cereals, fruits and vegetables are cultivated here. E.g. Orchids, *Aster, Accasia, Albizzia, Delbergia* species (timber) and many legumes etc.

(ii) the Central Himalayas or the Nepal Himalayas

(iii) the Western Himalayas: On the western Himalayas cold deserts of Ladakh support drought and cold resistant varieties of plants and animals e.g. Yak.

(iv) the North-West Himalayas or the Punjab Himalayas

Eastern Himalayas are one of the of the world and has large no animals because of its varied ecological conditions e.g. Pangolins elephants macaque languor civet.

(5) Ghats

Western and eastern ghats are also important ecosystems of India

Western ghats also known as Sahyadri extend from Tapti river in north to Kanyakumari in south covering nearly 1,40,000 sq km parallel to the west coast of peninsular India. They pass through the states of Gujarat, Maharashtra, Goa, Karnatka, Tamilnadu and Kerala. These ghats are one of the richest biological resources and form distinct ecological and biogeographical region of India. Western ghats are one of 25 hot spots of the world. *Hot spots are the regions which show maximum biodiversity, richness of species and endemic forms.* These ecosystems are the threatened due to human interference. June- September are rainy months. The rainfall may vary from 100 to 500 cm. Soil is mainly red or black in most of the regions and rich in nutrients. 3500 species of flowering plants have been recorded from western ghats of which nearly1500 are endemic species.

Nearly 209 species of fresh water fishes occur in these ghats of which 120 are endemic. Similarly out of 219 species of amphibians found here 106 are endemic.

Eastern ghats extend in north south-west strike in Indian peninnsula covering an area of about 75000 sq. km They are spread through the states of Orissa, Andhra Pradesh and Tamilnadu. The eastern ghats do not form a continuous range because the great rivers Mahanadi,Godavari and Krishna cut across them. They are an assemblage of discontinuous ranges of hills, plateaus and basins. The climate of these ghats may be semiarid to semihumid with a rainfall ranging from 60 to 160 cm. The vegetation ranges from evergreen trees to that of dry savannas. The eastern ghats are affected by the human activity. Conservation of biodiversity here is a big issue today. Special measures are taken to protect this floristic zone. United Nations Conference on Environment held in Rio de Janerio in 1992 discussed the issue of conservation of this region.

Notes

6.4.2 Aquatic ecosystem in India

Freshwater ecosystem

Freshwater are terrestrial aquatic ecosystems. Lakes, flood ponds, reservoirs and rivers are its important components. The total freshwater area of India is about 7.6 million hectare.

- **Lakes** are naturally formed deep water bodies e.g. Sultanpur lake, Batkal lake (Haryana).
- **Flood points** are the places that undergo periodic flooding as a river channel overflows with flood water i.e. natural areas constituting shallow and seasonal water bodies. Bank of large rivers have flood points.
- **Reservoir** is man made areas holding water irrigation and human use. e.g, reservoirs formed by dams used for irrigation.
- **Rivers** are the flowing water bodies as you have studied in this lesson. For example river Yamuna, Ganga and Tapti, Krishna, Kawari, Narmada etc.

Marine ecosystem

India has a long coastline of about 8000 km stretching along nine states and two island chains. At the coast a number of rivers form estuaries at their confluence with the sea. There are three gulfs - one on the east coast that is gulf of Mannar and two on the west coast i.e. gulf of Kutchch and gulf of Khambhat.

The continental shelf (extension of land into the sea) is 200 m in depth but variable in width along the coast. The Indian ocean is the smallest of the three great oceans.

The tides are very important in determining the marine life. Nearly 14 species of sea grasses and 120 species of sea weeds are found along the coast. Representatives of almost all the invertebrate and vertebrate groups are found in the marine ecosystem. Corals are the most abundant and play a very important role. 199 Species of corals are known from Indian Ocean. They make coral reefs which are home to a large number of other sedentary species like many molluscs, crustaceans and coelenterates. The biodiversity in a coral reef is comparable to that of a tropical rain forest. Sea shore provides feeding and breeding ground to a number of birds also. Sea crows, whales and dolphins are the mammals that have secondarily invaded the sea .

Marine fisheries constitute a highly productive sector in India It is a source of food and employment to the coastal population.

INTEXT QUESTIONS 6.4

1. Name the various zones of the Himalayas.

2. Where are deserts found in India?

_____

3. Give two differences between western and eastern ghats?

_____

4. Give two Plants and two animals which found in grassland.

_____

5. Name three gulf which are found in India.

_____

6.5 THE THREATENED ECOSYSTEMS

Some of the natural ecosystems are very sensitive to misuse by humans and to natural disasters or calamities. About such activities you will be study in lesson 12. *Natural disasters are sudden natural accidents or events that cause a lot of damage to natural ecosystems and human life*. Some of the important natural disasters are like tsunamies, earthquakes, landslides, volcanic eruptions and cyclones.

6.5.1 Estuaries

An estuary is a place where a river or a stream opens into the sea. It is a partially enclosed coastal area at the mouth of the river where its fresh water carrying fertile silt and runoff from the land mixes with the salty sea water. It represents an ecotone between fresh water and marine ecosystem and shows a variation of salinity due to mixing of sea water with fresh water.

Estuaries are very dynamic and productive ecosystems since the river flow, tidal range and sediment distribution is continuously changing in them. Examples of estuaries are river mouths, coastal bays, tidal marshes, lagoons and deltas.

Deltas are triangular areas bordering the river valley towards the mouth. They are associated with the land projecting into the sea in the form of protuberances.

Estuaries are richer in nutrients than fresh waters or marine waters therefore; they are highly productive and support abundant fauna. In general the phytoplanktons of estuaries are diatoms, dinoflagellates, green algae, blue-green algae. Towards the sea coast of the estuaries there are large algae and sea grasses. Near the mouth of the rivers and deltas there are mangrove forests.

The vast mangrove forests act as barriers for the costal habitat to check the wind speed during cyclones and high velocity landward winds.

Notes

All the plants and animals in the estuaries are subjected to variations in salinity to which they are adapted (osmoregulation).

Estuaries have been damaged due to urbanization, industrialization and population growth. Aquaculture activities such as prawn seed harvesting has caused considerable damage. Further, pollution due to industrial effluents and always remains have caused eutrophication.

6.5.2 Mangroves

Mangroves represent a characteristic littoral (near the sea shore) forest ecosystem. These forests grow in sheltered low lying coasts, estuaries, mudflats, tidal creeks backwaters (current less, coastal waters held back on land), marshes and lagoons of tropical and subtropical regions. They are distributed over the east and west coast and island of Andaman and Nicobar. Since mangroves are located between the land and sea they represent the best example of ecotone.

Characteristics of mangrove ecosystem:-

(1) The mangrove forests include a diverse composition of trees and shrubs.

(2) Plants are well adapted to high salinity(halophytic).

(3) Resistant to tidal effect.

(4) Tolerant to high temperature.

(5) Roots bear pneumatophore (or aerial roots), which is an aerating system.

Mangroves are highly productive ecosystems and the trees may vary in height from 8 to 20 m. They protect the shoreline from the effect of cyclones and tsunamies.

Indian mangroves are distributed along the east and the west coasts and Andaman and Nicobar islands. Mangroves along the east coast are more luxuriant and considerably diverse due to the presence of nutrient rich deltas formed by the rivers Ganga, Mahanadi, Godavari, Krishna and Cauvery.

The animal communities are of two types:

1. Permanent fauna mainly bentic are molluscs, crustaceans, polychaetes, insects and birds like kingfishers.

2. Visiting fauna includes mollusks, echinomerms, crustaceans and birds which come from adjacent terrestrial ecosystems and rivers . Tree frogs, crocodiles, turtles and snakes are also found in these forests. They are breeding and spawning ground for many commercially important fishes. *Sunderban mangroves are the only mangroves where tiger population is found.*

Mangroves in India have been reduced to more than 50% during the last forty years. They

are subjected to both natural as well as anthropogenic threats. Natural calamities such as cyclones, tsunamies and anthropogenic activities such as construction of houses and markets causing soil erosion and soil sedimentation has lead to their destruction. For example in Sunderbans collection of tiger prawn seeds for trade has greatly affected the other animals found in these forests.

6.5.3 Islands

Islands are land masses surrounded by sea water from all sides They may be far away from the continent (oceanic island)or may be very close to it (continental island). India has two main island groups: 1) Andaman and Nicobar islands in Bay of Bengal and 2) Lakshadweep in Arabian sea. These ecosystems are threatened mainly due to habitat destruction for resources and tourism. Although industrial pollution is much less on these islands, oil spills in oceans have greatly affected their fauna and flora. Many endemic species of turtles and birds have been threatened to extinction. The Government is taking special measures to protect them.

INTEXT QUESTIONS 6.5

1. Name two threatened ecosystems.

   (i) _____ (ii)_____

2. Where are mangrove ecosystem found in India.

   _____

3. Why is estuary a more productive ecosystem than ocean or fresh water?

   _____

4. What are islands?

   _____

6.6 ECOTONE

Ecotone is a zone of junction between two or more diverse ecosystems e.g. the mangrove forests. They represent an ecotone between marine and terrestrial ecosystem.Some more examples of ecotone are – grassland, estuary and river bank

Characteristics of ecotone:

(1) It may be very narrow or quite wide.

(2) It has the conditions intermediate to the adjacent ecosystems. Hence ecotone is a zone of tension.

Notes

(3) It is linear as shows progressive increase in species composition of one in coming community and a simultaneous decrease in species of the other out going adjoining community.

(4) A well developed ecotones contain some organisms which are entirely different from that of the adjoining communities.

(5) Sometimes the number of species and the population density of some of the species is much greater in this zone than either community. This is called **edge effect.** The organisms which occur primarily or most abundantly in this zone are known as **edge species.** In the terrestrial ecosystems edge effect is especially applicable to birds. For example the density of song birds is greater in the mixed habitat of the ecotone between the forest and the desert.

6.7 PROTECTION OF NATURAL ECOSYSTEMS

Natural ecosystems have been misused by the human being as a result of which the biodiversity and wild life has been threatened. Increasing human population, its increasing needs and greed are the root causes of destruction of natural ecosystems. Destruction and loss of any of the natural ecosystem will result in ecological imbalance and the human being (the destroyer) himself will become an endangered species. Hence natural ecosystems need protection

Protection of natural ecosystem demands management of human use of the biosphere resources such that they give maximum benefits to the present human generation while maintaining its potential to meet the needs of future human generations. Protection of natural ecosystems to an environmentalist means to protect animals and plants in their natural habitat in totality and not the protection of any one species . It can be achieved by the following methods:-

- Humans should reduce their needs.
- Introduction of the species from the other parts of the world and the human interference should be reduced to minimum into natural ecosystems.
- Some of the areas should be earmarked as **protected** or **reserve zones**. This can be achieved by making **buffer or transitional zones** around the protected area. (Buffer zone and transitional zones are where only a few humans are permitted to enter)
- Species in the detrimental habitats should be shifted to their unexploited natural habitat. Delhi Development Authority along with Delhi University has jointly established a Yamuna Biodiversity park in Delhi to protect and restore natural biodiversity lost from the Yamuna river bank. The same natural habitat is created for the plants and aquatic birds. Within a span of one year after the establishment of wetland the number of migratory birds has increased remarkably.

- Zones of megadiversity and hot spots of biodiversity should be protected. Megadiversity zones are those regions of the world which have largest number of species. 200 global megadiversities have been identified. India is one of the megadiversity countries**.** Hot spots are the richest and most threatened reservoirs of plant and animal life of the earth. They have maximum number of endemic species. 25 terrestrial hot spots have been identified for the conservation of biodiversity. They occupy 1.4% of the earth's surface and 20% of worlds the human population lives in these areas. Western ghats and Eastern Himalayas are two hot spots of India.
- International and national level efforts should be made for conserving natural ecosystems e.g. Earth Summit held in June 1992 at Rio di Janerio , Brazil, it was resolved to make efforts to protect and conserve biodiversity.
- Sacred forests and sacred lakes are protected by the tribal communities due to the religious sanctity accorded to these forests. They are most undisturbed by human activity and are known as **pristine forests.** Chipko movement to protect the forests of Mandal villages a good example of local people's effort to conserve natural ecosystems.

INTEXT QUESTIONS 6.6

1. Define ecotone.

   _____

2. Give four examples of ecotone.

   _____

3. Define edge species.

   _____

4. Why there are more number of species of song birds in Mangrove forests?

   _____

5. What is meant protection of natural ecosystem for an environmentalist.

   _____

WHAT YOU HAVE LEARNT

- Natural ecosystems are formed as a result of interaction of regional climate with the regional substrate without the interference by man.
- Natural ecosystems can be classified into two types: 1) terrestrial and 2) aquatic.

- Terrestrial ecosystems are forests, grasslands, deserts and tundra.
- Aquatic ecosystems are fresh waters bodies such as rever, lake and marine habitat such as seas and ocean.
- Similar altitudinal and latitudinal variations in the climatic conditions result in nearly identical.
- Distribution patterns of natural ecosystems from sea level to high mountain peaks and equator to poles.
- Tundra biome occurs in the region where the environmental conditions are very severe and there is very little vegetation below the poles and at high mountain peaks
- Forests are the regions densely packed with tall trees.
- Deserts like tundra form an extreme condition in the sequence of biomes. They occur in dry barren regions of the earth.
- Wetlands are ecotones between terrestrial and aquatic ecosystems like marshes, swamps and mangroves.
- Ecotone is a zone of junction between two adjoining communities e.g. estuaries, mangroves and grassland.
- We the human beings are responsible for the reduction of natural ecosystems. To protect our own species it is essential for us to protect them. Therefore to prevent the further destruction people should be educated and the various methods should be adopted for the protection of natural environment and ecosystem balance.

TERMINAL EXERCISE

1. What do you understand by natural ecosystem ? Give examples.
2. Give differences between the following:
   a. Alpine and arctic tundra
   b. Savanna and prairie
   c. Tropical and temperate forests
3. What do you understand by biodiversity? Explain its significance.
4. Give two desert adaptations of plants and animals.
5. Describe the various types of forest found in India (in brief).
6. Explain various zones of Himalayas.

7. Write short note on grassland and deserts found in India.
8. Explain how deforestation has resulted in ecological imbalance.
9. What is an ecotone? Explain its significance for the edge species.
10. Give two methods of protecting natural ecosystems.

ANSWER TO INTEXT QUESTIONS

6.1

1. Is an assemblage of plants and animals functions as a unit and is capable of maintaining its identity.
2. Terrestrial and Aquatic.
3. Forest, grasslands, deserts and tundra
4. Rivers, lakes and ponds

6.2

1. The leaves of these trees shed in autumn and new foliage grows in spring
2. Hot and low ration areas, suffering from water shortage (any other).
3. Animals– are fast runners, nocturnal habit conserve water by excreting concentrated urine.

   Plants – are mostly shrubs, leaves absent or reduced in size leaves and stems are succulent, root system well developed.
4. North America and Eurasia

6.3

1. Microscopic floating organisms such as diatoms, protozoan and larval forms re called plankton.
2. Refers to plant and animal communities occurring in water bodies. Flora and Fauna of marine ecosystem
3. Vascular plants are completely absent. Diatoms, algae, dinoflagellates and jelly fishes are free floating forms. Large crustaceans mollusks, turtles and mammals like seals, porpoises, dolphins and whales are free floating animals. Bottom dwellers are generally sessile (fixed) organisms like sponges, corals, crabs and starfish.

Notes

6.4

1. The Eastern Himalayas, the Central Himalayas, the Western Himalayas and the North-West Himalayas.
2. From Punjab, Haryana, Rajasthan to Gujarat state.
3.

Eastern Ghats	Western Ghats
Extended in north-south-west strike in Indian peninsula. Rainfall may vary from 60-160 m vegetation ranpees from evergreen trees to that of dry savannas.	Extended from Tapti river to Kanyakumari. Rainfall may vary from 100 to 500 cm. 3500 species of flowering plants and has been recorded.

4. Plants - Sedges, legumes and sunflower (Any two)

   Animals - Rat, mice, deer, elephant, dog, tiger (Any two)
5. Gulf of Mannar, gulf of Kutchch and gulf of Khambhat.

6.5

1. Estuaries, mangroves and islands (any two).
2. East and west coast and islands of Andaman and Nicobar.
3. Estuaries are very dynamic and productive ecosystems since the river flow, tidal range and sediment distribution is continuously changing in them. They are richer in nutrients than fresh waters or marine waters therefore; they are highly productive and support abundant fauna.
4. Island is land masses surrounded by sea water from all sides.

6.6

1. Ecotone is a zone of function between two or more diverse ecosystems. e.g. the mangrove forest.
2. Mangrove, grasslands, estuary and river bank.
3. The organisms which occur primarily or most abundantly in this zone are known as edge species.
4. Because of their mixed habitat of ecotone between the forest and the desert.
5. Protection of natural ecosystems to an environmentalist means to protect animals and plants in their natural habitat in totality and not the protection of any one species.