

## MODULE 16 - DESERT ECOSYSTEM

### OBJECTIVES

By the end of the session, the students will be able to understand:

1. What is a Desert?
2. Structure and functions of Desert ecosystem.
3. Important deserts of the world and India.

### SUMMARY

This film deals with characteristic features of Ecosystem in general and structure & functions of Desert ecosystem in particular various types of desert in the World and India have been enumerated. Two types of deserts i.e. dry deserts and cold deserts have been described.

Producers, consumers and decomposers of deserted ecosystem have been listed. Conservation of both types of ecosystems has been suggested.

### TRANSCRIPTION

#### Introduction

The word *Desert* is derived from the word 'desertaire' which means abandoned. Deserts are of two types:

- (a) **Hot deserts** such as Sahara in Africa and Thar in India.
- (b) **Cold deserts** such as Laddakh and Antarctica.

It is therefore difficult to have a uniform definition of desert.

On the basis of climate as well as vegetation, a desert is an area in which the annual potential evapotranspiration is greatly in excess of the annual rainfall, where the development of biota is over a substantial part of the year largely limited by the availability of water and where vegetation is sparse.

Desert habitat is scorched, wind scoured, waterless, endless and with wide gaps without shelter and still plants. Animal and human population continues to thrive inspite of hostility. In view of increasing population, deserts are expected to be man's future land banks.

## Location

In the world, deserts are located in two discontinuous belts, one in the northern and the other in the southern hemisphere roughly centered along the tropic of cancer and tropic of Capricorn between 15° and 35° latitudes with their greatest development being on the polar side. Deserts are spread over 17% part of land. Areas with less than 25 cm rainfall per year are called hot deserts while those covered with snow are called cold deserts or Tundra.

Hot deserts are further classified as *Dry* and *Semiarid* deserts while cold deserts are classified as *Arctic tundra* and *Alpine tundra*.

**Desert regions of Northern hemisphere:** Some of the important desert regions of the Northern hemisphere are:

- (1) **North American Desert:** This includes Western Colorado and Arizona. Main plants of this region are *Yucca* and *Carnegia* .
- (2) **Sahara Desert:** It is the largest desert on the earth, located in Africa. It is spread over an area of 48 million km to 5.6 million km covering almost the entire northern Africa. There are mountains and sandy areas. Ephemeral herbs like *Argemone* and *Solanum* are commonly found.
- (3) **Iranian Desert:** It includes some areas of Iran, Afghanistan and Baluchistan. The winters are cold and the summers are hot. *Artemissia herba-alba* is the common herb.
- (4) **Arabian Desert:** This includes Jordan, Iraq, Israel and Syria. Sand dunes are observed near the coastal areas. Common plant is *zygophyllum dumosum*.
- (5) **Turkistan Desert:** It is located in Russia. It has very harsh climate where the temperature in summers goes as high as 46°C and in winters it may drop to -40°C. *Poa bulbosa* and *Aristida* are the common grasses.
- (6) **Thar Desert:** It is located in Rajasthan (India) and popularly known as the Indian desert. Sand dunes are the common feature. Common plants are *Haloxylon*, *Euphorbia caducifolia* and *Aaristida*.

(7) **Takla-Makan Desert:** Located in Central Asia in the territory of Tibet. *Halophytic vegetation* occurs in old valleys.

(8) **Gobi Desert:** This is also located in Central Asia. Mountains and sand dunes are the common features.

**Desert regions of Southern Hemisphere:** Some of the main deserts of southern hemisphere are:

(1) **Australian Desert:** About half of the Australian continent is arid having desert conditions. Some deserts are sandy and some are stony. The most common plant is the grass known as *Spinifex* and small trees & shrubs like *Acacia*.

(2) **Kalahari Namib Desert:** It extends from Angola to St. Helena Bay in South Africa. Average rainfall is less than 5 cm per year but it remains covered with sea fog and dew. The vegetation includes *leafless plants* and succulents.

(3) **Potagonian Desert:** It is spread between Argentina and the eastern base of Andes. It experiences low rainfall from 15 to 30 cm per year. The vegetation is dominated by *xerophytic grasses* and *low cushion type shrubs*.

(4) **Atacama Peruvian Desert:** It is located between Chile and Peru. The annual rainfall is less than 1 cm. It is the driest coastal desert of the world. The common plant is *tillandsia*. A few lichens are also observed.

**Deserts in Indian subcontinent:** Apart from the Thar Desert of Rajasthan, Indian continent has arid and semi-arid regions in Andhra Pradesh, Gujarat, Haryana, Madhya Pradesh, Tamilnadu, Maharashtra, Punjab, Uttar Pradesh and Jammu & Kashmir.

### Structure of Dry desert ecosystem

The chief controlling climatic factor for the formation of deserts is low rainfall. The rainfall is usually less than 25 cm per year and not uniform. The temperature in the days is very high and the nights are cold. Only 10% of the land area is occupied by trees, plants, shrubs and herbs.

Just like the other ecosystems, the desert ecosystem also has three components: *Producers, Consumers and Decomposers*.

1. **The Producers:** The producers of dry desert ecosystem are green plants popularly designated as *Xerophytes*. The Xerophytes are of four types:

(a) *Drought escaping or Ephemerals:* They have a very short life span of 4 to 6 weeks. Their seeds germinate during the rains, produce roots, stems, leaves, flowers,

fruits and seeds within 1 to 2 months and disappear before the onset of the dry conditions. For example: *scilla*.

(b) *Drought evading*: These plants are very small in size. They have a restricted growth and require very low amount of water for their growth and development. In view of their small size, they conserve whatever little moisture they get and thus avoid droughts. Their life span is 4 to 6 months or hardly 1 year. For example: *Argemone* and *Solanum*.

(c) *Drought enduring*: These are slow growing shrubs or small trees. They grow extremely restricted and their leaves are reduced to leaflets. For example, *Aacacia nilotica* and *Acacia leucophloea*. *Capparis deciduas* is a leafless shrub. Australian acacia shows petiole modified to phyllode. Those plants which bear leaves become leafless during dry weather. They resume growth when the water is again available to their roots during the rainfall. Thus they endure droughts by some adaptations to overcome unfavorable seasons.

(d) *Drought resisting*: They are succulent plants with thick and fleshy stems and leaves. They are actually hoarders with plenty of water during rainy season in their stems which becomes modified to phylloclade e.g. opuntia and cactus. In *Bryophyllum*, *Aloe* and *Agave*, the leaves are fleshy.

2. **The Consumers**: The consumers are different categories such as the Primary, Secondary and Tertiary consumers. The primary consumers or herbivores are Camels, Sheep and Wild ass.

Secondary consumers are Toads, Frogs, Desert cats, Desert fox and the birds like great Indian bustard, florican and quail.

Tertiary consumers are lizard, snake, wolf etc.

## **Structure of Cold desert ecosystem or Tundra ecosystem**

Tundra means marshy plains. Tundra occurs on soil that is disturbed by periodic freezing and thawing of water. The soil is almost permanently frozen up to 10-20 cm deep down the surface. The surface of the soil is spongy and uneven. In some tundra regions of the Arctic, the permanently frozen soil is called as '*premafrost*' a short distance below the surface of the ground.

Tundra are spread over 5 million acre land in North America, North Canada, Alaska, North Eurasia and Arctic islands. Tundra is characterized by low annual rainfall (about 25

mm) and low temperature (-50°C to 10°C). The growing season is hardly up to 60 days. Tundra vegetation is in the form of treeless community.

The producers are lichen like *cladonia* (popularly known as reindeer moss), *mosses*, *grasses* and dwarf *Betula* and *Salix*. The cause of dwarfism is the snow-storms throughout the year.

Primary consumers or herbivores are *Reindeer*, *Yak*, *Polar deer*, *Musk deer* and *Antelope*. Penguin the flightless bird is common herbivore.

Secondary consumers are carnivores like *Polar bear* and *Polar wolf*.

All animals are covered with thick fur for protection from snow.

Decomposers are *fungi* and *bacteria*.

### **Uses of Desert ecosystem**

Areas of scarce vegetation with semiarid, scrubland are used for 'browsing' by *camel* and grazing by *goat* and *sheep* in Gujarat and Rajasthan.

Areas with little moisture are used for growing crops like *Sorghum* (Jawar) and *pearl millet* (Bajra). The natural grasses and local variety of crops adapted to low moisture conditions can be used for Genetic engineering and dry farming.

### **Threats to Desert ecosystem:**

Human activities are destroying the authenticity of desert ecosystem. Nuclear test in *Pokharan* desert has disturbed the producers and consumers of this area. Several desert areas have been brought under cultivation through expansion of irrigation. Canal water evaporates rapidly and leaves behind the salt which results in *Saline or oosar soil* (unproductive). To meet out the demand of water, deep tube wells are dug which lowers the water table creating more drier atmosphere. The special species which evolved here over millions of years have the risk of becoming extinct.

### **How Desert ecosystem can be conserved**

Desert ecosystem is extremely sensitive. Their ecological balance that forms the habitat for their flora and fauna is very easily disturbed. Desert people have traditionally protected their meager water resources. The Bishnoi tribe of Rajasthan is known to have protected their Khejdi trees (acacia leucophloea) and the blackbuck antelope for several generations through the movement of hugging with tree-trunks and even by sacrificing their lives. This movement has now been revived under the name 'Chipko movement'. Desert areas should be declared by the Govt. as the National Parks and Sanctuaries where the cutting of trees and the hunting of animals shall be prohibited. We need sustainable form of development that takes proper care of the Desert ecosystem.

### **GLOSSARY**

1.	<b>Shepherd</b>	:	Person who rears sheep
2.	<b>Pastoral</b>	:	of Shepherds
3.	<b>Degradation</b>	:	Destruction
4.	<b>Desert</b>	:	Abandoned area with extreme climatic conditions
5.	<b>Sparse</b>	:	Thinly scattered
6.	<b>Scorch</b>	:	Dry/burning heat
7.	<b>Wind scoured</b>	:	Having hot burning wind
8.	<b>Hostility</b>	:	Hatred
9.	<b>Tundra</b>	:	Treeless vast region having soil covered with snow
10.	<b>Xerophytes</b>	:	Plants growing in dry habitats
11.	<b>Evading</b>	:	Avoiding
12.	<b>Enduring</b>	:	Bearing
13.	<b>Drought resistant</b>	:	Having ability to withstand dry conditions
14.	<b>Permafrost</b>	:	Permanently frozen soil due to snow cover
15.	<b>Reindeer</b>	:	Sub arctic deer with large antlers
16.	<b>Lichen</b>	:	Plants having association of algae and fungi common in Tundra
17.	<b>Yak</b>	:	Haired Tibetan ox

### **F.A.Q.s**

Q 1: What is a desert?

Ans: Desert is an abandoned area.

Q 2: List two types of Deserts.

Ans: (a) Hot desert (b) Cold desert

Q3: List two examples of Hot deserts.

Ans: (a) Sahara in Africa (b) Thar in India

Q 4: Can we call the Cold deserts as tundra biome?

Ans: Yes

Q 5: List two climatic conditions necessary for Hot deserts.

Ans: (a) Rainfall up to 25 cm/year (b) Very hot days with very cold nights

Q 6: List two climatic conditions for Cold deserts.

Ans: (a) Scanty rainfall, about 25 mm/year (b) Snowy storms

Q 7: List two Cold deserts of the World.

Ans: (a) Laddakh (b) Antarctica

Q 8: List 4 types of Xerophytes.

Ans: (a) Drought escaping (b) Drought evading (c) Drought resistant (d) Drought enduring.

Q 9: What is the another name of Drought resistant Xerophytes?

Ans: Succulents

Q 10: List any 4 producers of hot desert ecosystem.

Ans: (a) Acacia (b) Capparis aphylla (c) Cactus (d) Bryophyllum

Q 11: List any two common herbivores of dry desert ecosystem.

Ans: (a) Camel (b) Wild ass

Q 12: List any two secondary consumers of desert ecosystem.

Ans: (a) Desert fox (b) Great Indian bustard

Q 13: List 3 tertiary consumers of desert ecosystem.

Ans: (a) Wolf (b) Snake (c) Lizard

Q 14: List any 4 hot deserts of Northern Hemisphere.

Ans: (a) Sahara (b) N. American desert (c) Thar (d) Gobi

Q 15: List any two deserts of Southern hemisphere.

Ans: (a) Australian desert (b) Kalahari Namib Desert

Q 16: In which states of India do the deserts occur?

Ans: (a) Rajasthan (b) Andhra Pradesh (c) Gujarat (d) Haryana (e) M.P. (f) Tamilnadu (g) Punjab (h) U.P. (i) J&K

Q 17: List common producers of Cold deserts or tundra ecosystem.

Ans: (a) Lichens like cladonia rangiferina or reindeer moss (b) Dwarf Betula & Salix

Q 18: List some herbivores of Tundra ecosystem.

Ans: (a) Reindeer (b) Yak

Q 19: List any two secondary consumers of Tundra ecosystem.

Ans: (a) Polar bear (b) Polar wolf

Q 20: How can the grassland and desert ecosystems be saved?

Ans: We can do it by declaring certain grasslands and deserts as National Parks and Sanctuaries where cutting of vegetation and killing of animals would be strictly prohibited.