MODULE 17 - FOREST ECOSYSTEM

OBJECTIVES

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

1. What is an ecosystem?
2. Types of ecosystem.
3. Characteristic features of forest ecosystem.
4. Structure and functions of forest ecosystem.
5. Types of forest in India.
6. Threats to forests ecosystem.
7. Conservation of forest ecosystem.

SUMMARY

This film deals with ecosystem, its different types and characteristic features, structure of forest ecosystem showing producers, consumers and decomposers of forest ecosystem. Different types of forests in India have also been discussed. Due to over population and exploitation of forest ecosystem by man the percentage of forest has been reduced from 33% to 11%. This is really a matter of concern. We should plant more and more trees and government should declare more and more forest areas as national parks and sanctuaries.

TRANSCRIPTION

Introduction

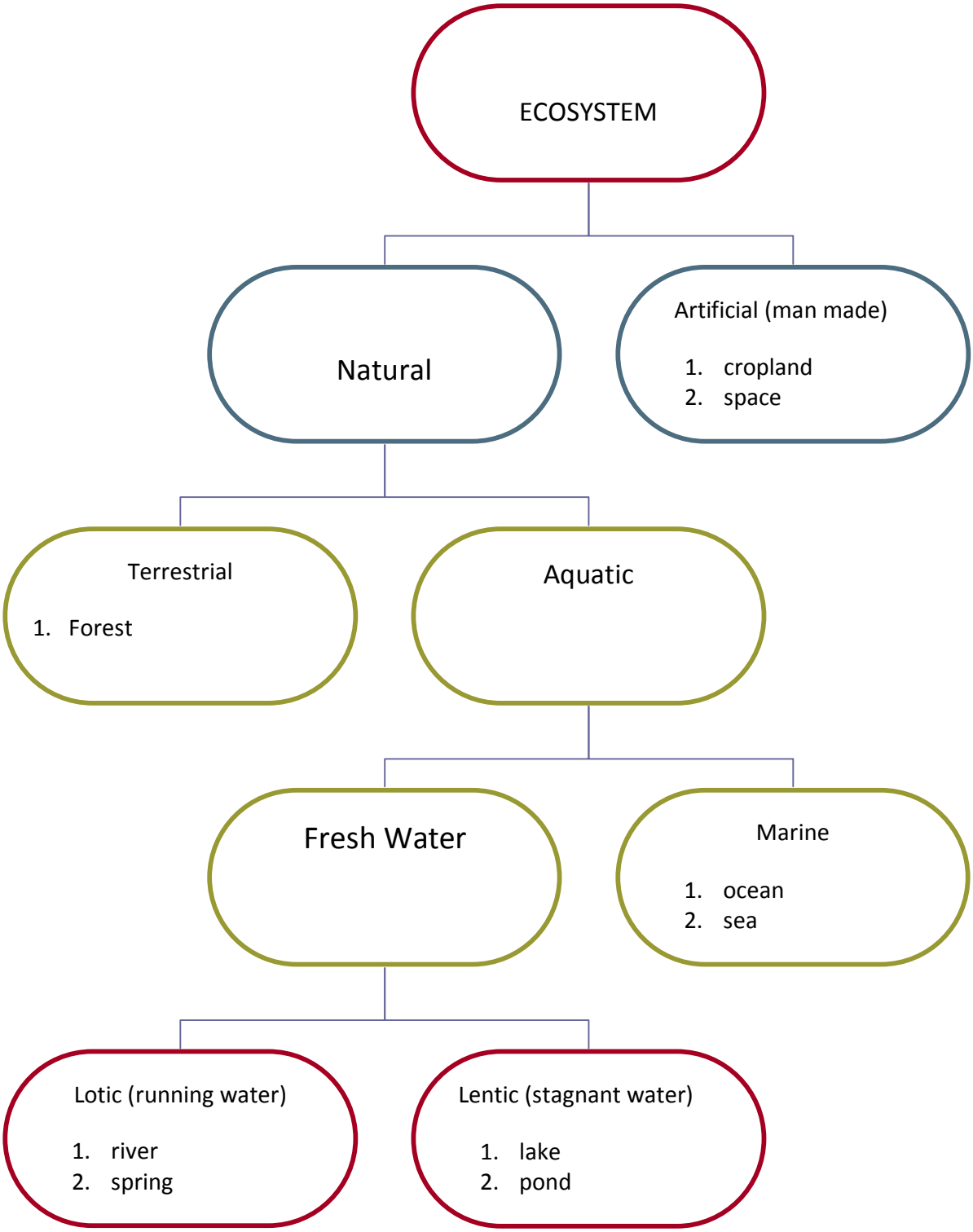
The word ecosystem was coined by A.G. Tansley in 1935. It is defined as interaction between the organisms and the environment, or living community of plants and animals in any area together with the non living components of environment such as soil, air and water constitute the ecosystem. Ecosystem occurs in space and exists in time. It has past as well as present and future. Ecosystem is the largest functional unit of ecology. It has various sizes such as a drop of Pond water, a square meter of grassland, a large lake or an ocean.

In nature, an ecosystem is an open system with its own sources of receiving and giving but it can be open as well as closed depending upon the communities occupying it. For example a forest with a dead log. Here forest is an open system with green plants on which different herbivores and carnivores as well as decomposers live but dead log with termites and ant eaters is closed ecosystem because the day the log is eaten by the termites the ecosystem will be finished.

Some ecosystems are quite robust and are less affected by human disturbances for example an ocean. Others are very fragile and are quickly destroyed by human activities. Mountain ecosystems are extremely fragile because degradation of forest cover leads to severe soil erosion and changes in river courses. Island ecosystems are also easily affected by any human activities leading to the extinction of several unique species of plants and animals. Evergreen forests and coral reefs are examples of species rich fragile ecosystems which must be protected against a variety of human activities that may lead to their degradation.

Rivers and wetland ecosystem can be seriously affected by industrial effluents and changes in the surrounding land use. Khan river of Indore has changed to a muddy Nala by industrial effluents.

Types of Ecosystems:



Characteristic features of forest ecosystem:

Forest ecosystem is a type of terrestrial ecosystem. The world forest is derived from the word “foris” which means “outside” or large natural terrestrial area outside the human habitats, but occupied by the wild plants and animals is called forest.

In an ideal ecosystem there should by 33% forest, 33% wild animals and 33% human beings but due to increase in population forest is converted to agricultural land and agriculture land to residential colonies. Industrial centers are also created by cutting forests. This has resulted in degradation of forests. Use of trees as fuel wood and timber also leads to felling of trees and deforestation.

When human population was small the forests could supply human needs. Due to increase in population and industrialization consumption of forest resources has increased. Short term economic gains have dominated over long term environmental benefits. Forests are decreasing day by day. The average of forests area has reduced from 33% to 11 to 12%. This is development at the cost of destruction.

Forest has community of plants having trees, shrubs, herbs and climbers. Forest trees show random growth they do not grow in rows as observed in plantation by man. We should remember that man can plant trees but he cannot grow a forest because forest is an ecosystem having its own producers, consumers and decomposers. It means that a forest is a natural ecosystem. It is pitiable to note that man can destroy a forest but he cannot grow a forest.

In a natural forest, trees grow in communities such Teak-Terminalia community or Zizyphus acacia community. In manmade plantation there are no such natural communities. Wild animals are very important part of forest ecosystem which are missing in plantation done by man.

Structure of forest ecosystem:

According to Odum each ecosystem has following components:-

Components of Ecosystem

Abiotic or Non-living	Biotic or Living
(i) Inorganic nutrients	(i) Producers
(ii) Organic compounds	(ii) Consumers

(iii) Climatic factors (iii) Decomposers

1. Abiotic Components:- amount of aboitic components present in an ecosystem at a given time is called standing stage while the amount of biotic components is called standing crop. The amount of biotic components and other abiotic conditions decide the type of forest. The forest on mountains and hills differ from those along river valleys. The amount of rainfall and local temperature which varies along latitude and altitude as well as soil type also decide the type of forest vegetation.

2. Biotic Components:- the living or biotic components of the forest ecosystem are-
   a) Producers- They include green plants in form of trees, shrubs, herbs and climbers. Trees like Teak and Sal belonging to flowering plants and Pines, Deodar and Canada Balsam belong to Gymnosperm.

      The common shrubs are Hibiscus tiliaceous, Acacia, Catechu, Pandanus tectorius, Grewia asiatica, carissa spinarum.

      The common herbs are crinum asiaticum, cassiatora, cassia occidentalis and grasses like Themeda, Cymbopogon, Heteropogon, Sehima & Apluda.

   b) Consumers- Primary consumers are herbivores like Beetles, Ants, Grass-hoppers, Rabit, Deer, Neelgai.

      Secondary consumers are carnivores like Birds, Snakes, Lizards, Fox, Jackal. Tertiary consumers are wolves. Quaternary or top most consumers are Tiger and Lion.

   c) Decomposers- forest is rich in decomposers like bacteria and fungi. The forest floor has large amount of decaying matter such as fallen leaves, dung and dead animals. They are decomposed by filamentous bacteria like Actinomycetes**.** Bactria like Bacillus are Pseudomonas and Fungi like Aspergilles, Fusarium and Alternaria.

In a forest the plant and animal species are closely dependent on each other together they form different types of forest communities. Man is the part of forest ecosystem and the local people depend directly upon the forest for several natural resources that act as their life support system.

Timber, firewood, fruits, honey, gum catechu, oil of turpentine are forest products directly used by man. Paper is indirect product obtained from wood pulp.

Forest types in India:

Depending upon the leaves forest are divided in two types:

1. Coniferous Forests
2. Broad leaved Forests

1. **Coniferous Forests** – They grow in Himalayan region & mountain regions where the temperature is very low. The forests have tall stately trees with needle like leaves and downward sloping branches so that snow can slip off the branches. They bear cones instead of flowers. They produce seeds but no fruits that mean their seeds are naked or not enclosed inside the fruit. Due to naked seeds they are called Gymnosperms.

The common trees are Pines, Deodar, Junipers, Abies, Cryptomeria cupressus and Taxus.

The common animals of this forest are wild goat and sheep. Himalayan black bear. Some rare animals of coniferous forests are snow leopard, Himalayan brown bear, musk deer, Himalayan wolf.

2. **Broad leaved Forests** – The trees have broad leaves. They are of following types:-

a) Evergreen forests
b) Deciduous forests
c) Thorn forests
d) Mangrove forests

a) Evergreen forests – They grow in high rainfall areas of Western Ghats, North Eastern India and Andaman Nicobar Islands. In these areas monsoon period is very long. Some places even get two monsoons as in Southern India.

Evergreen does not mean that there is no leaf fall. Actually its meaning is that leaf fall is gradual so that most of the leaves continue on the plants through the year. The trees overlap with each other to form continuous canopy. Very little light penetrates down the forest floor therefore ground vegetation is sparse. The forest is rich in orchids and ferns. The bark of the trees is covered with mosses and lichens.

The common trees are Maple, Oak, Jamun, Ficus and Dipterocarpus.

The common animals are Tiger, Leopard, Sambar, Tree frogs and Hornbill.

Rare animals are Pigmy dog, Rhino, lion tailed Macaque.

b) Deciduous forest – rainfall moderate and for few months. The trees shed their leaves during the winter and hot summer months. In April they regain their fresh leaves just before monsoon, when they show rapid growth in response to rains. Thus there are two clear periods of rainfall and canopy regrowth. Light can penetrate easily till the forest floor therefore they show undergrowth of shrubs and herbs. The vegetation shows three stories – i) herbs ii) shrubs iii) trees.

Such forests are common in Madhya Pradesh, Gujarat, Maharashtra, Andhra Pradesh, Mysore and Chennai.

The common plants are Teak, Terminalia, Madhuca, Anogeissus, Diospyros, Boswellia (salai) and Sterculia.

Dendrocalmus is common Bamboo while Phoenix Sylvestris is the common palm. The common climbers are Bauhinia Vahlii, Argyreia speciosa**.** The common parasites are Laranthus and Cuscutta reflexa**.**

The common shrubs are Acacia, Catachu, Salvadora, Capparis.

The common herbs are Cassia tora, Cassia occidentalis, and grasses like Andropogon, Themeda and Chrysopogon.

The common animals are Tiger, Chital, Barking deer, Fly catchers, Babblers and Hornbills.

c) Deciduous moist forest – these forest occur along coast of Western Ghats, Terrai region of U.P. and Bihar, Orissa and Eastern M.P. These area receive heavy rainfall upto 100 to 200 cms. The rainfall is restricted to few months and dry season is long and intense. By April-May most of trees shed their leaves. The common plants are Pterocapus, Terminalia bilata, salmalia, Albizia and Bamboo in patches. Cane palm is a common climber.

d) Thorn and scrub forest - these are common in Delhi, Punjab and Rajasthan and Western Gujrat. The temperature is high and rainfall is low. The common plants are Bamboo, Babool, Ber, Neem and Carrissa.
The common animals are Chinkara, Blackbuck, 4 horned antelopes, Patridge, Monitor lizard.Some of rare animals are Bustard and Florican.

e) Mangrove delta forest – these forests grow along river deltas especially along the rivers like Krishna, Godavari and Ganges. In Bengal Sundarban Delta is named of Sundari tree – heritiera fomes.

The common plants are Avicinea, Pandanus, Nipa fruticans, and Sundari tree. This vegetation is halophytic hence it is called mangrove vegetation. Rhizophora conjugate, Sonneratia apetala, Aegiceros and Acanthus also common in this forest. They produce pneumatopheres or respiratory roots which grow against gravity, come above the mud and develop pores for respiration. The seeds germinate on parent plant producing small seedlings or baby plants. The phenomenon is called vivapary or giving birth to young ones just like human beings.

The common animals are crocodile, sand pipers, plovers, fishes and crustaceans.

Rare animal is water monitor lizard.

Threats to forest ecosystem:

Population growth , urbanization and industrialization are the major threats to forest ecosystem. Forests are cut and forest land is converted to agriculture land. Agricultural land is converted to residential colonies to accommodate growing population.

Trees are cut in order to meet out our demands for furniture as well as fuel wood. The forest are rapidly shrinking. It is estimated that India's forest cover has decreased from 33% to 11% in the last century. Forests are also lost by mining and building dams. As the forest resources are exploited the canopy is opened up, the ecosystem is degraded and the wild life is seriously threatened. During the construction of dams government claims of rehabilitation of human beings, restoration of plants either though seeds or by tissue culture but nobody bothers about wild animals. Thus, several wild animals become extinct and can never be brought back.

Cutting of forest makes survival of tribal people to be very difficult. Village people do not get timber for making agricultural implements.

The insects that live and breed in the forest such as bees, butterflies and moths decrease in number. Therefore, pollination decreases and production of agricultural crops and fruits trees decreases.

The rain that falls on deforested land flows directly to near by rivers. Thus level of underground water decreases. The exposed soil is washed away during the rains. Once

the protective forest cover is removed serious environmental problem crop ups affecting the agriculture in such areas.

We should use alternate source of energy in place of fuel wood. We should grow more trees than are cut down from forests every year for timber.

Afforestation needs to be continuously done so that the fuel wood and timber are available. Growing trees like Acacia, Anogeissas for fuel wood is called energy plantation.

The natural forest with all their diverse species must be protected as national parks and sanctuaries where all the plants and animals can be preserved.

GLOSSARY

1. Ecosystem	:	Interaction between the organism and environment.
2. Open system	:	system with its own sources of energy.
3. Community	:	group of several populations.
4. Herbivores	:	vegetarians.
5. Robust	:	strong.
6. Fragile	:	delicate.
7. Degradation	:	destruction.
8. Soil erosion	:	removal of superficial soil layer.
9. Island	:	piece of land surrounded by water.
10. Extinction	:	vanishing.
11. Effluent	:	industrial waste.
12. Coral reef	:	island formed by coral growth.
13. Lotic	:	running water.
14. Lentic	:	stagnant water.
15. Random growth	:	haphazard.
16. Decomposer	:	disintegrate.
17. Biotic	:	living.
18. Abiotic	:	non living
19. Latitude	:	angular distance north south of equator
20. Altitude	:	height above sea length.

21. Carnivores : flesh eater.
22. Honey : sweet sticky yellowish fluid made by bees from nectar.
23. Catechu : tannin secreted by wattle tree used in confectionary and medicine; also applied to beetle leaf.
24. Coniferous forest : trees bearing cones but not flowers.
25. Oil of turpentine : oil of resin and pine tree used in varnish and paint.
26. Canopy : branches of tree forming an umbrella like structure on top.
27. Sparse : loose
28. Parasite : a plant feeding on another plant.
29. Delta : a triangular tract where a river meets the sea.
30. Pneumatophores : respiratory roots.
31. Vivipary : giving births to young ones.
32. Urbanization : converting rural towns to big cities.
33. Threat : danger.
34. Survival : existence.
35. .Tribal people : native people.
36. Rehabilitation : resettlement.
37. Deforested land : land from where forest trees have been cut.
38. Conserve : protect.
39. Afforestation : to grow trees in a new place.
40. Diverse : various.
41. National park : huge natural ecosystem where hunting and cutting trees is strictly prohibited by central government.
42. Sanctuary : place of refuge for plants and animals under wild condition. Looked after by state government.
43. Mangrove : vegetation along sea shore.

FAQs

Q1. What is an ecosystem?

A1. Interaction between the organism and environment.

Q2. Who coined the word ecosystem?

A2. A. G. Tansley.

Q3. What is the position of ecosystem in ecology?

A3. It is the largest functional unit of ecology.

Q4. List ecosystems of different range.

A4. a) A drop of pond water.

b) A square meter of natural grass like Praries.

c) A forest.

d) A lake.

e) An ocean.

Q5. Name the most dangerous animal in an ecosystem.

A5. Human Being.

Q6. List 3 artificial ecosystems.

A6. a) Cropland.

b) Aquarium.

c) Space.

Q7. What type of ecosystem is a forest?

A7. Terrestrial ecosystem.

Q8. What should be the percentage of forest in an ideal ecosystem?

A8. 33%.

Q9. On an average how much forest is left in India?

A9. 11 to 12%.

Q10. What primary product of forest?

A10. Timber.

Q11. What are secondary products of forest?

A11. a) Gum b) Catechu

c) Lac d) Honey

e) Bidi leaves f) Fruits

Q12. What are products of forest ecosystem?

A12. Green plants in the form of trees, shrubs and herbs.

Q13. Who are the primary consumers or secondary producers of forest?

A13. Herbivores like Deer, Rabbit, Nilgai.

Q14. Who are the secondary consumers of forest ecosystem?

A14. Fox, Jackal, Python.

Q15. Who are tertiary consumers of forest ecosystem?

A15. Wolf.

Q16. Who are the top-most consumers of ecosystem?

A16. Lion, Tiger.

Q17. What are decomposers of forest ecosystem?

A17. Filamentous bacteria like Actinomycetes and bacteria like Bacillus and Pseudomonas.

Q18. Does use of paper result in deforestation?

A18. Yes, because it is prepared from wood pulp of forest trees.

Q19. Is forest an open ecosystem?

A19. Yes, because it has its own sources of energy.

Q20. If there is dead dry log of wood attacked by termites in a forest, what type of ecosystem it shall be?

A20. Open as well as closed.

Q21. List 2 types of forests depending upon the outline of leaves?

A21. a) Coniferous forest with narrow needle like leaf

b) Broad leaved-forest having trees with the leaves of various outlines.

Q22. List some common trees of coniferous forest.

A22. Pinus, Cedars, Junipers, Abies balsamea, Taxus baceata.

Q23. List some important animals of coniferous forest.

A23. Himalayan black bear, Snow leopard, Musk deer, Himalayan wolf.

Q24. Write some important products of coniferous forest.

A24. Oil of turpentine, chilgoza seeds, Cedar wood oil and Canada balsam.

Q25. List four types of broad leaved forests.

A25. a) Evergreen forest.

b) Deciduous forest.

c) Thorn forest.

d) Mangrove forest.

Q26. Does evergreen forest mean that there is no leaf fall?

A26. No, leaves fall there, but it is gradual.

Q27. List any four trees of evergreen forest.

A27. Maple, Oak, Jamun and Eucalyptus.

Q28. What are common animals of evergreen forest?

A28. Tiger, Leopard, Tree frog, Rhino, Lion.

Q29. What is a deciduous forest?

A29. The forest in which trees shed their leaves in summer.

Q30. What are common trees of deciduous forest?

A30. Teak, Sal, Mahua, Salai, Dispyros.

Q31. In which State of India deciduous forests are common?

A31. Madhya Pradesh, Gujarat, Maharashtra, Andhra Pradesh, Mysore and Tamilnadu.

Q32. In which state of India moist deciduous forest are common?

A32. Western Ghats, forest hill regions of U.P. and Bihar as well as Eastern Ghats.

Q33. List some common plants of moist deciduous forest.

A33. Pterocarpes, Salmalia, Albizzia, Bamboo and cane palm.

Q34. What types of forests are found in Rajasthan?

A34. Thorn and scrub forests.

Q35. Name some common plants of thorn and scrub forest.

A35. Acacia, Ber, Neem, Karonda.

Q36. Which forests are common along river deltas?

A36. Mangrove forests.

Q37. After which plant Sunderban of Bengal is named?

A37. After Sundari or Herietiera forms, a common wild tree which is dominant member of Mangrove vegetation in this delta.

Q38. Write two unique characters of Mangrove vegetation.

A38. a) Pneumatophores or respiratory roots which grow against gravity come out of the muddy soil and develop pores for aeration.

b) Vivipary in which germination occurs in parent tree and small seedlings or baby plants or seen hanging on the parent tree. It's a thrilling sight and indicator of Mangrove forest.

Q39. List four important trees of Mangrove forest.

A39. a) Rhizophera

b) Avicinnea

c) Sonneratia

d) Aegiceros

Q40. List some common animals of Mangrove forest.

A40. a) Crocodile.

b) Shore birds.

c) Sand pipers.

d) Water monitor lizards.