Gokhale Memorial Girls' College

Date: 13/04/2023

To whom it may concern

Subject: Completion of ENVS Project by PSYA Gr. A students of Semester II in 2022

The undersigned hereby certifies that the students mentioned in the table given below have completed their AECC 2 - ENVS projects for the University of Calcutta B.A/B.Sc. Semester-II Examination, 2022. These students are mentioned in the modified template of Metric 1.3.2 (as DVV compliance) as ENVS-PSYA Gr. A with pdf link of their projects stated alongside.

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REGISTRATION NUMBER – 013-1211-0007-21

SUBJECT – ENVIRONMENTAL STUDIES

SUBJECT CODE – AECC-2

COLLEGE – GOKHALE MEMORIAL GIRLS' COLLEGE

TOPIC

VISIT TO A LOCAL POLLUTED SITE – URBAN/ RURAL/ INDUSTRIAL/ AGRICULTURAL

ACKNOWLEDGMENT

I would like to thank our respected Principal Ma'am, Dr. Atashi Karpha and our respected Namrata Basu Ma'am for giving us the opportunity to work on this project and guiding our way through it .

CONTENTS

TOPIC– VISIT TO A LOCAL URBAN POLLUTED AREA

INTRODUCTION

Pollution is the introduction of harmful materials into the environment. These harmful materials are called pollutants. Pollutants can be natural , such as volcanic ash . They can also be created by human activity , such as trash run-off produced by factories.Pollutants damage the quality of air , water and land. The three major types of pollution are –

• **Air pollution** -The presence in or introduction into the air of a substance which has harmful or poisonous effects.

• **Water pollution-** Water pollution is the contamination of water sources by substances which make the water unusable for drinking, cooking, cleaning, swimming, and other activities.

• **Land pollution** - Land pollution refers to the deterioration of the earth's land surfaces, at and below ground level.ve pollution , etc. Other types of pollution are light , noise, thermal, radioactive pollution etc. The four main sectors in which pollution can be seen are –

• **Urban**- urban pollution refers to the presence or introduction in cities and urban areas of poisonous or harmful substances.

• **Agricultural**- Agricultural pollution refers to biotic and abiotic by-products of farming practices that result in contamination or degradation of the environment and surrounding ecosystems, and/or cause injury to humans and their economic interests.

• **Industrial**- Industrial pollution is characterized as pollution that originates directly from industry. This form of pollution is one of the most common sources of pollution around the world. Industrial operations are a significant cause of pollutants in the air, water, and soil, resulting in sickness and death all over the world

• **Rural** – Rural pollution refers to the contamination of the rural areas due to agricultural activities, power plants nearby rural areas and heavy industries built in these areas.

In this following field study , pollution in ***urban sector*** has been focused.

URBAN POLLUTION

- ***DEFINITION***

Urban pollution refers to the presence or introduction in cities and urban areas of poisonous or harmful substances. It may come from natural sources, but the most detrimental are those emissions related to human activities.

- ***CAUSES***

1. ***Transportation***- The use of private vehicles (particularly older, diesel models) is the major source of urban air pollution.

2. ***Domestic use of fossil fuels***- The usage of fuels including wood, charcoal and coal, are burned in inefficient stoves that release large quantities of health-damaging pollutants.

3. ***Industrialisation***- Factories release many toxic gases due to the burning of fossil fuels and the use of chemicals. These gases react with each other and with other atmospheric constituents.

4. ***Power generation***- fossil fuels are tremendously being used to generate energy as they are cheap and readily available. The coal powered power plants are a major source of urban air pollution.

5. ***Combustion and agriculture*** - Combustion of material is an activity that releases toxic gases in the atmosphere and contributes to urban air pollution.

- ***EFFECTS***

1. Respiratory and heart problems
2. Global warming
3. Acid rain
4. Eutrophication
5. Wildlife endangerment

- ***PREVENTION***

1.Using public transport

2. Reducing the usage of plastic bags

3. Use of fans instead of air conditioners

4. Not burning firecrackers

5 . Afforestation

DHAPA DUMPING YARD(LAND POLLUTION)

LAND POLLUTION

- ***DEFINITION***

Land pollution refers to the deterioration of the earth's land surfaces, at and below ground level. The cause is the accumulation of solid and liquid waste materials that contaminate groundwater and soil.

In the following field study , the land pollution in Dhapa , East kolkata has been focused.

- ***CAUSES***

1. *Deforestation and soil erosion*-Deforestation carried out to create drylands is one of the major concerns. Land that is once converted into dry or barren land can never be made fertile again, whatever the magnitude of measures to redeem it is.

2. *Agricultural activities* -With the growing human population, the demand for food has increased considerably. Farmers often use highly toxic fertilizers and pesticides to get rid of insects, fungi and bacteria from their crops. However, with the overuse of these chemicals, they result in contamination and poisoning of soil.

3. *Overcrowded landfills* - Each household produces tonnes of garbage each year. Garbage like aluminium, plastic, paper, cloth, wood is collected and sent to the local recycling unit. Items that can not be recycled become a part of the landfills that hamper the beauty of the city and cause land pollution.

4. *Construction activities* - Due to urbanization, a large number of construction activities are taking place, which has resulted in huge waste articles like wood, metal, bricks, plastic that can be seen by naked eyes outside any building or office which is under construction

5. *Sewage treatment*- A large amount of solid waste is leftover once the sewage has been treated. The leftover material is then sent to the landfill site, which ends up

polluting the environment

- **EFFECTS**

1.Water that isn't safe to drink.

2. Polluted soil, which leads to a loss of fertile land for agriculture.

3.Climate change, which causes an onslaught of disastrous problems, including flash floods and irregular rainfalls .4.The endangerment and extinction of species in wildlife.

5.Habitat shifting, where some animals are forced to flee where they live in order to survive.

- ***PREVENTION***

1. Avoid use of chemicals in farming.
2. Reduce waste.
3. Recycle and reuse to stop pollution.
4. Take initiative to inform others about the harmful effects of littering.
5. Improve fertility of the land by deforestation.

DHAPA DUMPING GROUND

ABOUT DHAPA DUMPING GROUND

Dhapa is a locality on the fringes of East kolkata , India . The area consists of landfill sites where the solid wastes of the city of Kolkata are dumped. "Garbage farming" is encouraged in the landfill sites.More than 40 per cent of the green vegetables in the Kolkata markets come from these lands.There are four sectors in Dhapa for dumping garbage that are filled with 2,500 tonnes of waste per day.

Pollution in Dhapa

Dhapa has been a major victim of Air and sound pollution. In 1986 the pond next to the Dhapa Post Office was filled by the city garbage. As a result, at least 65% of the population above the age of 35 are infected by the exposure to tuberculosis. Now this pond is the current day Dhapa Saag bazaar which is a money minting ground for politically supported mafias. They use this ground for snatching (Hafta) money from the poor peasants

IMPROVEMENT MEASURES

The World Bank is funding a project of phyto-capping the whole area and it will cost no less than 60 crores. This dumpsite was operating since 1987, and catered to almost 300 lakh tonnes of municipal solid waste. Engineers are currently engaged in the largest scientific closure of the Dhapa dumpsite.

CONCLUSION

Pollution has been and is still , posing a great threat to our nature's wellbeing .Pollution affects the quality of life more than one can imagine. It works in mysterious ways, sometimes which cannot be seen by the naked eye. However, it is very much present in the environment.After learning the harmful effects of pollution, one must get on the task of preventing or reducing pollution as soon as possible. It is upon us and the society at large, to work unitedly towards the prevention of pollution and protect our environment . Everyone must take a step towards change ranging from individuals to the industries.

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IMAGE SOURCE

KMC Dhapa Garbage Dumping Ground

GCPF+WR, Khanaberia, Dhapa, Kolkata, West Bengal 700105 https://g.co/kgs/qSzDdY

20/6/22

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UNIVERSITY ROLL NUMBER — 212013-11-0005

SUBJECT CODE — AECC-2

COLLEGE — Gokhale Memorial Girl's College

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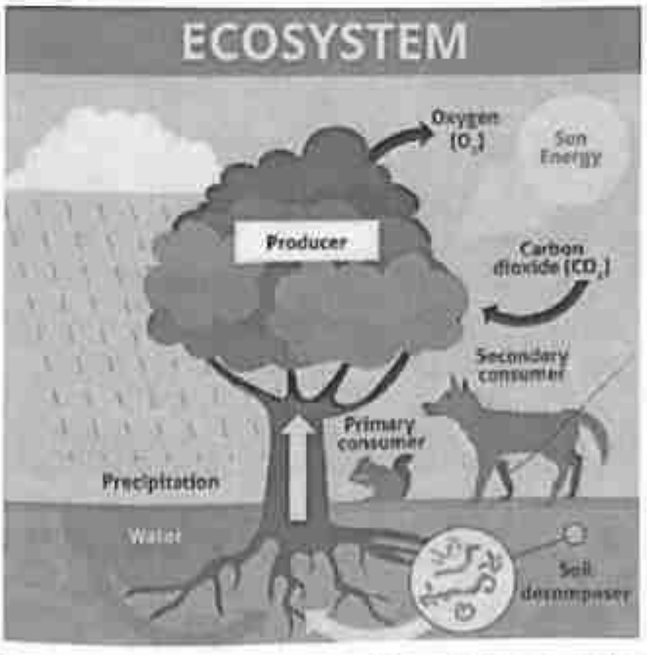
INTRODUCTION

Life does not exist in space or isolation. It needs a substratum which provides space, necessary substances and favourable conditions for living organisms. In an area, the community of living organisms interacts with its physical environment to form a definite structural and functional system. This structural and functional unit of life in nature is called an Ecological System or simply an Ecosystem (Asthana, D. K. (2006). Text Book of Environmental Studies).

The term "ecosystem" was first used by a British ecologist Arthur Tansley in 1935. An ecosystem (or ecological system) consists of all the organisms and the physical environment with which they interact. These biotic and abiotic components are linked together through nutrient cycles and energy flows. Ecosystems are controlled by external and internal factors. External factors such as climate, parent material which forms the soil and topography, control the overall structure of an ecosystem but are not themselves influenced by the ecosystem. Internal factors are controlled, for example, by decomposition, root competition, shading, disturbance, succession, and the types of species present.



Pictorial presentation of an ecosystem (Copyright -edusaksham.com)

RIVER ECOSYSTEM

River ecosystems are flowing waters that drain the landscape, and river ecosystems are part of larger watershed networks or catchments, where smaller headwater streams drain into mid-size streams, which progressively drain into larger river networks. The major zones in river ecosystems are determined by the river bed's gradient or by the velocity of the current. Faster moving turbulent water typically contains greater concentrations of dissolved oxygen, which supports greater biodiversity than the slow-moving water of pools. These distinctions form the basis for the division of rivers into upland and lowland rivers.

River ecosystems are prime examples of lotic ecosystems. Lotic refers to flowing water, from the Latin lotus, meaning washed. Lotic waters range from springs only a few centimetres wide to major rivers kilometres in width. The river ecosystem includes the biotic (living) interactions amongst plants, animals and micro-organisms, as well as abiotic (non-living) physical and chemical interactions of its many parts.

This stream in the Redwood National and State Parks together with its environment can be thought of as forming a river ecosystem (Copyright -Wikipedia.)

ABIOTIC COMPONENTS

The non-living components of the river ecosystem which are called abiotic components includes:

a. **Water flow-** Unidirectional water flow, which can vary between systems is the key factor in lotic systems influencing their ecology, where streamflow which is the result of the summative inputs from groundwater, precipitation, and overland flow, can be continuous or intermittent. Streamflow Rivers are continuously eroding, transporting, and depositing substrate, sediment, and organic material. The continuous movement of water and entrained material creates a variety of habitats, including riffles, glides, and pools.

Rapids in Mount Robson Provincial Park (Copyright - Wikipedia)

b. **Light-** Light is very important to lotic systems, because it provides the energy necessary to drive primary production via photosynthesis, and can also provide refuge for prey species. Larger river systems which also tends to be more turbulent, are wide so the influence of external variables is minimized, and the sun reaches the surface. Seasonal and diurnal factors might also play a role in light availability.

c. **Temperature-** Most lotic species are poikilotherms whose internal temperature varies with their environment; thus, temperature is a key abiotic factor for them. Shallow streams are typically well mixed and maintain a relatively uniform temperature within an area. In deeper, slower moving water systems, however, a strong difference between the bottom and surface temperatures may develop. The amount of shading, climate and elevation can also influence the temperature of lotic systems.

d. **Substrate-** The inorganic substrate which can also be organic and may include fine particles, autumn shed leaves, large woody debris such as submerged tree logs, moss, and semi-aquatic plants of lotic systems is composed of the geologic material present

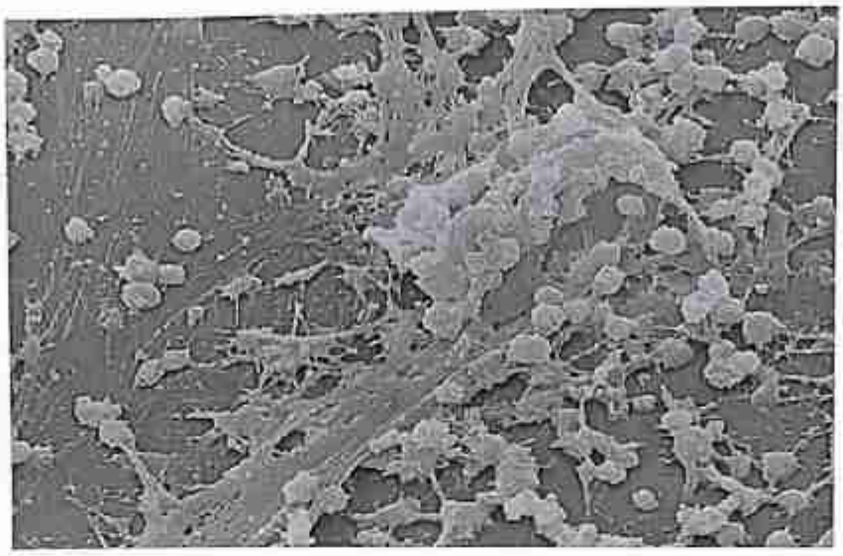
in the catchment that is eroded, transported, sorted, and deposited by the current. Inorganic substrates are classified by size on the Wentworth scale, which ranges from boulders, to pebbles, to gravel, to sand, and to silt.

River channel with boulder substrate (Copyright - iStock)

BIOTIC COMPONENTS

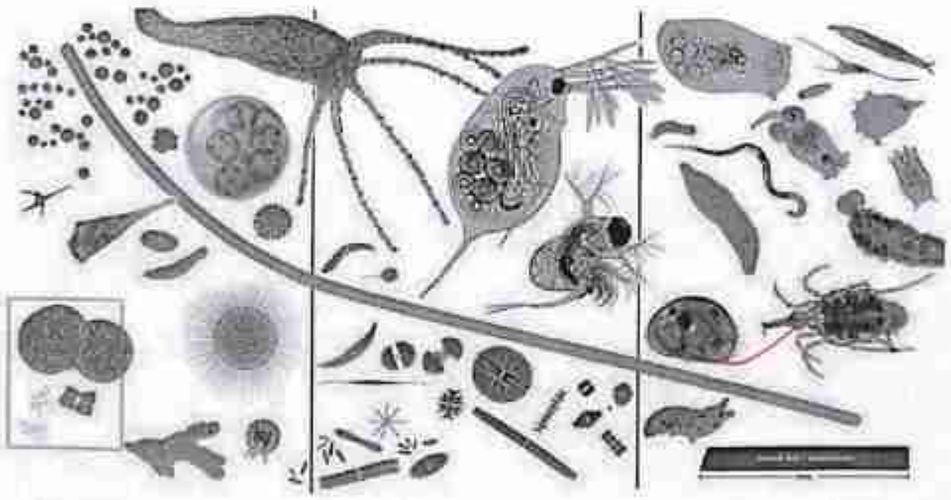
The living components of the river ecosystem which are the biotic components includes:

a. **Biofilm-** A biofilm is a combination of algae, fungi, bacteria, and other small microorganisms that exist in a film along the streambed. Biofilms which are understood as microbial consortia of autotrophs and heterotrophs, coexisting in a matrix of hydrated extracellular polymeric substances (EPS), are one of the main biological interphases in river ecosystems, and probably the most important in intermittent rivers.



Biofilms (Copyright - hfmmagazine.com)

b. Microorganisms- Bacteria are present in large numbers in lotic waters. Free-living forms are associated with decomposing organic material, biofilm on the surfaces of rocks and vegetation, in between particles that compose the substrate, and suspended in the water column. Bacteria play a large role in energy recycling.

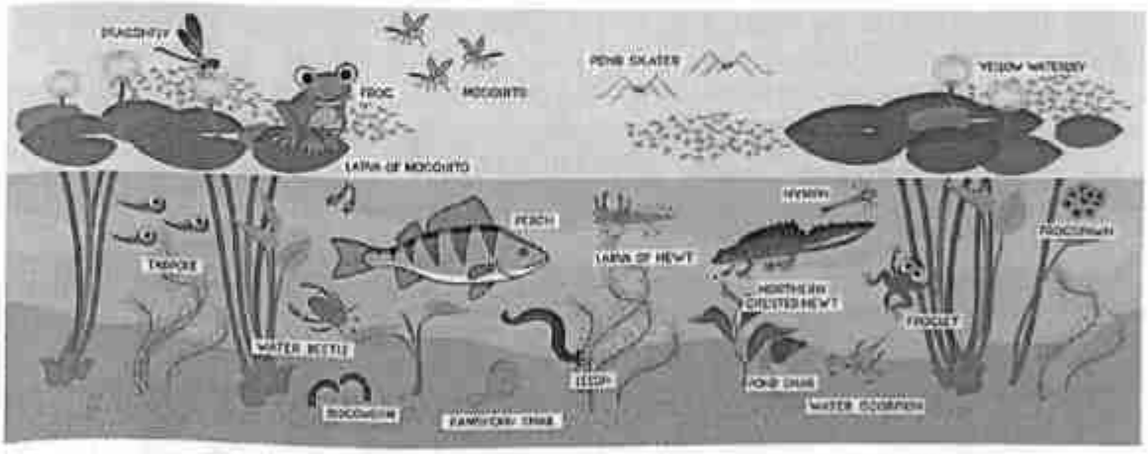


Mysterious Microorganisms of river ecosystem (Copyright - water-detective.net)

c. Insects and invertebrates- Up to 90% of invertebrates in some lotic systems are insects. These species exhibit tremendous diversity and can be found occupying almost every available habitat. e common orders of insects that are found in river ecosystems include mayfly, caddisfly, stonefly, some types of beetles, dragonfly, damselfly and some types true bugs along with molluscs such as snails and mussels, as well as crustaceans like crayfish and crabs.

The Giant Bug – A part of the river ecosystem (Copyright – ThoughtCo.)

c. **Fish and vertebrates-** Fish are probably the best-known inhabitants of lotic systems. The ability of a fish species to live in flowing waters depends upon the speed at which it can swim and the duration that its speed can be maintained. Continuous swimming expends a tremendous amount of energy and, therefore, fishes spend only short periods in full current. Salmon, Eels, amphibians, such as salamanders, reptiles (e.g., snakes, turtles,) various bird species, and mammals (e.g., hippos, river dolphins). With the exception of a few species, these vertebrates are not tied to water as fishes are, and spend part of their time in terrestrial habitats.



Vertebrates of the river ecosystem (Copyright - shutterstock)

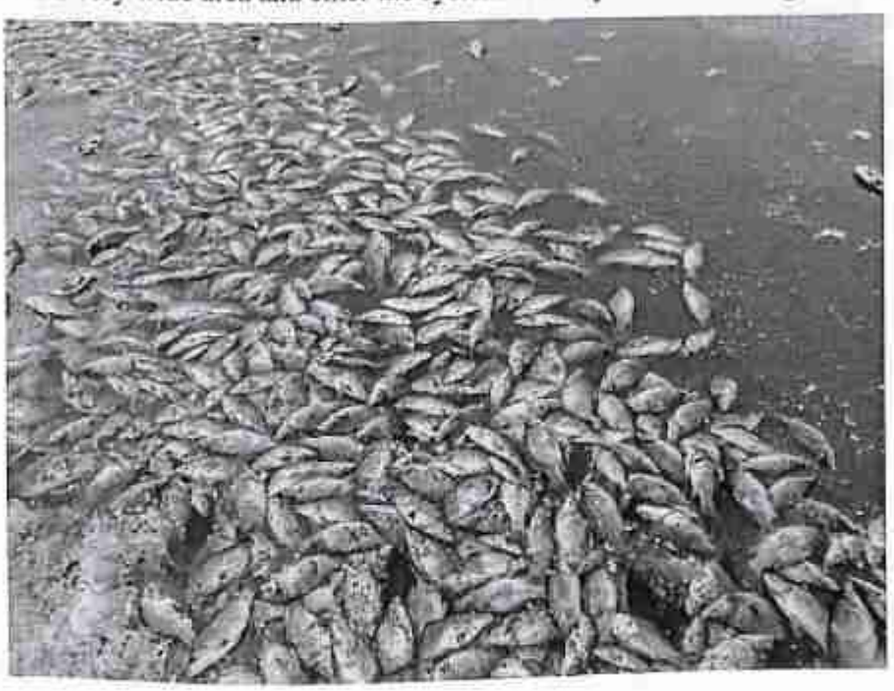
HUMAN IMPACTS

River pollution includes sewage and septic inputs, plastic pollution, nano-particles, pharmaceuticals and personal care products, synthetic chemicals, road salt, inorganic contaminants (e.g., heavy metals), and even heat via thermal pollutions. Another pollutant, acid rain, forms from sulphur dioxide and nitrous oxide emitted from factories and

power stations. These substances readily dissolve in atmospheric moisture and enter lotic systems through precipitation. This can lower the pH of these sites, affecting all trophic levels from algae to vertebrates. Mean species richness and total species numbers within a system decrease with decreasing ph.

Effect of sewage on River ecosystem (Copyright - Sciencing)

The effects of pollution often depend on the context and material, but can reduce ecosystem functioning, limit ecosystem services, reduce stream biodiversity, and impact human health. Pollutant sources of lotic systems are hard to control because they can derive, often in small amounts, over a very wide area and enter the system at many locations along its length.



Near about 28,656 fishes di due to pollution (Copyright - iStock)

Flow modification can occur as a result of dams, water regulation and extraction, channel modification, and the destruction of the river floodplain and adjacent riparian zones. Dams, which can cause enhanced clarity and reduced variability in stream flow, alter the flow, temperature, and sediment regime of lotic systems.

Invasive species have been introduced to lotic systems through both purposeful events (e.g., stocking game and food species) as well as unintentional events (e.g., hitchhikers on boats or fishing waders). These organisms can affect natives via competition for prey or habitat, predation, habitat alteration, hybridization, or the introduction of harmful diseases and parasites.

Invasive fish species that poses threat to Hudson River Ecosystem (Copyright – Westfair communications)

CONCLUSION

Large rivers being the lifeline od human beings have been serving for millennia as sources of food, water and energy. Despite the importance of a river ecosystem, human intervention and many other factors have led to its destruction and degeneration. Hence, river ecosystems should be saved from the hands of destruction by being more cautious and adapting to various preventive measures.

ACKNOWLEDGEMENT

I wish to express my sincere thanks to our ENVS Professor, Madam Namrata Basu, for sharing her expertise, and sincere and valuable guidance and encouragement. I also place on record, my sense of gratitude to one and all, who directly or indirectly, have put in their

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AB
20/6/2022

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STUDY OF ECOSYSTEMS – POND, RIVER, WETLAND, FOREST, ESTUARY AND AGRO ECOSYSTEMS

INTRODUCTION

ECOLOGY :

Ecology is a branch of science that studies organisms, the environment and how the organisms interact with each other and their environment.

A part of the subject matter of ecology are ecosystems.

AN INTRODUCTION TO THE STUDY OF ECOSYSTEMS :

An ecosystem (or ecological system) consists of all the organisms and the physical environment with which they interact. An ecosystem includes all the living things (plants, animals and organisms) in a given area, interacting with each other, and with their non-living environments (weather, earth, sun, soil, climate, atmosphere). In an ecosystem, each organism has its own niche or role to play. They are the foundations of the biosphere and they determine the health of the entire Earth system.

Ecosystems can be of any size, but usually they are places. It may be a whole forest, as well as a small pond. Ecosystem boundaries are not marked by rigid lines.

The structure of an ecosystem is characterised by the organisation of both biotic and abiotic components. Biotic components refer to all living components in an ecosystem. Abiotic components are the nonliving components of an ecosystem. Both of them are interrelated.

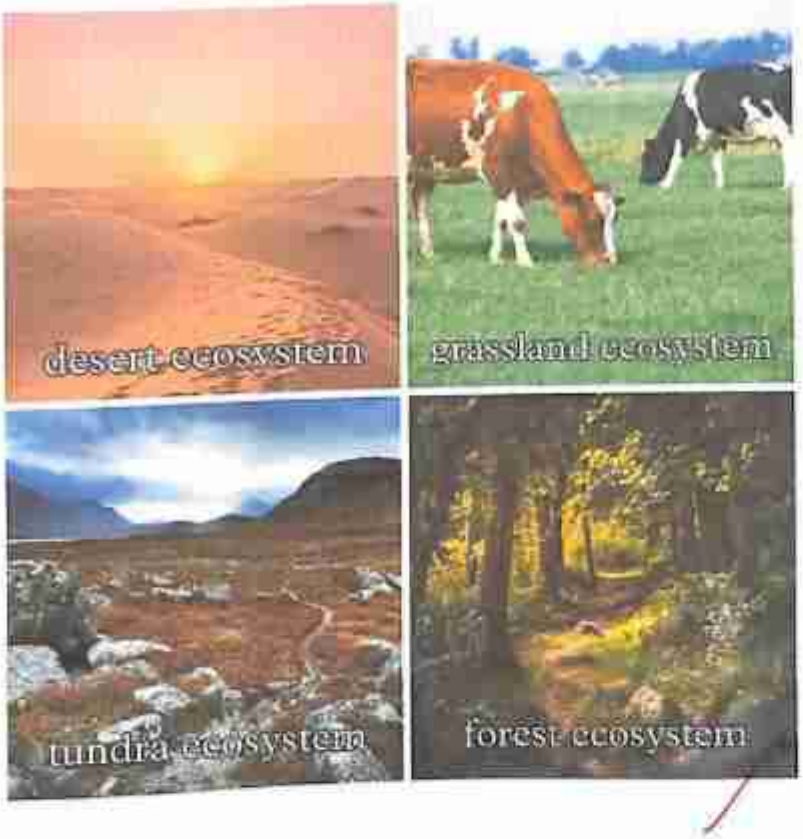
TYPES OF ECOSYSTEM :

There are two types of ecosystem:

- Terrestrial Ecosystem
- Aquatic Ecosystem

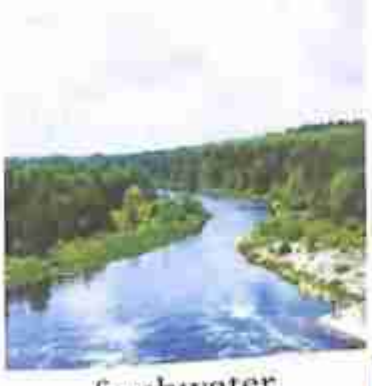
Terrestrial ecosystems are exclusively land-based ecosystems. There are different types of terrestrial ecosystems distributed around various geological zones. They are as follows:

- Forest Ecosystem
- Grassland Ecosystem
- Tundra Ecosystem
- Desert Ecosystem



Aquatic ecosystems are ecosystems present in a body of water. These can be further divided into two types, namely:

- Freshwater Ecosystem
- Marine Ecosystem



freshwater ecosystem

marine ecosystem

THE MARINE ECOSYSTEM :

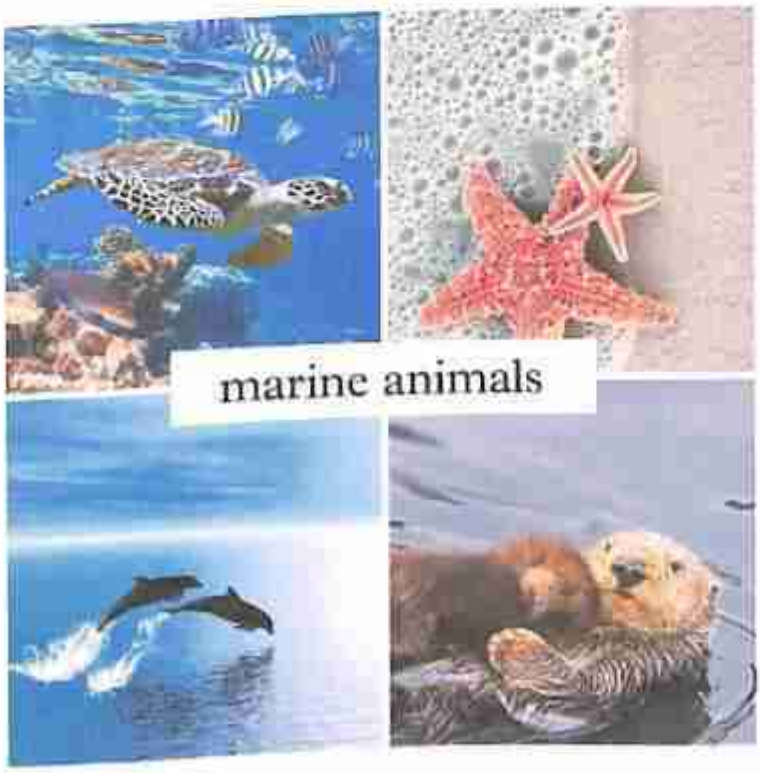
Marine ecosystems are aquatic environments with high levels of dissolved salt, such as those found in or near the ocean. A marine ecosystem is any that occurs in or near salt water, which means that marine ecosystems can be found all over the world, from a sandy beach to the deepest parts of the ocean. An example of a marine ecosystem is a coral reef, with its associated marine life, including fish and sea turtles and the rocks and sand found in the area. Marine ecosystems are defined by their unique biotic (living) and abiotic (non-living) factors. Biotic factors include plants, animals, and microbes; important abiotic factors include the amount of sunlight in the ecosystem, the amount of oxygen and nutrients dissolved in the water, proximity to land, depth, and temperature. Sunlight is one of the most important abiotic factors for marine ecosystems. The topmost part of a marine ecosystem is the euphotic zone, extending down as far as 200 meters below the surface. At this depth, there is sufficient light for regular photosynthetic activity. Most marine life inhabits this zone. Below the euphotic zone is the dysphoric zone, which can reach from 200 to as deep as 1,000 meters below the surface. At these depths, sunlight is still available, but only enough to facilitate some photosynthesis. Below the dysphoric zone lies the aphotic zone, which does not receive any sunlight.

Scientists divide marine ecosystems into several broad categories, although there are discrepancies depending on the source about what qualifies as a marine ecosystem. The number of marine ecosystems is actively debated. Although there is some disagreement, several types of marine ecosystems are largely agreed on: estuaries, salt marshes, mangrove forests, coral reefs, the open ocean, and the deep-sea ocean. The ocean covers 71 percent of the planet, so marine ecosystems make up most of the Earth.

Healthy marine ecosystems are important for society since they provide services including food security, feed for livestock, raw materials for medicines, building materials from coral rock and sand, and natural defences against hazards such as coastal erosion and inundation.

BIODIVERSITY IN THE MARINE ECOSYSTEM :

The marine ecosystem supports great biodiversity as compared to other ecosystems of the planet. The species of the marine ecosystem have adapted the aquatic culture for its survival. Some of the common aquatic species are,



- Plants like kelp, phytoplankton, seaweeds, seagrasses, mangroves, etc.
- Fishes like sharks, tuna, grouper, eels, seahorse, etc.
- Mammals like seals, dolphins, blue whales, walruses, etc.
- Molluscs like cuttlefish, conch, oysters, snails, octopus, etc. and many more species.

TYPES OF MARINE ECOSYSTEM :

Marine ecosystem types include open deep sea, salt water wet-land, coral reefs, estuary, mangroves, sandy beach, kelp forest, polar marine and rocky marine ecosystem.

- **Open Marine Ecosystem** : This open water surface is known as the marine ecosystem; This is the upper layer of the ocean where sun rays reach quite easily.

• **Deep Sea Marine Ecosystem** : The ecosystem deep inside the oceans at its floor is known as the deep sea marine ecosystem.

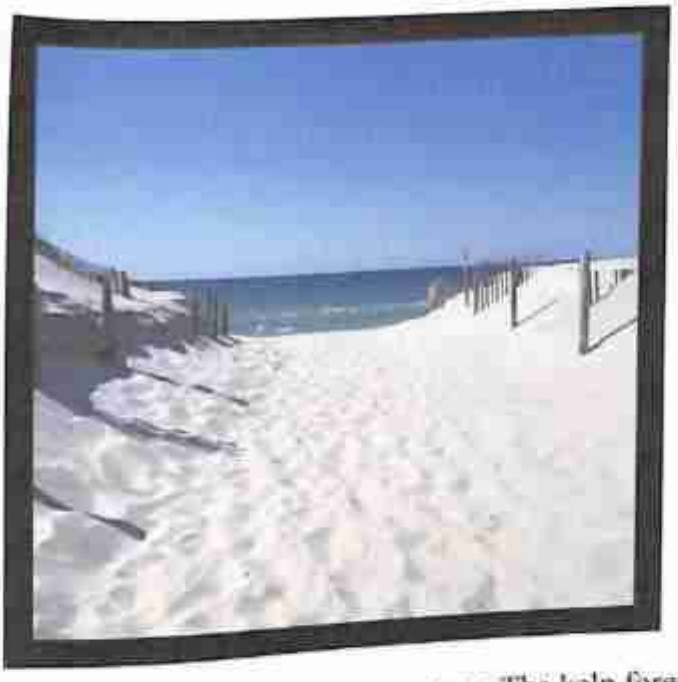
• **Coral Reef Marine Ecosystem** : This ecosystem is mostly found in tropical waters and is quite a productive ecosystem found on the Earth.

• **Saltwater Wetland Marine Ecosystem** : The coastal areas of oceans and seas are known as the saltwater wetland ecosystem.

• **Estuary Marine Ecosystem** : The area around the river mouth where it merges with marine water is usually termed as an estuary marine ecosystem.

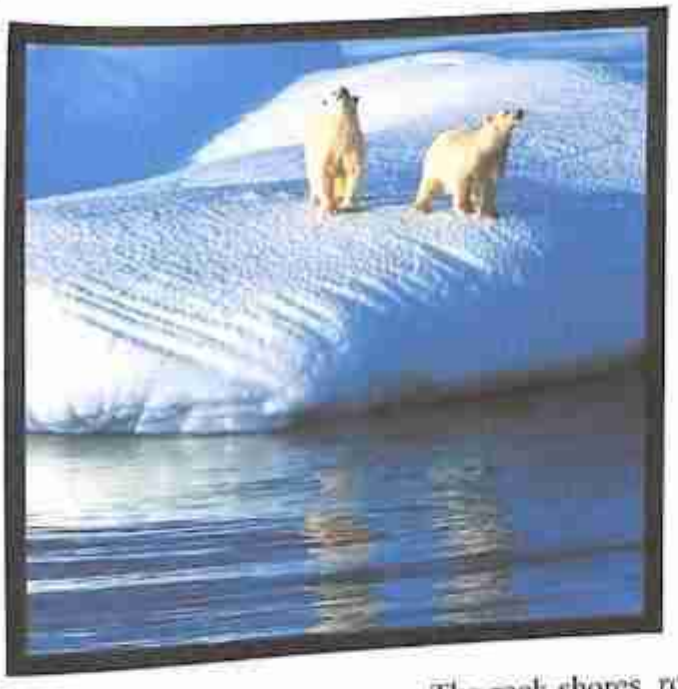
• **Mangrove Marine Ecosystem** : In some tropical and sub-tropical coastal regions, a special type of saltwater swamp is found, which is known as mangroves.

• **Sandy Beach Ecosystem** : Sandy's ecosystem is quite poor in terms of biodiversity as compared to different marine ecosystems.

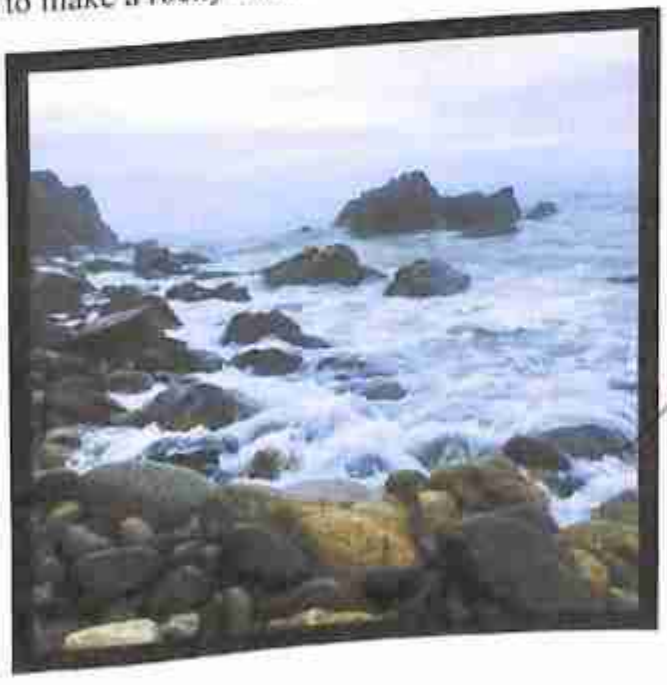


• **Kelp Forest Marine Ecosystem** : The kelp forest ecosystem is found in comparative cooler water.

• **Polar Marine Ecosystem** : As the climate of Polar Regions is extremely cold; thus, the temperature of this type of marine ecosystem is also too cold.



• **Rocky Marine Ecosystem** : The rock shores, rock cliffs, boulders, tide pools, etc. combine to make a rocky marine ecosystem.



CONCLUSION

Ecosystems are created by the interrelationships between living organisms and the physical environments they inhabit.

Human beings are part of ecosystems, as well as manipulators of ecosystems. As such we are dependent on, as well as responsible for, the ecological health of the ecosystems we inhabit.

Healthy ecosystems clean our water, purify our air, maintain our soil, regulate the climate, recycle nutrients and provide us with food. They provide raw materials and resources for medicines and other purposes.

Ecosystems are the foundation of all civilisation and sustain our economies.

NB 20/6/2022

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ENVS PROJECT FILE

GOKHALE MEMORIAL GIRLS' COLLEGE

STUDY OF ECOSYSTEM, PONDS, RIVERS,WETLANDS,FOREST,ESTUARIES AND AGRO-ECOSYSTEM

ACKNOWLEDGEMENT

I am grateful to my ENVS teacher Miss. Namrata Basu who provided us the opportunity to work on the topic of Study of ecosystem,ponds, rivers, wetland,forest,estuaries and agro-ecosystem. She provided us with all the necessary information she could and helped us complete the project without any difficulty. I would also like to thank my parents for their cooperation.

Thank you

INTRODUCTION

An ecosystem is a community of living organisms (plants, animals and microbes) in conjunction with the non-living components of their environment (things like air, water, and mineral soils), interacting as a system. These biotic and abiotic components are regarded as linked together through nutrient cycles and energy flows.

Ecosystems can be defined as the network of interactions among organisms, and between organisms and their environment. They can be of any size but usually encompass specific, limited spaces. They also influence the quantity of plant and microbial biomass present. By breaking organic matter, decomposers release carbon back to the atmosphere and facilitate nutrient cycling by converting nutrients stored in dead biomass back to a form that can be readily used by plants and other microbes.

Ecosystems are controlled by both external and internal factors. External factors such as climate, the parent material which forms the soil topography,control the overall structure of an ecosystem and the way things work within it, but are not themselves influenced by the ecosystem

TYPES OF ECOSYSTEMS

Aquatic Ecosystem
Marine water Ecosystem

- Large marine water Ecosystem

Freshwater Ecosystem

- Lake Ecosystem
- River Ecosystem
- Weland

Terrestrial Ecosystem

- Forest
- Littoral zone
- Riparian zone
- Subsurface lithoautotrophic ecosystem
- Urban ecosystem
- Desert

POND ECOSYSTEM

P.T.O

A pond is different from a river, they are hollows with water in them. There is very little flow of water in a pond. In this still water a whole community of plants and animals can grow who maintain an ecosystem with their environment for maintaining the correct balance in nature.

Habitat and Biodiversity

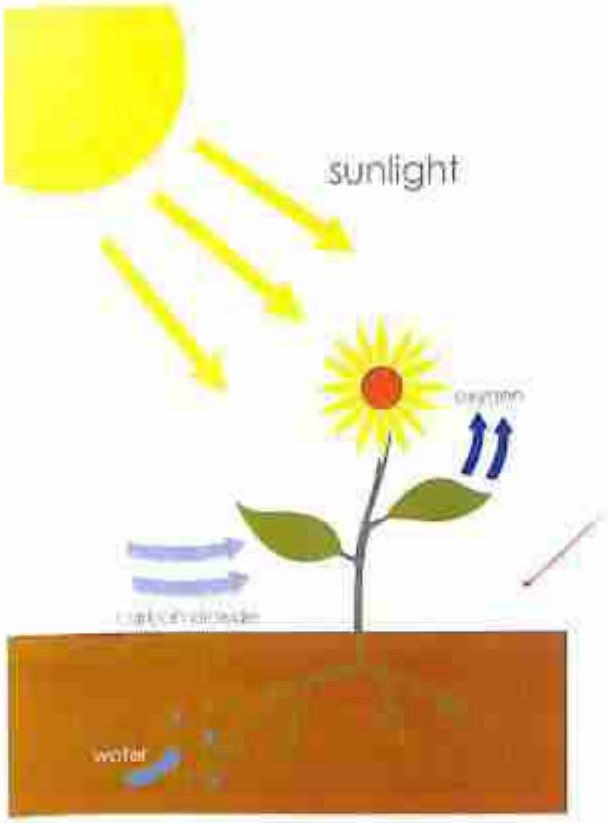
At one time there were many ponds than we have today. Farmers needed ponds for their cattle. They now have piped water. . Therefore ponds have disappeared which has reduced the habitat available to wildlife. This means that many pond creatures have become rarer. The word for the variety of life is biodiversity. Our native biodiversity is being reduced due to the lack of pond habitat.

Safety

Ponds may sometimes prove to be dangerous too. Steep sides and mud at the bottom can make even the shallowest water very dangerous.

Photosynthesis

P.T.O



Plants make their own food. They do this by using water and carbon dioxide to absorb the sun's rays. This is called photosynthesis. Plants are essential for all life present on earth. They absorb carbon dioxide and produce oxygen which allws animals to breathe. They also provide food for animals to eat. This is true of all ecosystems be it land or water, photosynthesis plays a very important role. A food chain would be better to understand how animals are dependent on plants.

Plants found in ponds

- Plankton

Plankton is the smallest plant found in pond water. They are so tiny that they cannot be seen except with a microscope.

- Algae

- Another type found is Algae. They float on ponds as what looks like green acum. However, they sometimes prove to be a threat for the pond water therefore farmers use chemicals like nitrates and phosphates as fertilizers.

- Plant Succession

If one looks at the pond one can see that some plants live entirely in it. Others are partially in the water. Flowers like forget- me - not and marsh marigolds live in the wet ground around the pond. Water lilies float in the pond and are attached to the bottom by long stems.

Creatures found in ponds

- Snail

A large community of snails are found in ponds. They vary in size from 25 - 50 mm. They have a hard shell and belong to mollucus kingdom. They float about and have gills which allow them to breathe underwater. They feed on algae.

- Shrimp 

The shrimp can be about 16mm. They are arachnids. They have 7 or 9 pairs of legs. They swim on their sides. They feed on floating dead matter in ponds. However, they don't live in polluted water, their presence indicates that the water is not polluted.

- Pond Skater

These are about 20mm across. They have 6 legs. They are held out from the body so it can spread its weight as widely as possible. This allows it to make across the surface very quickly allowing it to catch prey, the small creatures which live on the surface.

Food chain and Ecology of Pond

The picture below illustrates some of the life in the pond. All life in a pond depends upon the availability of the plants to photosynthesise. The animals are then able to feed from the plants

Following are the consumers of the pond habitat food chain :

- Primary consumers are the herbivores that depend on the producers for food- examples, tadpoles, snails, tin fishes, etc. 
- Secondary consumers are organisms which depend on the primary consumers for food- example, medium size fishes, frogs etc  .
- Tertiary consumers are organisms which can feed on the primary and the secondary consumers-example, ducks, cranes etc  .
- Top consumers are predators, which include the osprey, fish hawk, and humans.

Conclusion

Therefore, I would like to conclude by saying that we should try protecting our environment which will help maintain the ecological balance, by preserving trees and plants because they are the primary agent which help maintain the balance of the ecosystem.

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THANK YOU

AB
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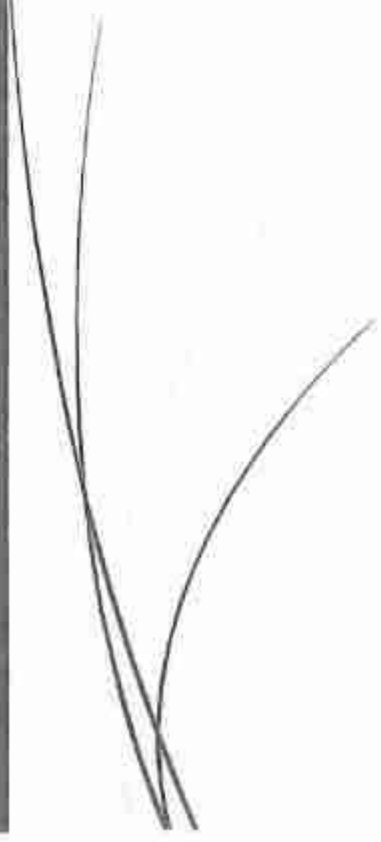
ENVS

Study Of Ecosystems-

FOREST



INTRODUCTION

A system formed by the interaction of all living organisms with each other and with physical and chemical factors of the environment in which they live, all linked by the transfer of energy and material, is called an ecosystem.

TYPES OF ECO-SYSTEM:

There are two types of ecosystems, mainly:

ECO-SYSTEM

1. Terrestrial Ecosystems: Terrestrial ecosystems are classified into various types based on temperature and annual rainfall. A few examples of terrestrial ecosystems are listed below:

a. Grassland Ecosystems

b. Forest Ecosystems

c. Desert Ecosystems

d. Cropland Ecosystems

2. Aquatic Ecosystems: Aquatic ecosystems are majorly two types-

a. Freshwater/Inland Ecosystems

b. Marine/Saltwater Ecosystems

Forest Eco-system

A forest ecosystem is an ecosystem of forests and resources. Forests are renewable natural resources. Forests are formed by a community of predominantly structurally defined plants by their trees, shrubs, herbs, climbers, and ground cover. Soil, animals, insects, microorganisms, and birds are the most important interacting units of a forest ecosystem. In India, the forests occupy about 18–20% of the total land area.

1. Abiotic Components of the forest include inorganic and organic components present in the soil along with temperature, rainfall, light, etc.

2. Biotic Components are represented by producers, consumers, and decomposers.

Types of Forest Ecosystem:

EVERGREEN RAINFOREST

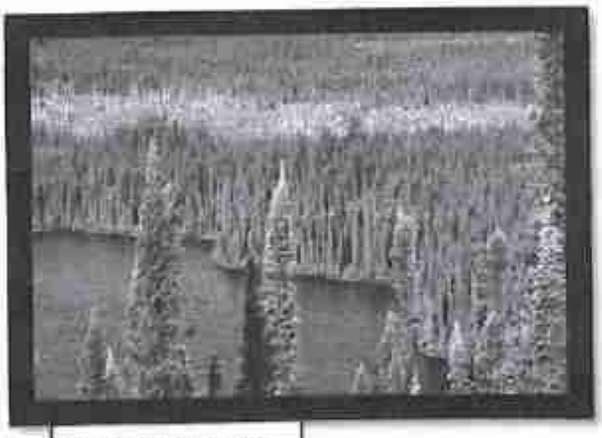
There are a few types of forest ecosystems listed below:

1. Tropical Evergreen Rainforest: Only a small percentage of tropical forests are rainforests where average rainfall is 80–400 inches in a year. This forest is characterized by deep and dense vegetation consisting of tall trees reaching different levels.

2. Tropical Deciduous Rainforest: The main characteristic of tropical deciduous rainforest are broad-leaved trees along with dense bushes, shrubs, etc. Two main seasons- summer and winter are distinctly visible there. This type of forest is found in many parts of the world. A large variety of flora and fauna are found here.

3. Temperate Evergreen Forest: Temperate evergreen forest is a type of forest that is characterized by a smaller number of trees but an adequate number of ferns and mosses.

4. Temperate Deciduous Forest: Temperate deciduous forest evolves in the moist temperate region with sufficient rainfall. Here also, winter and summer are well defined, and trees shed their leaves during winter. Dominant trees are maple, oak, peach, etc.



BOREAL FORESTS

5. Taiga/Boreal: Situated just south of the Tundra, Taiga is characterized by evergreen conifers. The average temperature is below the freezing point for almost half of the year.

Components of forest Eco-system

1. Producers: Producers can synthesize their own food by the photosynthesis process. All green plants are considered producers of the ecosystem as

they convert sunlight into the chemical energy of food.

2. Primary Consumers: Since the consumers can not prepare their own food, they depend on producers. Herbivorous animals get their food by eating the producers (plants) directly. Examples of primary consumers are grasshoppers, deer, etc.

HERBIVORES- PRIMARY CONSUMERS

3. Secondary Consumers: Secondary consumers draw their food from primary consumers.

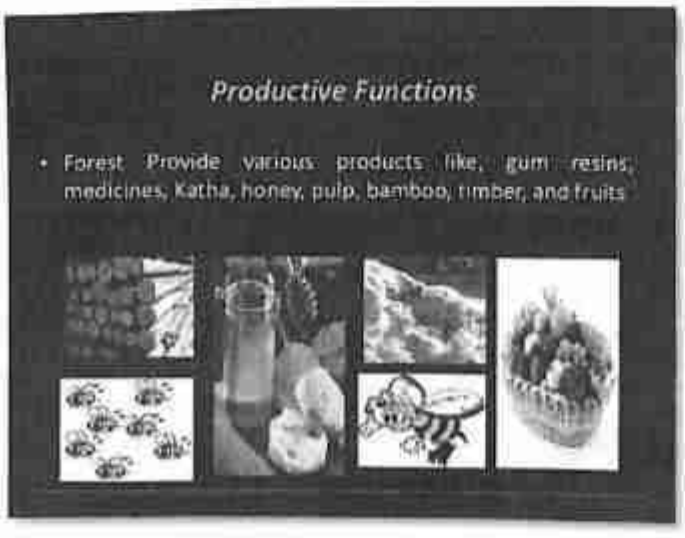
4. Decomposers: The decomposers of the forest ecosystem break down dead plants and animals, returning the nutrients to the soil so that they can be used by the producers. Apart from bacteria, ants and termites are important decomposers in the Amazon rainforest. Millipedes and earthworms also help to break down dead matter.

5. Nutrient Cycle: The nutrient cycle is cyclic. For the proper functioning of ecosystems, nutrients are required. Carbon, hydrogen, oxygen, and nitrogen constitute about 95% of the mass of living organisms. About 15 to 20 other elements are also needed in relatively small amounts. These are recycled repeatedly between the living and non-living components of the ecosystem.

6. Energy Flow: In a forest ecosystem, the grass, which draws its nutrition from sun, soil and water, is eaten by the grasshopper, which in turn is eaten by frogs, snakes and vultures in succession (different trophic levels). In this process of eating and being eaten, nutrients are passed from one step to the next in a food chain. The flow of energy that occurs along a food chain is called energy flow. The pyramid of energy represents the total quantity of energy at each trophic level of a food chain. The flow of energy is always unidirectional.

Characteristics of forest ecosystem

1. Forests are characterised by warm temperature and adequate rainfall, which make the generation of a number of ponds, lakes etc.,
2. The forest maintains climate and rainfall.
3. The forest supports many wild animals and protects biodiversity.
4. The soil is rich in organic matter and nutrients, which support the growth of trees.



Functions of Forest Eco-system:

1. Goods Obtained from Forests: There are various types of food products such as honey, wild meat, fruits, mushrooms, palm oil and wine, medicinal plants, etc., obtained from forests. Other than edible parts, we can obtain timber, wood biomass, cork, etc., from forests. The fuel can be extracted from old trees that are buried under the soil.

2. Ecological Functions: Forests play an important role in maintaining ecological factors such as

climate, carbon storage, nutrient cycling and rainfall.

3. Culture and Social Benefits: The tribal people who live in the forests treat forests as nature goddesses. The traditional beliefs and spirituality saves wild animals from hunters and cutting down of trees by urban people. Few modern people visit forests for recreation.

CONCLUSION

Conservation of forest is the practice of planting more trees and maintaining the forested areas for the sustainability for future generations. Forests are an important natural resource and are beneficial to humans in several ways. But due to increasing deforestation activities, it has become essential to conserve forests throughout the world. Deforestation is the permanent destruction or loss of forests for the expansion of lands for agriculture, livestock, etc. The process of destructing forests for the expansion of agricultural land is referred to as shifting cultivation.

DEFORESTATION

Following are some of the major steps for conservation of forest:

With the advent of industrialization, several trees have been cut at an alarming rate for raw materials and various other purposes. This felling of trees can be regulated by selective cutting, clear-

cutting and shelterwood cutting.

Forest fires are one of the common causes of loss of forests. Sometimes the forest land is set on fire to make the land available for commercial purposes. Once cleared, there can be no vegetation. Natural forest fires are also responsible for the destruction of huge forest covers. Latest fire fighting techniques should be adopted to conserve the forest. However, forest fires are an important part of the ecosystem and it helps replenish nutrients in the soil from dead and decaying matter.

More trees should be planted to increase the forest cover. Trees should be selected according to the geographical conditions of a particular region and proper care should be taken during the growth of trees.

Prevention of exploitation of forestry and forest products is necessary for the conservation of forest.

The existing forests should be protected from diseases by spraying chemicals, antibiotics or development of pest-resistant strains of trees.

ACKNOWLEDGEMENT

I would like to thank Namrata Basu ma'am for giving me this golden opportunity to be able to work on this enriching project.

I must also thank my parents for being constant support without which it would not have been possible to complete this project in a limited time frame.

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NB
20/6/2022

Title

Visit to an area to document environmental assets: Natural resources/flora/fauna, etc.

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- UNIVERSITY REGISTRATION NUMBER- 013-1211-0037-21
- COLLEGE ROLL NUMBER- 21/BAH/0130
- SUBJECT CODE- AECC 2 (Environmental Science)
- DEPARTMENT- PSYCHOLOGY HONORS
- COLLEGE NAME- GOKHALE MEMORIAL GIRLS' COLLEGE

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Acknowledgement

I would like to thank my teacher Namrata Basu who gave me this golden opportunity to work on this project. I got to learn a lot from this project about our diverse ecosystem and different types of flora and fauna. I would also like to thank our college principal Dr. Atashi Karpha.

At last, I would like to extend my heartfelt thanks to my parents because without their help and support this project would not have been successful. Finally, I would like to thank my dear friends who have been with me all the time.

Introduction

The ecosystem is a complex,interconnected network comprising biotic and abiotic elements. Biotic elements include all living organisms such as plants, animals and microorganisms. Abiotic components, on the other hand, include non-living entities that are vital for the survival of life and these include soil, water, climate, etc. Among all biotic elements, Flora and Fauna are the most fascinating ones.

Ecology is the study of the relation and interactions between organisms and their environment. It comprises the floral and faunal communities of an area. Flora and fauna are words originating from Latin. Flora in Latin means the goddess of the flower. Flora is also derived from the word floral, which means relating to flowers. Therefore flora is a group of indigenous plants in an ecosystem of a geographical region. The origin of the word fauna is a bit shrouded in mystery. According to Roman mythology, Fauna refers to the goddess of fertility. Fauna is sometimes referred to as Fauns, meaning forest spirits. By definition, fauna is a group of indigenous animals of any geographical region. So, the term flora and fauna was coined by biologists to refer to a collection of plant and animal species in a given geographic location.

Sundarbans

Sundarbans is a mangrove area in the delta formed by the confluence of the Padma, Brahmaputra and Meghna Rivers in the Bay of Bengal. It spans the area from the Baleswar River in Bangladesh's division of Khulna to the Hooghly River in India's state of West Bengal. It comprises closed and open mangrove forests, land used for agricultural purpose, mudflats and barren land, and is intersected by multiple tidal streams and channels. It was set up as a sanctuary in 1976 It is home to a rich population of different species of wildlife.

Some of the more commonly found plants and trees include Genwa, Dhundal, Passur, Garjan, Kankra, Sundari, and Goran. The Sundarbans forest serves as home to more than 200 tigers. Some of the more popular birds found in that region include: Open Billed Storks, White Ibis, Water Hens, Coots, Pheasant Tailed Jacanas, Pariah Kites, Brahminy Kites, Marsh Harriers, etc. Some of the fish and amphibians found in the park's waters include Sawfish, Butter Fish, Electric Rays, Silver carp,Common Carp, King Crabs,Gangetic Dolphins, Skipping Frogs, Common Toads, and Tree Frogs, etc.

The Sundarbans National Park hosts an abundance reptiles as well, including Olive Ridley Turtles, Sea Snakes, Dog Faced Water Snakes, Green Turtles, Estuarine Crocodiles, Chameleons, King Cobras, Salvator Lizards, Hard Shelled Batgun Terrapins, Russels Vipers, Mouse Ghekos, Monitor Lizards, Curviers, Hawks Bill Turtles, Pythons, Common Kraits, Chequered Killbacks, and rat Snakes.

Flora in Sundarbans

1. Sundari Tree

The Sundari is the dominant mangrove tree species of the Sundarbans of India and Bangladesh. Scientifically known as Heritiera fomes, it is a species of mangrove in the family Malvaceae. The Sundari tree can grow up to 60 feet in height with a girth of six feet. The tall hardy tree, with elliptic shaped leaves and micronutrient rich fruit.

2. Golpata

Nipa Palm locally known as golpata, Nypa fruticans, is a member of the family Arecaceae. It is a mangrove species, distributed throughout the mangroves of palm with tall erect leaves (3–9 m long). The underground stem is a short horizontal rhizome with a massive dense root system.

3. Passur

Passur, scientifically known as Xylocarpus mekongensis. It is a moderate size deciduous tree species attaining a height of 10 to 15 m. It has thick bark being red to blackish color with longitudinally fissured. Leaves are deep green, small, oblong, leathery, narrow and pointed at the apex.Fruits are round-shaped resembling a pear having flat on top and bottom with fleshy thick coverings.

4. Garjan

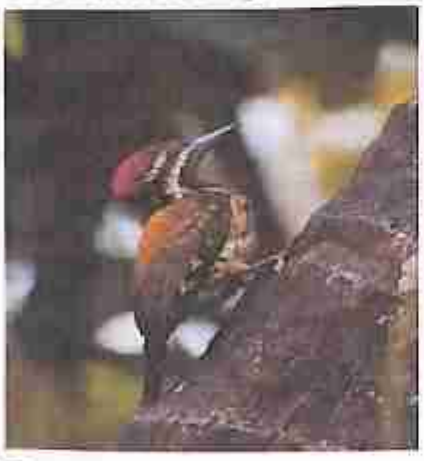
The garjan is a mangrove on stilts. Its long, umbrella-shaped stilt roots provide a broad, solid base, often wider than the tree-top, helping keep it stable in the face of harsh tides and loose sand.

Fauna in Sunderbans

1. The Royal Bengal Tiger

The Bengal tiger is a population of the Panthera tigris tigris subspecies. It ranks among the biggest wild cats alive today. It is considered to belong to the world's charismatic megafauna.The Bengal tiger's coat is yellow to light orange, with stripes ranging from dark brown to black; the belly and the interior parts of the limbs are white, and the tail is orange with black rings.

2. The Black-Rumped Flameback



The Black-Rumped Flameback woodpecker is a large bird species. It is 29-30cm long, mostly found in Indian sub-continent plains and widely seen in Sundarbans. This is the only kind of woodpecker species with a black throat and black rump.The adult male has a red crown and crest. Females have a black ford-crown spotted with white, with red only on the rear crest.

3. Collared Kingfisher or Mangrove Kingfisher

The Collared Kingfishers are one of the five most sighted Kingfishers which are found widely in Sundarban mangrove swamps. Commonly known as Mangrove Kingfisher, this little species inhabits coastal areas , farmlands, woodlands and particularly in mangroves.This bird species are 21 cm to 28 cm long. Due its white collar around the neck it has been named so and can be found in blue, green colour variants.

4. Crocodile

Crocodiles (family Crocodylidae) or true crocodiles are large semi aquatic reptiles. Crocodiles have webbed feet which, though not used to propel them through the water, allow them to make fast turns and sudden moves in the water or initiate swimming. Crocodiles are polyphyodont.

5. King Cobra

King Cobra grows upto 15 feet. The colours are shades of black, brown and olive green. It has light yellow to cream coloured chevron shaped markings from head to tail. They only eat other snakes and occasionally feed on monitor lizards. They are cannibalistic.

6. Gangetic Dolphins

The Gangetic dolphin (Platanista gangetica) is a species of toothed whale classified in the family Platanistidae. Gangetic dolphins are obligatory freshwater animals and they never enter the sea. They are found in brackish water zones such those in the Sundarbans estuary.

Conclusion

Sundarbans biodiversity and its ecosystem are more essential commodities for the ecological point of view. The flora, fauna and the other factors of the Sundarbans are highly responsible for its ecotype protection and minimize natural calamities. Biodiversity of the Sundarbans is a great source of food, fodder, fuel,wood,medicine and shelter belt. Flora and fauna are a part of the ecosystem and they are interdependent on each other for their survival

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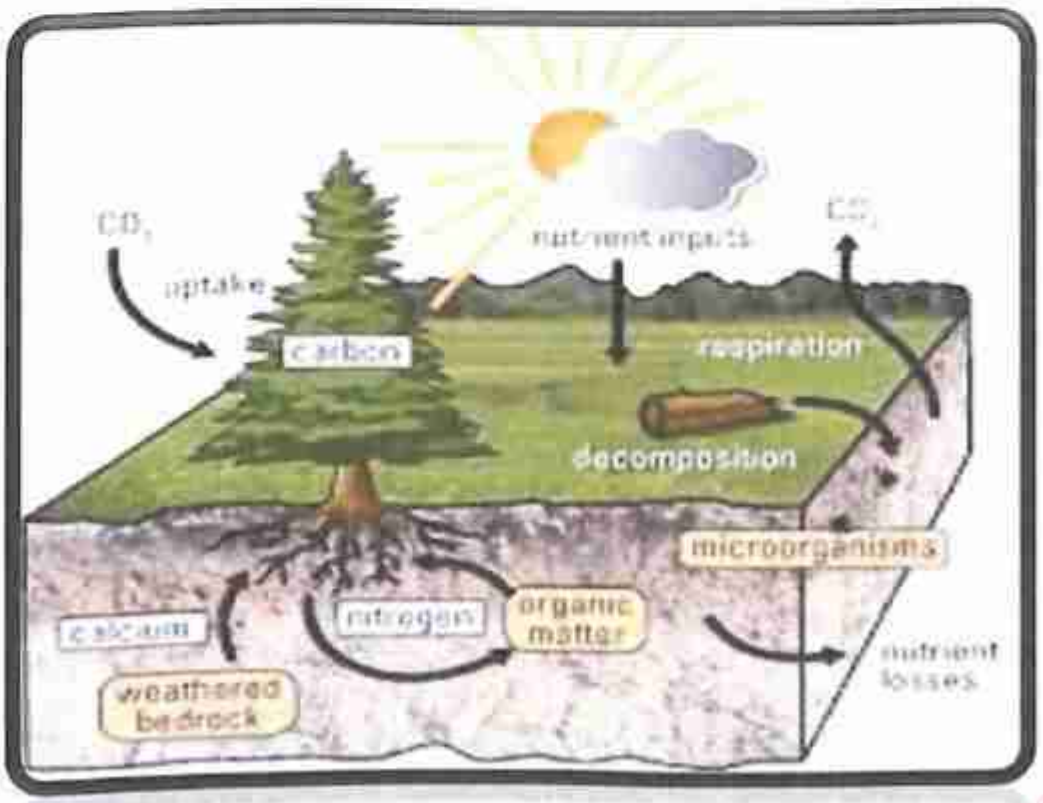
NB 20/6/2022

STUDY OF ECOSYSTEM

FOREST



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INDEX

INTRODUCTION:

An ecosystem refers to a functional unit of nature in which living organisms interact among themselves as well as with the surrounding physical environment. Ecologists look at the entire biosphere as a global ecosystem. Besides, the forest ecosystem is a part of the terrestrial ecosystem.

It, however, may vary largely in size i.e. from a small pond to a sea or a large forest. Usually, these are self-sustaining. We can divide the ecosystems into two broad categories, namely, terrestrial ecosystem and aquatic ecosystem.

The terrestrial ecosystem includes desert, grassland and forest ecosystem, whereas pond, lake, wetland and river ecosystem are parts of the aquatic ecosystem.

What is Forest Ecosystem?

A forest ecosystem is a functional unit or a system which comprises of soil, trees, insects, animals, birds, and man as its interacting units. A forest is a large and complex ecosystem and hence has greater species diversity.

Also, it is much more stable and resistant to the detrimental changes as compared to the small ecosystems such as wetlands and grasslands.

A forest ecosystem, similar to any other ecosystem, also comprises of abiotic and biotic components. Abiotic components refer to inorganic materials like air, water, and soil. Biotic components include producers, consumers, and decomposers.

These components interact with each other in an ecosystem and thus, this interaction among them makes it self-sustainable.

A forest ecosystem is a unique ecology, including a very nice community of flora and fauna. When we heard "forest," the primary thing that comes to our mind is trees. An area covered with trees making various canopy layers is commonly known as a forest ecosystem.

A natural woodland area making it a suitable place for the survival of biotic and abiotic components, is usually termed as a forest ecosystem. A forest ecosystem consists of various plants, animals, and other micro-organisms, making it a natural habitat for them.

In the forest's ecosystem, the trees, shrubs and moss are all producers. They turn water and sunlight into the energy they need to live and grow, through a process called photosynthesis. Forests have also sanitary influences upon environment due to the production of oxygen through photosynthesis. Forest plays a major role in reducing various types of pollution such as water, air and noise pollution.Forests are among the most complex ecosystems in the world, and they exhibit extensive vertical stratification. Conifer forests have the simplest structure: a tree layer rising to about 30 metres (98 feet), a shrub layer that is spotty or even absent, and a ground layer covered with lichens, mosses, and liverworts. Deciduous forests are more complex; the tree canopy is divided into upper and lower stories, while rainforest canopies are divided into at least three strata. The forest floor in both of these forests consists of a layer of organic matter overlying mineral soil. The humus layer of tropical soils is affected by the high levels of heat and humidity, which quickly decompose whatever organic matter exists. Fungi on the soil surface play an important role in the availability and distribution of nutrients, particularly in the northern coniferous forests. Some species of fungi live in partnership with the tree roots, while others are parasitically destructive.Forest ecosystems currently occupy approximately 31% of the Earth's land surface and are estimated to contain more than half of all terrestrial animal and plant species, the great majority of them in the tropics. In most of the world the major threat to forest ecosystems is conversion to agricultural land.

TYPES OF FOREST

There are three general types of forest that exist: temperate, tropical, and boreal. Experts estimate that these forests cover approximately one-third of Earth's surface. Temperate forests are found across eastern North America and Eurasia.

AN IMAGE OF TEMPERATE FOREST

- TEMPERATE FOREST:

The temperate forest biome is one of the world's major habitats. Temperate forests are characterized as regions with high levels of precipitation, humidity, and a variety of deciduous trees Decreasing temperatures and shortened daylight hours in fall mean decreased photosynthesis for plants.

- TROPICAL FOREST: The tropical rainforest biome has four main characteristics: very high annual rainfall, high average temperatures, nutrient-poor soil, and high levels of biodiversity (species richness). Rainfall: The word "rainforest" implies that these are the some of the world's wettest ecosystems.

AN IMAGE OF TROPICAL FOREST

- BOREAL FOREST:Taiga(also known as boreal forest) is the northernmost and coldest forest on the earth, dominated by species of evergreen conifers spruce, fir and pine, the deciduous conifer larch, and species of birch and aspen. It occurs in vast tracts across Alaska, Canada, Scandinavia, Russia and northeastern China.

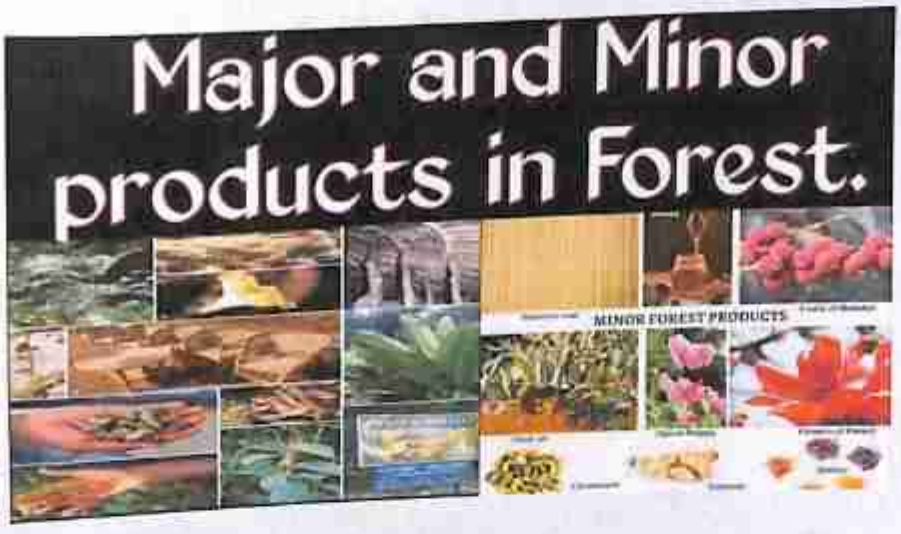
AN IMAGE OF BOREAL FOREST

THE IMPORTANCE OF THE FOREST ECOSYSTEM

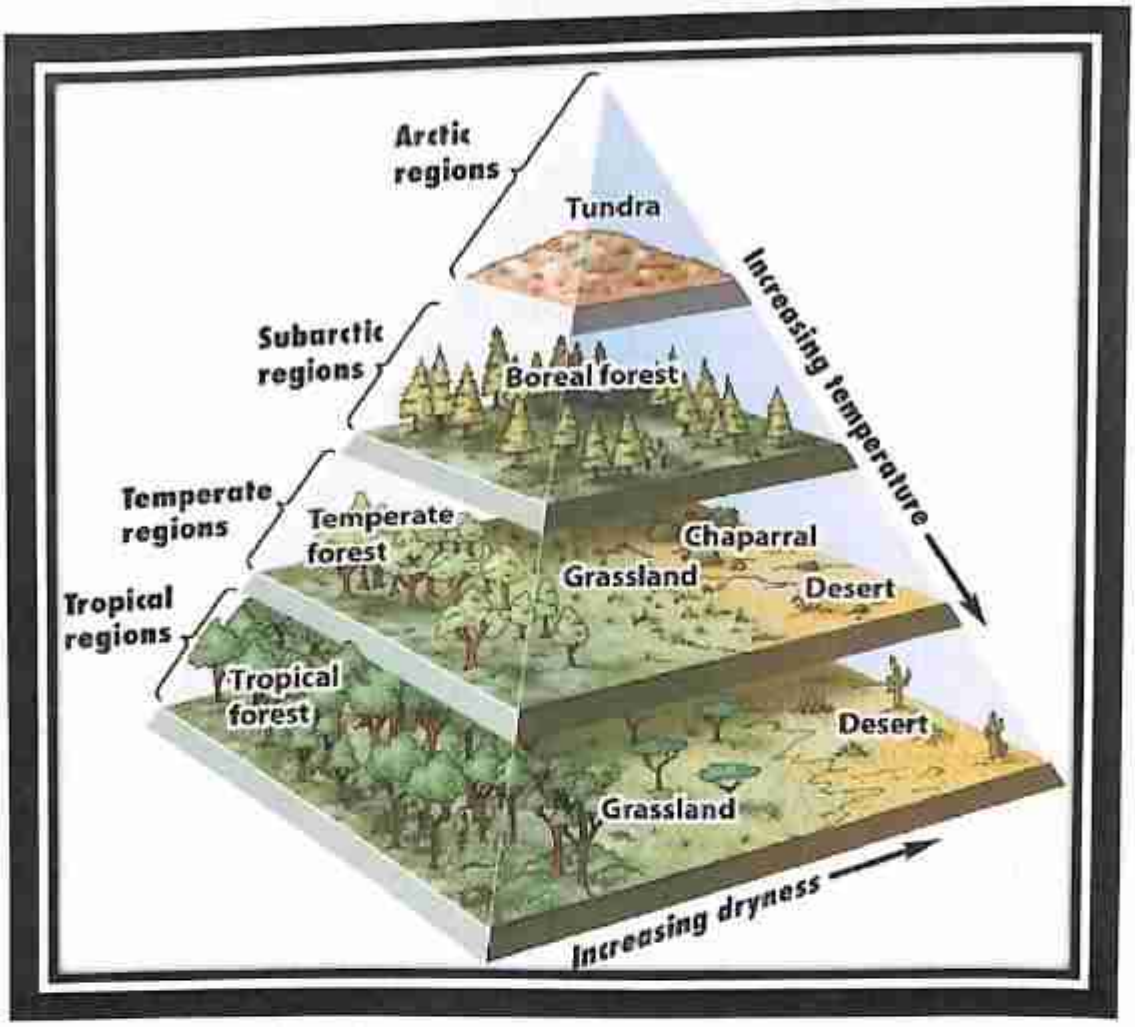
CHARACTERISTICS OF FOREST ECOSYSTEM

- Forest are characterised by warm temperature and adequate rainfall, which make the generation and adequate rainfall which also supports many wild animals and protects biodiversity.

- It provides good such as timber, food, fuel and bioproducts.



- **Ecological function such as carbon storage, nutrient and maintenance of wildlife.**
- **Social and cultural benefits such as recreation, traditional resource uses and spirituality.**
- **Both the environment and the energy fixation in any given ecosystem are limited and cannot be exceeded without causing serious undesirable effects.**
- **Alterations in the environments represent selective pressures upon the population to which it must adjust**



A VIVID DEPICTION OF THE FOREST ECOSYSTEM

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AGRO ECOSYSTEM

Index

Introduction

An **agro ecosystem** is the basic unit of study in agro ecology, and is somewhat arbitrarily defined as a spatially and functionally coherent unit of agricultural activity, and includes the living and nonliving components involved in that unit as well as their interactions.

An agro ecosystem can be viewed as a subset of a conventional ecosystem. As the name implies, at the core of an agro ecosystem lies the human activity of agriculture. However, an agro ecosystem is not restricted to the immediate site of agricultural activity (e.g. the farm), but rather includes the region that is impacted by this activity, usually by changes to the complexity of species assemblages and energy flows, as well as to the net nutrient balance. Traditionally an agro ecosystem, particularly one managed intensively, is characterized as having a simpler species composition and simpler energy and nutrient flows than "natural" ecosystem. Likewise, agro ecosystems are often associated with elevated nutrient input, much of which exits the farm leading to eutrophication of connected ecosystems not directly engaged in agriculture.

Any definition of sustainable agriculture must include how we examine the production system as an agroecosystem. We need to look at the entire system, or the entire "stream" using the analogy introduced above. This definition must move beyond the narrow view of agriculture that focuses primarily on the development of practices or technologies designed to increase yields and improve profit margins. These practices and technologies must be evaluated on their contributions to the overall sustainability of the farm system. The new technologies have little hope of contributing to sustainability unless the longer-term, more complex impacts of the entire agricultural system are included in the evaluation. The agricultural system is an important component of the larger food system (Francis et al., 2003). A primary foundation of agroecology is the concept of the ecosystem, defined as a functional system of complementary relations between living organisms and their environment, delimited by arbitrarily chosen boundaries, which in space and time appears to maintain a steady yet dynamic equilibrium (Odum, 1996; Gliessman, 1998).

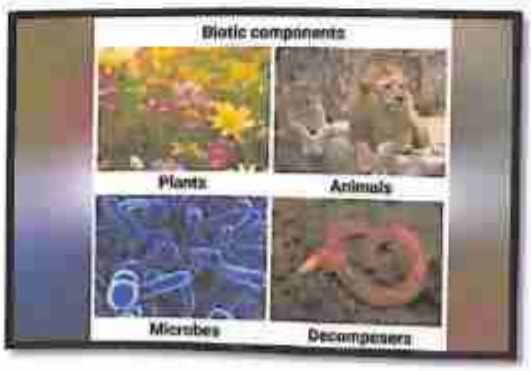
Components of an Ecosystem

There are main 2 components of ecosystem:

1. Living (Biotic component)

2. Nonliving (Abiotic component)

1.Biotic component of an Ecosystem:



Autotrops and heterotrops are biotic component of ecosystem. Green plants take simple inorganic materials and produce their own foods, This organism are called autotrops. All other form of life which do not possess chlorophyll can't produce their own foods and depend upon others are known as heterotrops. e.g. Fungi, most of bacteria and animal etc. Biotic components refer to all living components in an ecosystem. Based on nutrition, biotic components can be categorised into autotrophs, heterotrophs and saprotrophs (or decomposers).

- **Producers** include all autotrophs such as plants. They are called autotrophs as they can produce food through the process of photosynthesis. Consequently, all other organisms higher up on the food chain rely on producers for food.
- **Consumers** or heterotrophs are organisms that depend on other organisms for food. Consumers are further classified into primary consumers, secondary consumers and tertiary consumers.
    - Primary consumers are always herbivores as they rely on producers for food.
    - **Secondary consumers** depend on primary consumers for energy. They can either be carnivores or omnivores.
    - **Tertiary consumers** are organisms that depend on secondary consumers for food. Tertiary consumers can also be carnivores or omnivores.
    - **Quaternary consumers** are present in some food chains. These organisms prey on tertiary consumers for energy. Furthermore, they are usually at the top of a food chain as they have no natural predators.

Decomposers include saprophytes such as fungi and bacteria. They directly thrive on the dead and decaying organic matter. Decomposers are essential for the ecosystem as they help in recycling nutrients to be reused by plants.

2. Abiotic Component of an Ecosystem:

Abiotic component are non living environment are usually of 2 types. Materials like water, mineral salts, atmospheric gases etc. Energy like light, heat, stored energy in chemical bonds etc.

Types of Ecosystem

1.Natural ecosystem

♣ **Terrestrial ecosystem** Forest, desert, grassland etc.

♣ **Aquatic ecosystem** Fresh water, ponds, river, lake, marine, mangrove ecosystem etc.

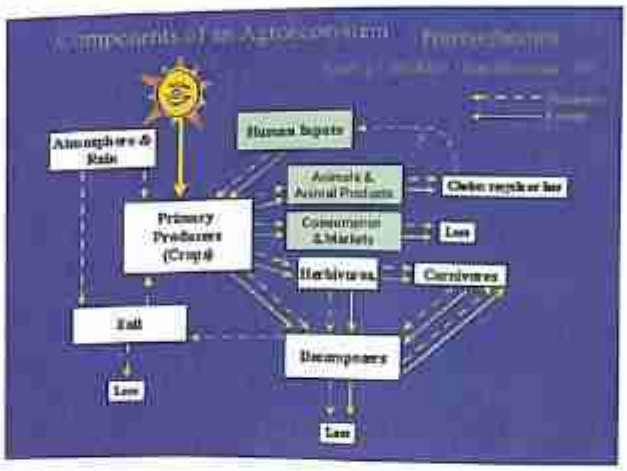
2. Artificial Ecosystem

Agro ecosystem, village ecosystem, town ecosystem etc.

Agro ecosystem

Interactive of agriculture and living organism with environment is called agro ecosystem.

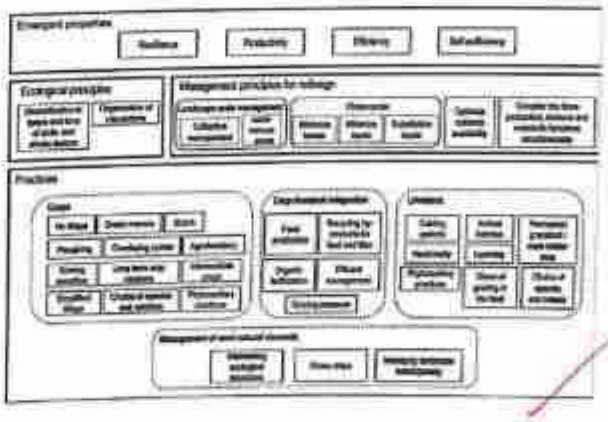
Components of Agro ecosystem



Primary producer: Primary producers are a basic part of an ecosystem. They can be thought of as the first and most important step in the food chain. Along with decomposers, they make up the base of a food web and together their populations number more than any other part of the web. Primary producers are consumed by primary consumers (generally herbivores), which are then consumed by secondary consumers and so on. Organisms at the top of the chain eventually die and are then consumed by decomposers, which fix the nitrogen levels and provide the organic material necessary for the next generation of primary producers. Crops and weeds of the field are the primary producer of agro ecosystem. e.g. In a Rice field, there are many producer like durba, mutha, syma etc also present with rice.

Consumer: A **consumer** in a food chain is a living creature that eats organisms from a different population. A consumer is a heterotroph and a producer is an autotroph. Both are organisms that obtain energy from other living things... Like sea angels, they take in organic moles by consuming other organisms, so they are commonly called consumers. Heterotrophs can be classified by what they usually eat as herbivores, carnivores, omnivores, or decomposers. On the other hand, autotrophs are organisms that use energy directly from the sun or from chemical bonds. Autotrophs are vital to all ecosystems because all organisms need organic molecules, and only autotrophs can produce them from inorganic compounds. Autotrophs are classified as either photoautotrophs (which get energy from the sun, like plants) or chemoautotrophs (which get energy from chemical bonds, like certain bacteria)Among consumer grasshoppers, aphids, bugs, ants, rats, birds, man etc are macro consumer and frog, snake, hack are micro consumer.

Properties of Agro ecosystem



1. Productivity- It is net increment of values products per unit resources (land, labour, energy, capital) and is commonly measured as annual yield /hectare.

2. Stability It is the degree to which, productivity remain constant, inspite of normal small scale fluctuation in environmental variables such as climate or in the economic condition in market.

3. Sustainability- It is defined as the ability of the system to maintain its productivity when subject to stress or perturbation. A stress is defined as regular, sometimes continues, relatively small and predictable disturbance. e.g. Affect of growing soil salinity. A perturbation by contrast is an irregular, in frequent relatively long and unpredictable disturbance such as drought or flood or a new pest.

4. Equitability- It is a measure of how evenly the produce of Agro ecosystem is distributed among its human beneficial. The more equitable the system, the more evenly are the products to fed shared among the population of the farm, village, regions or nation.

Conclusion

Diversified cropping systems, such as those based on intercropping and agrofor-estry or cover cropping of orchards, have been the target of much research recently. This interest is largely based on the new emerging evidence that these systems are more sustainable and more resource-conserving (Vandermeer, 1995). Much of these attributes are connected to the higher levels of functional biodiversity associated with complex farming systems. In fact, an increasing amount of data reported in the literature documents the effects that plant diversity have on the regulation of insect herbivore populations by favoring the abundance and efficacy of associated natural enemies (Altieri, 1994). Several hypotheses are emerging postulating the mechanisms explaining the relationships between plant species number and the stabilization of agroecosystem processes including the buffering of populations (Tilman et al., 1996). One aspect that is clear is that species composition is more important than species numbers per se. The challenge is to identify the correct assemblages of species that will provide through their biological synergisms key ecological services such as nutrient cycling, biological pest control, and water and soil conservation.

The exploitation of these synergisms in real situations involves agroecosystem design and management and requires an understanding of the numerous relationships among plants, herbivores, and natural enemies. Clearly, the emphasis of this approach is to help to restore natural control mechanisms through the addition of selective biodiversity within and outside the crop field, through a whole array of possible crop arrangements in time and space.

Data and practical experience indicate that it is possible to stabilize the insect communities of agroecosystems by designing and constructing vegetational architectures which support populations of natural enemies or that have direct deterrent effects on pest herbivores (Altieri, 1991). What is difficult is that each agricultural situation must be assessed separately, since herbivore-enemy interactions will vary significantly depending on insect species, location and size of the field, plant composition, the surrounding vegetation, and cultural management. One can only hope to elucidate the ecological principles governing arthropod dynamics in complex systems, but the biodiversity designs necessary to achieve herbivore regulation will depend on the agroecological conditions and socioeconomic restrictions of each area.

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SUBJECT–ENVIRONMENTAL STUDIES (AECC 2)

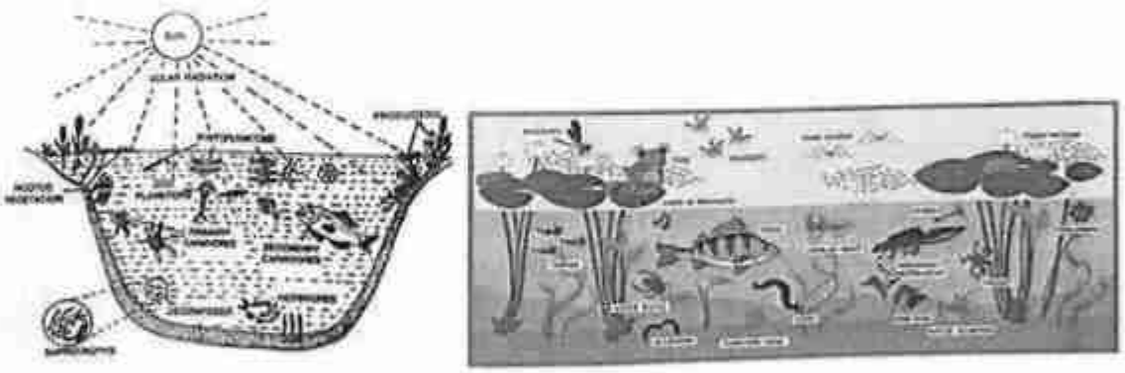
PROJECT-STUDY OF ECOSYSTEM (PONDS)

Introduction

Ecosystem ecology is the study of these and other questions about the living and nonliving components within the environment, how these factors interact with each other, and how both natural and human-induced changes affect how they function.

Understanding how ecosystems work begins with an understanding of how sunlight is converted into usable energy, the importance of nutrient cycling, and the impact mankind has on the environment. Plants convert sunlight into usable forms of energy that are carbon based. Primary and secondary production in populations can be used to determine energy flow in ecosystems. Studying the effects of atmospheric? CO_2 will have future implications for agricultural production and food quality.

A new focus in ecosystem ecology has been climate change. The world is being altered at an alarming pace from greater to lesser precipitation in some areas to change in ecosystems from grasslands to desert (desertification) or forests to grasslands (increased aridity). Ecosystem ecologists are now studying the causes and effects of climate change, hoping to one day minimize our impact on the planet and preserve natural ecosystems as we know them today.

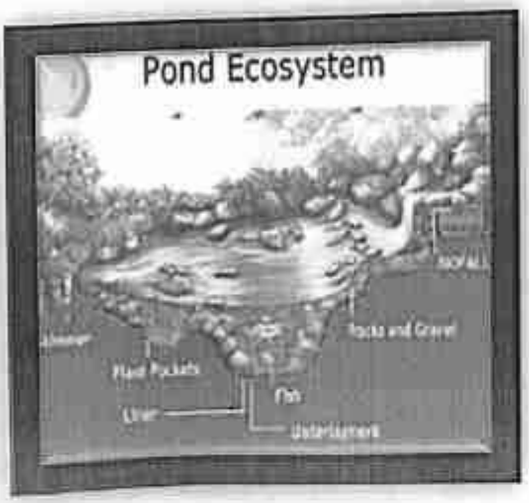


Pond Ecosystem

Pond Ecosystems are the balance of fish, bacterias, and plants which together support each other. The mutual relation between the living organisms and non- living things of a particular area is known as the ecosystem. In every ecosystem, every organism has a definite habitat and a definite life pattern. It is the main characteristic of an ecosystem.

Pond Ecosystem works on ponds that are shallow enough for the sunlight to pass through it. A pond is a self-sufficient and an ideal example of the ecosystem. In a pond, the intimate relation between the inhabiting living and non-living components is well understood. The non-living objects are various types of organic and inorganic substances such as water, sun rays, CO_2, oxygen, calcium, phosphorus, humic acid, etc. The living components are producers, primary consumers, secondary consumers, tertiary consumers, and various types of decomposers.

Pond Ecosystem is differs from other water ecosystems. Unlike the river ecosystem, which is categorized under the Lotic systems, pond ecosystem falls under the Lentic ecosystem for the reason that the water remains stagnant in ponds for a relatively longer period time.



Pond Ecology and Ecosystems
Meaning of Pond Ecosystem

A pond ecosystem is a system of organisms that live together in a pond. A pond ecosystem can be defined in three ways:

1. A closed community of organisms in a body of water.
2. An enclosed body of water that houses numerous different creatures.
3. A biological system that includes water and plant and animal life interacting with each other.

Types of pond ecosystem.

Ponds can come in many different forms, and they all have their own differentiating characteristics. Below, you will find a discussion of some of the key types of pond ecosystem.

1. Salt ponds.

Salt ponds contain brackish (i.e. salty) water and can occur close to the sea side where waterlogged ground creates natural pools. Salt ponds can also occur in rocky areas on the beach, though here they are called rock pools. It is also possible to find salt ponds inland, thanks to the presence of brackish streams created through streams flowing through salty rocks.

2. Garden ponds.

3. Wet: these ecosystems are wet and humid ones.

4. Different levels: distinct communities of creatures will live at different levels of a pond. Crustaceans and deep water fish may live at the lower level, for example, whilst birds and blooming plants may live towards the surface.

5. Variable in size: some pond ecosystems can be very small (such as a rockpool) whilst others can be almost as large as a lake.

Importance of pond ecosystems.

Pond ecosystems are very important, and for this reason it is vital that we take steps to protect and nurture them. Below, you will find some significant reasons why this is the case.

1. Biodiversity.

Pond ecosystems are very important habitats for so many different types of fish, birds, plants and crustaceans as well as insects such as dragonflies, damsel flies and pond skaters.

2. Ubiquity.

Pond ecosystems can be found on every continent on the planet. That makes them very important for the life of organisms all over the world.

3. Abundance.

Pond ecosystems are very abundant. Not only can they be found almost everywhere, they can be found plentifully. That, again, makes them a key habitat for many different species.

4. Source of hydration.

Even if they do not actually live in the pond ecosystem, many species of animals will come to pond ecosystems whenever they need a drink. A key example is a watering hole in a prairie or desert. Humans can also use these ecosystems as a source of water.

5. Beauty.

Pond ecosystems are very beautiful as well. As we watch the sunlight reflecting off the surface of a pond we can feel inspired, calm and in touch with nature.

Steps to prevent Ponds from damaging

It will become a bog and someday will resemble dry land. The process of return to dry land can happen in a decade or may take centuries. As a pond owner your job is to slow the process down as much as possible. Some of the principles you can employ are described below

Exclude Nutrients-Four basic elements are required to make aquatic organisms. They are carbon, oxygen, nitrogen, phosphorous. Of course it takes more than these to make even the simplest organism, but these are the materials required in abundance.

Buffers-Maintaining vegetation in all areas through which water must flow to reach the pond is very beneficial to the pond. Such buffers both slow water down and filter it. Slow moving water allows sediment to drop out of the water.

Sedimentation-Another method of keeping sediment out of ponds is to provide a shallow pool at the inlet of the pond. Water passing through this pool on its way to the pond will have an opportunity to drop its sediment load in the pool. This pool should be of such dimensions that it can be easily cleaned with a backhoe from the shore of the pool.

Limit Fertilization-When it is possible to decrease the use of fertilizer on turf or crops grown in the watershed area of the pond, the pond will receive a benefit.

Maintain Ecological Balance-Ponds are most satisfactory when there is a complete and balanced food web in place. Starting at the top this means that planktonic algae are present in sufficient quantity to feed some zooplankton. The zooplankton in turn provides food for the

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TOPIC : STUDY OF ECOSYSTEMS – POND ECOSYSTEM

INTRODUCTION:

Ecosystem may be defined as a community or group of living organisms that live in, and interact with each other. For instance, tropical forests are ecosystems made up of living beings such as trees, plants, animals, insects and micro-organisms that are in constant interaction between themselves and that are affected by other physical (sun, temperature) or chemical (oxygen or nutrients) components.

In other words, an ecosystem is a chain of interactions between organisms and their environment. The term 'ecosystem' was first coined by English botanist, A.G. Tansley in 1935.

THE STRUCTURE/COMPONENTS OF THE ECOSYSTEM:

The structure of the ecosystem is characterised by the organisation of both biotic and abiotic. This includes the distribution of energy in our environment. It also includes the climactic conditions prevailing in that particular environment. These two components are interrelated in an ecosystem. It is an open system where the energy and components can flow throughout the boundaries.

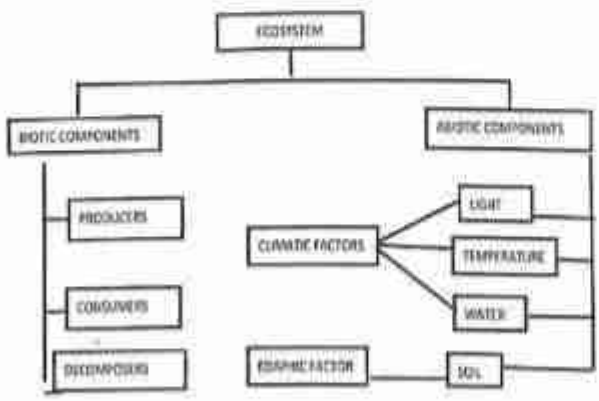


Fig 1.Schematic Representation of Structure of an Ecosystem

SOURCE : https://www.thefreshanswers.com/structure-of-ecosystem-biotic-and-abiotic-components/

BIOTIC COMPONENTS:

Biotic components refer to all living components in an ecosystem. Based on nutrition, biotic components can be categorised into autotrophs, heterotrophs and saprotrophs.

- Producers – these include all autotrophs such as plants. They are called autotrophs as they can produce food through the process of photosynthesis. Consequently, all other organisms higher up on the food chain rely on producers for food.

- Consumers – include the heterotrophs. They are the organisms that depend on other organisms for food. Consumers are further classified into primary, secondary and tertiary consumers.
  Primary consumers rely on producers for food. E.g;- all herbivores.
  Secondary consumers depend on primary consumers for energy. This includes carnivores and omnivores.
  Tertiary consumers rely on secondary consumers for food. This also includes omnivores and carnivores.
  Some food chains have Quaternary consumers, which include the organism who prey on tertiary consumers for energy. They are usually at the top of a food chain as they have no natural predators.

- Decomposers – these include saprophytes such as fungi and bacteria. They directly thrive on the dead and decaying organic matter. They are essential for the ecosystem as they help in recycling nutrients to be reused by plants.

ABIOTIC COMPONENTS:

Abiotic components are the non – living components of the ecosystem. Some of these are :

- Air
- Water
- Soil
- Minerals
- Sunlight

- Temperature
- Nutrients
- Wind
- Altitude
- Turbidity, along with many more other such factors.

FUNCTIONS AND FUNCTIONAL COMPONENTS OF THE ECOSYSTEM:

The various functions of the ecosystem are:-

- It regulates the essential ecological processes, supports life systems and renders stability.
- It is also responsible for the cycling of nutrients between biotic and abiotic components.
- It maintains a balance among the various trophic levels in the ecosystem.
- It cycles the minerals through the biosphere.
- The abiotic components help in the synthesis of organic components that involve the exchange of energy.

The functional units or components of the ecosystem are:-

- Productivity – refers to the rate of biomass production
- Energy flow – the sequential process through which energy flows from one trophic level to another
- Decomposition – it is the process of breakdown of dead organic material. The top soil is the major site for decomposition
- Nutrient cycling – nutrients are consumed and recycled back in various forms for the utilisation by various organisms

TYPES OF ECOSYSTEM:

There are mainly two types of ecosystem:-

I.Terrestrial Ecosystem-

They are exclusively land – based ecosystems. There are different types of terrestrial ecosystems distributed around various geological zones:

- Forest Ecosystem – This type of ecosystem consists of several plants, trees, animals and micro – organisms that live in coordination with the abiotic factors of the environment. Forests help in maintaining the temperature of the earth and are the major carbon sink.
- Grassland Ecosystem – here, the vegetation is dominated by grasses or herbs. E.g – temperate grasslands.
- Tundra Ecosystem – These ecosystems are devoid of trees and are found in cold climates or where rainfall is scarce. These are covered with snow for most of the year. It is found in the Arctic mountain tops.
- Desert Ecosystem – These are found throughout the world. These are regions with little rainfall and scarce vegetation.

II.Aquatic Ecosystem-

Aquatic ecosystems are ecosystems present in a body of water. These are divided into two types:

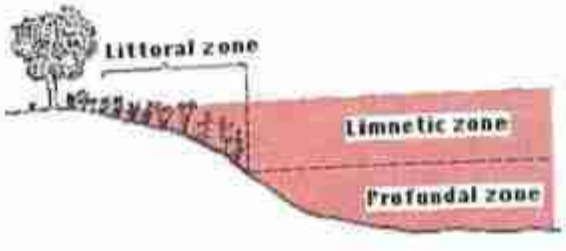
- Freshwater Ecosystem – It is an aquatic ecosystem that includes lakes, ponds, rivers, streams and wetlands. They have no salt content.
- Marine Ecosystem – This includes seas and oceans. They have more salt content and biodiversity as compared to freshwater ecosystem.

In this present project, we will be studying Ponds, a type of Aquatic (Freshwater) Ecosystem.

POND : DEFINITION AND COMPONENTS.

A pond is a quiet body of water that is too small for wave action and too shallow for major temperature differences from top to bottom. It usually has a muddy or silty bottom with aquatic plants around the edges throughout. Ponds get their energy from the sun. The chlorophyll in aquatic plants captures energy from the sun to convert carbon dioxide into oxygen. Usually, ponds are shallow, about 12 to 15 feet in depth. On the basis of water depth and types of vegetation and animals there may be three zones in a pond. They are:

- Littoral zone – It is the shallow water region which is usually occupied by rooted plants.
- Limnetic zone – It ranges from the shallow to the depth of effective light penetration and associated organisms are small crustaceans, rotifers, insects and their larvae, and algae.
- Pro – fundal zone – This includes the deep water parts where there is no effective light penetration. The associated organisms are mussels, crab, worms, etc.



ZONES OF POND ECOSYSTEM

SOURCE : https://www.biology-pages.info/F/Freshwater.html

BIOTIC COMPONENTS OF POND:

The different biotic components in a pond are:-

i) Producers –
- Phytoplankton(microscopic algae that float in the open water and give it a green appearance. They carry out photosynthesis)
- Periphytic algae(microscopic algae that attach themselves to substrates and give rocks and sticks a greenish brown slimy appearance. They also carry out photosynthesis and are used by decomposers)

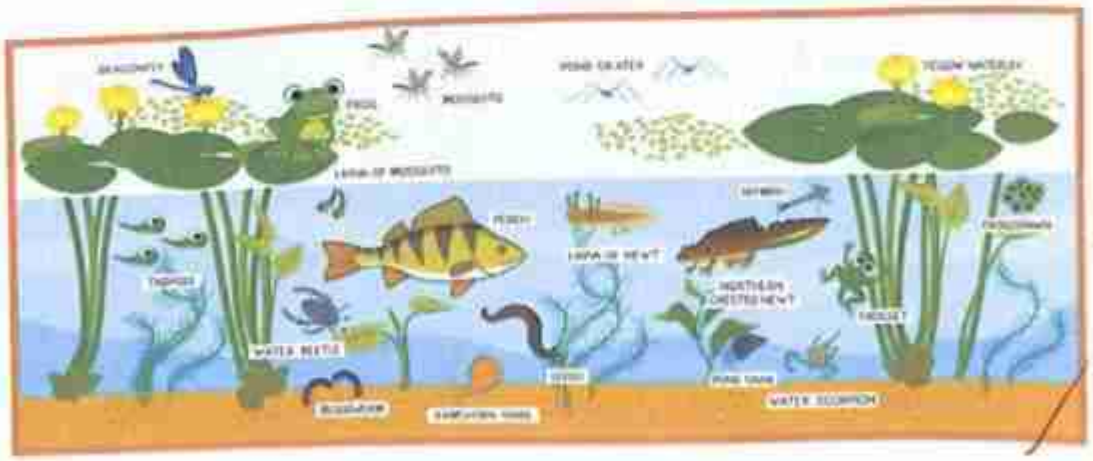
- Submerged plants
- Floating plants
- Emergent plants
- Shore plants

ii) Consumers-

- Zooplankton (microscopic animals that consume phytoplankton or smaller zooplankton. These include single – celled animals, tiny crustaceans, or tiny stages of larger animals)
- Invertebrates (include all animals without a backbone)
- Vertebrates (include all animals with a backbone. E.g : fish, frogs, salamander,etc)

iii) Decomposers-

- These include bacteria and other organisms.



POND ECOSYSTEM.

SOURCE : https://www.embibe.com/exams/pond-ecosystem/

POLLUTION OF PONDS:

The most common form of pollution observed in ponds is dumping of waste – ranging from old cars and drink cans to bikes and bottles. This not only makes the environment unsightly, but also may destroy pond life.

Another serious form of pollution is chemical pollution. This is a result of modern farming methods, where the fields are sprayed with pesticides to get rid of pests. Rain often washes the excess chemicals into nearby ponds, streams or rivers, poisoning some of the animals living there. A similar effect is observed by the use of fertilisers. They do not poison the wildlife, but the excess supply of nitrogen causes the water plants, especially algae, to grow very quickly. The plants use up so much oxygen during the night and decaying processes that there is none left for the other pond life. This growth also prevents sunlight reaching the organisms below. Eventually, all algae die, leaving a smelly, decaying mass.

POLLUTION OF POND

SOURCE: https://www.dreamstime.com/water-pollution-plastic-pollution-pond-water-pollution-plastic-pollution-pond-image199934233

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Project Topic

STUDY OF COMMON PLANTS

INDEX

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In the accomplishment of completion of my project on 'Study of Common Plants' I would like to convey my sincere thanks of gratitude to my teacher Miss. Namrata Basu. Her valuable guidance and suggestions helped me in various phases of the completion of this project.

Secondly, I would also like to thank my parents who helped me a lot in finalizing this project within the limited time frame.

Dipshikha Das
26/05/2022

INTRODUCTION

Plants are critical to other life on this planet because they form the basis of all food webs. Most plants are autotropic, creating their own food using water, carbon dioxide, and light through a process called photosynthesis. Some of the earliest fossils found have been aged 3.8 billion years. These fossil deposits show evidence of photosynthesis, so plants, or the plant-like ancestors of plants have lived on this planet longer than most other groups of organisms. At one time, anything that was green and that was not an animal was considered to be a plant. Now, what were once considered 'plants' are divided into several kingdoms : Prostista, Fungi and Plantae. Most aquatic plants occur in the kingdoms of Protista.

COMMON PLANTS

1) NEEM TREE

SCIENTIFIC NAME : Azadirachta indica

❖ MORPHOLOGY

- Neem is a medium-sized tree, reaching 15 to 30 m in height, with a large rounded crown up to 10-20 m in diameter.
- The branches are numerous and spreading.
- The leaves are alternate, petiolated, clustered at the end of the branches, unequally pinnate, glabrous and dark glossy green at maturity, 20-40 cm in length and bearing 10-20 leaflets .

❖ FAMILY AND DISTRIBUTION

- Azadirachta indica, commonly known as neem, nimtree or Indian lilac is a tree in the mahogany family Meliaceae.
- It is native to Burma but grown all over India and most of the countries in Africa. It is typically grown in tropical and semi-tropical regions. Neem trees also grow on islands in southern Iran.

❖ CHEMICAL COMPOSITION

- The alkaloids are the main active principles. They are nimbin, nimbinin, nimbidine, nimbosterine and nimbectin etc. Fatty acid present in the plant and seed contain 40% to 45% fixed oil.

❖ USES

- Neem is used in an ancient form of healing, called Ayurveda, to treat asthma, constipation, cough, diabetes, stomach ulcers, indigestion, gum disease, urinary tract infection,skin and hair problems and other illnesses.
- Neem leaf and its constituents have been demonstrated to exhibit anti-inflammatory, antimalarial, antifungal, antibacterial, antiviral, antioxidant properties.

2) ALOE VERA

Scientific Name: Aloe barbadensesMills.

❖ MORPHOLOGY

Aloe vera is a stemless or very short-stemmed plant growing to 60–100 cm (24–39 in) tall, spreading by offsets.

The leaves are thick and fleshy, green to grey-green, with some varieties showing white flecks on their upper and lower stem surfaces. The margin of the leaf is serrated and has small white teeth.

❖ FAMILY AND DISTRIBUTION

- Aloe vera belongs to Asphodelaceace (Liliaceae) family.
- It is native of West Indies or Mediterranean region. It grows wild in hot dry valleys of Western Himalayas and southern, Northern part of India

❖ CHEMICAL COMPOSITION

- The main active principle present in Aloe is crystalline glucoside known as barbaloin, other constituent like resin and derivatives like emodin, chrysophanic acid, anthroquinones, emoclin, also it contain glucose, galactose, mannose and galacturonic acid with protein. The plant contain aloesone and aloesin.

❖ USES

- Aloe is chiefly used as purgative, abortificient, anthelmintic, blood purifier, cathartic, cooling, digestive and diuretic, inflammation, painful parts of the body.
- It is useful in burn, cold cough, jaundice, worms and piles.
- Aloe is used in preparation of vegetables, pickles, cosmetics, skin blemisars, help to grow new healthy tissue. It is used as hair tonic as it stimulates the growth of hair.

3) PERIWINKLE

Scientific Name: Catharanthus roseus .

❖ MORPHOLOGY

- Periwinkle has 2- to 3-inch-long, oval-shaped, dark green leaves that appear opposite on round, sturdy stems.
- The leaves have a glossy finish and are pinnate, meaning the veins branch out on either side from the central stem in a way that resembles a feather.
- Space plants at least 12 and up to 24 inches apart, and periwinkle will form a dense ground cover 2 to 3 feet tall with an equal spread.

❖ FAMILY AND DISTRIBUTION

- Periwinkle belongs to Apocynaceae family.
- The plant is probably indigenous to Madagascar. It is cultivated in South Africa, West Indies, Srilanka, India, U.S.A., Europ and Australia as an ornamental plant. In India, it is grown in Nilgiri, Kanyakumari and Kottayam etc.

❖ CHEMICAL COMPOSITION

- Catharanthus mainly consists of glycosides and alkaloids.

- Some important alkaloids are vinblastine, vincristine, other alkaloids present in the plant are ajmalcine, serpentine, lochnerine, tetrahydroalstonine, vindoline, vindolinine and catheranthine.

❖ **USES**

- It is used in hypotensive, antidibetic action, other dimer indole-indoline used for curing the anticancer activity.
- The alkaloids vincristine is highly active in treatment of childhood leukaemia.
- Vincristine proves effective in breast cancer and the leaves are used in diabetes.

4) INDIAN GOOSEBERRY

Scientific Name: EmblicaofficinalesGaertn.

❖ **MORPHOLOGY**

- The gooseberry is a straggling bush growing to 1–3 metres (3–10 feet) tall, the branches being thickly set with sharp spines, standing out singly or in diverging tufts of two or three from the bases of the short spurs or lateral leaf shoots.

- The bell-shaped flowers are produced, singly or in pairs, from the groups of rounded, deeply-crenated 3 or 5 lobed leaves.

❖ FAMILY AND DISTRIBUTION

- Indian gooseberry belongs to Euphorbiaceae family.
- Emblica is a small genus of trees, native India, Srilanka, Malaya and China. It is found in local area of Sangola like Watamabare, Hadid, Kole, Methwade.

❖ CHEMICAL COMPOSITION

- The fruit is the richest source of Vitimin C.
- The other important constituents are gallic acid, tannic acid, gum, sugar, fat, phyllemblin, minerals Fe, P, Ca.
- Bark contain tannin and seeds contain fixed oil and essential oil.

❖ USES

- Fresh fruit used in intestine worms, pulp of fruit used in to cure the jaundice, anaemia, dyspepsia and scurvy.
- Dried fruit are used in haemorrhage (bleeding), diarrhea, dysentery, cough.
- It is used as laxative, headache, piles, liver
- Fruit juice is used in hair dye and seed oil and fruit juice are used in the preparation of hair oils and shampoos.

5)PURGING CASIA

Scientific Name: Casia fistula Linn.

❖ MORPHOLOGY

- The flowers of the golden shower tree are yellow in colour. The flowers grow in a pendulous raceme arrangement and have five yellow petals of same size and shape. In a pendulous pattern, the leaves are alternately arranged in a spiral manner.

- The deciduous leaves are up to 24 inches long and pinnate with up to eight pair of leaflets. The fruit has a pungent odour that is noticeable from a distance. The fruit is cylindrical and has more than 80 seeds.

❖ FAMILY AND DISTRIBUTION

- Purging Casia belongs to Caesalpinaceae family.

- This is an ornamental tree with yellow flowers found throughout India. Grow in valleys upto 1200 m in Himalayas.

❖ CHEMICAL COMPOSITION

- 1-8 dihydroxyanthraquinone, Tryptamines, Fistucacidin(3,4,7,8,4) pentahydroxyflavan Oxyanthraquinone, Epincatechin, Procyanidin 82, Biflavanoids, Rhenin, Physcion, Kaempferol, Chrysophanol, Fistulin, Fistulic acid.

❖ USES

- The sweet blackish pulp of the seedpod is used as a mild laxative. The wood is hard and heavy is used for cabinet and inlay work..
- It is useful in skin diseases, burning sensations and syphilis.
- Leaves are laxative, antiperiodic and depurative.
- It is useful in skin diseases, burning sensation, dry cough and bronchitis.
- It is used in flatulence, colic, dysentery, inflammations and intermittent fever.

CONCLUSION

Each plant is characterized by one of the three life histories: haploid (In), diploid (2n), or the most common haplaid-diploid. Within each of these three types, there are also variations. Of the plants with haploid life cycles, most algae lack a dikaryotic phase, while most fungi have a dikaryotic phase. There are also other algae and fungi that are characterized by diploid life cycles. Lastly, plants with a haploid diploid life history undergo an alternation of generations, either similar or dissimilar. In all of these life cycles, asexual reproduction may occur, but it is sexual reproduction that is responsible for genetic diversity. Due to variations arising separately and at different rates, the evolution of land plants did not follow a linear sequence. Before land plants, alga with mostly haploid life cycles existed, but land plants originated later.

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AUTHOR : Erach Bharucha

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20/6/2022

VISIT TO A LOCAL POLLUTED SITE- URBAN

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UNIVERSITY REGISTRATION NUMBER: 013-1212-0012-21

PAPER: AECC2

SUBJECT: ENVS

COLLEGE NAME: GOKHALE MEMORIAL GIRLS COLLEGE

CONTENT

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my professor Smt. Namrata Basu, who gave me this opportunity to do this wonderful project on the topic- "Visit to a local polluted site-Urban." This project has really helped me a lot in gathering some knowledge on the pollution characteristics of that area.

I would also like to thank my friends and parents who supported and helped me a lot in collecting different information and also completing the project within the allotted time.

INTRODUCTION

In simplest terms, pollution is the introduction of harmful materials into the environment. These harmful materials are called pollutants. Pollutants can be natural, such as volcanic ash. They can also be created by human activity, such as trash or runoff produced by factories. Pollutants damage the quality of air, water, and land. (ref: National Geographic Society)

With rapid industrialisation and development, pollution has become a global problem in this century. Although due to the presence of heavy-duty industries and fuelled vehicles, urban areas are usually a lot more polluted than the rural areas, pollution can spread to all remote places. For example, pesticides and other chemicals have been found in the Antarctic ice sheet and in the middle of the northern Pacific Ocean, a huge collection of microscopic plastic particles forms what is known as the Great Pacific Garbage Patch.

With respect to the natural resource affected, pollution can be divided into three major types- air pollution, water pollution and land pollution.

In this project the main focus will be on Urban Pollution. Urban pollution refers to the presence or introduction of poisonous or harmful substances in cities or urban areas. It may come from natural sources, but the most detrimental are those emissions related to human activities. Urbanisation, inadequate treatment capacity, and disposal of untreated wastes cause severe pollution in urban and peri-urban areas. Vehicle emissions produce over 90 percent of air pollution in urban areas in developing countries. The air quality index of million plus cities of India showed that more than 50 percent of cities have moderate to poor air quality.

(Image source: Google)

Dhapa- the landfill site of Kolkata

Dhapa is a locality on the fringes of East Kolkata, India. The area consists of landfill sites where the solid wastes of the city of Kolkata are dumped.

It is located near the Parama Island on the Eastern Metropolitan Bypass, on the eastern side of Kolkata. The closest landmarks near Dhapa are the ITC Sonar hotel and Silver Spring housing which fall on the west side, Milan Mela ground or the permanent trade fair ground and Science City which are on the south side and Mathpukur five-point crossing which is on the west side.

Dhapa has been a major victim of air and soil pollution. In 1986 the pond next to the Dhapa Post Office was filled by the city garbage. As a result, at least 65% of the population above the age of 35 are infected by the exposure to tuberculosis. The Dhapa landfill has colonial history attached to it, as it was set up in 1941 when the British still ruled India. The landfill was spread across an area of 12 to 14 hectares back then and a garbage train would ply along the city's main roads, collecting the garbage for disposal at the landfill. But waste generation in 1941 was minimal, as compared to today, when the city is generating 5,000 metric tonnes of waste every day. More than 4,000 metric tonnes of waste is dumped at the Dhapa landfill every day, which has become a sitting garbage mountain. When last measured by the Kolkata Municipal Corporation (KMC) in 2015, Dhapa had already crossed the dangerous height of 50 feet and exhausted its capacity to take in any more waste. So many years since the assessment, nothing has changed in terms of waste disposal in the city's landfill, where garbage continues to be dumped daily in large amounts.

The Dhapa dumping ground sometimes burns for months and the thick smoke that blows out of the site makes the city's polluted air even more toxic.The Calcutta Municipal Corporation has written to the pollution control board to help it take measures to contain the emission without closing the dumping site. Scientists, environment engineers and engineers of the Calcutta Municipal Corporation (CMC), custodian of the Dhapa ground, said methane gas could catch fire if it came in contact with atmospheric oxygen. Methane is present in abundance in the food waste dumped at the site. Open landfill sites (Dhapa is one), where methane is not collected and drained out in a scientific way through a network of pipes, were banned in the country in 2000. Since Dhapa predates the ban, it has not been closed down. The authorities, however, did not rule out the possibility of a ragpicker or someone else throwing a lit match or cigarette or bidi-end into the garbage.

Dhapa Dumping Ground

Landfill on Fire

Environmental Impact

The most pressing environmental concern regarding landfills is their release of methane gas. As the organic mass in landfills decompose methane gas is released. Methane is 84 times more effective at absorbing the sun's heat than carbon dioxide, making it one of the most potent greenhouse gases and a huge contributor to climate change.

Along with methane, landfills also produce carbon dioxide and water vapor, and trace amounts of oxygen, nitrogen, hydrogen, and non-methane organic compounds. These gases can also contribute to climate change and create smog if left uncontrolled.

The creation of landfills typically means destroying natural habitats for wildlife. The average landfill size is 600 acres.

While landfills are required to have plastic or clay lining by federal regulation, these liners tend to have leaks. This can result in leachate, a liquid produced by landfill sites, contaminating nearby water sources, further damaging ecosystems.

Social Impact

Emissions from landfills pose a threat to the health of those who live and work around landfills. A study in New York found that there is a 12% increased risk of congenital malformations in children born to families that lived within a mile of a hazardous waste landfill site.

Landfills bring hazards such as odor, smoke, noise, bugs, and water supply contamination.

Minority and low-income areas are more likely to find themselves home to landfills and hazardous waste sites.

Condition of people around the landfill

Conclusion

Unable to find an alternative ground to dump waste as large as Dhapa, the Kolkata Municipal Corporation has decided to continue with the existing facility but after scientifically reclaiming it in phases. Adopting multi-pronged strategies to combat the ill-effects of hazardous waste at Dhapa, the civic solid waste management department has started reclaiming portions of the dump yard, so that those areas could be reused after creating sanitary landfill. As the KMC is determined to reduce health hazards from the Dhapa dumping ground, a search for an alternative land is also on. Unlike Dhapa, the new facility will be an engineered landfill site where the methane trapped in food waste will be collected and disposed of through pipes. That will reduce chances of fires at the site. The West Bengal Pollution Control Board (WBPCB) will very shortly put up a continuous ambient air quality monitoring station (CAAQMS) near Dhapa — the city's landfill site — to keep an eye on the pollution level on a real-time basis and take remedial measures. Besides, WBPCB has already deployed two fire-tenders to douse flames in the mountain of garbage.

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I would really like to mention the sources which has proved to be helpful for me in making this presentation. They are as follows:

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NB
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ACKNOWLEDGEMENT

Firstly, I would like to express my special thanks of gratitude to my teacher Namrata Basu, who gave me an golden opportunity to do this wonderful project of environmental studies on the topic "ESTUARY ECOSYSTEM". She guided me so well to complete the project. Secondly,I want to also thank my parents as well as my friends who helped me a lot to complete the project. I came to know about so many new things which will help me in future. I am really thankful to them. Without them, the project would not have been completed within the limited time frame.

INDEX

INTRODUCTION

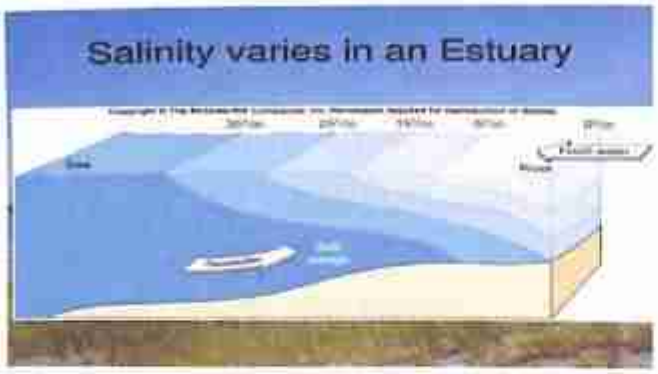
An ecosystem is a geographical area where plants, animals, and other organisms, as well as weather and landscape, work together to form a bubble of life. Ecosystems contain biotic as well as abiotic factors. **Estuaries are among the most productive ecosystems in the world**. Many animals rely on estuaries for food, places to breed, and migration stopovers. Estuaries are delicate ecosystems.

The word "estuary" is derived from the Latin word "aestuarium" meaning tidal inlet of the sea, which in itself is derived from the term "aestus" meaning tide. An estuary is the areas of water and shoreline where a freshwater stream or river merges with the ocean. It can be partially enclosed body of water (such as bays, lagoons, sounds or sloughs) where two different bodies of water meet and mix. They often bordered by salt marshes or intertidal mudflats. Estuaries are subject both to marine influences such as tides,, waves, and the influx of saline water, and to fluvial influences such as flows of freshwater and sediment. The mixing of seawater and freshwater provides high levels of nutrients both in the water column and in sediments, making estuaries among the most productive natural habitats in the world.

Estuarine ecosystems are among the most efficient in the world, developing more organic matter each year than similar-sized locations of the forest, grassland, or farming land. Protected estuary waters also home to unique communities of plants and animals that have actually adapted to life on the edge of the sea. It is the part in which the watercourses mix into the ocean circulation. They are typically located in areas where the tides are large with beaches to the sides, that when they disappear, display their flora.

CHARACTERISTICS OF ESTUARY ECOSYSTEM

. **Salinity-** The inflow of freshwater from one side and the open sea at the other gives rise to a gradient of increasing salinity from the interior to the estuary mouth. The salinity changes the tides and the season. Seasonal variations in salinity influence the circulation of organisms in the estuary. Continuous rains during the monsoon harm marine fauna. When salinity returns to regular after a couple of months, the marine animals re-establish themselves. Estuarine animals either adapt to prevent damaging salinities or endure a range in salinity by physical mechanism.



.Temperature- In shallow estuaries, the water is much cooler in the winter season and warmer in the summer season. These temperature level variations affect the species composition and remove most animals that cannot endure wide changes.

.Sediments- The sediment formation affects the organisms living in the estuary, especially plants and benthic animals. The substrate is made up of soft, loose mud or a mixture of mud and sand. Particular plants such as eelgrass in temperate areas and mangroves in the tropics develop on mudflats, making estuarine communities extremely efficient and at the same time providing special habitat for animals.

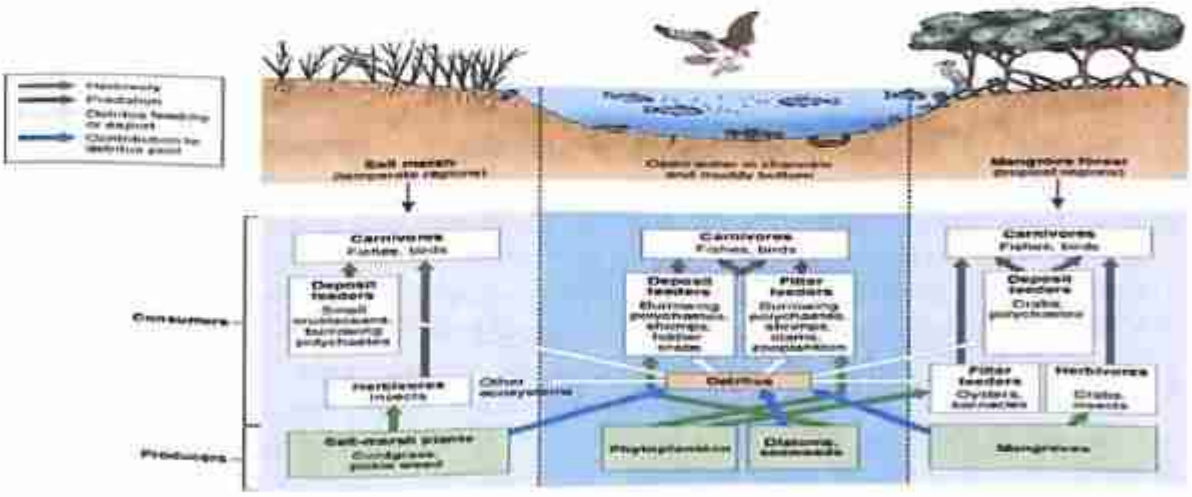
. **Turbidity-** The degree of turbidity varies extensively throughout the year; it is at a maximum during the rainy season. Turbid water avoids light from permeating even one meter below the water surface. This reduces the level of photosynthesis by phytoplankton in the deeper layers. Shore plants that are not covered by turbid waters are therefore the most important producers of raw material.

IMPORTANCE OF ESTUARY

- Of the 32 largest cities in the world, 22 are located on estuaries.
- Many animal species rely on estuaries for nesting and breeding and humans for jobs and recreation.
- Most of the fish and shellfish eaten in the United States, including salmon, herring, and oysters, complete at least part of their life cycles in estuaries.
- Estuaries filter out sediments and pollutants from rivers and streams before they flow into the ocean, providing cleaner waters for humans and marine life.
- Fishing, dams, and global climate change have led to a decline in the health of estuaries, making them one of the most threatened ecosystems on earth.

ESTUARY ECOSYSTEM

Estuaries are areas of great diversity with complex and interrelated trophic patterns and they support a large number of top predators, including humans. In the open ocean, where phytoplankton are the sole primary producers, estuarine systems usually contain several types of primary producers includes algae, sea grasses etc. Larger estuarine plants serve as food for some grazing aquatic animals but are more important food sources after they die and begin to decompose. Zooplankton graze on phytoplankton and become food for the carnivores plankton-eating fishes, such as small fish and omnivores. Estuaries are nurseries of the sea because juvenile forms of many marine animals live and feed in estuaries before returning to the sea. Bacteria and fungi promote the breakdown of the dead material organic detritus- an essential source of nutrition for detritus-eating animals and supports a detrital food web.



Bottom-dwelling, and bottom-oriented organisms are other important links in estuarine food chains and webs. Clams, for example, reside in the bottom sediments and feed on plankton and other organic matter by filtering it from the water. Deposit feeders, such as worms found in the estuary, move over and through bottom sediments where they find food deposited in or on the sediments. Shrimps, crabs, and other invertebrates are well adapted to bottom feeding,

as are many of the estuarine fishes. Near the top of the estuarine food web are various carnivores and omnivores. These are the fishes and birds as well as human.

HAZARDS OF ESTUARY ECOSYSTEM

- Estuaries are chosen locations for human settlement due to their high productivity and availability of natural connections between maritime and inland waterways. Residential, leisure and commercial developments (such as marinas, harbours, or ports) are normally situated right at the waterfront with supporting structures such as embankments influencing the upper shore communities. Estuaries are frequently challenged by land development; land improvement is particularly harmful in this respect as it results in an irreversible loss of habitat.
- Rivers releasing into their estuaries carry various constituents depending on the land use of the drainage area (catchment). These are the cause of the death of lots of organisms in estuaries.

PRESERVATION OF ESTUARIES

Ensuring the health of our estuaries is vital to the survival of the plant and animal communities that call them home and the humans that depend on them for their way of life. To preserve our estuaries, the National Estuarine Research Reserve System was established to protect more than 1.3 million acres of estuarine habitat for long-term research, monitoring, education, and stewardship throughout the coastal United States.

CONCLUSION

Estuaries are the vital part of the ecosystem.Without estuaries many species of plants and animals would not be able to survive. Everyone in the world depends completely on earth's ecosystem and the services they provide such as food, water climate regulation etc. Waters of streams and rivers ultimately drain into the sea; the place where freshwater from rivers and streams joins with the salt water of oceans is the estuary. Estuaries differ in size, shape and volume of water flow. Plants include phytoplankton, marsh plants and epiphytic vegetation. Mudskippers and gobies are important fishes. Grey mullet is commercial fish of estuarine water. The mangrove vegetation of the estuarine ecosystem is frequently possessed by reptiles, birds and mammals for food because shallow water during low tide exposes the animals as easy prey.

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NB
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Title

Flora and fauna in Sanjhekhali .

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DEPARTMENT : PSYCHOLOGY

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INDEX

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At last I would like to thank my parents because without their help this project would not have been successful. Finally, I would like to thank my dear friends who have been with me all the time.

INTRODUCTION

In natural capital accounting, ecosystem are assests that provide ecosystem service to people.Assests can be measured using both physical and monetary units . In the International System of Environmental Economic Accounting , ecosystem assests are generally valued on the basis of the net present value of the expected flow of ecosystem service .

Ecosystem is defined as the community or group of living organisms that live in and interact with each other in a specific

movement. Ecosystem functions have been identified as ecological properties that underly the supply of ecosystem service. However , few studies have managed to quantify ecosystem functions. In the SEEA EEA framework, capacity is a function of ecosystem condition and extent, and it is related to expected service provision sustainable yield . Nevertheless a proper definition of ecosystem is not provided in the SEEA EEA framework . Recent experience show that there is need to better define the concept of capacity and how they can be applied to the different types of services. We first focus on capacity , and subsequently analyses two related concepts , i.e potential supply of ecosystem service and ecosystem capabilities to generate those services.We contrast these definitions with ecosystem service flow , using the definition for ecosystem services from the SEEA EEA framework.

FAUNA IN SANJEKHALI

Sajnekhali Wildlife Sanctuary is a 362 km2 area in the northern part of the Sundarbans delta in South 24 Parganas district, West Bengal, India. It is located at the confluence of the Matla and Gumdi rivers.[2] The area is mainly mangrove scrub, forest and swamp. It was set up as a sanctuary in 1976. It is home to a rich population of different species of wildlife, such as water fowl, heron, pelican, spotted deer, rhesus macaques, wild boar, tigers, water monitor lizards, fishing cats, otters, Olive ridley turtle, crocodiles, Batagur terrapins, and migratory birds

FLORA IN SANJEKHALI

The tree may grow upto 25 km, trunk straight , leaves elliptic , roots with pnumetaphores and blind root sucker , Sundari, gewa or gengwa (Excoecaria agallocha), nipa palms (Nypa fruticans), and other halophytic (salt-tolerant) species are the dominant flora in the mangrove swamps. The Sundarbans region is renowned as a refuge for a variety of animal species, many of them rare and endangered. Much of the area has long had the status of a forest reserve, but conservation efforts in India were stepped up with the creation of the Sundarbans.

swamp, type of wetland ecosystem characterized by mineral soils with poor drainage and by plant life dominated by trees. The latter characteristic distinguishes a swamp from a marsh, in which plant life consists largely of swamp.

CONCLUSION

AS a conclusion , flora and fauna constitute our environment . The human begin is the main responsible of the destruction of flora and fauna . So the people can do many efforts to respect the law of protection of flora and fauna.

It is important because we must live in a healthy environment and to conserve our animal and tree species. Every living creatures play it's distinctive role to support life on the earth. Maintaining a natural balance is essential for the sustenancs of the ecosystem.

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NB 20/6/2022

ENVIRONMENTAL STUDIES PROJECT

Topic of the project : POLLUTION

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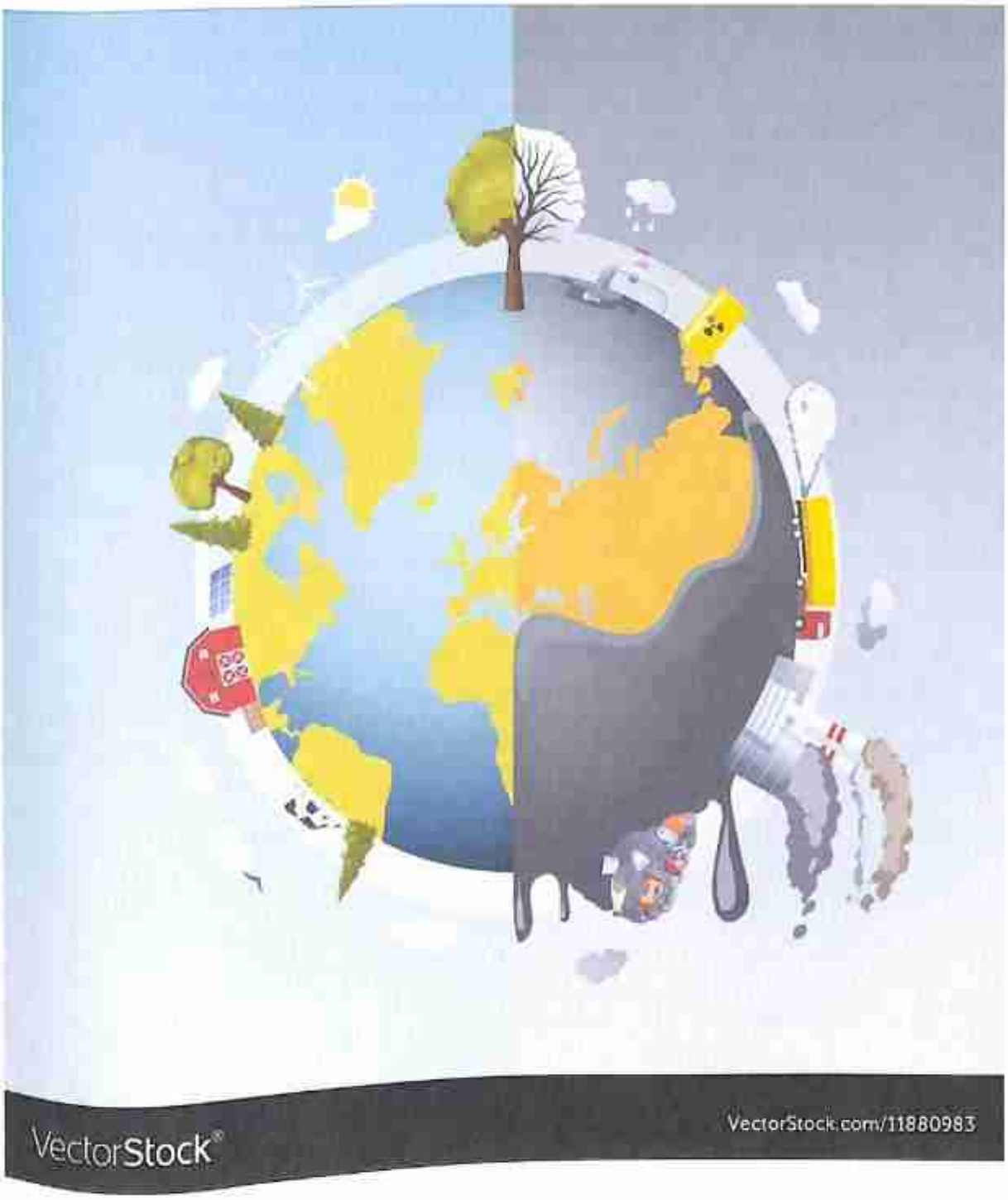
CONTENTS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INTRODUCTION

Pollution is a word that we are all aware of these days.

What does it mean exactly? If you look up "pollution" in the dictionary you will find something like - "to destroy purity of; to contaminate, especially with man-made waste". The environment, i.e. our surroundings, the place we live, is being made unclean by human activities.

The pollutants we produce not only affect our own lives but also those of other living things, the plants and animals that we share our environment with. All living things depend upon the non-living parts of the environment to survive - the land, the air and the water, and it is these 3 parts which are affected by pollution.

Land

A healthy soil is essential for life. Plants provide food for animals and human beings, and for growth and health plants need good conditions. A good soil should have plenty of humus - (decaying animal and plant remains), water, mineral salts, air and a population of living organisms, including bacteria, insects and worms. These good conditions may be ruined by:

Industrial Waste & Litter

If we're not careful, the planet could become just one big tip! Every household in the UK produces about one tonne of rubbish per year and most of it is buried in enormous landfill sites. Waste materials, some poisonous or radioactive, from factories may be dumped or buried causing danger to wildlife and humans. All the buried rubbish decomposes and can form poisonous substances which seep into the soil.

The careless throwing away of unwanted things - litter - onto the streets and in the countryside by thoughtless human beings is also both unsightly and dangerous to other animals.

Fertilisers & Pesticides

A growing human population over the years has meant a growing demand for food. To meet this demand, farmers have been using artificial fertilisers and chemical sprays to kill crop pests. Problems arise when these substances are over-used.

Artificial fertilisers may lead to soil erosion i.e. manure used to be put on the land which contains humus and this holds the soil together; powdery artificial fertilisers do not contain humus and without it the action of the rain and wind washes or blows the valuable topsoil away. Soil erosion is a serious problem throughout the world and some areas have been turned into dustbowls and deserts.

Air

Air is a mixture of gases and without it animals and plants cannot live. Pollution is caused when harmful or poisonous substances are released

or found in the air, rivers, seas, animals, plants or even our

bodies. Now, we live on a strong planet with robust plants and hardy animals and humans - but there's only so much we can take.

Pollution is one of the main causes of asthma which affects 5.4 million people in the UK. 1.1 million children (1 in 11) are receiving treatment for asthma and 4.3 million adults (1 in 12).

Exhaust Fumes

In the UK by 2019, nearly 38.4 million vehicles were contributing to the pollution of the air. Petrol fumes contain carbon monoxide, carbon dioxide, nitrogen oxide, soot, oil vapour and lead - all potentially dangerous to human health. Fortunately, lead free petrol is now being used extensively and cars with catalytic converters - which remove the polluting gases (except carbon dioxide) - are beginning to be introduced. In some cities, such as Los Angeles, fog combines with the fumes to form "smog" which causes lung problems.

Industrial Smoke

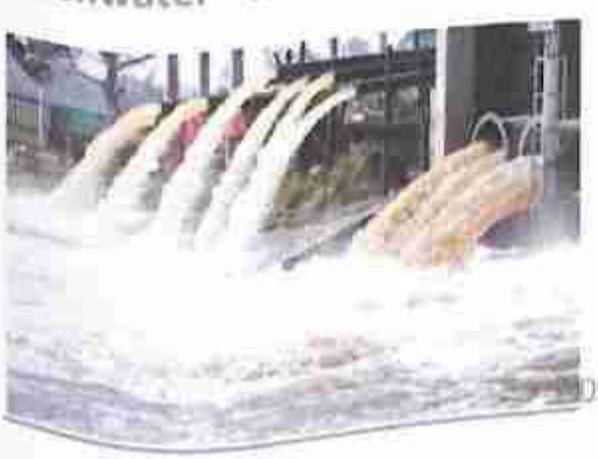
In our technological world we need masses of energy for lighting, heating, cooking, transport, industry...etc. To supply this energy, fuels are burnt. When power stations burn coal, oil and gas, these fuels are not totally used up and smoke is produced This smoke contains sulphur dioxide, nitrogen oxides, carbon particles and tar.

One of the worst types of pollution that we have been producing over the last 100 years is a direct result of the gases from power stations, especially sulphur dioxide and the nitrogen oxides. These gases combine with gases such as hydrogen and oxygen to produce the dangerous acids, sulphuric acid and nitric acid. These fall to the ground as acid rain and cause damage to buildings, plants, rivers and lakes. Whole habitats around the world have been totally destroyed by acid rain.

WATER

Every living thing depends on water for life. Over two thirds of the planet Earth is covered by sea water and there are also numerous freshwater habitats. Yet essential though all water is, humans continue to pollute it at an alarming rate.

Freshwater - rivers, streams, lakes and ponds



Factories, often built beside rivers so that water can be used, may discharge poisonous chemical waste into the water so killing the river-life.

Sewage works clean waste water from our homes and then discharge it back into the rivers. Bacteria in the filter beds digest the organic waste matter but if the water contains chemicals, such as bleach, the bacteria die and polluted water is often returned to the rivers. The water is also so depleted of oxygen that the animals cannot live in it.

Oceans

River estuaries and coastal waters are particularly affected. In addition, a lot of waste is deliberately dumped in the open sea. The most serious problem is radioactive waste which began to be disposed of after the Second World War. Some of the containers have leaked and we are still not sure of the long-term impact on marine life.

Enormous quantities of sewage, often untreated, containing dangerous chemicals and bacteria, are discharged into the oceans. Spills from oil tankers are another major hazard to marine life.

Microplastic Beaches

Scientists have discovered that under the microscope water samples taken from beaches show tiny bits of plastic, also known as microplastic. This microplastic shouldn't be here so where has it come from?

Researchers took 18 samples from beaches around the globe including the UK, US, India and Singapore. They found that all the samples contained this tiny plastic pollutant which could be causing harm to our marine environments, and also making its way into the food chain.

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Plastics such as polyester, acrylic and nylon were among the major finds across the samples, do you recognise these names? Take a look at a clothes label and you will very often find that it is made out of one of these synthetic fibres. Man-made fibres account for 68% of fibres used worldwide but how do these plastics end up on our beaches? Through our washing machines.

The researchers discovered that just one garment released up to 1,900 microplastic particles per wash! On a washing cycle when the machine is finished all the dirty water flows into sewers before being treated and flushed out to sea or in rivers. The microparticles aren't filtered out by water treatment, so make it out to sea.

These particles are swallowed by animals and can become lodged in their cells. In 2004 scientists tested plankton samples right back to the 1960s and found that the levels of microplastics had increased significantly over time. The nature of plastic is that it stays around for a long time, taking hundreds if not thousands of years to break down, and it is thought that microscopic plastics will never entirely disappear or decompose.

CONCLUSION

Environmental pollution is causing a lot of distress not only to humans but also animals, driving many animal species to endangerment and even extinction.
Everything on our planet is interconnected, and while the nature supplies us with valuable environmental services without which we cannot exist, we all depend on each other's actions and the way we treat natural resources.

It's widely recognised that we are hugely overspending our current budget of natural resources – at the existing rates of its exploitation, there is no way for the environment to recover in good time and continue "performing" well in the future.

Perhaps we should adopt a holistic view of nature – it is not an entity that exists separately from us; the nature is us, we are an inalienable part of it, and we should care for it in the most appropriate manner. Only then can we possibly solve the problem of environmental pollution.

Seen
LB
20/6/2022

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STUDY OF ECOSYSTEMS-
PONDS

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TOPIC: STUDY OF ECOSYSTEMS -PONDS

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INTRODUCTION

WHAT ARE ECOSYSTEMS?

The self-sustaining structural and functional interaction between living and non-living components

An ecosystem is a geographic area where plants, animals, and other organisms, as well as weather and landscape, work together to form a bubble of life.

Ecosystems contain biotic or living, parts, as well as abiotic factors, or nonliving parts. Biotic factors include plants, animals, and other organisms. Abiotic factors include rocks, temperature, and humidity.

An ecosystem is a biological community composed of different types of organisms interacting with each other and the surrounding environmental conditions. We see many living microorganisms living around us in various habitats such as land, oceans, forests, ponds, lakes, deserts, etc. All living organisms are adapted to their respective habitat.

Each ecosystem has its own community. An aquarium community, for example, can have small fish and other organisms. A desert community may have cacti, small snakes, and scorpions. A pond community can have frogs, insects, snakes, and plants, and a forest community may have rabbits, foxes and pine trees. The species in a community are divided into populations according to the particular habitats and ecological niches in the ecosystem.

POND ECOSYSTEM

A well-demarcated area formed by rain or overflowing water is called a pond or pool. It serves as a habitat for different aquatic organisms that interact with each other and the surrounding environment and constitutes a pond ecosystem.

A pond ecosystem is a freshwater ecosystem that can either be temporary or permanent and consists of a wide variety of aquatic plants and animals interacting with each other and the surrounding aquatic conditions. The pond ecosystem falls under the category of a lentic ecosystem because the water remains stagnant for a longer period.

Pond Ecosystem works on ponds that are shallow enough for the sunlight to pass through it. A pond is a self-sufficient and an ideal example of the ecosystem. In a pond, the intimate relation between the inhabiting living and non-living components is well understood. The non-living objects are various types of organic and inorganic substances such as water, sun rays, CO_2, oxygen, calcium, phosphorus, humic acid, etc. The living components are producers, primary consumers, secondary consumers, tertiary consumers, and various types of decomposers.

TYPES OF POND ECOSYSTEM

There are the following types of pond ecosystems:

1. **Garden Pond ecosystems:** These are man-made artificial pond ecosystems that comprise ornamental plants and animal species exported from all over the world.

2. **Salt Pond ecosystems:** These ecosystems are naturally formed at the seaside and contain brackish water. These are formed due to waterlogging. These can also be found in rocky areas on the beach called rock pools. Since it contains brackish water, it can accommodate sea plants and animals.

3. **Freshwater Pond ecosystems:** These ecosystems are naturally formed due to rainfall or soil water saturation due to continuous rain. Moreover, they can also be formed due to the flow of river water into a large and deep depression. These ecosystems serve as a home to freshwater fishes, amphibians, crustaceans, and many other kinds of wildlife.

4. **Venereal Pond ecosystems:** These are seasonal ponds that are temporarily formed during the heaviest rainfall due to the accumulation of water in the depressions in the ground. With the change in the season, they often turn into desert land.

5. **Mountain Pond ecosystems:** Naturally formed ponds are found in the mountain regions. These are formed due to the shifting of rocks and snow melting. They accommodate rare or endangered aquatic species.

CHARECTERISTICS OF POND ECOSYSTEM

The following are the main characteristics of the pond ecosystem:

1. The water in the pond ecosystem is stagnant.

2. Either natural or artificial boundaries surround the pond ecosystem.

3. The pond ecosystem exhibits three distinct zones, the littoral zone, limnetic zone, profundal zone, and benthic zone.

4. The biotic components of the pond ecosystem occupy different levels in the pond ecosystem, therefore, avoid the competition for survival. Scavengers and decomposers occupy the bottom level, and fish occupy the middle level. The plants enclose the pond's boundaries and provide shelter to small animals and insects.

5. Pond ecosystems show a wide range of variety in their size.

POLLUTION OF PONDS

The water in a pond must remain clean if it is to provide a healthy environment for the organisms (animals and plants) living in it. The natural waste from the living and dead organisms is 'recycled' by special tiny organisms called bacteria. Plenty of oxygen is needed for the bacteria to 'break down' the waste.

Perhaps the most serious threat to ponds is chemical pollution as a result of modern farming methods. Over the years fields have been sprayed with pesticides to rid the crops of pests. However, rain often washes the excess chemicals off the crops into nearby ponds, streams or rivers, poisoning some of the animals living there. Fortunately, these poisonous chemicals are not used so freely now and, hopefully, this problem will gradually be reduced.

Another, equally serious, problem connected with agriculture is the use of artificial fertilizers. Powdery chemical fertilizers, containing nitrates, are put on the crops to help their growth but they can also be washed off by rain into nearby ponds. They do not poison the wildlife but the rich supply of nitrogen causes the water plants, especially algae, to grow very quickly. The plants use up so much oxygen during the night and during decaying processes that there is none left for the other pond-life.

PRACTICAL TECHNIQUES FOR CONTROLLING POND POLLUTION

The best way of preventing ponds from becoming polluted is to ensure that their catchments do not produce pollutants. Since most ponds have surface catchments that are relatively small, this is often quite feasible.

To minimize pollution impacts, ensure that as much as possible of the land that drains water into the pond (i.e., the land uphill of the pond) has semi-natural vegetation (e.g., extensive grassland, moorland) and is not intensively managed farmland or urbanized.

In ponds where it is not possible to maintain semi-natural vegetation cover over the whole catchment other useful options are:

1) Route any piped inflow from a potentially polluted source away from the pond.

2)Establish buffer zones around the pond.

3)To eliminate phosphorus induced eutrophication.

4)Remove sediments.

5)Controlling filamentous algae is largely a matter of reducing nutrient levels.

6)To control planktonic algal blooms.

7)Preventing acidification by atmospheric deposition.

CONCLUSION

Pond Ecosystem has a great significance.

They provide inhabitation to scarce species and support biodiversity much more than any other freshwater habitat. The ponds provide inhabitation to wetland plants and animals. Pond works with a combination of three food webs at a time. They are not just important for quenching thirst or providing inhabitation but also to add beauty to the mother nature. It touches our heart and we feel calm and close to nature.

NB
29/6/2022

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Secondly, I would like to express my gratitude to my sister and friend who helped me a lot in finalizing this project within the limited time frame.

Vasundhara Thapa

Psychology Department

Semester 2

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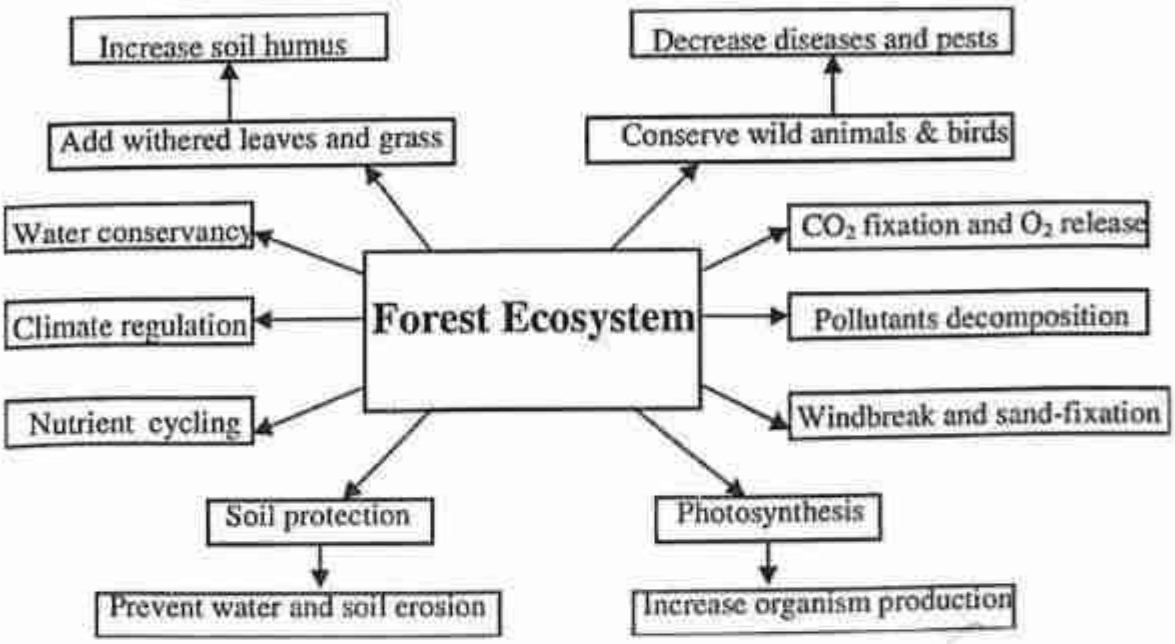
INTRODUCTION



An ecosystem refers to a functional unit of nature in which living organisms interact among themselves as well as with the surrounding physical environment. A Forest Ecosystem is a part of the terrestrial system in which living organisms such as trees, insects, animals and human beings interact with each other. It is the basic ecologic unit in a particular forest that exists as a "home" for a community of both native and introduced classified organisms. In other words, a forest ecosystem is typically associated with landmasses covered in trees and those trees are often classified by foresters into forest cover types. A forest is a large and complex

ecosystem and hence has greater species diversity. It is much more stable and resistant to detrimental changes as it does not undergo major changes by the effect of weather, forces of nature or human intervention. A forest ecosystem, similar to any other ecosystem, also comprises abiotic and biotic components. Abiotic components refer to inorganic materials like air, water, and soil. Biotic components include producers, consumers, and decomposers. In India, the forests occupy about 18–20% of the total land area. There are many types of forest ecosystems and the classifications are based on the temperature and rainfall in the area of the particular forest ecosystem under observation.

STRUCTURAL FEATURES OF THE FOREST ECOSYSTEM

The two main structural features of a forest ecosystem are:

Species composition: Species composition refers to the contribution of each plant species to the vegetation. Species composition is generally expressed as a percent so that all species components add up to 100%. It also refers to the identification and enumeration of the plant and animal species of a forest ecosystem.

Stratification: It refers to the vertical distribution of different species which occupy different levels in the forest ecosystem. Every organism occupies a place in an ecosystem on the basis of a source of nutrition. For example, in a forest ecosystem, trees occupy the top level, shrubs occupy the second and the herbs and grasses occupy the bottom level.

TYPES OF FOREST ECOSYSTEM

There are a few types of forest ecosystems listed below:

1. **Tropical Evergreen Forest:**

   Only a small percentage of tropical forests are rainforests where the average rainfall is 80–400 inches in a year. This forest is characterized by deep and dense vegetation consisting of tall trees reaching different levels.

2. **Tropical Deciduous Rainforest:**

   The main characteristic of tropical deciduous rainforest are broad-leaved trees along with dense bushes, shrubs, etc. Two main seasons- summer and winter are distinctly visible there.

3. **Temperate Evergreen Forest:**

   Temperate evergreen forest is a type of forest that is characterized by a smaller number of trees but an adequate number of ferns and mosses.

4. **Temperate Deciduous Forest:** Temperate deciduous forest evolves in the moist temperate region with sufficient rainfall. Here also, winter and summer are well defined, and trees shed their leaves during winter. Dominant trees are maple, oak, peach, etc.

5. **Taiga/Boreal:** Situated just south of the Tundra, Taiga is characterized by the contiguous green belt of conifer and deciduous trees that encircles a large portion of the Northern Hemisphere. The average temperature is below the freezing point for almost half of the year.

COMPONENTS OF FOREST ECOSYSTEM

Different organisms exist within the forest layers. These organisms interact with each other and their surroundings. Each organism has a role or niche in sustaining the ecosystem.

Some provide food for other organisms; others pro-vide shelter or control populations through predation:

1. **Producer:**

   Producers can synthesize their own food through the photosynthesis process. In a forest ecosystem, trees and other plants get their energy from sunlight. Plants produce their own food, in the form of carbohydrates. Plants are, therefore, called the primary producers, since they produce the basic foodstuffs for other organisms within food chains and food webs.

2. **Primary Consumers:**

   Since the consumers cannot prepare their own food, they depend on producers. Herbivorous animals get their food by eating the producers (plants) directly. Examples of primary consumers are grasshoppers, deer, etc.

3. **Secondary Consumers:**

Secondary consumers draw their food from primary consumers. Secondary consumers are referred to as carnivores.

4. **Decomposers:**

The decomposers of the forest ecosystem break down dead plants and animals, returning the nutrients to the soil so that they can be used by the producers. Apart from bacteria, ants and termites are important decomposers in the Amazon rainforest. Millipedes and earthworms also help to break down dead matter.

5. **Nutrient Cycle:**

The nutrient cycle is cyclic. For the proper functioning of ecosystems, nutrients are required. For example, carbon, hydrogen, oxygen, and nitrogen constitute.

6. **Energy Flow:**

The flow of energy that occurs along a food chain is called energy flow. The pyramid of energy represents the total quantity of energy at each trophic level of a food chain. The flow of energy is always unidirectional.

Characteristics of Forest Ecosystem

1. Forests are characterized by warm temperatures and adequate rainfall, which make the generation of a number of ponds, lakes etc.,

2. The forest maintains climate and rainfall.

3. The forest supports many wild animals and protects biodiversity.

CONCLUSION

Forest is a dense land covered with various plants and trees. There are three main types of forests: coniferous, deciduous and tropical rainforests. Forests ecosystem are divided based on adequate rainfalls and temperature. The Forest ecosystem is home to many animals and fully fills all the basic needs required such as wood, timber, medicinal plants, etc. Forest helps in maintaining the oxygen and temperature levels of the atmosphere.

The forest ecosystem helps in preventing global warming. The water in the soil is absorbed by plants through roots. They release excess into the atmosphere, which helps in the occurrence of rainfall. Forest ecosystems prevent soil erosion and maintain the fertility of the soil.

NB 20/6/2022

Environmental Studies Project

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TOPIC-

ENVIRONMENTAL ASSETS: FLORA, FAUNA AND NATURAL RESORCES.

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Introduction:

The ecosystem is a complex, interconnected network comprising biotic and abiotic elements. Biotic elements include all living organisms such as plants, animals and microorganisms. Abiotic components, on the other hand, include non-living entities that are vital for the survival of life and these include soil, water, climate, etc. Among all biotic elements, Flora and Fauna are the most fascinating ones.

In a nutshell, the term flora relates to all plant life and the term fauna represents all animal life.

the term flora in Latin means "Goddess of the Flower." Flora is a collective term for a group of plant life found in a particular region. The whole plant kingdom is represented by this name.

According to the place at which they grow, they have adaptations also. For example, Cactus plants are naturally seen in deserts. They have adaptations like modified leaves or prickles to preserve water and protect themselves from predators.

Fauna represents the animal life indigenous to a region. There are many explanations regarding the origin of the word. As per Roman mythology, Fauna or "*Faunus*" is the name of the goddess of fertility. Another source is "*Fauns*" which means "*Forest spirits*".

Natural Resources :

Natural resources are materials available on the planet that can be used to keep people alive and meet their needs. A natural resource might be any natural substance that humans utilize. This includes oil, coal, natural gas, metals, stone, sand, air, sunlight, soil, and water. Natural resources may also include animals, birds, fish, and vegetation.Food, fuel, and raw materials for manufacturing are all made from natural resources. Plants and animals provide all of the food that people consume. Heat, light, and power are provided by natural resources such as coal, natural gas, and oil.

Natural Resources can be categorized into two main categories — Renewable and Non-renewable sources of energy.

Renewable Resources

Renewable resources are those that are either always available like water, air, and sun or can be replaced or recovered in a reasonable amount of time like vegetative lands. Animals can also be considered renewable since they may produce young ones to replace adult animals.

Organic renewable resources are renewable resources that originate from living things like trees and animals. Inorganic renewable resources are renewable resources that originate from non-living sources such as water, sunlight, and wind.

Non-renewable Resources

Non-renewable resources are resources that can't be replenished once they've been depleted or cannot be recovered in a reasonable amount of time. Fossil fuels, and minerals are examples of non-renewable resources because, while they form naturally through a process known as the rock cycle, the process can take thousands of years, making them non-renewable.

Examples of Non- Renewable natural resources are as follows.

Air: The existence of all living beings requires clean air. However, due to several reasons, the air gets polluted and it indirectly affects the health of living beings.

Water: A very small amount of freshwater is available on Earth. Out of this amount, some amount is portable which means that it can be used for drinking. Since there is a constant change in the climate, there is a change in the rainfall pattern as well. The melting of ice is dropped in winter as well. All these factors result in lowering the amount of this natural resource which is crucial to life on Earth.

Fossil Fuels: Natural resources like natural gas, coal, and petroleum would be over someday which means that they are exhaustible. It takes several millions of years for one dead organism to get converted into fuels. They are consumed at a faster rate than the rate that it is formed. The excess burning of these fossil fuels leads to air pollution since it gives out carbon dioxide which is a type of greenhouse gas.

AREA OF VISIT- South Kolkata

Commonly found flora and fauna:

TREES AND PLANTS-

There are many trees which are commonly found and Banyan tree is the most familiar shade giving tree in our country. Interestingly, it originated in India itself. These Indian trees have the largest canopy coverage in India. Not many people know but the banyan tree is also the national tree of India. Banyan tree is commonly found in the city where people relax and take a shade to cover themselves from the sun

Many plants typically the plants used for religious purposes are mostly grown in the nearby places. Plants like Basil, Hibiscus, marigold and sunflower are the most commonly found floras.

-A picture of a banyan tree.

DOMESTIC ANIMALS-

Domestic animals make crucial contributions to human wellbeing as sources of food, fiber, power, and many other products and services. Worldwide, domestic animal production centers on a small number of globally distributed species, including cattle, pig, sheep, goat, horse, donkey, rabbit, chicken, duck, goose, and turkey. These are augmented by a similar array of regionally important food- and fiber-producing species, such as water buffalo, dromedary and Bactrian camel, llama, alpaca, yak, reindeer, and guinea pig.

Conclusion

Thus to conclude we can say that ecosystems are created by the interrelationships between living organisms and the physical environments they inhabit (land, water, air). Flora and fauna of India include a wide range of plant and animal species, most of which is not found anywhere else in the world. Prominent examples of flora include junipers, pines and deodars, lotus, milk worts, Assam catkin yew, spiderwort, etc. Examples of fauna present in India include the Bengal tiger, Asian elephant, snow leopard, Indian rhino, Indian sloth bear, etc. Flora and fauna are a part of the ecosystem and they are interdependent on each other for their survival. Besides, the ecosystem becomes imbalanced if there are any adverse effects on flora and fauna, such as an extinction of a species. Also natural resources help in satisfying the human needs to its fullest. Furthermore, the rational use of natural resources maintains the earth's atmosphere. Also, the wise use leads to protection of bio-diversity. Humans cannot imagine their lives without natural resources.

NB
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STUDY OF ECOSYSTEM: POND ECOSYSTEM

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INDEX

INTRODUCTION

An ecosystem is a structural and functional unit of ecology where the living organisms interact with each other and the surrounding environment. In other words, an ecosystem is a chain of interactions between organisms and their environment. The term "Ecosystem" was first coined by A.G.Tansley, an English botanist, in 1935.

The structure of an ecosystem is characterised by the organisation of both biotic and abiotic components. This includes the distribution of energy in our environment. It also includes the climatic conditions prevailing in that particular environment.

The structure of an ecosystem can be split into two main components, namely:

- Biotic Components
- Abiotic Components

The biotic and abiotic components are interrelated in an ecosystem. It is an open system where the energy and components can flow throughout the boundaries.

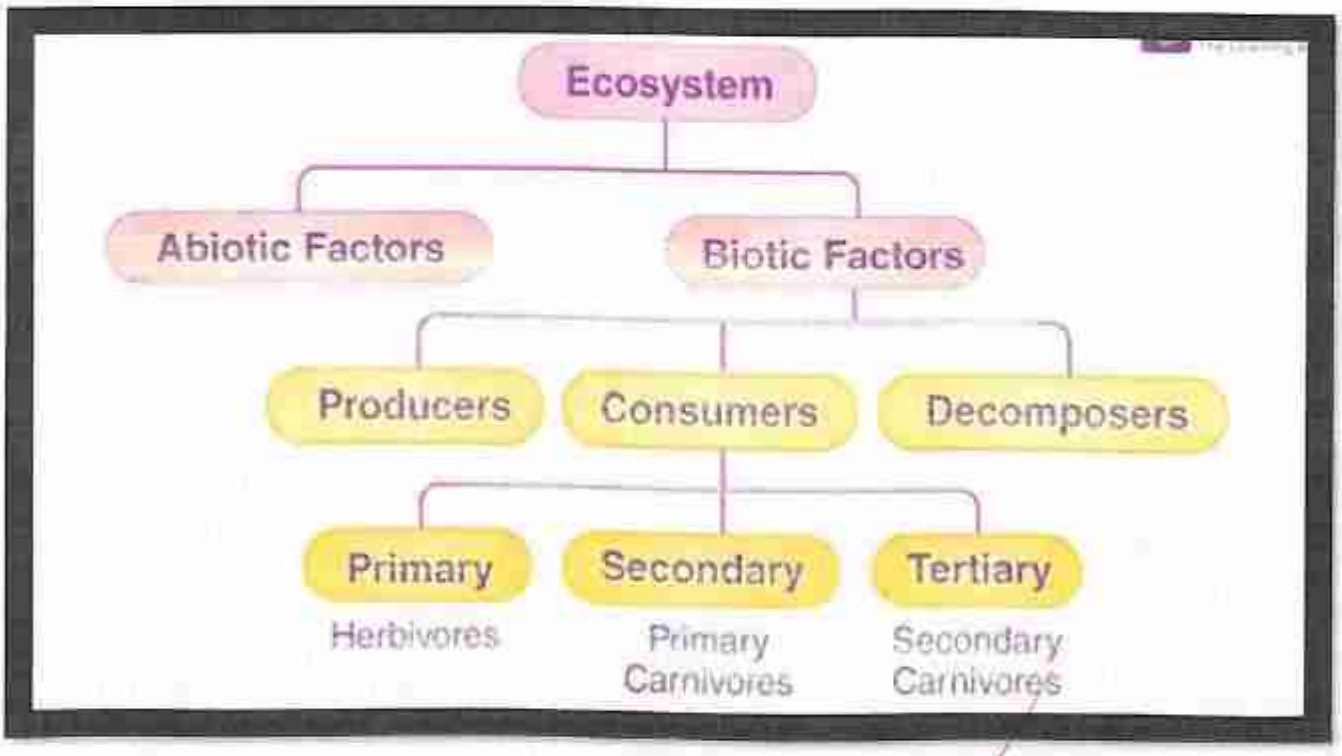


Fig: Components of Ecosystem

Biotic components refer to all living components in an ecosystem. Based on nutrition, biotic components can be categorised into autotrophs, heterotrophs and saprotrophs (or decomposers).

- **Producers** include all autotrophs such as plants. They are called autotrophs as they can produce food through the process of photosynthesis. Consequently, all other organisms higher up on the food chain rely on producers for food.
- **Consumers** or heterotrophs are organisms that depend on other organisms for food. Consumers are further classified into primary consumers, secondary consumers and tertiary consumers.
    - **Primary consumers** are always herbivores as they rely on producers for food.
    - **Secondary consumers** depend on primary consumers for energy. They can either be carnivores or omnivores.
    - **Tertiary consumers** are organisms that depend on secondary consumers for food. Tertiary consumers can also be carnivores or omnivores.
    - **Quaternary consumers** are present in some food chains. These organisms prey on tertiary consumers for energy. Furthermore, they are usually at the top of a food chain as they have no natural predators.
- **Decomposers** include saprophytes such as fungi and bacteria. They directly thrive on the dead and decaying organic matter. Decomposers are essential for the ecosystem as they help in recycling nutrients to be reused by plants.

Abiotic components are the non-living component of an ecosystem. It includes air, water, soil, minerals, sunlight, temperature, nutrients, wind, altitude, turbidity, etc.

Types of Ecosystem

There are two types of ecosystem:

- Terrestrial Ecosystem-Terrestrial ecosystems are exclusively land-based ecosystem.They are as follows:

1. Forest Ecosystem
2. Grassland Ecosystem
3. Tundra Ecosystem
4. Desert Ecosystem

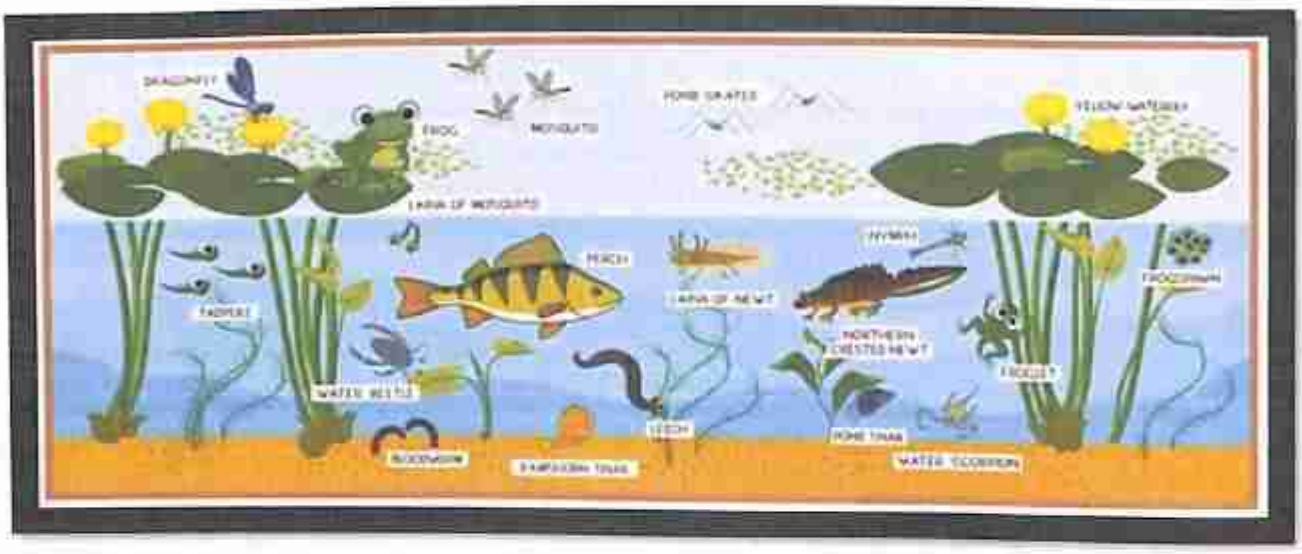
- Aquatic Ecosystem- Aquatic ecosystems are ecosystems present in a body of water. These can be further divided into two types, namely:

1. Freshwater Ecosystem-Ponds, lakes, rivers, streams etc.
2. Marine Ecosystem-Abyssal plain, coral reefs, kelp forests etc.

POND ECOSYSTEM

Pond Ecosystem is a type of freshwater ecosystem. A pond ecosystem is a freshwater ecosystem that can either be temporary or permanent and consists of a wide variety of aquatic plants and animals interacting with each other and the surrounding aquatic conditions.

Fig: Pond Ecosystem



Types of Pond Ecosystem

There are the following types of pond ecosystems:

1. **Garden pond ecosystems:** These are man-made artificial pond ecosystems that comprise ornamental plants and animal species exported from all over the world.
2. **Salt pond ecosystems:** These ecosystems are naturally formed at the seaside and contain brackish water. These are formed due to waterlogging. These can also be found in rocky areas on the beach called rock pools. Since it contains brackish water, it can accommodate sea plants and animals.
3. **Freshwater pond ecosystems:** These ecosystems are naturally formed due to rainfall or soil water saturation due to continuous rain. Moreover, they can also be formed due to the flow of river water into a large and deep depression. These ecosystems serve as a home to freshwater fishes, amphibians, crustaceans, and many other kinds of wildlife.
4. **Venereal pond ecosystems:** These are seasonal ponds that are temporarily formed during the heaviest rainfall due to the accumulation of water in the depressions in the ground. With the change in the season, they often turn into desert land.
5. **Mountain pond ecosystems:** Naturally formed ponds are found in the mountain regions. These are formed due to the shifting of rocks and snow melting. They accommodate rare or endangered aquatic species.

Characteristics of Pond Ecosystem

The following are the main characteristics of the pond ecosystem:

1. The water in the pond ecosystem is stagnant.
2. Either natural or artificial boundaries surround the pond ecosystem.
3. The pond ecosystem exhibits three distinct zones, the littoral zone, limnetic zone, profundal zone, and benthic zone.
4. The biotic components of the pond ecosystem occupy different levels in the pond ecosystem, therefore, avoid the competition for survival. Scavengers and decomposers occupy the bottom level, and fish occupy the middle level. The plants enclose the pond's boundaries and provide shelter to small animals and insects.
5. Pond ecosystems show a wide range of variety in their size.

Stratification in the Pond Ecosystem

Different factors such as distance from the shore, penetration of light, depth of water, plant and animal species, etc. determine the following zones found in the pond ecosystem:

1. **Littoral zone:** It is the zone closer to the shore. It contains shallow water and allows easy penetration of light. Rooted plant species occupy it. Animal species include reeds, crawfish, snails, insects, etc.
2. **Limnetic zone:** The limnetic zone refers to the open water of the pond with an effective penetration of light. This zone is dominated by phytoplankton. Animal species mainly include small fishes and insects.
3. **Profundal zone:** The region of a pond below the limnetic zone is called a profound zone with no effective light penetration. Some amphibians and small turtles occupy it.
4. **Benthic zone:** The bottom zone of a pond is benthic and is occupied by a community of decomposers. The decomposers are called benthos.

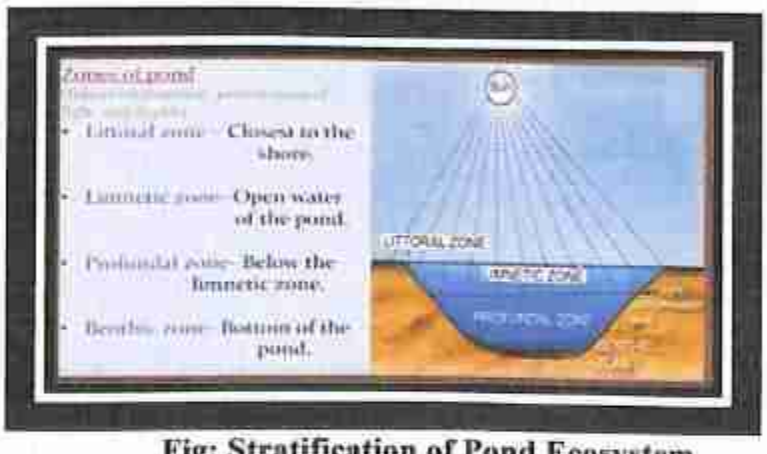


Fig: Stratification of Pond Ecosystem

Abiotic Components of the Pond Ecosystem

Abiotic components are the non-living components of an ecosystem that matter for the aquatic species' survival. There are the following main abiotic components of a pond ecosystem:

- Light: Light serves as a main abiotic component required for the photosynthetic activities of the phytoplankton. The littoral zone has the maximum light penetration, whereas the profound zone has the least light penetration.
- Temperature: As the depth of the pond increases, the temperature of the water gradually decreases due to the gradual decrease in the light penetration.
- Dissolved oxygen: The amount of dissolved oxygen is maximum in the shallow water and gradually decreases while moving from the surface to the depth of the pond.

Biotic Components of the Pond Ecosystem

Biotic components are living components. A wide variety of living components are found in the pond ecosystem can be discussed as follows:

1. Producers: These include species of rooted, submerged, emerged, floating plants and algae. The most common filamentous algae found in ponds is Spirogyra. Mougeotia and Zygnema are some other algae found in the pond. Azolla, Hydrilla, Pistia, Wolffia, Lemna, Eichhornia, Nymphaea, Potamogeton, Jussiaea, etc., are a few examples of green plants that are found in the pond ecosystem.
2. Primary consumers: A large population of zooplanktons are the main primary consumers. Besides these, small herbivores such as snails, insects, small fishes, tadpoles, and larvae of aquatic animals are the primary consumers often found in the pond.
3. Secondary consumers: These include large animal species such as frogs, big fishes, water snakes, crabs, etc. The consumers of the highest order might include mammals like water shrews, water voles, herons, ducks, kingfishers, etc.
4. Decomposers: These include different types of bacteria and fungi that feed upon dead and decaying parts of the aquatic species.

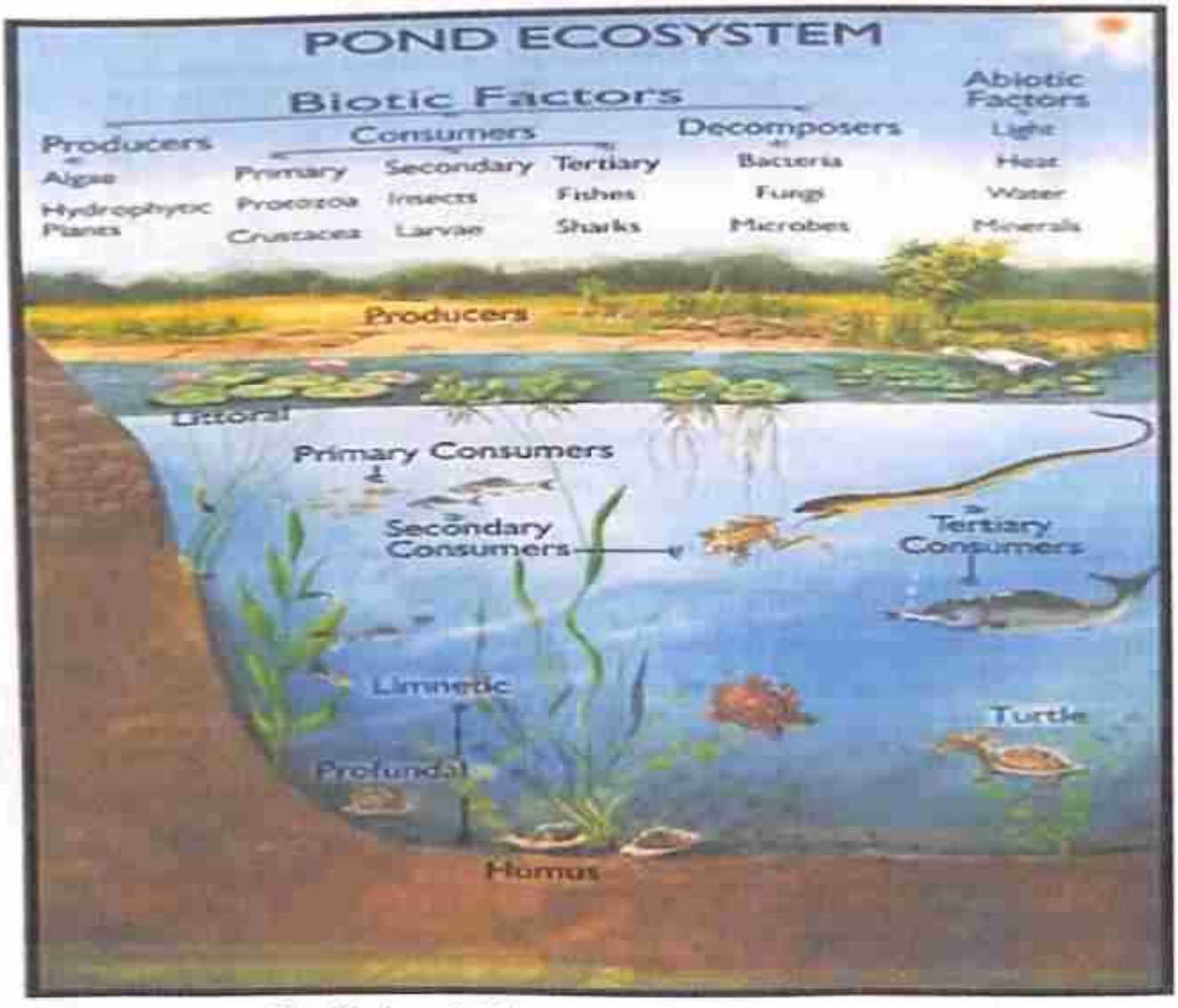


Fig: Biotic and Abiotic Factors of Pond Ecosystem

Food Chain in the Pond Ecosystem

1. The food chain is a sequence of organisms in which each organism eats the lower member and is being eaten up by the next higher member.
2. Phytoplankton and algae serve as producers that convert solar energy into chemical energy.
3. Phytoplankton is being consumed by zooplankton (primary consumers).
4. The food chain further proceeds with the small pond species that feed on zooplankton.
5. Small pond species are eaten by large pond species.
6. A number of bacteria and fungi feed on dead and decaying parts of the animal species and are therefore called decomposers. Decomposers convert the organic matter (dead plants and animals) into their inorganic components that are again utilised by producers, and hence a continuous flow of energy is maintained.

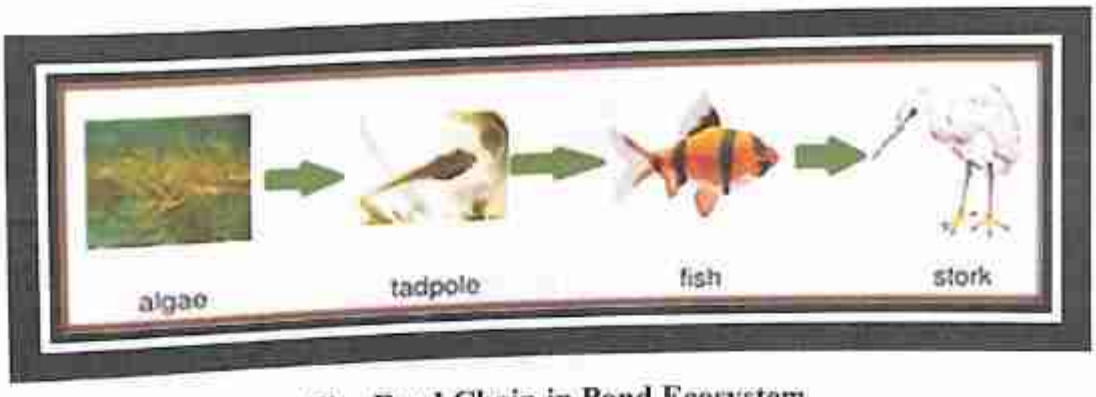


Fig: Food Chain in Pond Ecosystem

Importance of Pond Ecosystem

The importance of the pond ecosystem can be discussed as follows:

1. Some aquatic plants help to improve the water quality by absorbing pollutants and heavy metals.
2. The shoreline plants absorb nitrogen and phosphorus and therefore prevent the algal bloom and maintain the oxygen level in the pond. Moreover, aquatic plants absorb animal wastes to reduce the nutrient availability for plants and therefore prevent the growth of algae.
3. The pond ecosystem is one of the sites for the conservation of biodiversity as different types of plants and consumers occupy different strata in the pond and live together by interacting with each other. Ponds in mountain regions conserve the endangered species.
4. The pond ecosystem also serves as a source of water for the species that do not live in the pond.
5. Pond ecosystems contribute to the beauty of nature as they accommodate a variety of ornamental flowering plants.
6. Stratification in the pond ecosystem determines the distribution of animal species in the pond. It reduces the competition among the species to some extent.

CONCLUSION

Though pond ecosystems can be found all over the globe, they are often neglected by conservationists. All of our wetland ecosystems ought to be safeguarded because they are vital habitats for an abundance of different species.

Unfortunately, the world's pond ecosystems are being threatened by many factors. These include the drainage of wetlands for industrial purposes, pollution, urban sprawl and global warming which is changing the face of the planet and its weather systems. So, it is up to us right now to do all that we can to look after these beautiful and significant ecosystems.

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NB
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SUBJECT: ENVIRONMENTAL STUDIES(ENVS)

SUBJECT CODE: AECC-2

COLLEGE NAME: GOKHALE MEMORIAL GIRLS' COLLEGE

STUDY OF ECOSYSTEM: RIVER ECOSYSTEM

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INTRODUCTION

An ecosystem is a structural and functional unit of ecology where the living organisms interact with each other and the surrounding environment. In other words, an ecosystem is a chain of interactions between organisms and their environment. The term "Ecosystem" was first coined by A.G.Tansley, an English botanist, in 1935.

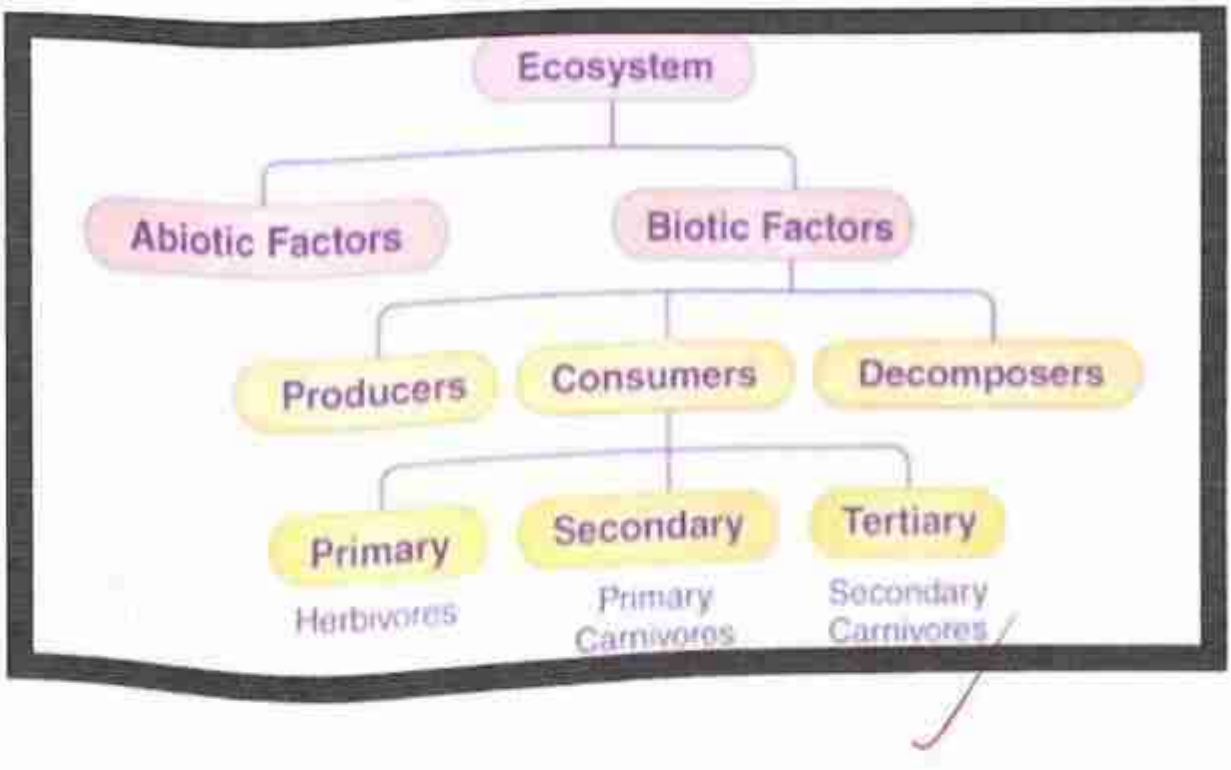
The structure of an ecosystem is characterised by the organisation of both biotic and abiotic components. This includes the distribution of energy in our environment. It also includes the climatic conditions prevailing in that particular environment.

The structure of an ecosystem can be split into two main components, namely:

- Biotic Components
- Abiotic Components

The biotic and abiotic components are interrelated in an ecosystem. It is an open system where the energy and components can flow throughout the boundaries.

Fig: Components of Ecosystem



Biotic components refer to all living components in an ecosystem. Based on nutrition, biotic components can be categorised into autotrophs, heterotrophs and saprotrophs (or decomposers).

- **Producers** include all autotrophs such as plants. They are called autotrophs as they can produce food through the process of photosynthesis. Consequently, all other organisms higher up on the food chain rely on producers for food.
- **Consumers** or heterotrophs are organisms that depend on other organisms for food. Consumers are further classified into primary consumers, secondary consumers and tertiary consumers.
    - **Primary consumers** are always herbivores as they rely on producers for food.
    - **Secondary consumers** depend on primary consumers for energy. They can either be carnivores or omnivores.
    - **Tertiary consumers** are organisms that depend on secondary consumers for food. Tertiary consumers can also be carnivores or omnivores.
    - **Quaternary consumers** are present in some food chains. These organisms prey on tertiary consumers for energy. Furthermore, they are usually at the top of a food chain as they have no natural predators.
- **Decomposers** include saprophytes such as fungi and bacteria. They directly thrive on the dead and decaying organic matter. Decomposers are essential for the ecosystem as they help in recycling nutrients to be reused by plants.

Abiotic components are the non-living component of an ecosystem. It includes air, water, soil, minerals, sunlight, temperature, nutrients, wind, altitude, turbidity, etc.

Types of Ecosystem

There are two types of ecosystem:

- Terrestrial Ecosystem-Terrestrial ecosystems are exclusively land-based ecosystem.They are as follows:

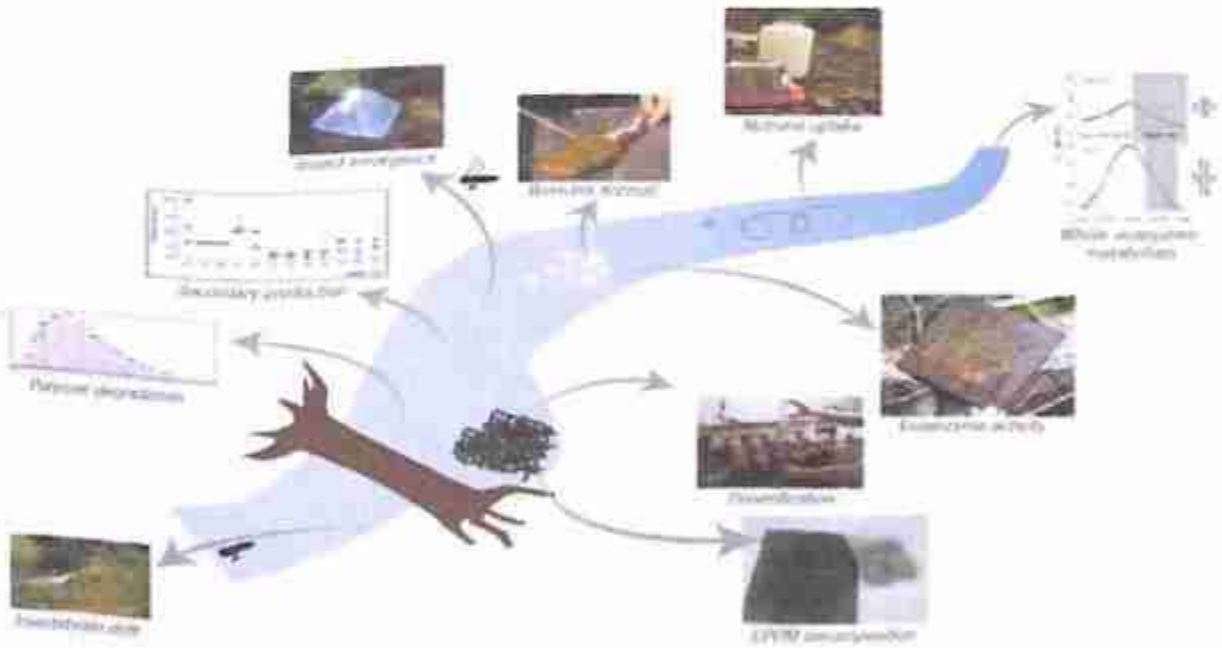
1. Forest Ecosystem
2. Grassland Ecosystem
3. Tundra Ecosystem
4. Desert Ecosystem

- Aquatic Ecosystem- Aquatic ecosystems are ecosystems present in a body of water. These can be further divided into two types, namely:

1. Freshwater Ecosystem-Ponds, lakes, rivers, streams etc.
2. Marine Ecosystem-Abyssal plain, coral reefs, kelp forests etc.

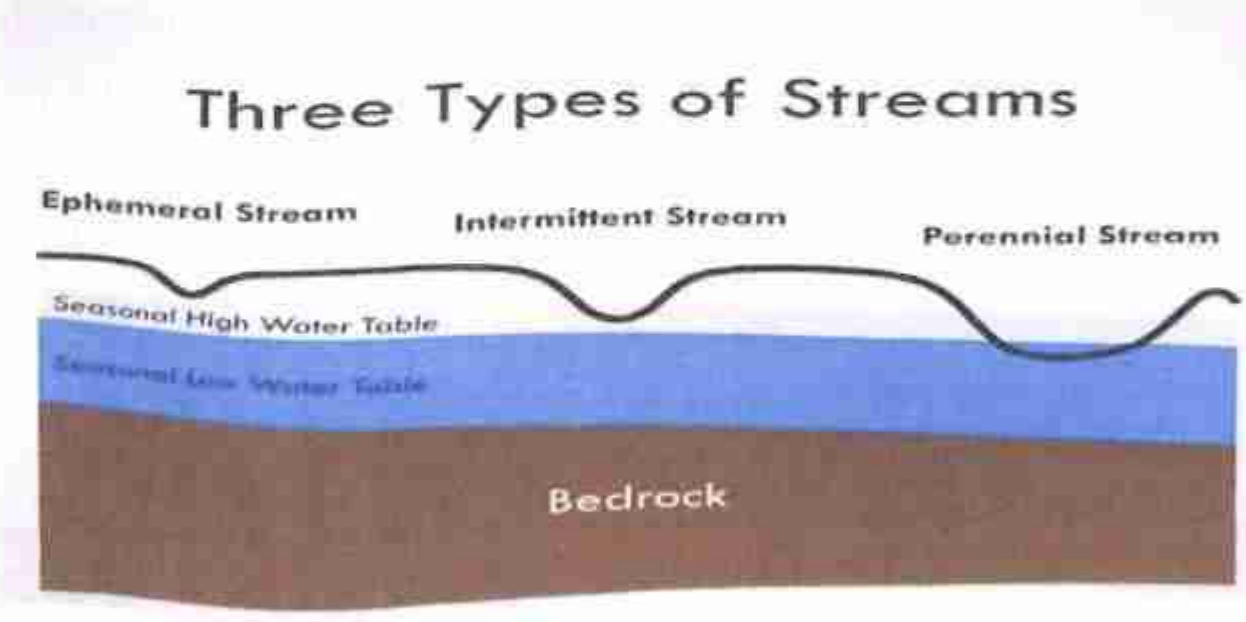
RIVER ECOSYSTEM

Water is an essential component of life. Surface water resources are the mostly preferred locations for life settlements. Most of the human civilizations were also originated near water courses, especially along the major rivers. A River is a large natural course of flowing water obtained from precipitation. The surface water moves down along the slopes due to the action of gravity. Streams, tributaries, brooks, creeks and springs are the different types of water courses classified based on their dimension and distribution.



- A river is also termed as major, medium and minor, based on its number and length of tributaries, stage of development, area of catchment and geomorphological conditions.
- Every major river must have a place of origin in the upstream side, which is called as the headwaters, and a point of confluence with the sea or water body at the downstream end.
- A river water is always on the move.
- Every river has its own longitudinal profile and different cross-sections.

- The longitudinal profile indicates the nature of slope existing at different places and levels.
- The cross-section of a river varies from headwater zone to the mouth. These are called as river valleys which may be ranging from sharp canyons and gorges to wider flat streams nearer to the delta.
- The level at which water flows in a river is called as the river stage.
- The velocity of water flowing in a stream is not uniform along the longitudinal profile, also within their cross sections.
- A river is a powerful geological agent. It has the capacity to erode, transport and deposit the sediments. These are called as river alluvium.
- The alluvial deposits, clay and silt of a river are the materials preferred for different activities.



A river may be into the following 3 types:

a) In a perennial river , there will be a continuous flow of water throughout the year

b) In intermittent streams, the flow is seasonal.

c) In ephemeral streams, the flow is occasional or rare.

The following are the terms used to denote the small portions of rivers.

- Pool is a segment where the water is deeper and moving slowly.
- Riffle - is a segment where the flow is shallower and more turbulent
- Headwater , in a river, is the point of origin of the stream.
- Channel is the river courses developed by constant erosion
- Floodplain is the flatland existing on either side of the stream that are subject to seasonal flooding

The confluence of a river is called as the mouth. This is the point at which the stream discharges all its load into a sea or other static body of water.

A flowing river water carries enormous amount of salts in solution and sediments in suspension. It also rolls up a lot of bedload along the bottom.The water flowing through a river is called as its discharge. The volume and velocity of river discharge depends on several geomorphic factors. The suspended and bed load sediments carried along with other organic matter in the flowing water control the characteristics of the river ecology.

The life along rivers, vary from its head/ source to the mouth, from stream to stream, from country to country. The velocity of flow and force, nature of substratum like alluvium or rock bottom may determine, some of the habitat of a river course.

2. LIMITING FACTORS AND STRUCTURE:

The major abiotic factors controlling the lotic ecosystems are

a) Slope and geomorphic conditions including the nature of substratum

b) Physico-chemical properties of water. Tempertaure, color, alkalinity, pH and dissolved oxygen

c) Flow velocity and quantity

d) Type and amount of suspended and bed-load sediments

e) Turbidity

f) Thickness of water column and the depth of light penetration

g) The climatological factors like atmospheric temperature, humidity, sun shine hours, evapotranspiration and wind.

Depending upon the temperature of water, streams are classified into iso-thermal and non-isothermal streams.In all the rivers, most of the abiotic parameters vary both in space and time. The interface between the land and water and the interface between water and air play a significant role in controlling the environmental

conditions of an area.

3. CHARACTERISTICS OF LOTIC ADAPTATIONS

Lotic habitats are influenced by the effect of continuously moving water, pollution, suspended sediments, floods and other human activities.

The animals and plants living in lotic environments have certain specific adaptations. They are subjected to varieties of dynamic environmental factors, like water currents, pollutants and suspended sediments.

The unique characteristics of running water habitat are :

1. The establishment of a firm attachment with the substratum. Most of the sponges, diatoms and moss are examples of these. They live on the wooden logs, stones, rock exposures.

2. The swimmers are expected to have hooks or suckers to maintain grip over the polished surfaces.

3. Some of them build nets around them for food trapping.

4. some of them , like snails and worms, may have sticky bottoms to move long the base.

5. The life living in rivers, have a stream-lined shape of the body. They may have a body rounded anteriorly and tapering posteriorly. This is for a free-swimming habit against the water currents.

6. Some have a flat body to stay within the cracks and crevices of rocks.

7. Rheotaxis is a feature seen in rivers. This is the capacity, or mechanism by which fishes and other animals swim against the currents and rapidly flowing water. This is the resistance capacity of many lotic forms.

8. Clinging habitat is another feature of Life in river ecosystems. Some organisms mostly stay closer and nearer to the hard bodies or materials.

9. Some of the life forms in rivers have the characteristic feature of Osmo regulation. Especially, the Protozoans eliminate excess water through a contractile vacuole.

For respiration, life systems in rivers, have respiratory siphons. Eg. The Mayfly is equipped with gills. The productivity is more in streams than standing waters. The temperature is not constant along the river course. Oxygen content is high at all levels, due to the flowing water. C02 occurs as carbonate and bicarbonate salts. Turbidity is a limiting factor of river ecosystems.The pelagic adaptations include both planktonic and

nektonic adaptations. Floating and swimming organism come under these groups. Planktons possess typical body structures. They are bladder like, needle-like and hair-like. Walled bodies and locomotory structures like cilia, appendages, fins and musculature are common to these life. Some of them are characterised by light and thin skeletons.

4. LIFE ALONG RIVERS:

In rivers, there are varieties of life like fishes, plants, animals, and numerous microorganisms that we can't see. In addition to these, along the river banks, trees and shrubs grow which are the shelter belts for birds and mammals.

Many tiny organisms also exist in river waters and they play a crucial role in maintaining the food supply for the entire ecosystem. They act as feeders, collectors, and grazers. They help in breaking down the plant matter that grows along streams or falling from the overhanging vegetation. The river snails work for processing the calcium present in water to build their shells. Some of the trees and plants act as shades for other life and filter the pollutants and extract trace metals from the sediments.

Predator -prey relationships are more along the rivers. The larger fish eats the smaller ones and smaller predatory organisms parasitize the larger fish commonly in rivers. Varieties of local and migratory birds, snakes, frogs, bears and other land animals, including cattle and humans, all come to the river for drinking water, fihsing, preparing food, bathing, washing and living. Every life along rivers produces waste which becomes food for some other type of feeder. The producers or autotrophs are the green plants including the chemosynthetic micro organisms present in rivers. The micro consumers of rivers are the herbivores, predators and parasites. The decomposers or micro consumers are the worms, bacteria and fungi. In a stream ecosystem, food is constantly being produced, consumed and recycled. Pollution and other human activities can change the food source and impair the life cycles of the creatures living in and around the water courses. As all living beings along the river depend on one another, any change in the system parameters will affect all others as well.

Example: a) Floods in rivers. b) Dumping solid wastes into rivers.

May hamper the normal living environments.

5. LONGITUDINAL ZONATION

Streams exhibit two habitats - rapids and pools.

So, the stream organisms may be divided into rapid communities and pool communities.

The nature of communities existing in rivers, depends on the

a) type of stream bottom

b) density of population.

The river bottom may be containing sand, pebbles, clay, bedrock or rubble rock. The rapids community are called as Torrential fauna, as they are subjected to the turbulence created by the currents. Eg. A blackfly larva which exists in the rock bottom is an example to this group.

The pools community includes the burrowing types, which are living along the stream banks or bottom. Eg. Mayfly nymph and the Dragon-flynymph. There is also a zonation in the stream communities. The Headwater species are different from the deltaic species. The gradational changes in communities are due to the changes in temperature, velocity of water flow and the quality of water including its pH.

The Zonation could be seen in the following portions:

a) Water surface- upper, middle, lower zones

b) High velocity and low velocity zones

c) Clear and turbid water zones

d) Zones of deep and shallow waters

e) Winter and summer flows

f) Normal and flood periods.

CONCLUSION

The Aquatic biodiversity is a primary concept in environmental analysis. It encompasses most of the freshwater ecosystems, including lakes, ponds, and reservoirs, rivers and streams, groundwater, and the wetlands. Aquatic ecosystems also provide a home to many species including the phytoplankton, zooplankton, aquatic plants, insects, fish, birds, mammals, and others.

They are organized at many levels, from the smallest building blocks of life to complete ecosystems, encompassing communities, populations, species, and genetic levels. In summary, aquatic biodiversity includes all unique species and habitats, and the interaction between them. It has enormous economic and aesthetic value and is largely responsible for maintaining the overall environment. Humans have long depended on aquatic resources for food, medicines, and materials as well as for recreational and commercial purposes such as fishing and tourism. Aquatic organisms also rely upon the great diversity of resources existing in rivers for their food, materials, and breeding. Several Factors affect these conditions.

They are overexploitation of species, introduction of exotic species, pollution from urban, industrial, and agricultural activities, as well as the habitat loss and alteration through damming, and diversion of water into other places.All these contribute to the declining levels of aquatic biodiversity, especially the freshwater ecosystems. It is necessary to adopt certain conservation strategies to protect and conserve the aquatic life and to maintain the balance of nature and support the availability of resources for future generations.

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