Gokhale Memorial Girls' College

Date: 13/04/2023

To whom it may concern

Subject: Completion of ENVS Project by CNDV Gr. B 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-CNDV Gr. B with pdf link of their projects stated alongside.

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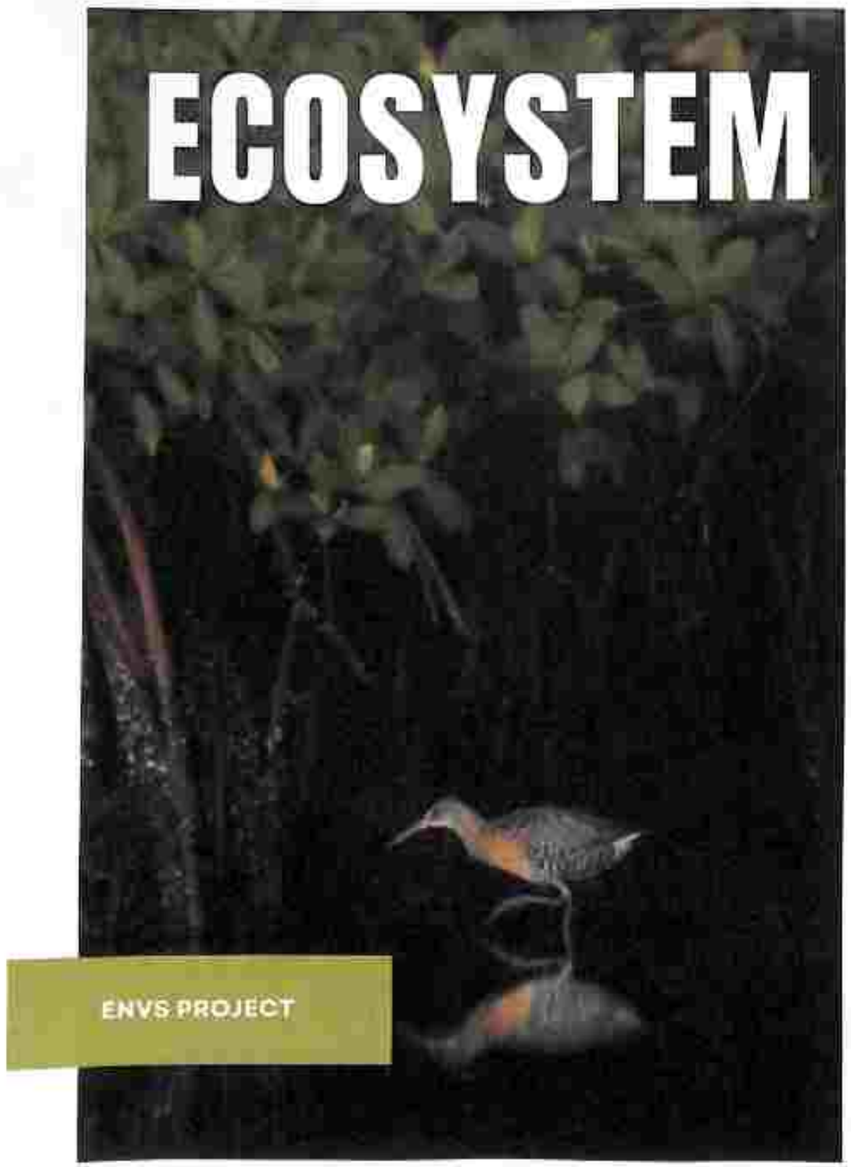

SEMESTER 02

CU ROLL NO.:- 213013-13-0015

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CONTENT

ECOSYSTEM

An ecosystem refers to a practical unit of nature where living organisms act together among themselves and with the surrounding physical environment. Environmentalists look at the whole biosphere as a global ecosystem. Moreover, the forest ecosystem is a part of the terrestrial ecosystem.

However, it can differ generally in size; for example, it can be a small pond or a sea, or a huge forest. Typically, these are self-sustaining. We can split the ecosystems into two comprehensives classifications, specifically, terrestrial ecosystem and aquatic ecosystem.

The terrestrial ecosystem includes grassland, desert, and forest ecosystem, but the lake, pond, river, and wetland ecosystems fall under the aquatic ecosystem umbrella.

Ecosystems are controlled by external and internal factors. External factors such as climate, parent material that forms the soil, and topography control the overall structure of an ecosystem but are not themselves influenced by the ecosystem. Internal factors are controlled by decomposition, root competition, shading, disturbance, succession, and the types of species present.

POND ECOSYSTEM

Introduction: A pond is either a natural or an artificial body of water that is enclosed. Ponds can occur naturally in the world or they can be human-made (such as a garden pond).

An ecosystem is a technical term for a community of organisms. For such a community to form an ecosystem, it needs to be a distinct system where the organisms live and interact.

The pond Ecosys differ from other water ecosystems. Unlike the river ecosystem, which is categorized under the Lotic systems, a point he d ecosystem falls under the Lentic

ecosystem for the reason that the water remains stagnant in ponds for a relatively long period.

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.

So, to summarize, a pond ecosystem is:

- A community of organisms living together
- Within a body of water that can be either artificially enclosed or naturally enclosed.
- A distinct community with its ecology.

Types of pond ecosystem:

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

appear and at other times of the year will be relatively deserted - one example for instance is a seasonal oasis in the desert. These types of pond ecosystems are sometimes referred to as ephemeral pools as well, to reflect the fact that they only exist at certain times of the year.

5. Underground ponds.

Ponds can also form underground, in the rocky environment of caves. Here, a surprising amount of life can be found, including fish, different bacteria, lichens, and so on.

Characteristics of pond ecosystems.

Several things mark pond ecosystems out from other types of ecosystems. Below, you will find a list of some of the main features of these ecosystems.

1. Still waters: pond ecosystems are lentic ecosystems i.e.; they involve stagnant or standing water.
2. Surrounded banks: by definition, pond ecosystems are surrounded by either artificial or natural banks.
3. Wet: these ecosystems are wet and humid.
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.

almost everywhere, but they can also be found plentifully. That, again, makes them a key habitat for many different species.

4. Source of hydration.

Even if they do not 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.

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 eaten up by the next higher member.
2. Phytoplankton and algae serve as producers that convert solar energy into chemical energy.
3. Phytoplankton is 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. Several 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 util-utilized producers, and hence a continuous flow of energy is maintained.

Conclusion:

Though they can be found all over the globe, pond ecosystems 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. This includes pond ecosystems which, as we have seen, can come in many different shapes and forms and can perform many different functions.

RIVER AS AN ECOSYSTEM:

Water is an essential component of life.
Surface water resources are the most preferred locations for life settlements. Most of the human civilizations originated near water courwatercoursesly 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 watercourses classified based on their dimension and distribution.

- A river is also termed major, medium, and minor, based on its number and length of tributaries, stage of development, area of catchment,t and geomorphological conditions.
- Every major river must have a place of origin on the upstream side, which is called the headwaters, and a point of

rivers. They are the veins of the earth through which life flows. Rivers not only make our planet habitable; they also make it exceedingly beautiful. Rivers are invaluably useful for man, animals, and plants. They are the source of potable water, irrigation for agriculture, power generation, transport, food, recreation, and leisure, etc.

Rivers are the most precious gift that nature has given to the ind. No life can be imagined there would be no water(river). It is the sole duty of overtry person the to prevent this indispensable resource from getting polluted. If we don't take this seriously, the existence of Human Beings will become a History on this Earth.

What is a Wetland?

A wetland is an area where water covers the soil or is present either at or near the surface of the soil all year or for varying periods during the year, including during the growing season. Water largely determines how the soil develops and the types of plant and animal communities living in and on the soil. Wetlands may support both aquatic and land species. The prolonged presence of water creates conditions that favor the growth of specially adapted plants and promote the development of characteristic wetland soils. Wetlands vary widely because of regional and local differences in soils, topography, climate, water, vegetation,and other factors, including human disturbance. Indeed, wetlands are found from the tundra to the tropics and on every continent except Antarctica. Two general categories of wetlands are recognized: coastal wetlands and inland wetlands. Often called "nurseries of life," wetlands provide habitat for thousands of species of aquatic and terrestrial plants and animals. Although wetlands are best known for being home to water lilies, turtles, frogs, snakes, alligators, and crocodiles, they also provide important habitats for waterfowl, fish, and mammals. Migrating birds use wetlands to rest and feed during their cross-continental journeys and as nesting sites when they are at home. As a result, wetland loss has a serious impact on these species.

Types of Wetlands:

MARSHES are wetlands dominated by soft-stemmed vegetation. They are sometimes saturated, flooded, or ponded with water and characterized by grasses adapted to wet soil conditions. Marshes are further characterized as tidal marshes and non-tidal marshes. SWAMPS are wetlands dominated by trees and other woody plants. Swamps occur in either freshwater or saltwater floodplains. They are characterized by very wet soils during the growing season and standing water during certain times of the year. Well-known swamps include Georgia's Okefenokee Swamp and Virginia's Great Dismal Swamp.

BOGS are freshwater wetlands characterized by spongy peat deposits, evergreen trees and shrubs, and a floor covered by a thick carpet of sphagnum moss. These systems, whose only

world, comparable to tropical rain forests and coral reefs in their productivity and the diversity of species they support. Aquatic plant life flourishes in the nutrient-rich environment, and energy converted by the plants is passed up the food chain to fish, waterfowl, and other wildlife and us as well. In addition to the biological productivity of wetlands, an acre of wetland can store 1-1.5 million gallons of floodwater. Although wetlands keep only about 5% of the land surface in the conterminous United States, they are home to 31% of our plant species and support one-third of all endangered species. Wetlands are found on all continents except Antarctica and their diversity is as broad as their geographic occurrences. Read on for more specific functions and values of wetland ecosystems.

Functions of a Wetland:

1) Absorption and storage of floodwaters and groundwater recharge in dry periods Protection of coastlines from high energy open ocean waves
2)Slowing of water velocity so sediments may settle out thereby improving water quality.
3)Filtering and removal of excess nutrients and toxins by wetland soils and plants Providing nurseries for juveniles of many aquatic species including most commercially harvested fish.
4)Providing habitat for many upland species such as raccoons and deer as well as habitat for sensitive wetland-dependent species like salamanders.

Value of Wetlands to Humans:

Alternately, the value of a wetland is an estimate of the importance or worth of one or more of its functions to society. For example, a value can be determined by the revenue generated from the sale of fish that depend on the wetland, by the tourist dollars associated with the wetland, or by public support for protecting fish and wildlife. Although large-scale benefits of functions can be valued, determining the value of individual wetlands is difficult because they differ widely and do not all perform the same functions or perform functions equally well.

What is Wetland Restoration?

Wetlands are one of the most valuable and fragile components of a watershed, but for many years they were filled and drained for agriculture and development. Now we are learning that wetlands are crucial to the health of our waters and wildlife. Wetland restoration, the renewal of natural and historical wetlands that have been lost, is a growing activity. It can improve water quality and wildlife habitat across the nation.

Conclusion of wetlands:

of precipitation in the region governs the forest's development. If there is adequate rain for the growth of trees, then a forest will typically develop. Otherwise, the region will turn into grasslands.

Tropical rainforest ecosystem:

Tropical rainforests are one of the most vital forest ecosystems on Earth. These outstanding ecologies are homes to countless species of animals and plants. Rainforests not only have high biodiversity of plants but are also fully packed with tall trees that create a ceiling (canopy) from the sun above. This ceiling stops smaller plants on the forest floor from growing, but in some parts where sunlight makes it to the surface, are filled with fascinating plants. These plants are considered the "understory" or the shrub layer of a forest.

Boreal/Taiga Forest ecosystem:

• Boreal forest ecosystem is the collective green stretch of deciduous and coniferous forest that surrounds a big share of the Northern Hemisphere. In North America, boreal forest lands expand across the majority of northern Canada and into Alaska. It has been recognized as one of the Earth's great forest ecosystems for a long time.
• This forest ecosystem spreads over about 35% of Canada's landmass and is the single biggest land-based ecosystem in North America. It furthermore comprises a considerable amount of Canada's biodiversity and has long been documented as a central global carbon sink. Although we don't, being such a major carbon sink should, in itself, be considered an ecosystem service for the benefit of mankind! Although the boreal is comparatively unfamiliar, it is central as the "great lung" of North America. This forest ecosystem houses the biggest and tiniest mammal species (such as the wood bison and pygmy shrews respectively).
• Boreal forest has various natural resource components. Ripe with large lakes and northern rivers; huge swamps, bogs, and other organic marshes. The abundant biological diversity of the Boreal is a delight to see: lynx and caribous, cranes and bison, owls, woodpeckers with three toes instead of four, multicolour wood warblers, and beetles.
The Boreal has more than 5,000 species of visible and vibrant fungi, illustrious far more in Siberia and Scandinavia than in North America. Then there are the exquisite old-growth forests, the lushest and most biologically varied of the Boreal Forest groups that are vital for a lot of Boreal species.

Savanna forest ecosystem:

The Savanna ecosystem is generally found in South America, Australia, and Africa.
Savanna forests are quite vulnerable to forest fires; on the other hand, it has characterized by the ability to re-grow much faster.
The landscapes of the Savanna Forest ecosystem are covered with large areas of green lands, bushes & clusters of feeble trees.

Characteristics of a forest ecosystem:

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 save wild animals from hunting and cutting down of trees by urban people. Few modern people visit forests for recreation.

Threats to forest ecosystem:

• Deforestation

One of the major challenges faced by the forest ecosystem is deforestation. Deforestation is nothing but cutting the forests for some other purpose other than for forest use. Huge amounts of forests are cut down every year by the state governments for agriculture, settlements, constructing multipurpose projects, etc.
Some contractors even do illegal deforestation for monetary benefits. As a result of deforestation, the quality of soil also gets degraded because of soil erosion which in turn cannot sustain forests further.

Barren Quality:

Nearly half of the forests in India are there only for the namesake. Only the remaining half of the forests have a green cover. If we remove the barren forests from the list of forests, the ratio of forests to land in India will be around 11%, which is far short of the current estimate. So, it is important to grow forests to increase the ratio further. Construction of Multipurpose Projects

Forests are being cleared by the State Governments for constructing multipurpose projects and their associated canals. To support these projects, additional infrastructure is provided like constructing roads, buildings, etc. Similarly, roads are constructed for transportation facilities which in turn leads to the fragmentation of forests.

• Jhumming or Shifting Cultivation

The tribal people generally practice shifting cultivation where crops are grown for one or two years after clearing the forest areas and when the fertility of the soil gets exhausted, they move to newer forest areas. Similarly, to earn a livelihood, tribal people exploit forest wealth.

• Forest Fires

Though forest fires are not major threat to forests in India they are a common phenomenon the world over. Forest fires that happen either due to natural or man-made causes destroy the forests and hence cause deforestation.

Conservation of Forest:

Conservation of forests is the practice of planting more trees and maintaining the forested areas for sustainability for future generations. Forests are an important natural resource and are beneficial to humans in several ways. But due to

combinations. Estuaries have diverse flora and fauna and tremendous productivity:

- Salt marsh grasses, algae, and phytoplankton are the major producer.
- Many species of annelids, oysters, crabs, and fish are present.
- Many marine invertebrates and fish breed in estuaries or migrate through them to freshwater habitats upstream.
- A large number of waterfowl and other semi-aquatic vertebrates use estuaries as feeding areas.
- Human activities are having a large impact on estuaries. Estuaries receive the pollutants dumped into the streams and rivers that feed them.
- Residential and commercial development not only adds to pollution but eliminates some estuaries due to land filling.

Freshwater from rivers sometimes moves with large freshwater bodies as the Great Lakes creating a "freshwater estuary" that functions like typical brackish estuaries.

Estuary Classification by Water Circulation freshwater-
The amount of circulation affects the salt distribution and salinity concentrations salt-wedge, fjord, slightly stratified, vertically mixed, Fresh Water.

Salt-Wedge Estuaries

- Salt wedge estuaries occur when the mouth of a river flows directly into salt water.
- The mouths of the Mississippi, Columbia and Hudson rivers are examples of salt wedge estuaries.
- The water circulation is controlled by the river that pushes back the seawater. This circulation creates a sharp boundary that separates an upper less salty layer from an intruding wedge-shaped salty bottom layer.

Fjord

- Fjord type estuaries are characterized by a deep elongated machine that is 'U' shaped and a ledge or barrier that separates the basin from the sea.
- Fjord type estuaries are found along glaciated coasts such as Alaska, Chile, New Zealand.
- They have moderately high river input and little tidal mixing.

Slightly Stratified or Partially Mixed Estuary

- Partially mixed estuaries have a tidal flow that provides a means of easing the salt wedge.
- Deeper estuaries such as Puget Sound and San Francisco Bay are examples of partially mixed estuaries.
- The salt water is mixed upward and fresh water is mixed downward.
- The lower layers of water typically remain saltier than the upper layers

Vertically Stratified or Well Mixed Estuaries

- Well-mixed estuaries have strong tidal mixing and low river flow that mix the sea water throughout the shallow estuary.

- Mudflat characteristics are defined by their specific combination of sand, silt, clay and organic matter content.
- Organisms best suited for the mud flat are burrowers.

Tidal Stream

- Tidal streams are highly productive transitional areas between the freshwater of rivers and the saltwaters of bays.
- Tidal streams serve as nurseries for many fish and shellfish, including several species important for commerce and recreation.
- Many macroinvertebrates are often present

Barrier Beaches

- Barrier Beaches are spits of sand that form parallel to the shore.
- Pounding waves, shifting sands, strong winds, and saline soils make living on the beach difficult.
- Microscopic and larger animals have adapted to life under the sand to escape the harsh conditions at the surface by burrowing into the sand.
- Low, sprawling root systems help hold the plants in place as winds blow and sands shift.
- Thick leathery or hairy leaves help reduce water loss.

Salt Marshes

- Salt marsh are wetland flooded regularly by tidal, brackish water.
- Sediment in the salt marsh often has a high salt content.

POINT AND NON-POINT SOURCE POLLUTION:

- Pollutants pose a large threat to estuarine organisms.
- Pollutants are introduced into estuaries from either point sources or non-point sources.
- Point sources are clearly defined, localized inputs such as pipes, industrial plants, sewer systems, oil spills from tankers, and the state governments regulate them.
- Non-point sources are indistinct inputs that do not have a clearly defined source, such as runoff of petroleum products from roadways or pesticides from farmland Estuary Preservation.
- 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.
- A majority of pollutants find their wat into estuaries from non-point sources.
- Non-point sources are harder to detect and to control.
- Reduction of pollution requires substantial individuals and collective efforts.

ESTUARY PRESERVATION

Ensuring the health of our estuaries is vital to the survival of the plant and animal communities that all of home and the humans that depend on them for their way of life.

water, disease management, climate regulation, spiritual fulfilment and aesthetic enjoyment. The transformation of the planet has contributed substantial net gains in human wellbeing and economic development. An ecosystem is balanced when the natural animals and plants and non-living components are in harmony. With increasing pollution change in migratory patterns and rise of human population, many ecosystems are in danger of losing that harmony. Human beings are an integral part of ecological systems and depend on nature for survival and quality of life. Thus, saving nature will save the ecosystems and ourselves.

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AECC2 ENVS PROJECT
ON
STUDY OF ECOSYSTEMS

→ POND
→ RIVER
→ WETLAND
→ FOREST
→ ESTUARY
→ AGRO ECOSYSTEM

Name ??

CU ROLL NO.- 213013130016
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INDEX

Ecosystem

An ecosystem refers to a practical unit of nature where living organisms act together among themselves and with the surrounding physical environment. Environmentalists look at the whole biosphere as a global ecosystem. Moreover, the forest ecosystem is a part of the terrestrial ecosystem.

We can split the ecosystem into two comprehensive classifications, specifically terrestrial ecosystem and aquatic ecosystem. The terrestrial ecosystem includes grassland dissert and forest ecosystem, but lake, pond and river and wetland ecosystem fall under the aquatic ecosystem.

The term "ecosystem" was first coined by A.G. Tansley, an English botanist, in 1935.

Ecosystem vary in size: Some are small enough to be contained within single water droplits while others are large enough to encompass entire landscapes and regions.

The fundamental source of energy in almost all ecosystem is radiant energy from sun.

POND ECOSYSTEM

Introduction: A pond is either a natural or an artificial body of water that is enclosed. Ponds can occur naturally in the world or they can be human made.

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

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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

1. Salt ponds - Salt pond contain brackish water and can occur close to sea side where waterlogged ground creates natural pools.

2. Garden ponds: These artificially created ponds can contain ornamental plant and animal species that come from all over the world.

3. Freshwater pools: Freshwater pools can be from anywhere inland, either from rainfall or from presence of water saturating soil. They can be home to fish, birds, amphibians, and etc.

4. Vernal pools: They are seasonal ponds. These types of ponds ecosystems are sometimes referred to as ephemeral pools as well, to reflect the fact that they only exist at certain times of year.

Characteristics of Pond ecosystems

There are several things that mark pond ecosystem out from other types of ecosystems.

1. Still waters - They involve standing water.
2. Surrounded by banks - Sourrounded by either artificial or natural banks.
3. Wet - These ecosystems are wet and humid ones.
4. Different levels - Distinct communities of creatures will live at different levels of a pond.
5. Variable in size - Some pond can be very small while other can be as large as a lake.

Importance of Pond ecosystem

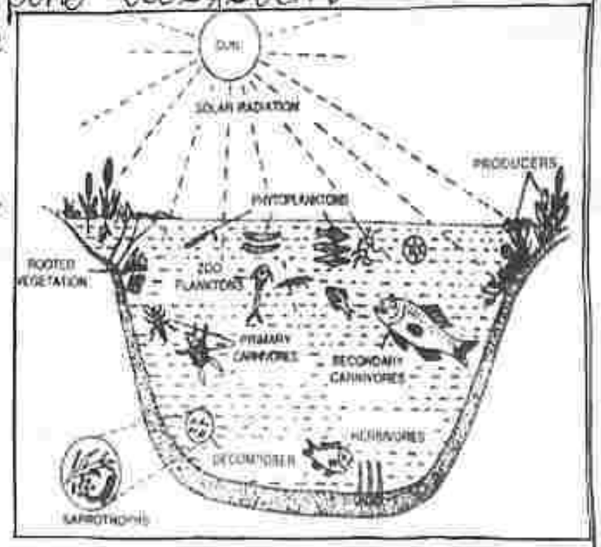
1. Biodiversity:- Pond ecosystems are very important habitats for so many different types of fish, birds, plants and insects such as dragonflies, and pond skaters.

2. Ubiquity:- Pond ecosystem 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 they can be found almost everywhere. That makes them a key habitat for many species.

4. Source of hydration:- Even if they do not actually live in the pond ecosystem, many species of animals will come to pond ecosystem whenever they need a drink.

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 next higher number.
2. Phytoplankton and algae serve as producers that convert solar energy into chemical energy.
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4. The food chain further proceeds with the small pond species that fed on zooplankton.
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6. A no. of bacteria and fungi feed on dead parts of animal species.

RIVER AS AN ECOSYSTEM

Water is an essential component of life. Surface water resources are the mostly preffered locations for life settlements. Most of the human civilization were also originated near water courses, especially along the major rivers.
The surface water moves down along the slopes due to the action of gravity.
A river water is always on the move
A river is also termed as major, medium, minor, based on its number and length of tributaries, stage of development, area of catchment and geomorphological conditions.
Every river has its own longitudinal profile and different cross-sections.
A river is a powerful geological agent. It has the capacity to erode, transport and deposit the sediments

A river may be into the following 3 types :
a) In a perennial river, there will be a continious flow of water throughout the year.
b) In intermittent streams, the flow is seasonal.
c) In ephremal streams, the flow is occasional or rare.

We frequently overlook the fact that rivers have four spatial dimensions - length, width, height (depth) and time. Actually even if it seems that the river height is the water level and the width is the distance between its two banks, this isn't a completly accurate perception considering the contemporary concepts of the river, its ecosystem and the river corridor, which are much broader.

Floodplain

The floodplain is theoretically divided into two parts: hydrologic floodplain and topographic floodplain.
The hydrologic floodplain is an area inundated about two out of every three years. The topographic includes the hydrologic floodplain up to the altitude reached by a flood peak of given frequency. The topographic floodplain is used in spatial planning and development, and all activities there in must consider the risk of flooding.

Pollution

River pollution can include but is not limited to: increasing sediment export, excess nutrients from fertilizer or urban runoff, sewage and septic inputs, plastic pollution, nano-particle pharmaceuticals and personal care products, synthetic

AGRO ECOSYSTEM

An agroecosystem contains va lesser diversity of plant an animal specius than a natural ecosystem like a forest. An agroecosystem is intensively manipulated by man and subjectid to sudden alterations, such as plowing, intercultivation, and treatment with pesticides. Agroecosystem are characterized by both planned and unplanned diversity, Unplanned diversity includes weedy plants, herbivore predators, microbes and other organisms.

Components of Agro ecosystem

Primary producers: Crops and weeds of the feild 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: Among consumer grasshoppers, aphids, bugs, ants, rats, birds, man etc are macro consumer and frog, snake, 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 yeild hectare.

2. Stablity - 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.

4. Equitability - It is a measure of how evenly the produce of Agro ecosystem is distributid among its human binificial.

Major Objectives

- Understand the complex and interconnected linkages between agriculture, biodiversity and ecosystem management.
- Conduct ecological risk assessment of agroecosystems under changing climatic condition.
- Integrate landscape ecology and ecosystem based approaches to support agrobiodiversity and ecosystem sirvices of agricultural systems.
- Manage wetlands for sustainable agriculture, aquaculture and other ecosystem services.
- Popularize information technology for precision farming and sustainable agroecosystem management.
- Recommed sustainable use of agro-residues for multipurpose environmental benefits.
- Formulate sustainable strategies to restore degraded system for agricultural extensification.

Acknowledgement-

I would like to express my special thanks of gratitude to my teacher Dr. Rahua Dutta who gave me the golden opportunity to do this wonderful project of EVS Project on 'Study of ecosystem'. I came to know about so many things I am really thankful to them.

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

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Examined
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1816

STUDY OF ECOSYSTEM ⇒

- FOREST ECOSYSTEM
- WETLAND ECOSYSTEM
- POND ECOSYSTEM
- RIVER ECOSYSTEM
- ESTUARY ECOSYSTEM
- AGRO ECOSYSTEM

INTRODUCTION OF ECOSYSTEM :-

In the present world, it is a very vast, and it represents a big ecosystem called "biosphere? The word ecosystem is made up of "eco" and "system"! Eco means the habitat, and system means a complex set of interconnected component, both living and non-living. Here system also indicates a functional property and hence an ecosystem can be considered as a functional unit of nature. An ecosystem is a geographic area where plant, animal, animal and other organisms, as well as weather and landscape work together to form a bubble of life.

The whole surface of Earth is a series of connected ecosystems. Ecosystems are often connected in a large biome. Biomes are large sections of land, sea or atmosphere. Forests, ponds, wetlands, rivers, dessert and tundra are all types of biomes, for example. They're organized very generally, based on the types of plants and animals that live in them. Within each forest, each pond, each river, each section of estuaries are found to be many different ecosystem.

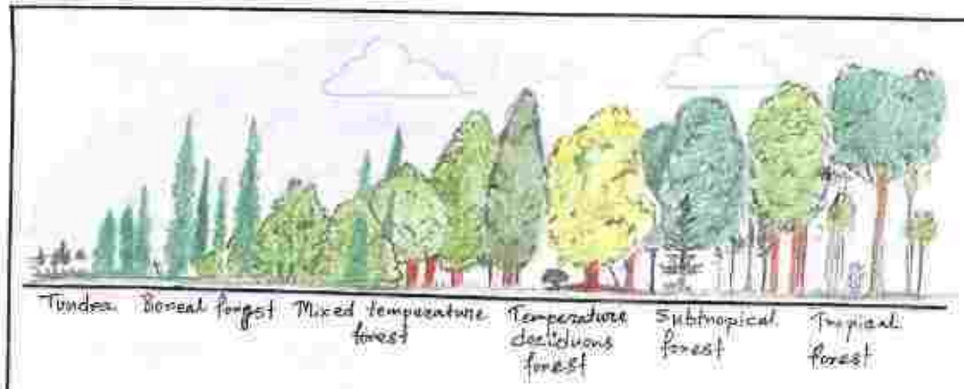
Ecosystems can be broadly divided into two main categories: terrestrial and aquatic. Major terrestrial ecosystems include forgests, grasslands and deserts while lakes, rivers, oceans, estuaries and wetlands are collectively known as aquatic ecosystem. In this ecosystem study, we will discuss about- pond, river, wetland, forest, estuary and ango ecosystem.

-: FOREST ECOSYSTEM :-

The word forest is derived from the Latin word 'foris' meaning outside, the reference leeing to village boundary fence that must have included all uncultivated and uninhabited land. Today a forest is any land managed for the diverse purpose of forestry, whether covered with trees, shrubs and climbers or not. The forest ecosystem includes a complex assemblage of different kinds of biotic communities. The nature of soil, climate and local topography determine the distribution of trees and their abundance in the forest vegetation.

Characteristics of different types of forests are described next page.

P.T.O.



i) Coniferous Forest: Cold regions with high rainfall and strongly seasonal climates with long winters and fairly short summers are characterised by boreal coniferous forest which is transcontinental. These forests are characterised by evergreen plant species such as spruce. (Picea glauca), fir (Abies balsamea) and pine trees (Pinus roxburghii/Pinus strobes) and by animals such as the lynx, wolf, bear, red fox, porcupine, squirrel and amphibians like tree frogs and pond frogs.

The litter resultant from conifer needles is broken down very slowly and is not particularly rich in nutrients. These soils are acidic and are mineral deficient. The productivity and community stability of boreal forests are lower than those of any other ecosystem.

ii) Temperate Deciduous Forest: The temperature in this kind of forests are characterised by a moderate climate and broad-leafed deciduous trees, which shed their leaves in winter and grow neew foliage in the spring. These forests are characteristic of North America, Europe, Eastern Asia (including China and Japan), Chile and part of Australia with a cold winter and an annual rainfall of 75-150 cm. The precipitation maylee fairly uniform throughout year.

Trees are quite tall about 40-50m in height and their leaves are thin and broad. The predominant genera of this biome are maple (Acer), beech (Fagus), oak (Quercus), hickory (Carya), basswood (Tilia), chestnut (Castanea) and cottonwood (Populus). In Himalayas, the temperature vegetation includes pines, cedars (Cednus), fir and juniper trees along with rhododendrons and willow (Salix). The common animals are deers, beares, squinnels, grey foxes, bobcats, wild turkey and woodpeckers. Common invert. ebrates include earthworms, snails, millipedes, coleoptera and onthoptera. Vertebrates include amphibians such as toad, salamander, cricket and frog, reptiles such as turtle, lizard and snake,

mammals such as racoon, opossum, pig and mountain lion and birds like horned owl and hawks.

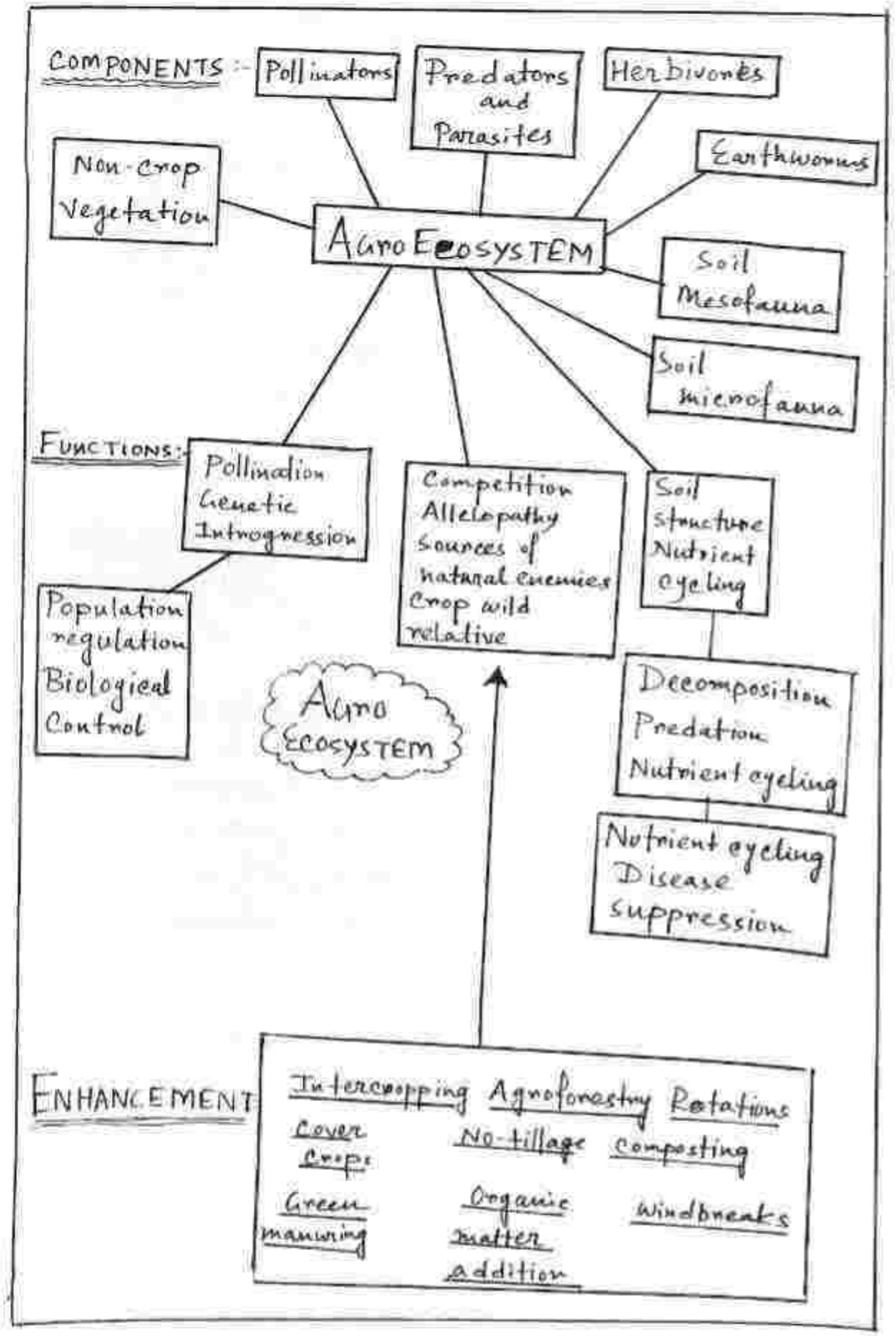
iii) Temperate Evergreen Forest:- Many parts of the world have a mediterranian type of climate which is characterised by warm, dry summers and cool, moist winters. These are commonly inhabited by low evergreen trees having needle-like or broad leaves. These include hemlock, yew and maple. Shrubs may range up to 3-4m in height. The characteristic animals of temperate evergreen ~~wood~~ woodland chaparral are mule, deer, brush rabbit, wood rat, chipmunk and lizard.

iv) Temperate Rain Forest: The temperate rain forests are colder than any other rainforest and exhibit a marked seasonality with regard to temperature and rainfall. Rain-fall is high, but fog maybe veryheavy which may actually represent a more important source of water than rainfall itself. The diversity of plant and animals is much low a compared to their warmer counterparts.

v) Tropical Rain Forest: Tropical rain forest occur near the equator, and are among the most diverse communities on the earth. Both temperature and humidity remain high and more or less uniform. The annual rainfall exceeds 200 cm and is generally distributed throughout the year.

The common vertebrates of tropical rain forests are the arboreal amphibian Rhacophorus malabaricus, aquatic reptiles, chameleons, agamids, geckos, many species of snakes and birds, and a variety of mammal such as leopard, jungle cats, ant-eaters, giant flying squirrels, monkeys and sloths.

vi) Tropical Seasonal Forest: Tropical seasonal forests occur in regions where total annual rainfall is very high but segregated into pronounced wet and dry periods. In exceedingly wet tropical seasonal forests, commonly known as monsoon forests, the annual precipitation maybe several times that of the tropical seasonal forests of India (central India) and South East



Components of Agroecosystem :-

Abi-otic components of agro-ecosystems include temperature, soil, water, relative humidity, light and wind. Biotic factors include parasitic and herbivorous pests, competition between crops and other plants, and favorable (symbiotic) relationships among organisms such as belowground organisms and pollinators. Agro-ecosystems are made-up of non living (abiotic) and living (bi-otic) components in a human-managed agricultural system. Agro-ecosystems are the arenas in which crop evolution occurs, presenting both stresses and opportunities to which crops and farmers must adapt in ad order to thrive. The farmers who manage these factors via irrigation, nutrient input, pest control, land preparation, mixed/relay cropping, and other practices are also a "biotic component" of agro-ecosystem.

Importance of Agro-ecosystem :-

Agro-ecosystem services and biodiversity for food and agriculture, underpin our food system, regulate our climate, and enable us to manage and mitigate the impact of health and climate shocks and crises.

-: Conclusion of Ecosystem :-

Ecosystems are created by the interrelationships between living organisms and the physical environments they inhabit (land, water, air). Ecosystems required a source of energy to make them work and for most, although not all, this is light from the sun. Human beings are part of ecosystems, ~~are~~ as well as manipulators of ecosystem. We completely depends on Earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfillment, and aesthetic enjoyment. Over the past 50 years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel. So it is better that care for ecosystem should be taken as one of the major responsibility of every individual for sustainable living of future generations as well.

-: Acknowledgement :-

I would like to express my special thanks of gratitude to my teacher Dr. Mahua Dutta who gave me the golden opportunity to do this wonderful project of Environmental Science studies on "STUDY OF ECOSYSTEM" who also helped me in completing my project. I came to know about so many new things I am really thankful to them. Secondly, I would also like to thank my parents and friends who helped me a lot in finalizing this project within the limited time frame.

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A project on

Study of Eco-System

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18/6

Content

Pond Ecosystem

The ecosystem is a basic unit in ecology, formed by the interaction of plants, animals and microorganisms forming biotic factors with their physical environment or the abiotic factors. A pond ecosystem refers to the freshwater ecosystem where there are communities of organisms that are dependent on each other and with the prevailing water environment for their nutrients and survival. Usually, ponds are shallow (hardly 12 – 15 feet) water bodies in which sunlight can reach to its bottom, permitting the growth of the plants that grow there. On the basis of water depth and types of vegetation and animals there may be three zones in a lake or pond. The different zones are as follows:

I. Littoral
II. limnetic
III. pro-fundal

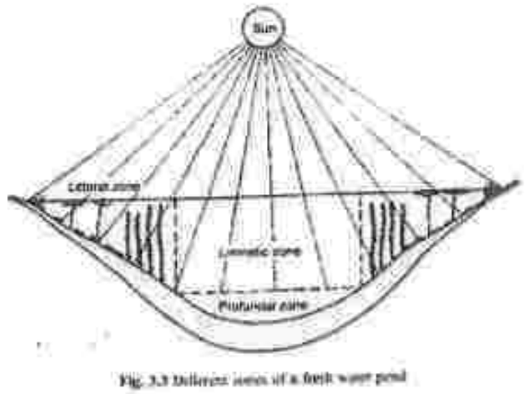


Fig. 3.3 Different zones of a fresh water pond

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

The organisms inhabiting this freshwater ecosystem include algae, fungi, microorganisms, plants and fish. These organisms can be further classified as producers, consumers and decomposers, based on their mode of obtaining nutrition. The energy in an ecosystem flows from the producers to the consumers. Decomposers, on the other hand, get nutrients from the dead organisms by decomposing them. Two main components of pond ecosystems are as follows-

1. Biotic component
2. Abiotic component

Producers

The main producers in pond or lake ecosystem are algae and other aquatic plants, such as Azolla, Hydrilla, Potamogeton, Pistia, Wolffia, Lemna, Eichhornia, Nymphaea, Jussiaea, etc. These are either floating or suspended or rooted at the bottom. The green plants convert the radiant energy into chemical energy through photosynthesis. The chemical energy stored in the form of food is utilized by all the organisms. Oxygen evolved by producers in photosynthesis is utilized by all the living organisms in respiration.

Consumers

In a pond ecosystem, the primary consumers are tadpole larvae of frogs, fishes and other aquatic animals which consume green plants and algae as their food. These herbivorous aquatic animals are the food of secondary consumers. Frogs, big fishes, water snakes, crabs are secondary consumers. In the pond, besides the secondary consumers, there are consumers of highest order, such as water-birds, turtles, etc.

Decomposers and Transformers

When aquatic plants and animals die, a large number of bacteria and fungi attack their dead bodies and convert the complex organic substances into simpler inorganic compounds and elements. These micro-organisms are called decomposers chemical elements liberated by decomposers are again utilized by green plants in their nutrition.

Abiotic component

Abiotic factors are non-living factors that can have an impact on the ecosystem The main factors of ponds include water quality, temperature, light, soil, and seasonal change. Water is an important abiotic factor. The quality of water is crucial for living organisms in the pond. The temperature could impact the ecosystem if they are at the extremes. Water that is too hot will not have as much oxygen for the fish and they will in return become weak and prone to parasites and diseases. Too low of a water temperature also puts the aquatic ecosystem under stress and the fish can die off in large amounts. pH is also taken into consideration because too low or too high of acidity in the water can clog a fish's gills and reproduction will be more challenging. The lay of the land and the soil is of importance as well. The soil needs to contain enough moisture to keep the surrounding plants alive. If the soil or ground is dry, it is less likely to sustain a live or growing plant in comparison to moist, fertile soil that will help the plant stay alive. Light is also an abiotic factor in this ecosystem. The plants need light for photosynthesis so they can produce oxygen not only above the water but below as well to sustain healthy oxygen levels for aquatic organisms. Fish

Attempts to place fragments of knowledge of the structure of the riverine biota into a holistic framework started with Shelford in 1911. But the first effort to integrate the biological structure of fish communities as a function of abiotic hydrological factors (river slope velocity) was proposed by Huet in 1949. A large step which exceeded the actual level of advancement of river ecology was proposed by Hynes (1970)—that rivers should be analyzed from a watershed perspective. The next serious development occurred as a shift from "structural" thinking (species composition in river zones) to "functional" thinking (production to respiration ratio) in the holistic framework of the River Continuum. This was extended by the concepts of nutrient spiralling (Webster, Patten 1979) and the flood pulse (Junk *et al.* 1989). All these ideas were defined through syntheses of experimental and conceptual efforts, and some of the most notable are detailed below.

One might be considered especially in relation to the genesis of Ecohydrology (Zalewski *et al.* 1997). Zalewski and Naiman (1985) suggested, considering the regulatory mechanisms for fish communities in rivers, that "abiotic factors (hydrology) were of primary importance in most situations but when the environmental conditions approach the physiological optimum for fish and become stable and predictable, the role of biotic interactions gradually increases" (the Abiotic-Biotic Regulatory Concept). A substantial change, expressing a new proactive attitude in ecological/environmental thinking, brought also the consideration of the role of the landscape in mitigating human impacts—namely, managing land/water buffering zones (UNESCO MAB Programme). For the first time this concept of the manipulation of the structure of the biota (ecotones) was considered for management, restoration and implicitly for conservation. All above efforts created the background against which the Ecohydrology Concept was formulated and developed over the lifetime of UNESCO IHP-V, 1997-2001. The concept provides a holistic integrative and interdisciplinary approach for scientific research and watershed management.

Ecohydrology –

An integrative and interdisciplinary approach for scientific research and watershed management.

In the face of increasing pressure on freshwater resources, there remains an urgent need for new practical tools to achieve their sustainable management. Traditional water management does not consider the use of ecosystem processes as a potential management tool. For the above reasons, the UNESCO International Hydrological Programme (IHP) initiated an integrative theme of activities to achieve an increased understanding of hydrological and ecological processes in water ecosystems. This was defined as "Ecohydrology". **Ecohydrology is a sub discipline of hydrology focused on ecological aspect of hydrological cycle.**

As far as hydrological cycle posses the terrestrial and aquatic phase, which by specific methods differs, it should be distinguish in literature as the terrestrial and aquatic ecohydrology. Terrestrial phase focuses on water-plant-soil interactions (Eagleson 1982, Bird & Wilby 1999, Rodriguez-Iturbe 2000). Aquatic phase integrates progress in limnology and oceanography (coastal zone ecohydrology) into hydrology for problem solving in water management (Zalewski *et al.* 1997, 2000, 2002; Wolanski *et al.* 2004). During the genesis of ecohydrology, it was concluded that the key questions to integrate biota and hydrology should meet the two following fundamental conditions:

1. They should be related to the dynamics of two entities in such a way that the answer without consideration of one of the two components (both ways E↔ H) would be impossible. In other words, this question should enable the defining of relationships between hydrological and biological processes in order to obtain comprehensive empirical data at the same spatial and temporal scales.

2. The results of the empirical analysis should test the whole range of processes (from molecular to catchment scale), should enable their spatial/temporal integration, and should be convertible to large-scale management measures in order to enable further testing of the hypotheses. Taking into account the above conditions, the key questions for ecohydrology have been defined based on an in-depth understanding of the interplay between biological and hydrological processes and the factors that regulate and shape them. The hypotheses have been defined in the form of the following statements:

Hypothesis H1: "The regulation of hydrological parameters in an ecosystem or catchment can be applied for controlling biological processes".
Hypothesis H2: "The shaping of the biological structure of an ecosystem(s) in a catchment can be applied to regulating hydrological processes".
Hypothesis H3: "Both types of regulation integrated at a catchment scale and in a synergistic way can be applied to the sustainable development of freshwater resources, measured as the improvement of water quality and quantity (providing ecosystem services)". It should be stressed that according to the Ecohydrology Concept, the overall goal defined in the above hypotheses is the sustainable management of water resources. This should be focused on the enhancement of ecosystem carrying capacity for ecosystem services and anthropogenic stress. Such an interdisciplinary, integrative approach provides the background to convert environmental threats into sustainable development.

So far, the dominant approach in environmental management, based upon descriptive science, over-engineering of the natural environment and often spatially restricted environmental conservation, leads to continuing global environmental deterioration. A solution to this dilemma requires both technical and environmental sciences. The target for technical sciences has been recently suggested by Von Weizsacker *et al.* (1997), as 'a factor of 4'. This means the technical capability exists to reduce by four times the use of energy and raw materials per unit of growth per capita. This will substantially reduce emission of pollutants to the nvironment but maintain progress in living conditions for global population. This solution alone is not sufficient because of the scale of the degradation of our planet's hydrological and biogeochemical cycles. Environmental science needs both a target and a means of achieving it. The progress in understanding the functioning of ecosystems over the last 10 years has improved our understanding of ecological processes (e.g.,), to the point

Wetland

A wetland is an area where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. Water largely determines how the soil develops and the types of plant and animal communities living in and on the soil. Wetlands may support both aquatic and land species. The prolonged presence of water creates conditions that favor the growth of specially adapted plants and promotes the development of characteristic wetland soils.

Wetlands vary widely because of regional and local differences in soils, topography, climate, water, vegetation and other factors, including human disturbance. Indeed, wetlands are found from the tundra to the tropics and on every continent except Antarctica. Two general categories of wetlands are recognized: coastal wetlands and inland wetlands. Although wetlands are often wet, a wetland might not be wet year-round. In fact, some of the most important wetlands are only seasonally wet. Wetlands are the link between the land and the water. They are transition zones where the flow of water, the cycling of nutrients, and the energy of the sun meet to produce a unique ecosystem characterized by hydrology, soils, and vegetation—making these areas very important features of a watershed. Using a watershed-based approach to wetland protection ensures that the whole system, including land, air, and water resources, is protected. Often called "nurseries of life," wetlands provide habitat for thousands of species of aquatic and terrestrial plants and animals. Although wetlands are best known for being home to water lilies, turtles, frogs, snakes, alligators, and crocodiles, they also provide important habitat for waterfowl, fish, and mammals. Migrating birds use wetlands to rest and feed during their cross-continental journeys and as nesting sites when they are at home. As a result, wetland loss has a serious impact on these species. Habitat ruin since the 1970s has been a leading cause of species extinction.

Wetlands do more than provide habitat for plants and animals in the watershed. When streams and rivers overflow, wetlands help to absorb and slow floodwaters. This ability to control floods can alleviate property damage and loss and can even save lives. Wetlands also absorb excess nutrients, sediment, and other pollutants before they reach rivers, lakes, and other waterbodies. They are great spots for fishing, canoeing, hiking, and bird-watching, and they make wonderful outdoor classrooms for people of all ages.

Types of Wetlands

Do you think all wetlands are the same? Think again. Each wetland differs due to variations in soils, landscape, climate, water, vegetation, and human disturbance. Wetlands found in the United States include: marshes, swamps, bogs, fens, vernal pools, and prairie potholes, to name a few.

MARSHES are wetlands dominated by soft-stemmed vegetation. They are sometimes saturated, flooded, or ponded with water and characterized by grasses adapted to wet soil conditions. Marshes are further characterized as **tidal marshes** and **non-tidal marshes**.

Tidal (coastal) marshes occur along coastlines and are influenced by tides and often by freshwater from runoff, rivers, or ground water. Salt marshes are the most common types of tidal marshes and are characterized by salt tolerant plants. Salt marshes have one of the highest rates of productivity among wetland ecosystems because of the inflow of nutrients from surface and/or tidal water. Tidal freshwater marshes are located upstream of estuaries. Tides influence water levels but the water is fresh. The lack of salt stress allows a greater diversity of plants to thrive. Cattail, wild rice, pickerelweed, and arrowhead are common and help support a large and diverse range of bird and fish species, among other wildlife.

Non-tidal (inland) marshes are also dominated by soft-stemmed low plants and frequently occur in poorly drained depressions, floodplains, and shallow water areas along the edges of lakes and rivers. These freshwater marshes are characterized by periodic or permanent shallow water. They typically derive most of their water from surface waters, including floodwater and runoff, but do receive ground water inputs. Major regions of the United States that support inland marshes include the Great Lakes coastal marshes, the prairie pothole region, and the Florida Everglades.

SWAMPS are wetlands dominated by trees and other woody plants. Swamps occur in either freshwater or saltwater floodplains. They are characterized by very wet soils during the growing season and standing water during certain times of the year. Well-known swamps include Georgia's Okefenokee Swamp and Virginia's Great Dismal Swamp. Swamps are classified as forested, shrub, or mangrove. Forested swamps are found in broad floodplains of the northeast, southeast, and south-central United States and receive floodwater from nearby rivers and streams. Common deciduous trees found in these areas include bald cypress, swamp white oak, and red maple. Shrub swamps are similar to forested swamps except that shrubby species like buttonbush and swamp rose dominate. Mangrove swamps are coastal wetlands characterized by salt-tolerant trees, shrubs, and other plants growing in brackish to saline tidal waters.

BOGS are freshwater wetlands characterized by spongy peat deposits, evergreen trees and shrubs, and a floor covered by a thick carpet of sphagnum moss. These systems, whose only water source is rainwater, are usually found in glaciated areas, often in old glacial lakes, of the northern United States.

FENS are freshwater peat-forming wetlands covered mostly by grasses, sedges, reeds, and wildflowers. Like bogs, most fens formed when glaciers retreated. Unlike bogs, fens receive

FOREST ECOSYSTEMS

While trees sometimes stand alone, most often they are part of a community called a forest. Forests consist not only of living ***(biotic)*** components like trees, animals, plants, and other living things but also of nonliving ***(abiotic)*** components such as soil, water, air, and landforms. All of these components together make up a forest ***ecosystem.***

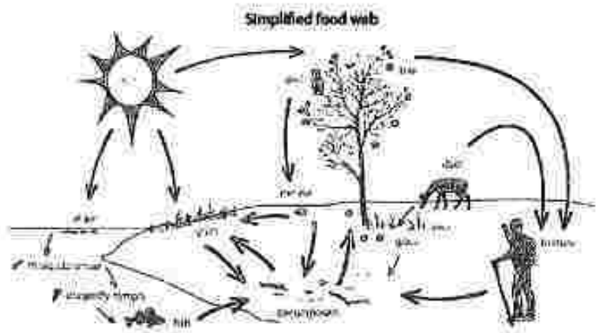
Systems

Forests are more than collections of living and nonliving things found in the same place. Their many components are connected to each other as food chains of interdependence. Food chains move the basic requirements for life—energy, water, carbon, air, and nutrients—in a series of connections and processes. All food chains consist of:

Producers—organisms that produce energy

Consumers—organisms that consume producers and other consumers

Decomposers—organisms that consume producers and consumers, and provide nutrients into the soil.



Several food chains linked together are known as a food web. Plants capture energy from the sun, but plants, animals, and decomposers move energy from individual to individual in an intricate web of relationships.

Applying the ***system*** above to a simple real-world example is as follows:

Producer: grass (produces energy from the sun and nutrients)

Consumer: deer (eats grass)

Decomposer: worms (eats deer, creates nutrients from which grasses can grow). The sun provides energy to the forest. Trees and other plants (producers) use photosynthesis to transform the sun's energy into glucose (sugars).

Consumers—plant-eating animals such as caterpillars, chickadees, and deer, and animal eating predators such as coyotes, woodpeckers, and spiders—get their energy from other living things. Decomposers such as sowbugs, fungi, and bacteria get their energy from dead plants and animals.

Several food chains linked together are known as a food web. Every collection of individuals, connections, or processes that regularly interacts and depends on other individuals, connections, or processes forms a unified whole called a system. While each system depends on all other systems, when change occurs (as it always does), the web adapts and adjusts, flexibly. Oxygen, carbon dioxide, water, and nitrogen all move in natural cycles through the forest. Along with carbon dioxide (from the air) and water (from the soil), energy from the sun triggers photosynthesis in plants, which produces oxygen. Then, plants and animals use oxygen and ***respire*** carbon dioxide and water. Water cycles from the sky to earth and back again, often after spending days, months, or years cycling through lakes, rivers, groundwater reservoirs, and living things. Nitrogen and other nutrients cycle among soil, water, air, and living things. As you can see, numerous cycles overlap and depend on each other to keep in balance. Everything in the forest is connected to everything else. That means it is impossible to make a change in just one part of the system. Any alteration, whether intentional or accidental, will have effects that ripple throughout the entire ecosystem.

Layers

Many forests contain several different heights or layers of plants. And, as different animals are often found within each layer, the diversity of animals is often related to plant diversity in the forest. Imagine, for a moment, standing in a sun-filtered stand of mature aspen nterspersed with a few white and red pines, remnants of the great northern forest that once stretched across the brow of Minnesota. Some 60 feet (18 meters) above you, resides the top layer, or ***canopy, of the forest*** The canopy contains literally millions of leaves busily photosynthesizing sunlight, carbon dioxide, and water to create oxygen and sugar. In turn, all organisms depend on oxygen and sugar for survival. Some of the animals that dwell in the canopy include eagles, bats, and insects. In the ***understory,*** where the tops of smaller trees absorb whatever sunlight reaches them, a variety of birds and smaller mammals such as warblers and red squirrels eat their suppers and make their nests. Beneath that, in the head-high ***shrub layer*** made up of saplings and smaller woody plants such as alder and chokecherry, berries and berry-eaters abound.

Also in the shrub layer reside browsers such as white-tailed deer, black flies, and mosquitoes. Even lower, in the ***herb layer,*** seedlings, grasses, and ***forbs***—non-woody plants such as ferns, sedges, and wildflowers—live and die, providing food and habitat in the process for mice, insects, snakes, and more. The ***forest floor,*** though not their exclusive home, is the kingdom of the decomposers such as insects, bacteria, and fungi. Decomposers break down the bodies of plants and animals into nutrients, which combine with eroded rock to create rich soil. This soil in turn provides the nutrients and moisture that trees and other plants need to thrive—and the cycle begins again.

Lives in the Forest

The animals of Minnesota's forests come in many sizes and shapes, from tiny mites that inhabit the soil to towering moose and bulky bears. Same with plants, which can be as minute as mosses or lichen or as large as giant oaks. They all have one thing in common: they all rely on the forest setting, or ***habitat,*** for food, water, shelter, and space. Some animals and plants are adapted to very narrow ranges of conditions in which they are able to live. These animals are called ***specialists.*** The Canada lynx, for instance, needs large tracts of relatively undeveloped forests for hunting. If roads or development fragment a forest, the reclusive lynx may not be able to roam through all of its territory, limiting its ability to access food, water, shelter, or a mate. Other forest inhabitants, called ***generalists,*** thrive in a wide range of habitat types. One such creature is the highly adaptable raccoon, which is as much at home

ESTUARY ECOLOGY

Estuaries

- An estuary is the areas of water and shoreline where a freshwater stream or river merges with the ocean
- Estuaries 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
- Salinity varies within the estuary from nearly fresh water to ocean water
- It also varies daily in these areas due to rise and fall of tides
- They are very productive due to nutrients brought in by rivers
- A unique combination of salt and fresh water creates a variety of habitats in which the plants and animals survive in various brackish water combinations
- Estuaries have a diverse flora and fauna and tremendous productivity
- Salt marsh grasses, algae, and phytoplankton are the major producers many species of annelids, oysters, crabs, and fish are present Many marine invertebrates and fish breed in estuaries or migrate through them to freshwater habitats upstream
- A large number of water fowl and other semi-aquatic vertebrates use estuaries as feeding areas
- Human activities are having a large impact on estuaries Estuaries receive the pollutants dumped into the streams and rivers that feed them
- Residential and commercial development not only adds to pollution but eliminates some estuaries due to land filling
- Freshwater from rivers sometimes mixes with large freshwater bodies as the reat Lakes creating a "freshwater estuary" that functions like typical brackish estuaries

Estuary Classification by Water Circulation: - salt-wedge, fjord, slightly stratified, vertically mixed, freshwater – The amount of circulation affects the salt distribution and salinity concentrations Salt-Wedge Estuaries □ Salt wedge estuaries occur when the mouth of a river flows directly into salt water.

- The mouths of the Mississippi, Columbia and Hudson rivers are examples of salt wedge estuaries
- The water circulation is controlled by the river that pushes back the seawater.
- This circulation creates a sharp boundary that separates an upper less salty layer from an intruding wedge-shaped salty bottom layer.

Fjord

- Fjord type estuaries are characterized by a deep elongated basin that is U-shaped and a ledge or barrier that separates the basin from the sea.
- Fjord type estuaries are found along glaciated coasts such as British Columbia, Alaska, Chile, New Zealand, and the Scandinavian countries
- They have moderately high river input and little tidal mixing. Slightly Stratified or Partially Mixed Estuary
- Partially mixed estuaries have a tidal flow that provides a means of erasing the salt wedge.
- Deeper estuaries such as Puget Sound and San Francisco Bay are examples of partially mixed estuaries
- The salt water is mixed upward and fresh water is mixed downward.
- The lower layers of water typically remain saltier than the upper layers Vertically Stratified or Well Mixed Estuaries
- Well-mixed estuaries have strong tidal mixing and low river flow that mix the sea water throughout the shallow estuary.
- Shallow estuaries such as the Delaware Bay are well-mixed estuaries
- The mixing is so complete that the salinity is the same top to bottom and decreases from the ocean to the river.

Freshwater Estuaries

- Freshwater estuaries occur where massive freshwater systems, as the Great Lakes, are diluted by river or stream waters draining from adjacent lands
- Freshwater estuaries do not contain saltwater, but they are unique combinations of river and lake water, which are chemically distinct
- freshwater estuaries are storm-driven while brackish estuaries that are tidally driven
- Storm surges and subsequent seiches (vertical oscillations, or sloshing, of lake water) regulate the composition of the estuary water
- Though the Great Lakes do exhibit small tides, Seiches acting like tides, exchanging water between the river and the lake
- Changes in temperature differences between stream water and lake waters can cause stratification and mixing of the water
- Shallow waters of streams respond more quickly to changes in temperature changes than deeper lake waters influencing the chemistry such as its salinity, dissolved oxygen, and pH the of the water of the river and the large lake Lake Superior Estuary

Kelp Forests

- Kelp Forests occur in cold, nutrient-rich water of shallow open coastal waters
- Dependence upon light for photosynthesis restricts them to clear shallow water
- They are rarely much deeper than 15-40 m
- Kelp plants attach to the rocky bottom with tough holdfasts and grow up towards the surface on strong flexible stipes that are buoyed by gas bladders.
- When the fast growing fronds reach the surface, they spread horizontally to form the kelp forest canopy – some species can grow 30 cm per day

- Kelp forests are very productive and support areas of high plant biomass
- They are rich in animal species Rocky Shorelines and Bottoms
- Rocky shores and bottoms have hard surfaces made of stones, boulders and bedrock.
- These habitats are found along our west and northeast coasts
- They deal with may have high waves and strong high energy winds
- Flooding occurs only when the tide goes out

Soft Shores and Bottoms

- Soft shores and bottoms are low-lying sand beaches, muddy shores and mudflats made of sediments that have mixed with detritus (think of muck or ooze).
- Soft shore and bottom habitats are found along coasts across the country
- Some contain submerged and upland vegetation, some do not.
- Many different benthic communities or bottom dwellers flourish in the soft shores and bottoms including burrowing worms, snails, crabs and clams

Submerged Aquatic Vegetation

- Submerged aquatic vegetation, also called SAV, are beds of leafy rooted, grass-like plants with tiny flowers, found in shallow waters where light can penetrate.
- SAV is found along coasts across the county
- They survive underwater subtidal areas or in areas that are both flooded and partially exposed by the tides (intertidal areas)

Coastal Marshes

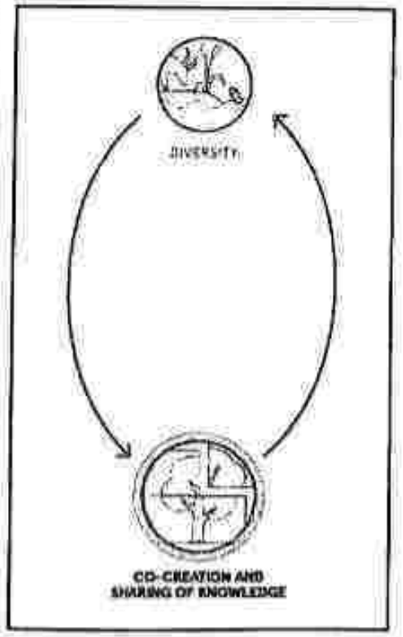
- Coastal marshes are composed of upright plants that live above the water surface, often with their roots submerged
- Coastal marshes are found across the county
- Some examples of coastal marsh plats are cattails, grasses, and sedges Mangroves or Mangrove Forests

- Various kinds of trees up to medium height and shrubs that grow in saline coastal sediment habitats in the tropics and subtropics
- Mangroves are trees that can survive in very salty areas
- These forests grow along the coasts of the Gulf of Mexico and in the Caribbean
- Mangroves grow in clusters and their roots form a complex maze along the base of the trees
- They are commonly identified by their unique roots which project from the muddy bottoms at the shore to the tree's trunk coast

Deepwater Swamps and Riverine Forests

- Deepwater swamps and riverine forests are flooded, forested wetlands growing near edges of lakes, rivers and sluggish streams.
- Deepwater coastal swamps and riverine forests are found across the country.
- They are most common along the Atlantic and Gulf Coasts and throughout the Mississippi River valley
- They are different from other forests because they can survive in areas with prolonged flooding Mud Flats and Sand Flats
- Mudflats are part of benthic (bottom) zone exposed at low tide and comprised of extremely fine sediments
- Sand flats area of bottom of aquatic system that is exposed by low tides and composed of sand - particles of sediment larger than those of mudflats
- Mudflat characteristics are defined by their specific combination of sand, silt, clay and organic matter content
- Organisms best suited for the mud flat are burrowers
- Mudflats are exposed during low tides, leaving non-burrowing species open to predation.

Mixed grazing by different species of ruminants reduces health risks from parasitism, while diverse local species or breeds have greater abilities to survive, produce and maintain reproduction levels in harsh environments. In turn, having a variety of income sources from differentiated and new markets, including diverse products, local food processing and Agritourism, helps to stabilize household incomes. Consuming a diverse range of cereals, pulses, fruits, vegetables, and animal-source products contributes to improved nutritional outcomes. Moreover, the genetic diversity of different varieties, breeds and species is important in contributing macronutrients, micronutrients and other bioactive compounds to human diets. For example, in Micronesia, reintroducing an underutilized traditional variety of orange-fleshed banana with 50 times more beta-carotene than the widely available commercial white-fleshed banana proved instrumental in improving health and nutrition. At the global level, three cereal crops provide close to 50 percent of all calories consumed,10 while the genetic diversity of crops, livestock, aquatic animals and trees continues to be rapidly lost.



Agroecology can help reverse these trends by managing and conserving agro-biodiversity, and responding to the increasing demand for a diversity of products that are eco-friendly. One such example is 'fish-friendly' rice produced from irrigated, rainfed and deepwater rice ecosystems, which values the diversity of aquatic species and their importance for rural livelihoods.

CO-CREATION AND SHARING OF KNOWLEDGE

Agricultural innovations respond better to local challenges when they are co-created through participatory processes.

Agroecology depends on context-specific knowledge. It does not offer fixed prescriptions – rather, agroecological practices are tailored to fit the environmental, social, economic, cultural and political ontext. The co-creation and sharing of knowledge plays a central role in the process of developing and implementing agroecological innovations to address challenges across food systems including adaptation to climate change.

Through the co-creation process, agroecology blends traditional and indigenous knowledge, producers' and traders' practical knowledge, and global scientific knowledge.

Producer's knowledge of agricultural biodiversity and management experience for specific contexts as well as their knowledge related to markets and institutions are absolutely central in this process.

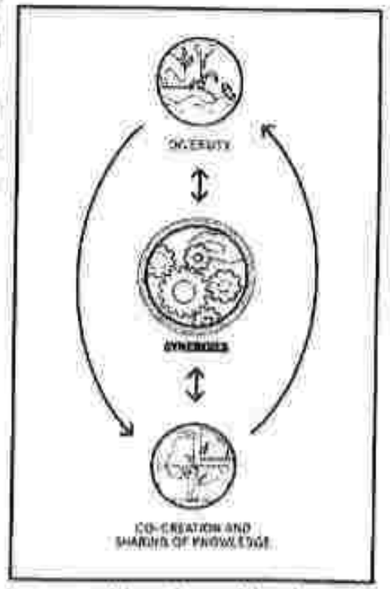
Education – both formal and non-formal – plays a fundamental role in sharing agroecological innovations resulting from co-creation processes. For example, for more than 30 years, the horizontal *campesino a*

campesino movement has played a pivotal role in sharing agroecological knowledge, connecting hundreds of thousands of producers in Latin America. In contrast, top-down models of technology transfer have had limited success. Promoting participatory processes and institutional innovations that build mutual trust enables the co-creation and sharing of knowledge, contributing to relevant and inclusive agroecology transition pro cesses.

SYNERGIES

Building synergies enhances key functions across food systems, supporting production and multiple ecosystem services.

Agroecology pays careful attention to the design of diversified systems that selectively combine annual and perennial crops, livestock and aquatic animals, trees, soils, water and other components on farms and agricultural landscapes to enhance synergies in the context of an increasingly changing climate. Building synergies in food systems delivers multiple benefits. By optimizing biological synergies, groecological practices enhance ecological functions, leading to greater resource-use efficiency and resilience. For example, globally, biological nitrogen fixation by pulses in intercropping systems or rotations generates close to USD 10 million savings in nitrogen fertilizers every year,13 while contributing to soil health, climate change mitigation and adaptation. Furthermore, about 15 percent of the nitrogen applied to crops comes from livestock manure, highlighting synergies resulting from crop–livestock integration.14 In Asia, integrated rice systems combine rice cultivation with the generation of other products such as fish, ducks and trees. By maximising synergies, integrated rice systems significantly improve yields, dietary diversity, weed control, soil structure and fertility, as well as providing biodiversity habitat and pest control. At the landscape level, synchronization of productive activities in time and space is necessary to enhance synergies. Soil erosion control using *Calliandra* hedgerows is common in integrated agroecological systems in the East African Highlands.16 In this example, the management practice of periodic pruning reduces tree competition with crops grown between hedgerows and at the same time provides feed for animals, creating synergies between the different components. Pastoralism and extensive livestock grazing systems manage complex interactions between people, multi-species herds and variable environmental conditions, building resilience and contributing to ecosystem services such as seed dispersal, habitat preservation and soil fertility.17,18 While agroecological approaches strive to maximize synergies, trade-offs also occur in natural and human systems. For example, the allocation of



resource use or access rights often involve trade-offs. To promote synergies within the wider food system, and best manage trade-offs, agroecology emphasizes the importance of partnerships, cooperation and responsible governance, involving different actors at multiple scales.

EFFICIENCY

Innovative agroecological practices produce more using less external resources.

Increased resource-use efficiency is an emergent property of agroecological systems that carefully plan and manage diversity to create synergies between different system components. For example, a key efficiency challenge is that less than 50 percent of nitrogen fertilizer added globally to cropland is converted into harvested products and the rest is lost to the environment causing major environmental problems. Agroecological systems improve the use of natural resources, especially those that are abundant and free, such as solar radiation, atmospheric carbon and nitrogen. By enhancing biological processes and recycling biomass, nutrients and water, producers are able to use fewer external resources, reducing costs and the negative environmental impacts of their use. Ultimately, reducing dependency on external resources empowers producers by increasing their autonomy and resilience to natural or economic shocks.

One way to measure the efficiency of integrated systems is by using Land Equivalent Ratios (LER). LER compares the yields from growing two or more components (e.g. crops, trees, animals) together with yields from growing the same components individually. Integrated agroecological systems frequently demonstrate higher LERs. Agroecology thus promotes agricultural systems with the necessary biological, socio-economic and institutional diversity and alignment in time and space to support greater efficiency.

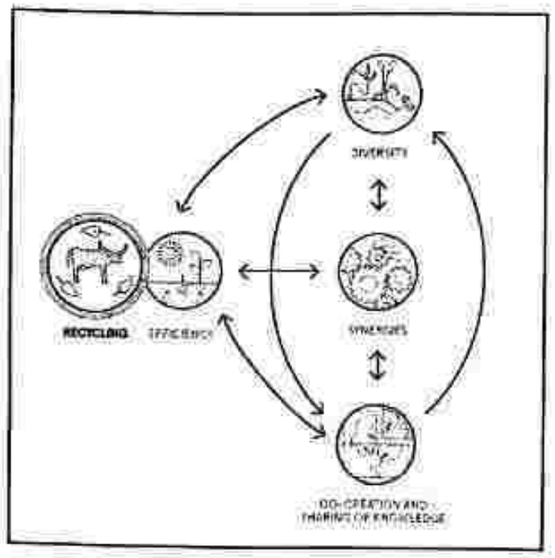
RECYCLING

More recycling means agricultural production with lower economic and environmental costs.

Waste is a human concept – it does not exist in natural ecosystems. By imitating natural ecosystems, agroecological practices support biological processes that drive the recycling of nutrients, biomass and water within production systems, thereby increasing resourceuse efficiency and minimizing waste and pollution.

Recycling can take place at both farm-scale and within landscapes, through diversification and building of synergies between different components and activities.

For example, agroforestry systems that include deep rooting trees can capture nutrients lost beyond the roots of annual crops.21 Crop–livestock systems promote recycling of organic materials by using manure for composting or directly as fertilizer, and crop residues and by-products as livestock feed.



Nutrient cycling accounts for 51 percent of the economic value of all non-provisioning ecosystem services, and integrating livestock plays a large role in this.22 Similarly, in rice–fish systems, aquatic animals help to fertilize the rice crop and reduce pests, reducing the need for external fertilizer or pesticide inputs.

Recycling delivers multiple benefits by closing nutrient cycles and reducing waste that translates into lower dependency on external resources, increasing the autonomy of producers and reducing their vulnerability to market and climate shocks. Recycling organic materials and by-products offers great potential for agroecological innovations.

RESILIENCE

Enhanced resilience of people, communities and ecosystems is key to ustainable food and agricultural systems.

Diversified agroecological systems are more resilient – they have a greater capacity to recover from disturbances including extreme weather events such as drought, floods or hurricanes, and to resist pest and disease attack.

Following Hurricane Mitch in Central America in 1998, biodiverse farms including agroforestry, contour farming and cover cropping retained 20–40 percent more topsoil, suffered less erosion and experienced lower economic losses than neighbouring farms practicing conventional monocultures. By maintaining a functional balance, agroecological systems are better able to resist pest and disease attack. Agroecological practices recover the biological complexity of agricultural systems and promote the necessary community of interacting organisms to selfregulate pest outbreaks.

On a landscape scale, diversified agricultural landscapes have a greater potential to contribute to pest and disease control functions. Agroecological approaches can equally enhance socio-economic resilience. Through diversification and integration, producers reduce their vulnerability should a single crop, livestock species or other commodity fail.

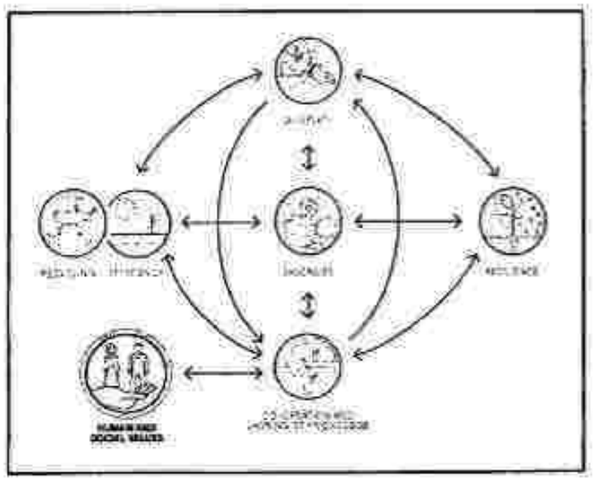
By reducing dependence on external inputs, agroecology can reduce producers' vulnerability to economic risk. Enhancing ecological and socioeconomic resilience go hand-in-hand – after all, humans are an integral part of ecosystems.

HUMAN AND SOCIAL VALUES

Protecting and improving rural livelihoods, equity and social well-being is essential for sustainable food and agricultural systems.

Agroecology places a strong emphasis on human and social values, such as dignity, equity, inclusion and justice all contributing to the improved livelihoods dimension of the SDGs. It puts the aspirations and needs of those who produce, distribute and consume food at the heart of food systems. By building autonomy and adaptive capacities to manage their agro-ecosystems, agroecological approaches empower people and communities to overcome

poverty, hunger and malnutrition, while promoting human rights, such as the right to food, and stewardship of the environment so that future generations can also live in prosperity.



Agroecology seeks to address gender inequalities by creating opportunities for women. Globally, women make up almost half of the agricultural workforce. They also play a vital role in household food security, dietary diversity and health, as well as in the conservation and sustainable use of biological diversity. In spite of this, women remain economically marginalised and vulnerable to violations of their rights, while their contributions often remain unrecognized. Agroecology can help rural women in family farming agriculture to develop higher levels of autonomy by building knowledge, through collective action and creating opportunities for commercialization.

Agroecology can open spaces for women to become more autonomous and empower them at household, community levels and beyond – for instance, through participation in producer groups. Women's participation is essential for agroecology and women are frequently the leaders of agroecology projects. In many places around the world, rural youth face a crisis of employment. Agroecology provides a promising solution as a source of decent jobs. Agroecology is based on a different way of agricultural production that is knowledge intensive, environmentally friendly, socially responsible, innovative, and which depends on skilled labour. Meanwhile, rural youth around the world possess energy, creativity and a desire to positively change their world. What they need is support and opportunities.As a bottom-up, grassroots paradigm for sustainable rural development, agroecology empowers people to become their own agents of change.

CULTURE AND FOOD TRADITIONS

By supporting healthy, diversified and culturally appropriate diets, agroecology contributes to food security and nutrition while maintaining the health of ecosystems.

Agriculture and food are core components of human heritage. Hence, culture and food traditions play a central role in society and in shaping human behaviour. However, in many instances, our current food systems have created a disconnection between food habits and culture. This disconnection has contributed to a situation where hunger and obesity exist side by side, in a world that produces enough food to feed its entire population.
Almost 800 million people worldwide are chronically hungry and 2 billion suffer micronutrient deficiencies. Meanwhile, there has been a rampant rise in obesity and diet-

Acknowledgement

I would like to express my special thanks of gratitude to my teacher Dr. Mahua Dutta as well as our Principal Dr. Atashi Karpha who gave me the golden opportunity to do this wonderful project on the topic Study of Ecosystem, which also helped me in doing a lot of Research and I came to know about so many new things I am really thankful to them.

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TOPIC: STUDY OF ECOSYSTEMS

SUB: ENVIRONMENTAL STUDIES

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CU ROLL NO: 213013-13-0019

CU REGISTRATION NO: 013-1211-0250-21

COLLEGE ROLL NO: 21-BSCV-0210

CONTENTS

ECOSYSTEM

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. Eco Systems contain biotic or living, parts, as well as abiotic factors, or nonliving. parts. Biotic factors include plants animals and other organisms. As a Society, we depend on healthy eco systems to do many things; to purify the air so we can breathe properly, sequester carbon for climate regulation cycle nutrients so we have access to clean drinking water without costly infrastructure and pollinate our crops. So we don't go hungry.

POND ECOSYSTEM

An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the nonliving environment, interacting as a functional unit. Remember that the, organisms living in an ecosystem are broken down in to Categories: Producers, Consumers, and decomposers.

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 and throughout. However, it is often difficult to classify the differences between a pond a lake, since the two terms are artifical and the ecosystems really exist on continuum. Generally, in a pond, the temperature changes with the air temperature layering or stratification takes place in Summer and winter, and these layers turnover in spring and fall.

Ponds get their energy from the Sun. As with other eco-Systems, plants are the primary producers. The chlorophyll in aquatic plants captures energy from the Sun to convert carbon dioxide and water to organic compounds and oxygen through the process of photosynthesis. Nitrogen and phosphorus are important nutrients for plants. The addition of these substances may increase primary productivity. However, too many nutrients can cause algal blooms, leading to eutrophication.

PRODUCERS :-

- Phytoplankton literally "Wandering plants" are microscopic algae that float in the open water and give it a green appearance. They carry out photosynthesis using carbon dioxide that is dissolved in the water and release oxygen that is used by the bacteria and animals in the pond. Phytoplankton are not actually plants - they are protists!
- Periphytic algae are microscopic algae that attach themselves to substrates and give the rocks and sticks a greenish brown slimy appearance. They also carry out Photosynthesis and produce oxygen, often near the bottom of the pond where it can be used by decomposers.
- Submerged Plants grow completely under water.
- Floating Plants include plants that float on the surface and plants that are rooted on the bottom of the pond but have leaves and/or stems that float.
- Emergent plants are rooted in shallow water but their stems and leaves are above water most of the time.
- Shore plants grow in wet soil at the edge of the pond.

CONSUMER :-

- Zooplankton are microscopic animals that eat phytoplankton or smaller zooplankton. Some are single-celled animals, tiny crustaceans, or tiny immature stages of larger animals. Zooplankton float about in the open water portions of the pond and are important food for some animals.
- Invertebrates include all animals without back bones. Macroinvertebrates are big enough to be seen with the naked eye. Some of them are only found in clean water.
- Invertebrates include all animals with backbones. In pond these might include fish, frogs, salamanders and turtles.

DECOMPOSERS :-

Animal waste and dead and decaying plants and animals from detritus on the bottom of the pond. Decomposers, also known as detritovores, are bacteria and other organisms that break down detritus into material that can be used by primary producers, thus returning the detritus to the ecosystem. During decay microbes living on detritus can pull nutrients from the overlying water thus acting to improve water quality. In the process of breaking down detritus, decomposers produce water and carbon dioxide.

CONCLUSION :-

Though they can be found over the globe, Pond ecosystems are often by conservationists. All of our wetland ecosystems ought to be safeguarded because. They are vital habitats for an abundance & different species. This includes Pond ecosystems which, as we have seen, can come in many different shapes and forms and can perform many different functions.

RIVER ECOSYSTEM

INTRODUCTION:-

ECO System are classified into aquatic and terrstrial ecosystem The aquatic ecosystems are water-borne and the terrestrial ecosystems are land based. Based on the terrestrial ecosystems are land based. further classified into fresh water and marine. types Being potable and industrial consumption. In addition to natural water bodies. artficial reservoirs and Dams are construct-ed to preserve the fresh water, without letting them into Seas or natural lakes. Freshwater ecosystems deal with both reming and standing water bodies, respectively. Almost all ecological factors like temperature, light, PH, dissolved gases and salts of water, turbidity, alkalinity, salinity, depth and areal distribution play an active role in controlling the habit at of these ecosystems.

ECO SYSTEM OF RIVER :-

Water is an essential component of life. Sourface water resources are the mostly preffered locations for life Settlements. Most of the human civilizations were also originated near water courses, especially along the major rivers.

- A river is also termed as major, medium and minor based on its number and lenght of tributaries, stage of development, area of catchment and geomarphological conditions.

- Every major river must have a place of origin in the Upstrem Side, which is called as the headwaters, and a point of confluence with the Sea or water body at the down stream 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 alluvial deposits clay and silt of a river are the materials preferred for Differend 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 RIVER AT LENGTH :-

All rivers, regardless of their type, have the same stages of structural changes from Source to delta. The profile of every river can be divided into three zones:- (1) Source zone.
(2) Tranfer zone.
(3) Defesition zone.

POLLUTION :-

River Pollution can include but is not limited to increasing Sediment enfort, excess nutrients from fertillizer or runoff, Sewage septic inputs. Plastic Pollution, nano-particles, Pharmaceuticals and personal care products synthetic chemicals, road Salt. inorganic contaminants (heavy metals) and even heat via thermal Polution. The effects of Pollution often depend on the content and material, but can reduce ecosystem functioning limit ecosystem Services.

CONCLUSION :-

Rivers are the lifline for all life forms. All the civilizations in our world were born, grew and developed on the banks of river. Rivers are invaluably useful for man, animals, and plants. They are the Source of Potable water, irrigation for agriculture, power generation, transfart, food recreation and leisure.

WETLAND ECOSYSTEM

Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year including during the growing season. Water saturation largely determines how the soil develops and the types of plant and animal communities living in the soil. Wetlands may support both aquatic and terrestrial species. The prolonged presence of water creates conditions that favour the growth of specially adapted plants (hydrophytes) and promote the development of characteristic wetland (hydric) soils.

Wetlands may support both aquatic and terrestrial species. The prolonged presence of water creates conditions that favor the growth of specially adapted plants and promote the development of characteristic wetlands soil.

Wetlands may be natural or human-made (human-made wetlands may be constructed for water management purposes in urban areas. What unique about all wetlands is that they contain vegetation that is specially adapted to such wet conditions plants that live in wetlands must be quite tolerant of wet productive soils.

Wetlands are areas where water is primary factors controlling the environment and the associated plant and animal life. They occur where the water table is at or near the surface of the land, or where the land is covered by shallow water.

IMPORTANCE OF WETLAND :-

Wetlands are some of the most biologically productive natural ecosystems in the world, comparable to tropical rain forests and coral reefs in their productivity and the diversity of species they support. Aquatic plant life flourishes in the nutrient-rich environment, and energy converted by the plants is passed up the food chain to fish, waterfowl, and other wildlife and to us as well. In addition to the biological productivity of wetlands, an acre of wetland can store 1-1.5 million gallons of flood water. Although wetlands keep only about 5% of the land surface in the conterminous united states. They are home to 31% of our plant species and support one-third of all endangered species. Wetlands are found on all continents except Antartica and their diversity is as broad as their geograpic occurrences.

FUNCTION OF A WETLAND :-

- Absorption and storage of flood waters and ground water recharge in dry periods.

- Protection of coastlines from high energy open Ocean waves.
- By Slowing of water velocity so Sediments may Settle out thereby improving water quality.
- Filtering and removal of excess nutrients and toxins by Wetland Soils and plants.
- Providing nurseries for juveniles of many aquatic Species including most commercially harvested fish
- Providing habitat for many upland species Such as raccoons and deer as well as habitat for Sensitive wetland dependent Species like Salamanders.
- Stop over and resting Sites for migratory birds as well as water fowl habitat. In fact, upto One-half of North American bird species nest or feed in wetlands.

CONCLUSION:-

Wetlands jurisdiction is diffused and falls under various departments like agriculture fisheries, irrigation, revenue, tourism, water resources and local bodies. For instance, all mangroves in the country fall under the direct control of forest department. The lack of a comprehensive wetland policy, with each department having its own developmental priorities, works against the interests of wetlands resulting or spill over that further aggravates the problem.

FOREST ECOSYSTEM

A forest ecosystem is a functional unit or a classification which includes birds, insects trees, animals, soil and humans as its networking units. A forest is a big and multi faceted ecosystem and therefore has more species diversity.

Furthermore, it is much more unchanging and unaffected by the harmful alterations in comparison to the smaller ecosystems like wetlands and grasslands.

Forest ecosystems, like any other ecosystem, also consists of abiotic and biotic components. Abiotic components are inorganic elements like air, soil and water. Biotic components comprise of producers, consumers and decomposers.

There components intermingle with each other in an ecosystem and as result, this collaboration among them makes it self sustainable. There connections allow for very high sustainability among forested ecosystems. These are often indicative of forest health as well.

FUNCTIONS OF FOREST ECOSYSTEM :-

• 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 timber, wood biomass, cork, etc. from forests. The fuel can be extracted from old trees that are buried under the soil.

• Ecological Functions :-

Forest play an important role in maintaining ecological factors such as climate, carbon-storage, nutrient cycling and rainfall.

• 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 mordern people visit forests for recreation.

CONSEVATION OF FOREST :-

Conservation of forest is the practice of planting more trees and maintaining the forested areas for the sustainability for future generations. Forests are and important natural resource and are beneficial to humans in several ways. But due to increasing deforestation activites it has become essential to conserve forests throughout the world. The process of destructing forests for the expansion of agricultural land in reffered to as shifting cultivation.

ATTRACT BIRD SPECIES TO TAKE SHELTER :-

The forest ecosystem provides the most favorable conditions to various species of birds. As a result these species get attracted by the forest ecosystem and take shelter on trees.

ATTRACT INSECTS & PROVIDE HABITAT :-

The forest ecosystem is home to a huge variety of insects. These insects found thousands of options as their shelter in the forest ecosystem. Hence, these insects get attracted to the natural habitats provided by the forest ecosystem.

SOIL FERTILITY :-

The soil of forest ecosystems varies in terms of fertility. For example the soil of temperate and trapical decidous forests is very fertile enriched with nutrients.

On the other hand, the soil of boreal forests is mostly acidic due to the falling of conifer needles on the forest floor. In the case of: trapical rainforests, the soil is impaverished in terms of fertility due to continuous leaching on nutrients caused by heavy rainfall.

ESTUARY ECOSYSTEM

INTRODUCTION :-

- Estuaries are unique environments to which plants and animals have specially adapted.
- Transition from land to Sea and fresh water to salt water.
- Estuaries are protected from Ocean forces by reefs, barrier islands, headlands and deltas.
- Estuaries trasport and trok nutrients and sediment through the combined action of freshwater flow, wind, waves and tidal action.

ESTUARINE ECOSYSTEMS :-

- , These are areas where both ocean and land contribute to a unique ecosystem.
- A basic feature is instability of an estuary due to the ebb and flood of the tide.
- Plant and animal wastes are washed away sediment is shifted and fresh and salt water are mined.

- Estuaries provide a calm refuge from the open Sea from millions of Plants and animals.
- Visiting species include birds which roost and feed. Pelagic fish to Spawn and use as nurseries.
- Estuaries are among the most productive enviroments on earth.
- Photosynthesis occurs throughout the water columnand on the Sediment surface- very productive.
- Sediments are important as they store organic matter and are the Site of microbial activity.
- Filter feeders Such as cockles and pipis continually add faecal deposits to the Sediment.
- Plants and animals have adapted Specially for the different habitats of this unique ecosystem.
- Visiting animals from land, Sea and fresh water use the esthary for feeding, breeding, spawningand as nurseries for their young. Food is abundant and easy to access because of the shallow water attracting many types of birds including gulls ducks and wading birds.

IMPORTANCE OF ESTUARIES :-

- Of the 32 largest cities in the world, 22 are located on estuaries.
- Many animal species rely on estuaries for nesting and breeding
- 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.
- Humans also rely on estuaries for recreation, jobs, and even our homes.
- Coastal development introduction of invasive species, over fishing, dams and global climate changes led to a decline in the health of estuaries, making them one of the most threatened ecosystems on Earth

AGRO ECOSYSTEM

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

COMPONENTS OF AGROECOSYSTEM :-

Primary producer :- 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, Symacte also present with rice.

Consumer :- Among consumer grasshoppers, aphids, bugs, ants, rats, birds, man etc are macro consumer and frog, Snake, hack are micro Consumer

PROPERTIES OF AGRO ECOSYSTEM :-

- Productivity :- It is net increment of values products per unit resources (land, labour, energy capital land) and is commonly measured as annual yield / hectare.
- Stability :- It is the degree to which, productivity remain constant, in spite of normal small scale fluctuation in environmental variables such as climate or in the economic condition in market.

• Sustainability :- It is defined as the ability of the system to maintain its productivity when subject to stress on pertubation 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.

• Equitability :- It is a measure of how evenly the produce of Agro ecosystem is distributed among its human benefical. 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

Everyone in the world depends completely on earth's ecosystems and the services they provide, such as feed, water disease managment, climate regulation Spiritual fulfillment and aesthetic enjoyment. The transfermation of the planet has contributed to substantial net gains in human well being and economic development. An ecosystem is balanced when the natural animals and plants and nonliving components are in harmony. With increasing pollution change in migratory patterns and rise of human population, many ecosystems are in denger of loosing that harmony. Human beings are in integral part of ecological system and depend on nature for survival and quality of life. Thus, Saving nature will save the ecosystems and ourselves.

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Examined
18/6

TOPIC: STUDY OF ECOSYSTEMS

SUB: ENVIRONMENTAL STUDIES

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Gokhale Memorial Girls' College Kolkata

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Content:

Ecosystem:-

An ecosystem refers to a Practical unit of nature where living organisms act together among themselves and with the surrounding Physical environment. Environmentalists look at the whole biosphere as a global ecosystem. Moreover, the forest ecosystem is Part of the terrestrial ecosystem.

However, it can differ generally in size, for example, it can be a small Pond or a sea or a huge forest. Typically, these are self-sustaining. We can split the ecosystem into two comprehensive classifications. Specifically, terrestrial ecosystem and aquatic ecosystem.

The terrestrial ecosystem includes grassland, desert and forest ecosystem, but lake, Pond and river and wetland ecosystem fall under the aquatic ecosystem umbrella.

P.T.O

Pond Ecosystem:-

An ecosystem is a dynamic complex of Plant, animal, and microorganism communities and the nonliving environment, interacting as a functional unit. Remember the organisms living in an ecosystem are broken down into categories: Producers, consumers, and decomposers.

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 and throughout. However, it is often difficult to classify the differences between a Pond and a lake, since the two terms are artificial and the ecosystems really exist on a continuum. Generally, in a Pond, the temperature changes with the air temperature and is relatively uniform. Lakes are similar to Ponds, but because they are larger, temperature layering or stratification takes Place in summer and winter, and these layers turnover in Spring and fall.

Ponds get their energy from the sun. As with other ecosystems, Plants are the Primary Producers. The chlorophyll in aquatic Plants captures energy from the sun to convert carbon dioxide and water to organic compounds and oxygen through the Process of Photosynthesis. Nitrogen and Phosphorus are important nutrients for Plants. The addition of these substances may increase Primary Productivity. However, too many nutrients can cause algal blooms, leading to eutrophication

P.T.O

Producers:-

- Phytoplankton: literally "wandering Plants", are microscopic algae that float in the open water and give it a green appearance. They carry out Photosynthesis using carbon dioxide that is dissolved in the water and release oxygen that is used by the bacteria and animals in the Pond. Phytoplankton are not actually Plants - they are Protists

- Periphytic algae are microscopic algae that attach themselves to substrates and give the rocks and sticks a greenish brown slimy appearance. They also carry out Photosynthesis and Produce oxygen. often near the bottom of the Pond where it can be used by decomposers

- Submerged Plants grow completely under water.

- Floating Plants include Plants that float on the surface and Plants that are rooted on the bottom of the Pond but have leaves and/or stems that float.

- Emergent Plants are rooted in shallow water but their stems and leaves are above water most of the time.

- Shore Plants grows in wet soil at the edge of the Pond.

P.T.O

Consumers:-

- zooplankton are microscopic animals that eat Phytoplankton or smaller zooplankton. Some are single-celled animals, tiny crustaceans, or tiny immature stages of largeer animals. zooplankton float about in the open water. Proteins of the Pond and are important food for some animals.

- Invertebrates include all animals without backbones. Macroinvertebrates are big enough to be seen with the naked eye. Some of them are only found in clean water.

- Vertebrates are animals with backbones. In a Pond these might include fish, frogs, salamanders, and turtles.

Decomposers:-

Animal waste and dead and decaying Plants and animals from detritus on the bottom of the Pond. Decomposers, also known as detritovores, are bacteria and other organisms that break down detritus into material that can be used by Primary Producers, thus returning the ecosystem. As this material decomposes it can serve as a food resource for microbes and invertebrates. During decay microbes living on detritus can pull nutrients from overlying water thus acting to improve water quality. In the process of breaking down detritus, decomposers Produce water and carbon dioxide

P.T.O

Conclusion

Everyone in the world depends completely on earth's ecosystems and the services they provide, such as feed, water, disease management, climate regulation spiritual fulfillment and aesthetic enjoyment. The transformation of the Planet has contributed to substantial net gains in human well being and economic development. An ecosystem is balanced when the natural animals and plants and nonliving components are in harmony. With increasing Pollution change in migratory Patterns and rise of human population, many ecosystems are in dengen of loosing that harmony. Human beings are in integral Part of ecological system and depend on nature for survival and quality of life. Thus, saving Nature will save the ecosystems and ourselves.

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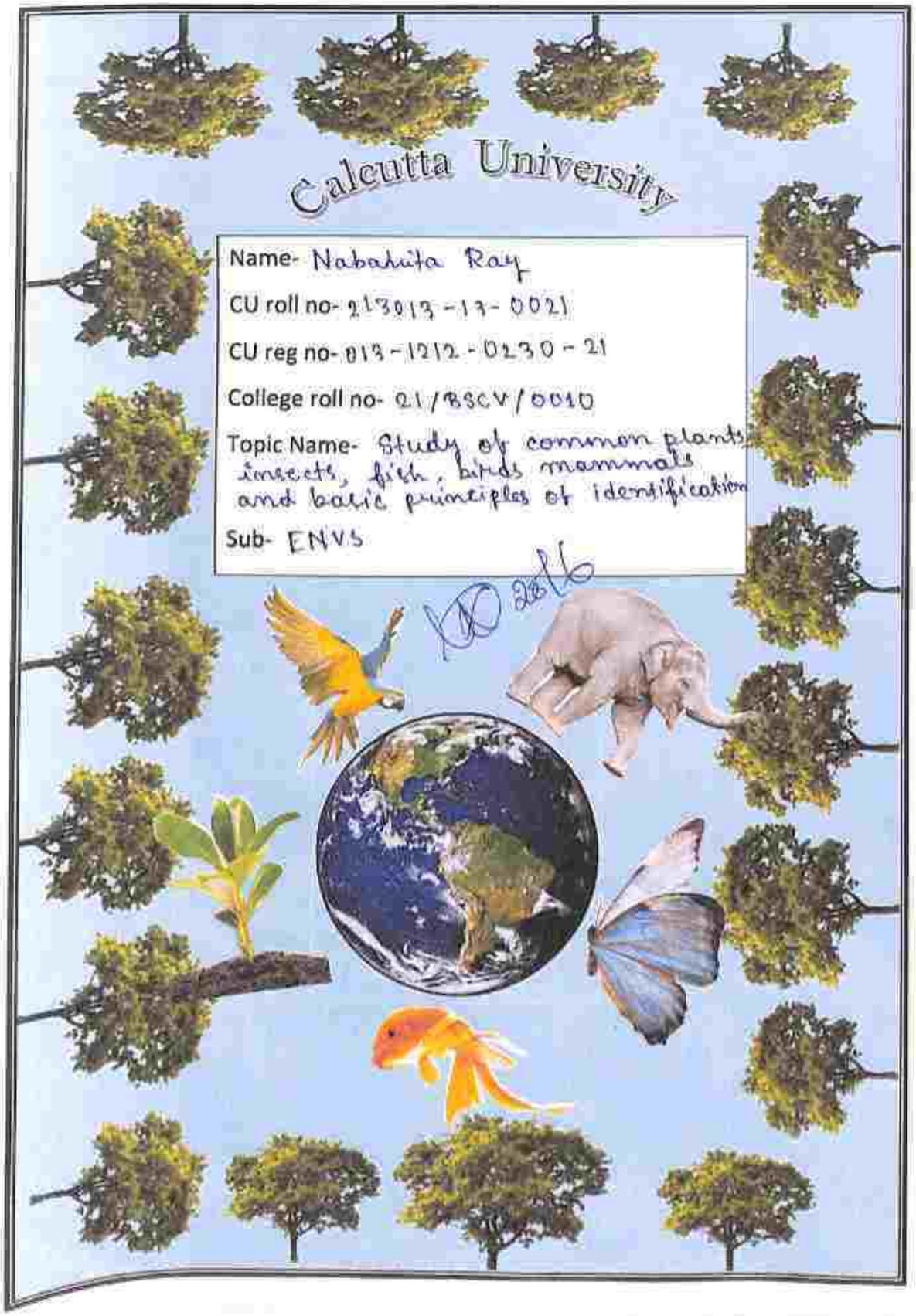
Examined
18/1



Contents:

PLANTS

Plants are critical other life on Earth 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 at 3.8 billion years. These fossil deposits show evidence of photosynthesis, so plants, or the plant like structure ancestors of plants, have lived on this planet longer that most of other groups of organisms. At one time, anything was green and wasn't an animal was considered to be a plant. Now, plants are divided into several kingdoms: Protista, Fungi and Plantae. Most aquatic plants occur in the kingdoms Plantae and protista.

classification:

Kingdom: Plantae

Division: Tracheophyta (vascular plants)

class: Magnoliopsida (flowering plants)

Genus: Petunia, Jus.

❖ Points of Identification:

(1) Taproot and Branched.

(2) Stem green, hairy, herbaceous and branched.

(3) Leaves simple, exstipulate, reticulate venation.

(4) Flowers pentamerous, regular, bisexual.

(5) It is a cultivated, annual ornamental plant. The plant is a herb, attaining a height of 2-3 feet.

classification:

Kingdom: Plantae

Division: Tracheophyta (vascular plants)

class: Gymnospermae (simple leaf, seeds naked, cones present, xylem lacks vessels)

Genus: Pinus sp.

❖ Points of Identification:

(1) It is an evergreen, perennial and woody plant.

(2) Main plant body is sporophyte which is differentiated into roots, stem and needle like leaves.

(3) The stem is cylindrical, erect, covered with bark and branching is monopodial.

(4) It produces different kind of spores.

(5) Microsporophylls bear microsporangia which produce microspores i.e., pollen grains. Pollen grains are light and winged. These are dispersed by the wind.

BUTTERFLIES

Butterflies are the large group of insects belonging to the order lepidoptera which means scally wings. They are characterized by their large, often colourfull wings, and they are probotis which they use to suck flowers nector.

Kingdom: Animalia
Phylum: Arthopoda
order: Lepidoptera
class: Insects
Scientific Name: Rhopalocera
life span: 15 - 29 days
size: 1/8 inch to 12 inches
colour: white, red, green etc (can be of any colour)
family: Picnidae, Riodinidae.

Special characteristics:
Camouflage: A productive colouring that enables butterflies to blend in with its environment thus hiding from it predators.

Structure: Like other insects, Butterflies have 6-legs and three main body parts - head, thorax and abdomen. They also have two antennae and an exoskeleton.

Habitat: Butterflies live and bread in diverse habitat including salt marshes, mangroves, sand dunes, lowland forest, & grasslands and mountain zones.

Primary Diet: Butterflies mostly eat nector and water. Each butterfly species prefer a specific plant but they will feed whenever food is available.

FISH

Fish or Fishes are an aquatic group of vertebrates which live in water and reprise (get oxygen) with gills. They do not have limbs, like arms or legs, and they do have digits (fingers & toes). This is a defination which does not quite work. Some amphibia also live in water and have external gills, but they are not fish.

Fish used to be a class of vertebrates. Now the term covers five classes of aquatic vertebrates:—

(i) Jawless Fish (ii) Armoured Fish
(iii) Cartilaginous Fish (iv) Ray-Finned Fish
(v) Lobe-Finned Fish

There are more fish than tetrapods: there are 33,000 described as species of fish. Fish are usually covered with scales. They have two sets of paired fins and several unpaired fins. Most fish are cold-blooded. A fish takes in the Oxygen form the water using gills. There are many different kinds of fish. They live in fresh water in the Ocean. Some fish are less than one centimetre long. The longest fish is the whale shark, which can be almost 15 meters long and weight 15 tons. most fish live in the water. A group of fish called the lungfish have developed lungs because they live in rivers and pools which dry up in certain parts of the year. They burrow into mud and activate until the water returns.

'Fish' is a paraphyletic term in cladistics because it lacks a monophyletic group of descendants. It does not include the land vertebrates or tetrapods, which descended from fish.

ceramic vessels. That we now do in glass fish tanks.

FRESH WATER FISH

41% of all fish live in freswater. There are also some important fish which breed in rivers, and spend the rest of their life in the seas.

Examples are: Salmon, Trout, the Sea Lamprey, and three spined stickle back. Some other fish are borrn in salt water, but live most of their adult lives in fresh water. For example the eels. Spries like these change their physiology to cope with the amount of salt in the water.

BIRDS

Introduction

Birds are ready visitors that visit frequently from place to place even from continent to continent. The introduction of birds says that they are organisation of Aves-class warm-blooded vertebrates characterized by wings, hard-shelled egg-laying, toothless baked jaws, an increased metabolic rate, a heart with four chambers, and a powerful yet light skeleton. The birds scientific name is Aves.

A good number of birds visit different sites due to change of environment particularly for their feed and reproduction. They come to thrive there for a temporary period to hatch eggs carry a good number off springs during their back journey.

Observation

(1) SPARROW

Scientific name: Passeridae

Bengali name: Charai

comomon English name: Sparrow.

Characteristics: Sparrows have beautiful voices and their chirping and singing can be heared all over. Other unique characteristics are their smooth round heads and rounded wings. Males have feathers on their back and females are brown

MAMMALS

Introduction: Mammals are a group of vertebrates constituting the class Mammalia characterised by the presence of mammary glands which in females produce milk for feeding (nursing) their young, a neocortex (a region of the brain), fur or hair, and three middle ear bones. Thisese characteristics distinguish them from reptiles (including birds) from which they diverged in their carboniferous. over 300 million years ago. Around 6,100 extant species of mammals have been described. Most mammals are intelligent, with some possessing large brains, self-awareness, and tool use.

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 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. The white tiger is a recessive mutant, which is reported in the wild from to time to time in Assam, Bengal and Bihar.

Conclusion

Birds: Birds spatial distributions are directly effected by Global warming and subsequently climate change. In general terms it was been stated by the scientific community that the distribution of species have been moving in a pole ward trend. Within the realm of our study we found no conclusion that the distribution of species is infact being altered by climatic change by we were unable to determine exactly what change it was. This project focus on Birds species and how they could be identified. Evidence found specifically from bird shows that their is a co-relation between bird relation characteristics and alteration in climatic factors such as temparature and precipitation. The change in population characteristics shows that some sort of shift is occurring.

Fish: Fish are vital part of our eco system. Fish playe an important role in nutrient cycles become the store a large portion of ecosystem nutrients in their tissues. transport nutrients farther than other aquatic animals and excrete nutrients in dessolve forms that are readily available to primary producers. Although the influence of fish community on food web structure, nutrient recycling and productivity is well documented little is known as about the effect on ecosystem of a reduction in the fish species richness.

Insects: Insects plays many important and roles in nature. They and bacteria, fungi and other organisms in the decomporion of organic matter and in soil formation. They decay of carrion for example about maimly or by bacteria is accelerated by the

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Nabanita Ray

Examined

STUDY OF COMMON PLANTS, INSECTS, FISH, BIRDS, MAMMALS AND BASIC PRINCIPLES OF IDENTIFICATION

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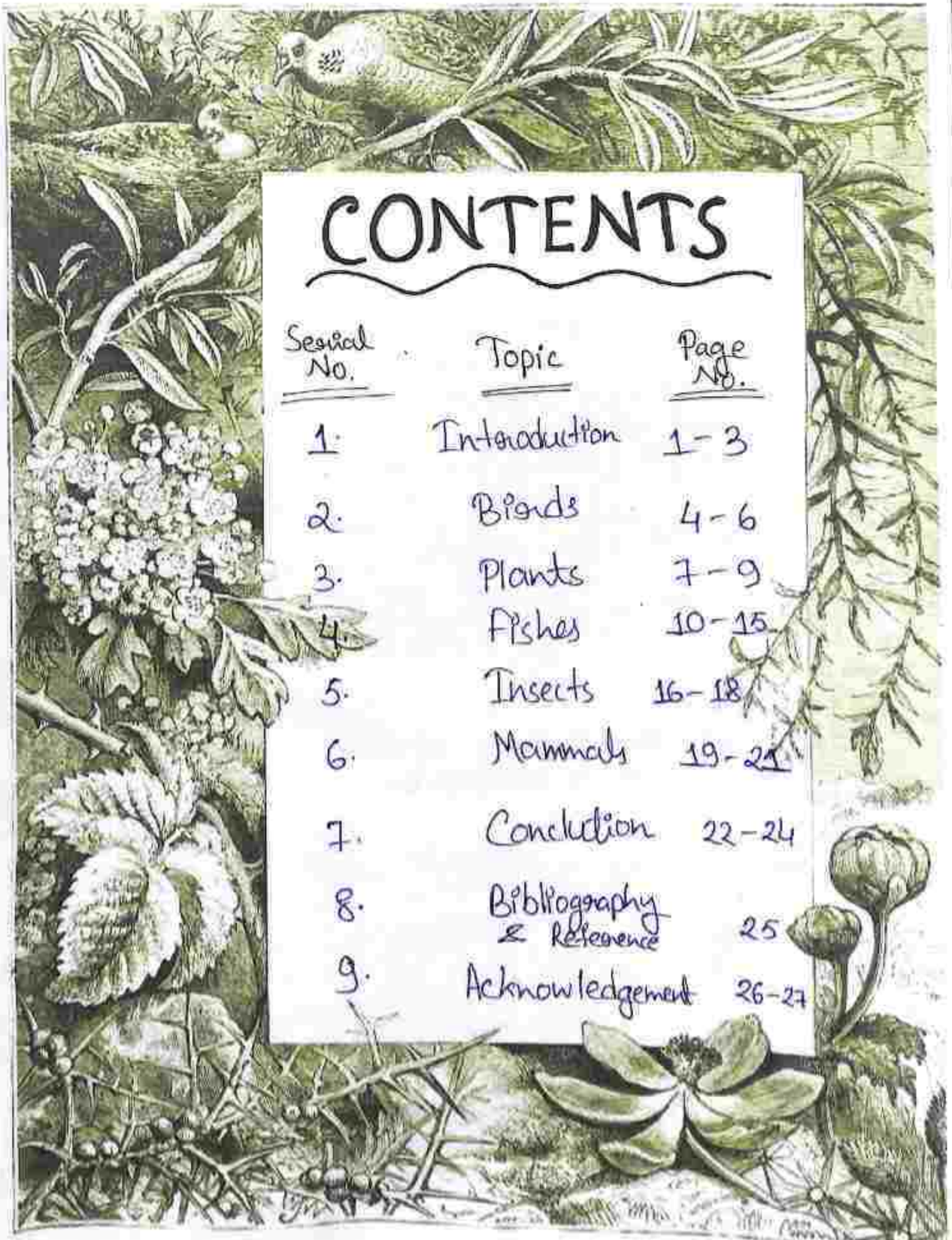

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INTRODUCTION

BIRDS

Birds are ready visitors that visit frequently from place to place even from continent to continent. The introduction of birds says that they are organization of Aves-class warm blooded vertebrates characterized by wings, hard-shelled egg-laying, toothless baked jaws, an increased metabolic rate, a heased with four chambers and a powerful yet light a skeleton. The birds scientific name is Aves. A good number of birds visit different site due to change of environment particulary for their feed.

PLANTS

Plants are critical to other life on earth because they form the basis of all food webs. Most plants are autotrophic, creating their own food using water, carbon dioxide and light through a process called photosynthesis. Some of the earliest fossil found have been aged at 3.8 billion years. So plants, or the plant like structure ancestors of plants, have lived on this planet longer that most of other groups of orgnism. At one time, anything was green and wasn't an animal was considered to be a plant. Now plants are divided into several kingdoms: Protista, Fungi and Plantae.

FISHES

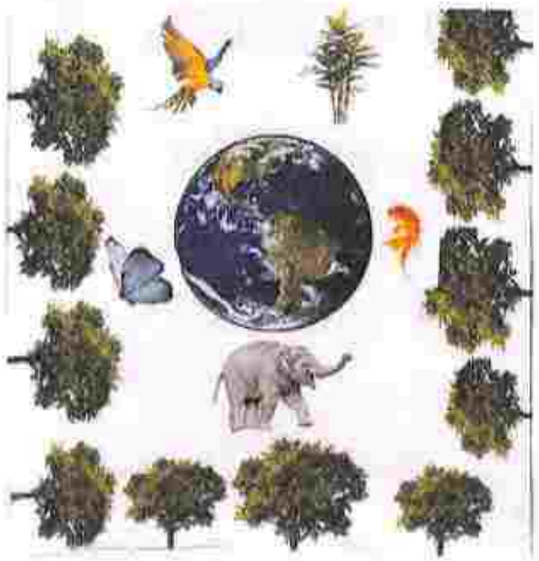
Fish or fishes are an aquatic group of vertebrates which live in water and reposise (get any gen) with gills. They do not have limbs, like arms or legs and they do have digits (fingers & toes). This is a defination which does not quite work: some amphibia also live in water and have external gills, but they are not fish. Fish used to be a class of vertebrates.

INSECTS

Insects are genually considered the most succesful group of living organisims on the earth. Insects are distinguished from other arthropods by their body, which is divided into three major gregions, (1) the head, which becas the mouthparts, eyes and a pair of antennae, (2) the three segmented thorax which usually has three pairs of legs (hence "Hexapoda") in adults and usually one or two pairs of wings. 97% insect habitat are on land.

MAMMALS

Mammals are a group of vertebrates constituting the class Mammalia characterized by the presence of mammary gland which in females produce milk for feeding (nursing) their young, a neocortex (a region of the brain), fur or hair, and three middle ear bones. These characteristics distinguish them from reptiles (including birds). Most mammals are intelligent, with some possessing large brains, self-awareness, and tool use.



BIRD

1. SPARROW

Scientific Name:- Passeridae.

Bengali Name:- Chorai.

Common English Name:- Sparrow.

Characteristics:- Sparrow have beautiful voice and their chirping and singing can be heard all over. Others unique characteristics are their smooth, round heads & rounded wings. Males have reddish feathers on their backs & female are brown and striped.

Distribution:- It is native to Eurasia and North Africa, and was introduced to south Africa, North and South America, Australia, New Zeland, Middle East, India and Central Asia, where its population thrived under a variety of environmental and climatic conditions.

2. BAYA WEAVER

Scientific Name:- Ploceus Philippinus

Bengali Name:- Babui Pakhi

Common English Name:- Baya Weaver

Characteristics:- A widespread weaver that is known for its nest- a long hanging nest with a bulbous chamber and a narrow tubular entrance. They have yellow forehead and crown a dark throat that contrasts with yellow underparts.

Distribution:- The baya weaver is a weaver bird found across the Indian Subcontinent and Southeast Asia. Flocks of these birds are found in grassland areas.

3. COMMON MYNA

Scientific Name :- Acridotheres Tristis

Bengali Name :- Shalik

Common English Name :- Common Myna

Characteristics :- The common myna is greedily identified by the brown baby, black hooded head and the bare yellow patch behind the eye. The bill and legs are bright yellow. There is a white patch on the outer primaries and the wing lining on the underside is white. The sexes are similar.

Distribution :- It is found from southern Kazakhstan, Turkmenistan and eastern Iran to southern China, Indochina, the Malay Peninsula and Southern India. It has also been introduced to Hawaii and North America.

PLANT

1. PETUNIA HYBRIDA

Classification

Kingdom :- Plantae
Division :- Tracheophyta (vascular plants)
Class :- Magnoliopsida
Genus :- Petunia, Juss.

Points of Identification

1. Taproot and Branched.
2. Stem green, hairy, herbaceous and branched.
3. Leave simple, exstipulate, reticulate venation
4. Flowers pentamerous, regular, bisexual.
5. It is a cultivated, annual ornamental plant. The plant is a herb, attaining a height of 2-3 feet.

2. PINUS

Classification

Kingdom :- Plantae
Division :- Tracheophyta (vascular plants)
Class :- Gymnospermae (simple leaf, seeds naked, cones present, xylem, lacks vessels)
Genus :- Pinus sp.

Points of Identification

1) It is an evergreen, perennial and woody plant.
2) Main plant body is sporophyte which is differentiated into root, stem and needle like leaves.
3) The stem is cylindrical.
4) It produces different kind of spores.
5) Microsporophylls bear microsporangia which produce microspores. ie, pollen grains.

3. AGARICUS (Mushroom)

Classifications

Kingdom :- Fungi

Division :- Eumycota

Class :- Basidiomycetes

Genus :- Agaricus sps.

Points of Identifications

1) It is a fleshy, saprophytic fungus which grows on damp logs of wood.

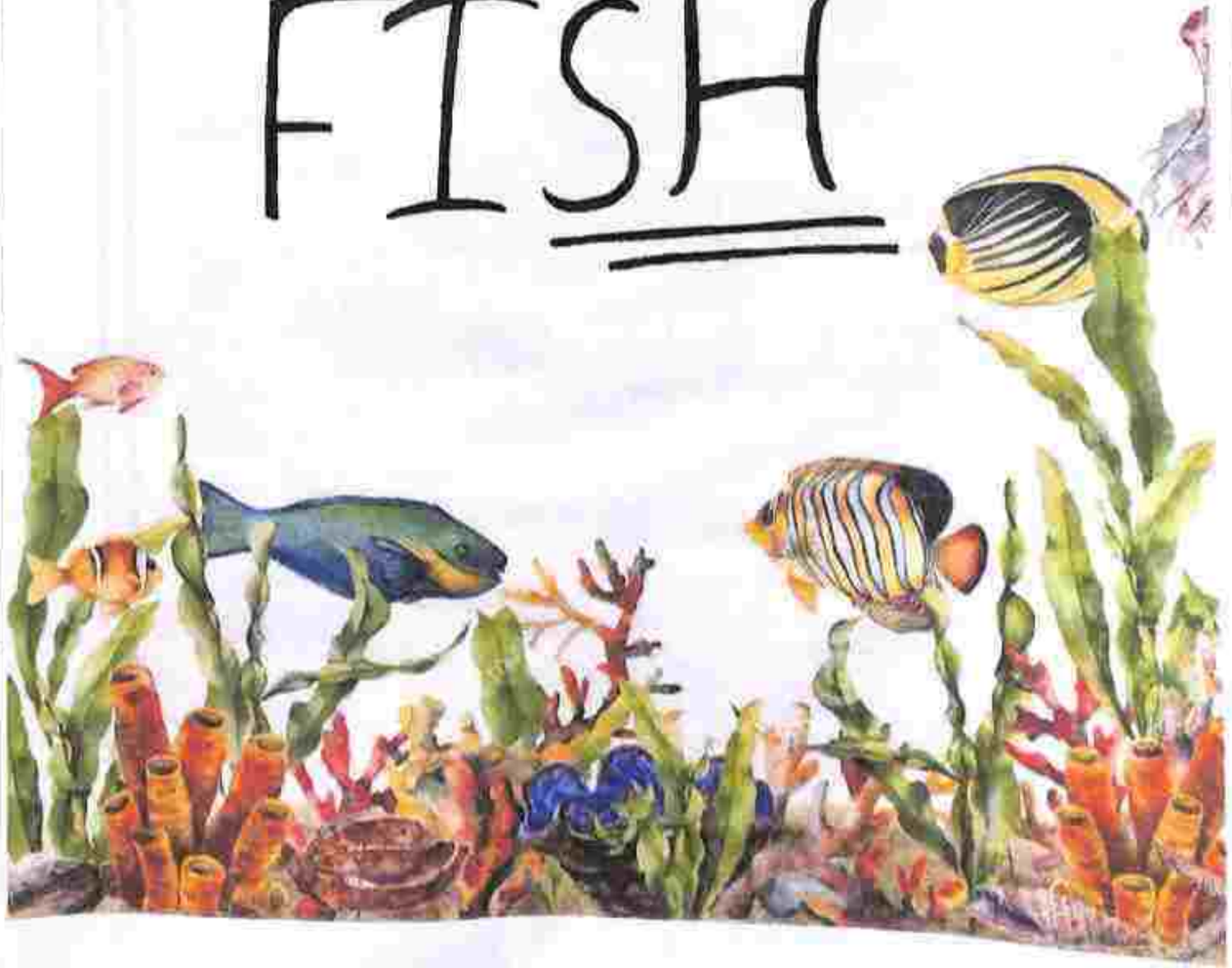
2) The fungal body consists of two parts- i) Somatic & ii) Reproductive.

3) Primary mycelium produced from basidiospore is septate, haploid and Monokaryotic.

4) Secondary mycelium is dikaryotic and long lived.

5) Mushrooms main body is umbrella-shaped called fruitification.

FISH



Fish used to be a class of vertebrates. Now the term covers five classes of aquatic vertebrates:

- Jawless fish
- Armoured fish
- Cartilaginous fish
- Ray-finned fish
- Lobe-finned fish

There are more fish than tetrapods (land vertebrates): there are over 33,000 described species of fish. Fish are usually covered with scales. They are two sets of paired fins and several unpaired fish. Most fish are cold-blooded. There are many different kinds of fish. The largest fish is the whale shark. Most fish live in the water. A group of fish called the lungfish have developed lungs because they live in rivers and pools which dry up in certain parts of the years. They burrow into mud and aestivate until the water returns.

Types of Fish

Fish is not a formal taxonomic grouping in systematic biology.

Fish are oldest vertebrate group. The term includes a huge range of types, about 490 million years ago, to the present day.

These are the main groups:

Agnatha: the jawless fish. Cambrain to present day.

Pteraspids: the head-shields.

Anaspids: gills opened as holes.

Cephalaspids: scaly jawless fish.

Lampreys: living ectoparasites.

Osteostral: bony-armoured jawless fish.

Placoderms: heavily armoured fish.

Osteichthyes: bony fish.

Actinopterygi: the ray-finned fish.

① Body Shape

The shape of the body of a fish is important to its swimming. This is because streamlined body shapes makes the water drag less. Here are some common fish shapes—

A) EEL-LIKE

The long, ribbon-like shape of an eel's body shows another shape. This enables them to hide in cracks, springing out quickly to capture prey, then returning quickly to their hiding spot.

B) FLAT FISH

Flat fish live on the bottom of the ocean or lake. Most use camouflage: they change colours to match the ocean floor. During their early lives, their eyes move to the upper side of their flat body.

C) REEF FISH

Reef fish also have flat bodies, and their body is often highly coloured. Flat bodies can slip in and out among the corals, sponge and rocks. Angel-fish, surgeonfish and butterfly fish are examples.

② FISH AS FOOD

Some people eat many different kinds of fish. These include carp, cod, herring, perch sardines, sturgeon, tilapia, trout, tuna, and many others. A person who buys and sells fish for eating is called a fishmonger.

The word to fish is also used for the activity of catching fishes. People catch fish with small nets from the side of the water or from small boats.

Because people are catching too many fish for food or other uses, there are less and less fish in the sea. This is a problem known as Overfishing.

③ FISH AS PETS

Selective breeding of carp made them into the domesticated koi in Japan, and goldfish in China. This breeding over 2000 years ago. The Chinese brought their goldfish indoors the song Dynasty. Then we now do in glass fish tanks.

④ FRESH WATER FISH

41% of all fish live in freshwater. There are also some important fish which breed in rivers and spend the rest of their life in the seas. Some other fish are born in salt water, but live most of their adult lives in fresh water: for example the eels. Species like these change their physiology to cope with the amount of salt in the water.

INSECT

1. BUTTERFLY

Kingdom :- Animalia
Phylum :- Arthopoda
Order :- Lepidopetsa
Class :- Insects
Scientific Name :- Rhopalocera
Life span :- 15- 29 days
Size :- 1/8 inch to 12 inch
Colour :- white, gred, green etc. (can be of any colour)

Structure :-
Like other insects butterflies have 6 legs and three main body parts head, thorax and abdomen. They also have two antennae and an exoskeleton.

Special Characteristics :-
Camouflage — A productive colouring that enables butterflies to blend in with its environments thus hiding from its predators.

2. GRASSHOPPER

Kingdom :- Animalia
Ordes :- Orthopetera
Class :- Insects
Family :- Acrididae
Scientific Name :- Caelifela
Colour :- Green
Size :- 1 to 7cm in length

Habitat :-

Most grasshoppers prefers dry open habitats with lots of grass and small plants. They are generally found in tempesate, tropical and terristrial boarders.

Special Characteristics :-

Grasshoppers use their chirping ability to give them a boost into the air most are pretty strong flies and make good wrings to escape predators.

3. MOSQUITO

Kingdom :- Animalia
Phylum :- Arthropoda
Class :- Insecta
Ordeo :- Diptera
Family :- Culicidae
Species :- Varies
Size :- 1/4" to 3/8"

Habitat :-

Mosquitoes breed in soft, moist soil or stagnant water sources such as storm drains, old tires, children's wading pools and bird-baths.

Impact :-

Mosquitoes spread diseases such as West Nile Virus, Malaria and dengue fever.

MAMMAL

1. ROYAL BENGAL TIGER

The Bengal tigen is a population of the Panthera tigris subspecies. It ranks among the biggest wild cats alive today. It is considered to belong to the world's charismatic megafauna. The Bengal tigen'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. The white tiger is a repeated in the wild from time to time in Assam, Bengal and Bihar.

2. ONE HORNED RHINO

The Indian Rhinoceros, also called the Indian rhino, greater one-horned rhinoceros or great Indian rhinoceros, is rhinoceros species native to the Indian subcontinent. As a result of habitat destruction and climate changes its range has gradually been reduce so that by the 19th century, It only survived in the Terai grasslands of southern Nepal, northern Uttar Pradesh, northern Bihar, northern West Bengal and in the Brahmaputra valley of Assam.

3. ASIATIC ELEPHANT

The Asian elephant, also known as the Asiatic elephant, is the only living species of the genus Elephas and is distributed throughout the Indian subcontinent and Southeast Asia, from India in the west, Nepal in the north. Sumatra in the south, and to Borneo in the east. The Asian elephant is the largest living land animal in Asia.

CONCLUTION

BIRDS

Birds' spatial distributions are directly effected by global warming and subsequently climate change. Within the realm of our study we found no conclusive evidence to prove or disprove this statement. This project focused on bird species. The change in population characteristics shows that some sort of shift or generally trended movement is occurring.

PLANTS

Each plant is characterized by one of the three life histories: haploid (1n), diploid (2n), or the most common haploid- diploid. There are also variations. Due to variations arising separately and at different rates, the evolution of land plants did not follow a linear sequence, but land plants later originated from a hoploid- diploid ancestor.

FISHES

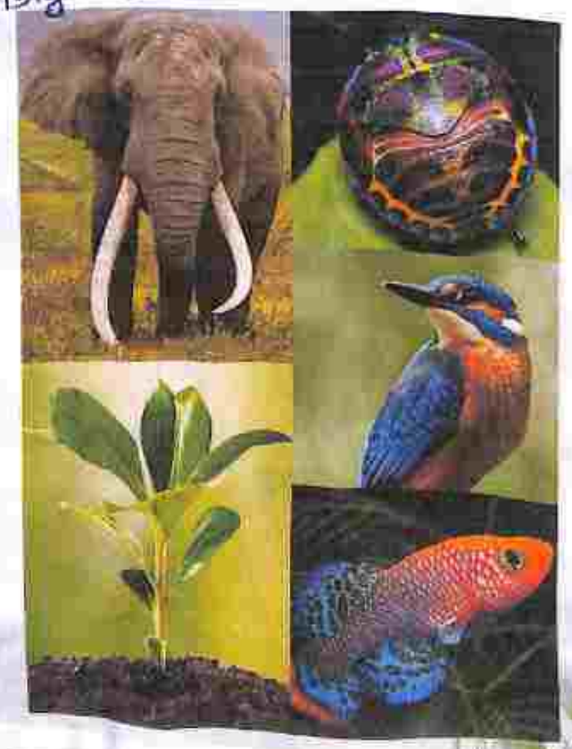
Fish are a vital part of our ecosystem. Fish play an important role in nutrient cycles because they store a large proportion of ecosystem nutrients in their tissue, transport nutrients farther than other aquatic animals and excrete nutrient in dissolved forms that are readily available to primary producers. It is therefore to significant importance to evaluate the potential impacts of ongoing decreases in fish diversity.

INSECTS

Insects play many important roles in nature. They aid bacteria, fungi and other organisms in the decomposition. The activities of these larvae, which distribute and consume bacteria, are followed by those of moths and beetles, which break down hairs and feathers. Many plant depend on insects for pollination. Some insects are predators of others.

MAMMALS

Mammals play a vital role in maintaining the atmosphere on the Earth. Through their reproduction pattern and gestation period they come to be together in contacting the pressure of eco-system in Earth. So it cannot be consider common on light problems. If is confirmed that if this method can't be stopped it will lead to the extinction of all the species on the Earth, so we shouldn't hesitate to try our best to save their life.



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https://en.m.wikipedia.org/wiki/Plant

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(2) Kaushik Anubha, Kaushik C.P. New Age International Publishers.

(3) Singh Savindra- Environmental Geography- Allahabad, Pravalika.

ACKNOWLEDGEMENT

The success and final outcome of this assignment required a lot of guidance and assistance from many people and we are extremely fortunate to have got this all along the completion of our assignment work.

I respect and thank DR. MAHUA DUTTA MADAM for giving us an opportunity to do this assignment work and providing us all support and guidance which made us to complete the assignment on time, We are extremly greatful to her providing such a nice support & guidance.

This assignment cannot be completed without the effort from our friends. Last but not least, we would like to express our gratitude to our classmates and respondents for support and willingness for this project.

Professor's Signature

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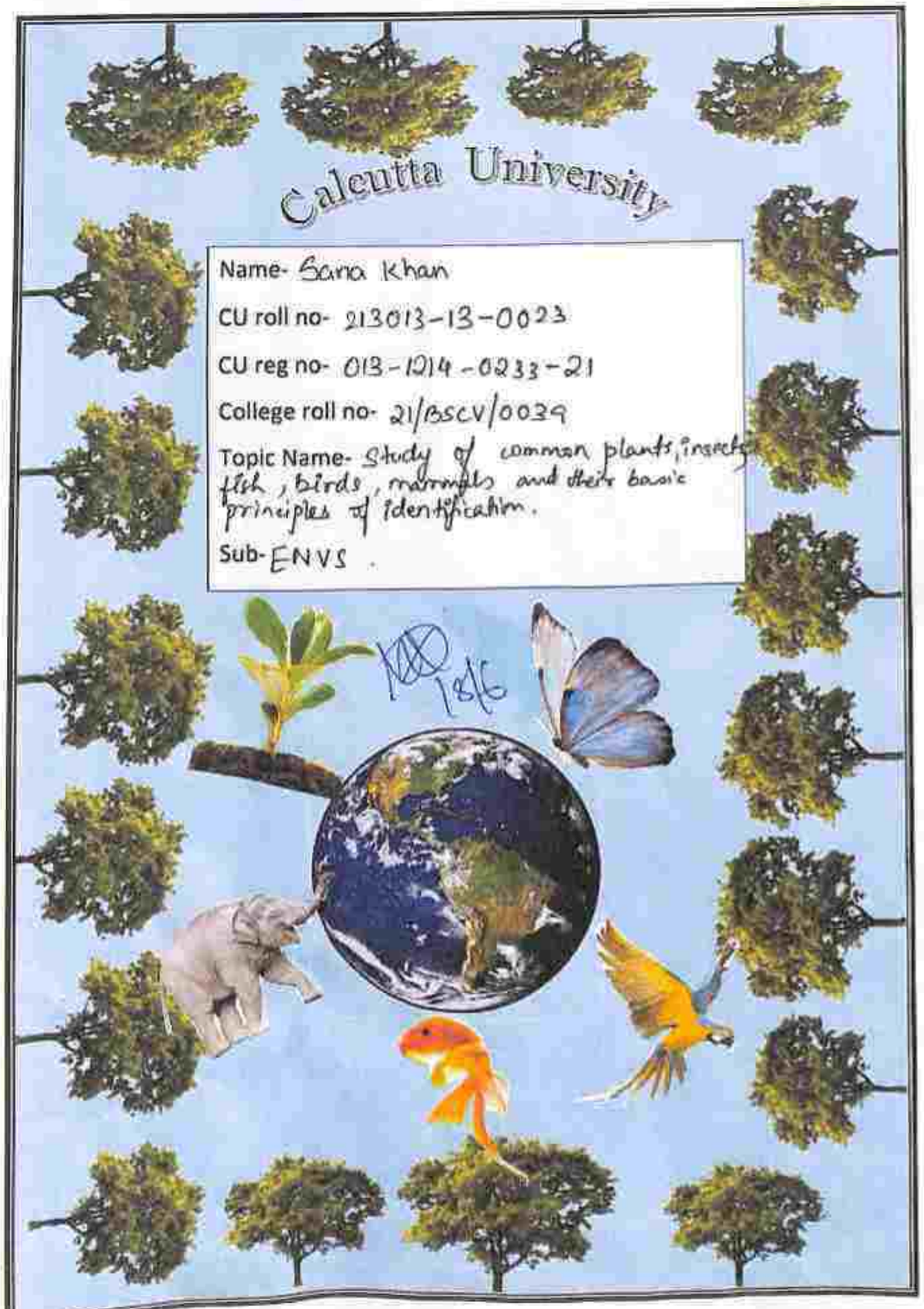

PLANTS

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

PETUNIA HYBRIDA

Classification:

Kingdom : Plantae

Division : Tracheophyta (vascular plants)

Class : Magnoliopsida (flowering plants)

Genus : Petunia; Juss.

Points of Identification:

1. Taproot and Branched.
2. Stem green, hairy, herbaceous and branched.
3. leaves simple, exstipulate, reticulate venation.
4. Flowers pentamerous, regular, bisexual.
5. It is a cultivated, annual ornamental plant. The plant is a herb, attaining a height of 2-3 branched feet.

PINUS

Classification :

Kingdom : Plantae

Division : Tracheophyta (vascular plants)

Class : Gymnospermae (simple leaf, seeds naked, cones present, xylem lacks vessels)

Genus : Pinus sp.

Points of Identification :

1. It is an evergreen, perennial and woody plant.
2. Main plant body is sporophyte which is differentiated into root, stem and needle like leaves.
3. The stem is cylindrical, erect, covered with bark and branching is monopodial.
4. It produces different kind of spores.
5. Microsporophylls bear microsporangia which produce microspores i.e., pollen grains. Pollen grains are light and winged. These are dispersed by the wind.

AGARICUS (Mushroom)

Classification

Kingdom: Fungi (non-green, heterotrophic organisms, poses hyphae)

Division: Eumycota (mycelium and fungal cellulose present)

Class: Basidiomycetes (bear basidiospores on basidium)

Genus: Agaricus spp.

Points of Identification.

1. It is a fleshy, saprophytic fungus which grows on damp logs of wood, trunks of trees and on decaying organic matter.
2. The fungal body consists of two parts:
   (i) Somatic: Vegetative mycelium under the ground
   (ii) Reproductive: fruitification or fruiting body above the ground.
3. Primary mycelium produced from basidiospore is septate, haploid, short lived and monokaryotic.
4. Secondary mycelium is dikaryotic and long-lived. A mass of hyphae is interwoven to form a rhizomorph.
5. Mushroom's main body is umbrella-shaped called fruitification or fruting body which is an aerial, erect called Basidiocarp.

INSECTS

Insects are generally considered the most successful group of living organisms on earth. Insects are pancrustacean hexapod invertebrates of the class Insecta. They are the largest group within the arthropod phyllum. Insects have a chitinous exoskeleton, and three pairs of jointed leg, a three-part body, compound eyes, and a pair of antennae. Insects are adapted creatures that live in almost every habitat on earth while some insects do live in water but 97% of insect habitat are on land. Insects blood is not totally contained in vessels; some circulates in an open cavity known as the haemocoel. Nearly all insects hatch from eggs. Insect growth is constrained by the inelastic exoskeleton and development involves a series of molts.

GRASSHOPPER

Grasshopper is a plant-eating insect with long hind legs which they use for producing a chirping sound frequently found in grassy places and low vegetation.

Kingdom : Animalia
Order : Orthopetra
Class : Insecta
Family : Acrididae
Scientific Name : Caelifera.

Colour : Green
Size : 1 to 7 cm in length
Other physical feature : Ectotherms

Habitat :
Most grasshoppers dry open habitats with lots of grass and small plants. They are generally found in temperate, tropical and terrestrial barriers.

Primary Diet :
Grasshoppers are primarily herbivores. They mostly eat leaves, flowers, stems, etc.

Special characteristics :
Grasshoppers use their chirping ability to give them a boost into the air but most are pretty strong flies and make good use of their wings to escape predators.

MOSQUITOE

Theres are about 170 different kinds of mosquitoes in North America alone. These pets are part of the same family as houseflies and fruit flies, because they all have two clear veined wings. Best known as a summer pest, Mosquitoes can develop from egg to adult in 10 to 14 days.

Size : 1/4" to 3/8"
Shape : Narrow, oval
Colour : Pale brown with whitish stripes across abdomen.
Legs : 6
Wings : Yes
Antenna : Yes
Common Name : Mosquito

Kingdom : Animalia
Phylum : Arthropoda
Class : Insecta
Order : Diptera
Family : Culicidae.
Species : Varies.

DIET : We usually say, "I have been bitten by Mosquito" but this is not true. Mosquitoes do not bite. Female mosquitoes feed on plant nectar and blood. They need the protein to produce. To get to the blood, the pierce our skin with their proboscis and suck our blood. Male Mosquito feed exclusively on plant nectars. Mosquitoes are busiest at night and will fly up to 14 miles for a blood meal. They hunt for food by detecting body heat and carbon dioxide, which we breathe out.

Habitat : Mosquitoes breed in soft, moist soil or stagnant water sources such as storm drains, old tires, children's wading pools and birdbaths.

IMPACT : Mosquitoes spread diseases as West Nile Virus, Malaria and dengue fever.

FISH :-

Fish are a vital part of our ecosystem. Fish play an important role in nutrient cycles because they store a large proportion of ecosystems nutrients in their tissues, transport nutrients farther than other aquatic animals and excrete nutrients in dissolved forms that are readily available to primary producers. Although the influence of fish communities on food web structures, nutrient cycling and productivity is well documented, little known about the effects on the ecosystems of a reduction in the fish species richness. It is therefore of significant importance to evaluate the potential impacts of ongoing decreases in fish diversity.

MAMMALS. :-

Mammals play a vital role in maintaining the atmosphere on the Earth. Through their reproduction pattern and gestation period they come to be together in controlling the pressure of eco-system in the Earth as a whole. so it can't be considered as a common or right problem and should be taken as a serious matter in the eco-system of the whole planet. to have speculation in a group to come to the state to protect the endangered species. Its not that if the species from one place are extinct, it'll affect to that particular place only, but it

can bring problem in the eco-system of the whole planet. It can lead to unequal distribution of the species. So when any one country is suffering from such endangered problems the developed countries should take an action towards that and should launch some social programs and some rewarding state so that people can get encouraged to preserve the environment and the whole Earth. It is confirmed that if this method can't be stopped it will lead to the extinction of all the species on the earth, so we shouldn't hesitate to try our best to save their life.

ACKNOWLEDGEMENT

The success and final outcome of this assignment required a lot of guidance and assistance from many people and we are extremely fortunate to have got this all along the completion of our assignment work. Whatever we have done is only due to such guidance and assistance and we would not forget to thank them. I respect and thank Dr. Mahua Dutta Ma'am for giving us an opportunity to do this project work on the topic Study of common Plants, lizards, fish, birds mammals and basic principles of identification and providing us all support and guidance which made us to complete the assignment on time, We am extremely grateful to her for providing such a nice support and guidance. this assignment cannot be completed without the effort from our friends. Last but not least, We would like to express any gratitude to our classmates and respondents for support and willingness for this project.

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AECC-2 ENVS PROJECT

CONTENTS

INTRODUCTION

An ecosystem refers to a practical unit of nature where living organisms act together among themselves and with the surrounding physical environment. Environmentalists look at the whole biosphere as a global ecosystem.

However, it can differ generally in size; for example it can be a small pond or a sea or a huge forest. Typically these are self-sustaining. We can split the ecosystem into two comprehensive classifications, specifically terrestial ecosystem and aquatic ecosystem.

The terrestial ecosystem includes grassland, dessert and forest ecosystem, but lake, pond and river and wetlands ecosystem fall under the aquatic ecosystem umbrella.

POND ECOSYSTEM

A pond ecosystem is a system of organism that live together in a pond. A pond ecosystem can be defined as a closed community of organisms in a body of water or an enclosed body of water that houses numerous different creatures.

TYPES OF POND ECOSYSTEM: Ponds can come in many different forms and they all have their own differentiating characteristics:

1. Salt Ponds – They contain brackish (salty) water and can be found close to the sea side where waterlogged ground creates natural pools.
2. Giarden Ponds – These are artificially created ponds and can contain ornamental plants and animal species.
3. Freshwater Pools – They can form anywhere in land, either from rainfall or from the presence of water saturating the soil. They can also be created by river.
4. Vernal pools – They are seasonal pond. They form in depression in the pond but only during certain time in the year when the rainfall is heavier.
5. Underground Ponds – Ponds can also form underground, in the rocky environment of caves. A surprising amount of life can be found including fish, bacteria, lichens and so on.

CHARACTERISTICS OF POND ECOSYSTEM: There are several things that mark pond ecosystem out from other types of ecosystem. Some of the main features are:

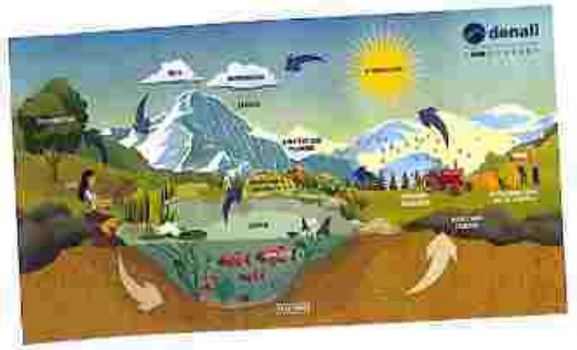
1. Still waters – They are lentile ecosystem — i.e, they involve Stagnant or standing water.
2. Surrounded by banks – By defination, pond ecosystem are surrounded by either natural or artificial banks.
3. Wet – These ecosystems are wet and humid.
4. Different level – Distinct communities of creatures will live at different level of pond. For example, fish may live at a lower level, while birds and blooming plants may live towards the surface.
5. Variable in size – Some pond ecosystems can be very small and some as large as a lake.

IMPORTANCE OF POND ECOSYSTEM: Pond ecosystem are very important and for this reason it is vital that we take steps to protect and nurture them.

1. Biodiversity – Pond ecosystem are important habitat for so many types of fish, birds, plants, crustaceans as well as insects such as dragon flies.
2. Ubiquity – Pond ecosystem can be found everywhere around the earth, and it makes them very important for the life of organisms all around the earth.
3. Abundance – They are very abundant, and can be found plentifully. That, again makes them a key habitat for various species.
4. Source of hydration – Even if they do not actually live in the pond, many species of animal will come to the pond ecosystem whenever they need to drink.

CONCLUSION – Though they can be found all over the globe, pond ecosystem are always neglected by conservationists. All of our wetland ecosystems ought to be safeguard because they are vital habitat for an abundance of species. This includes pond ecosystem which can be seen in different shapes and forms and can perform many different functions.

RIVER ECOSYSTEM



A river is a large natural course of flowing water obtained from preception. A river can be divided into three types:

1. Perennial river, which has water throughout the year.
2. Intermittent stream, the flow is seasonal.
3. Ephemeral, the flow is rare or occasional.

3.

River ecosystems are flowing water that drains the landscapes, and include the biotic interactions amongst plants, animals and micro-organisms, as well as abiotic physical and chemical interactions of its many parts. River ecosystem are parts of larger watershed networks or catchments, where smaller headwater streams drain into mid-size streams, which drains into larger river networks. The major zone in river ecosystems are determined by the river bed's gradient or by the velocity of current. Faster moving turbulent water typically contains greater concentration 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.

The following unifying characteristics make the ecology of running water unique among aquatic habitat: the flow is unidirectional, there is a stage of continous physical change,

AGRO ECOSYSTEM

Small holder agriculture persists as the foundation of global food systems. Farms smaller than 2 hectres produce more than 30% of the world's food, and occupy 24% of agricultural land, yet small holders face severe socio economic and environmental challenges that can destabilize livelihoods and threaten their resilience. In degraded landscapes, where poor soil fertility can jeopardize crop yields, many small holders are forced to compromize long-term sustainability to meet short term production needs. While food production in the short term production is essential to maintain household nutrition, neglect for long-term ecological sustainability can make land unreliable for future production. Thus, there is an interplay between ecological and nutritional functions of agroecosystems that may influence whether small holders are able to adapt and continue farming within a deteroiting environmental context. Farmer management decision can neither increase or decrease these functions, demonstrating their capacity to adapt, and make inoremental adjustments or changes that ultimately affect their resilience. Because, smallholders agro ecosystem support a third of the food system, understanding and promoting their adaptive capacity and resilence is critical for the social, ecological and nutritional

well being of rural communities and ultimately, global population.

COMPONENTS OF AGRO ECOSYSTEM:

There are two main components of ecosystem

1. Living (Biotic components).
2. Non-living (Abiotic components).

1. BIOTIC COMPONENTS —

Autotrops and hetrotrops are biotic components of the ecosystems. Green plants takes simple inorganic materials and produce their own food. These organisms are called autotrops. All other forms of life which do not possess chlorophyll cant produce their own food and depend upon others for their food are called hetrotrops. Eg. Fungi, most of bacterias animals etc.

2. ABIOTIC COMPONENTS —

Abiotic components are non-living environment and are usually of two types—

Materials like water, mineral salts, atmospheric gases etc.

Energy like light, heat, stored energy in chemical bonds etc.

CONCLUSION

Everyone in the world depends completely on Earth's ecosystems and the service they provide such as food, water, disease management, climate regulation, spiritual fulfillment and aesthetic enjoyment.
The transformation of the planet has contributed to substantial net gains in human well being and economic development. An ecosystem is balanced when the natural animals and the plants and non-living components are in harmony. With increasing pollution change in majority patterns and rise in human population, many ecosystem are in danger of loosing that harmony. Humans are an ecological systems and depend on nature for survival and quality of life. Thus, saving nature will save the ecosystems and ourselves.

ACKNOWLEDGEMENT

I would like to thank our teacher Dr. Malwa Dutta for assigning us with the project which helped us to explore a topic otherwise ignored by the present populations, and also learned a lot in the process.

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This project would not have been possible without the help, encouragement, guidance, and support of my family, who have extended all possible help to me any time I needed it.

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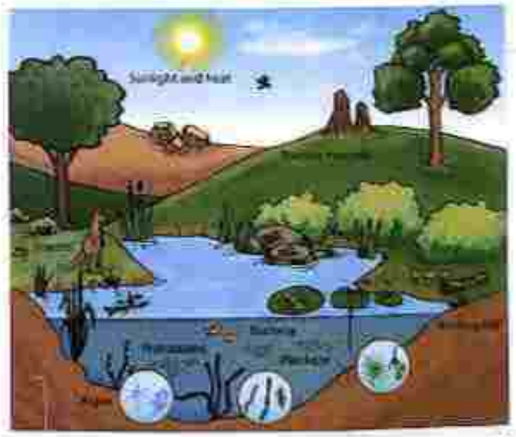
CONTENTS

Study of Ecosystems

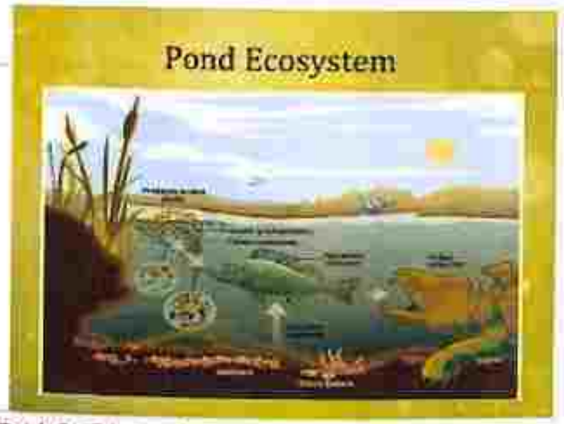


An ecosystem refers to a practical unit of nature where living organisms act together among themselves and with the surrounding physical environment. Environmentalists look at the whole biosphere as a global ecosystem. Moreover, the forest ecosystem is a part of the terrestrial ecosystem.

However, it can differ generally in size; for example, it can be a small pond or a sea or a huge forest. Typically, these are self-sustaining. We can split the ecosystem into two comprehensive classifications, specifically, terrestrial ecosystem and aquatic ecosystem.

The terrestrial ecosystem includes grassland, desert and forest ecosystem; but lake, pond and river and wetland ecosystem fall under the aquatic ecosystem umbrella.

POND ECOSYSTEM



INTRODUCTION

A pond is either a natural or an artificial body of water that is enclosed. Ponds can occur naturally in the world or they can be human made (such as a garden pond).

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. Some of the key types of pond ecosystem are listed below:

- Salt Ponds
- Garden Ponds
- Freshwater Ponds
- Vernal Ponds
- Underground Ponds

CHARACTERISTICS OF POND ECOSYSTEM

There are several things that mark pond ecosystems out from other types of ecosystems. Below is a list of some of its main characteristics:

- Still Waters
- Surrounded by Banks
- Wet
- Different Levels
- Variable in Size

IMPORTANCE OF POND ECOSYSTEM

Pond ecosystems are very important, and for this reason it is vital that we take steps to protect and nurture them. Here are some of the significant reasons listed to 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 dragon flies, damselflies 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.

FOOD CHAIN IN THE POND SYSTEM

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.

→ Phytoplankton and algae serve as producers that convert solar energy into chemical energy.

→ Phytoplankton is being consumed by zooplankton (primary consumers).

→ The food chain further proceeds with the small pond species that feed on zooplanktons.

→ Small pond species are eaten by pond species which are large.

→ 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.

RIVER ECOSYSTEM

INTRODUCTION

A river is a large 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 condition.

CHARACTERISTICS OF RIVER

- Every major river must have a place of origin in the upstream side, which is called as the head-waters 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 place 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.

TYPES OF RIVERS

A river may be divided into the following 3 types :

- In a perennial river, there will be a continuous flow of water throughout the year.
- In intermittent streams, the flow is seasonal.
- In ephemeral streams, the flow is occasional or rare.

DIMENISIONS OF A RIVER

We frequently overlook the fact that rivers have four spatial dimensions :

- Length
- Width
- Height (Depth)
- Time

Actually, even if it seems that the river height is the water level and the width is the distance between its two banks, this is not a completely accurate perception considering the contemporary concepts of the river, its ecosystems and the river corridor, which are much broader.

RIVER POLLUTION AND CONSERVATION

River pollution can include but is not limited to :

▽▽ Increasing sediment export, excess nutrients from fertilizers or urban runoff, sewage and septic inputs, plastic pollution, nano-particles, pharmaceuticals and personal care products, synthetic chemicals, road salt, nonorganic contaminants (e.g., heavy metals), and even heat via thermal pollution. The effects of pollution often depend on the context and materials, but can reduce ecosystem functioning, limit ecosystem services, reduce stream biodiversity and impact human health.

△△ Trees are also helpful. Not only do they look beautiful when they grow, but these natural items reduce erosion that washes pollution into the water and help protect the nearby water supply from pollutants. Fauna also limits Carbon Dioxide in the water, which balances out its pH level.

△△ Rivers are the lifeline for all life forms. All the civilizations in our world were born, grew and developed on the banks of

rivers. They are the veins of the earth through which life flows. Rivers not only make our planet habitable, they also make it exceedingly beautiful. Rivers are invaluably useful for man, animals, and plants. They are the source of potable water, irrigation for agriculture, power generation, transport, food recreation and leisure, etc.

△△ Rivers are the most precious 'Gift' that the nature has given to the mankind. No life can be imagined if there would be no water (river). It is the sole duty of each and every person to prevent this indispensable resource from getting polluted. If we don't take this seriously, the existence of human beings will become a history on this Earth.

FOREST ECOSYSTEM

INTRODUCTION

A forest ecosystem is a functional unit or classification which includes birds, insects, trees, animals, soil and human as its networking units. A forest is a big and multi faceted ecosystem and therefore has more species diversity.

Furthermore, it is much more unchanging and unaffected by the harmful alteration in comparision to the smaller ecosystems like weather and grasslands.

Forest ecosystems, like any other ecosystem, also consist of abiotic and biotic compounds. Abiotic components are inorganic elements like air, soil and water. Biotic components comprise of producers, consumers and decomposers.

These components intermingle with each other as an ecosystem and as a result, this collaboration among them makes it self sustainable. These connections allow for every high sustainability among forested ecosystems. There are often of forest health as well.

TYPES OF FOREST ECOSYSTEMS

There are different types of forest ecosystems :

- Temperate Forest Ecosystem
- Tropical Forest Ecosystem
- Boreal / Taiga Forest Ecosystem
- Savanna Forest Ecosystem

CHARACTERISTICS OF FOREST ECOSYSTEM

- Seasonal Variation
- Deciduous or Evergreen in nature
- Canopy layer Structure
- Attract bird species to take shelter
- Attract insects and provide habitat
- Soil Fertility

FUNCTIONS OF FOREST ECOSYSTEM

- Goods obtained from Forests
- Ecological Functions
- Culture and Social Benefits

THREATS TO FOREST ECOSYSTEM

- Deforestation
- Barren quality
- Construction of Multipurpose Projects
- Thinning or Shifting cultivation
- Forest fires

CONSERVATION OF FORESTS

Conservation of Forest is the practice of planting more trees and maintaining the forested areas for the sustainability for future generations. Forests are of the important natural resource and are beneficial to human 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

MAJOR STEPS FOR CONSERVATION OF FORESTS

—o 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 and shelterwood cutting.

—o Forest fires are one of the common causes of loss of forests. Sometimes the forest land is set to fire to make 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.

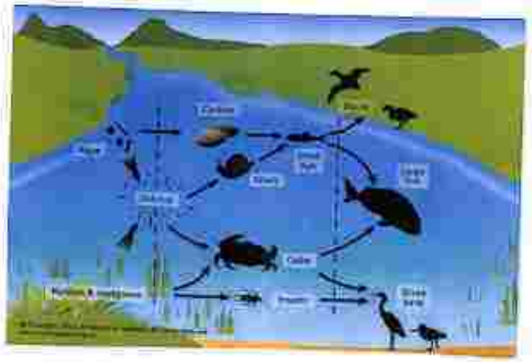
—o More trees should be planted to increase the forest cover. Trees should be selected according to the geographical area and proper

care should be taken during the growth of the trees.

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

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

ESTUARY ECOSYSTEM



INTRODUCTION

An estuary is the area of water and shoreline where a freshwater stream or river merges with the ocean.

Estuaries can be partially enclosed body of water where two different bodies of meet and mix.

They often bordered by salt marshes or intertidal mudflats.

Salinity varies within the estuary from nearly freshwater to ocean water.

They are very productive due to the nutrients brought by the rivers.

A unique combination of salt and freshwater creates a variety of habitats in which the plants and animals survive in various brackish water combinations

Estuaries have a diverse flora and

fauna and tremendous productivity-

- Salt marsh, grasses, algae and phytoplankton are the major producers.
- Many species of annelids, oysters, crabs and fish are present.
- A large number of water fowl and other semi-aquatic vertebrates use estuaries as feeding areas.

Human activities are having a large impact on estuaries-

- Estuaries receive the pollutants dumped into the streams and rivers that feed them.
- Residential and commercial development not only adds to pollution but eliminates soon estuaries due to land filling.

Freshwater from rivers sometimes mixes with large freshwater bodies as the Great lakes creating a freshwater estuary that functions like typical brackish estuary.

ESTUARY CLASSIFICATION BY WATER CIRCULATION

- Salt-Wedge Estuaries
- Fjord
- Slightly Stratified
- Vertically Stratified
- Freshwater Estuaries

COMMON ESTUARINE HABITATS

- Oysters reefs
- Kelp forests
- Mud flats
- Barrier beaches
- Salt marshes
- Coastal marshes
- Tidal streams
- Rocky and soft shorelines
- Deepwater swamps and riverine forests
- Mangroves or Mangrove forests
- Submerged Aquatic Vegetation

FOOD WEB AND ADAPTATIONS IN AN ESTUARY

Special Adaptations of their Organisms.
Estuaries can contain several types of habitat that determine the types of organisms that can survive. Salinity, temperature, water levels and light levels vary along the lengths of an estuary.

Organic accumulation is common. Irregular surfaces and high energy wind patterns and waves along with tidal action require strong root systems for plant and methods for dealing with intermitted dry and wet conditions.
These conditions require special adaptations to survive.

→ Many of the species can live in one or more estuary environment because their characteristics stress the organisms in similar ways.

→ Coping mechanisms include moving out of favourable areas, shutting up shells, digging burrows and excretion of excess salts.

→ Many fish maintain water balance by actively drinking salt water, from which

the much of water is absorbed by the gills and the kidneys.

→ Fish also adapt by increasing their respiratory water flow and increase oxygen consumption to compensate for the depressing effects of low temperatures.

→ Organisms have mechanisms to deal with high energy winds and wave.

→ Other adaptations of the tree may include flattening of the trunk, root and branches in a plan parallel to the wind direction.

INTRODUCTION

A wetland is an area where water covers the soil, or is present either at or near the surface of the soil all year or varying periods of time during the year, including during the growing season. Water largely determines how the soil develops and the types of plant and animal communities living in and on the soil. Wetlands may eventually support both land and aquatic species. The prolonged presence of water creates conditions that favour the growth of specially adopted plants and promotes the diagramatic development of characteristic wetland soils.

Wetlands vary widely because of regional and local differences in soils, topography, climate, water, vegetation

and other factors including human disturbance. Indeed, wetlands are found from the tundra to the tropics and on every continent except Antarctica. Two general categories of wetlands are recognised: Coastal wetlands and Inland wetlands.

Often called "nurseries of life", wetlands provide habitat for thousands of species of aquatic and terrestrial plants and animals. Although wetlands are best known for being home to water lilies, turtles, snakes, alligators and crocodiles, they also provide important habitat for waterfowl, fish, and mammals. Migrating birds use wetlands to rest and feed during their cross-continental journeys and as nesting sites when they are at home. As a result, wetland loss has a serious impact on these species.

TYPES OF WETLANS

- Marshes
- Swamps

- Bogs
- Fens
- Vernal Pools
- Prairie Potholes

WHY ARE WETLANDS IMPORTANT

Wetlands are some of the most biologically productive natural ecosystems in the world, comparable to tropical rain forest, and coral reefs in their productivity and the diversity of species they support. Aquatic plant life flourishes of species they support. Acquatic plant life flourishes in the nutrient-rich-environment and energy converted by plants is passed up the food chain to fishes, waterfowl and other wildlife and to us as well. In addition to the biological productivity of wetlands, an acre of wetland can store 1-1.5 million gallons of flood water. Wetlands are found on all continents except Antarctica and their diversity is broad as their geographic occurance.

FUNCTION OF A WETLAND

- Absorption and storage of flood water and ground water recharge in dry periods.
- Protection of coastlines from high energy open ocean waves.
- Slowing of water velocity so sediments may settle out thereby improving water quality.
- Filtering and removal of excess nutrients and toxins by wetlands soils and plants.
- Providing nurseries for juveniles of many aquatic species including most commercially harvested fish.
- Providing habitat for many upland species such as raccoons and deer as well as habitat for sensitive wetlands dependent species like salamanders.

VALUE OF WETLANDS TO HUMANS

Alternately, the value of a wetland is an estimate of the importance or worth of one or more of its functions to society.

For example : A value can be determined by the revenue generated from the sale of fish that depends on the wetland, by the tourist dollars associated with the wetland, or by public support for protecting fish and wildlife. Although large scale benefits of functions can be valued, determining the value of individual wetlands is difficult because they differ widely and do not perform the same functions or perform functions equally well.

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Thank You.
Yours faithfully
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