Gokhale Memorial Girls' College

Date: 13/04/2023

To whom it may concern

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

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

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UNIVERSITY OF CALCUTTA

ENVIRONMENTAL PROJECT ON SOLID WASTE MANAGEMENT

(WITH SPECIAL EMPHASIS ON HOWRAH)

GOKHALE MEMORIAL GIRLS' COLLGE

SOUMILI SHEE

ENGLISH DEPARTMENT

SEMESTER 2

COLLEGE ROLL NO: 21/BAH/0094

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AECC-2 PAPER

CONTENTS

1. INTRODUCTION

What is Solid Waste Management?

Solid waste management is a term that is used to refer to the process of collecting and treating solid wastes. It also offers solutions for recycling items that do not belong to garbage or trash. As long as people have been living in settlements and residential areas, garbage or solid waste has been an issue. Waste management is all about how solid waste can be changed and used as a valuable resource. The tasks of solid-waste management present complex technical challenges. They also pose a wide variety of administrative, economic, and social problems that must be managed and solved.

2. CLASSIFICATION OF WASTE

Organic waste: Kitchen waste, waste from food preparation, vegetables, flowers, leaves, fruits, and market places.

Combustibles: Paper, wood, dried leaves, packaging for relief items etc. that are highly organic and having low moisture content.

Non-combustibles: Metal, Tins, Cans, bottles, stones, etc.

Toxic waste: Old medicines, paints, chemicals, bulbs, spray cans, fertilizer and pesticide containers, batteries, shoe polish.

Recyclables: Paper, glass, metals, plastics.

Ashes or Dust: Residue from fires that are used for cooking.

Construction waste: Rubble, roofing, broken concrete etc.

Hazardous waste: Oil, battery acid, medical waste, industrial waste, hospital waste.

Dead animals: Carcasses of dead livestock or other animals.

Bulky waste: Tree branches, tires etc.

Soiled waste: Hospital waste such as cloth soiled with blood and other body fluids.

3. SOURCES OF SOLID WASTE

Every day, tones of solid waste are disposed of at various landfill sites. This waste comes from homes, offices, industries and various other agricultural related activities.

1. Residential

Residences and homes where people live are some of the major sources of solid waste. The garbage from these places includes food wastes, plastics, paper, glass, leather, cardboard, metals, yard wastes, ashes and special wastes like bulky household items such as electronics, tires, batteries, old mattresses and used oil.

2. Industrial

Industries are known to be one of the biggest contributors to solid waste. They include light and heavy manufacturing industries, construction sites, fabrication plants, canning plants, power and chemical plants, food wastes, packaging wastes,

ashes, construction and demolition materials, special wastes, medical wastes as well as other hazardous wastes.

3. Commercial

Commercial facilities and buildings are yet another source of solid waste today. Commercial buildings and facilities, in this case, refer to hotels, markets, restaurants, go downs, stores and office buildings.

5. Construction and Demolition Areas

Construction and demolition sites also contribute to the solid waste problem. Construction sites include new construction sites for buildings and roads, road repair sites, building renovation sites and building demolition sites.

6. Municipal Services

The urban centers also contribute immensely to the solid waste crisis in most countries today. Some of the solid waste brought about by the municipal services include street cleaning, wastes from parks and beaches, wastewater treatment plants, landscaping wastes and wastes from recreational areas, including sludge.

7. Treatment Plants and Sites

Heavy and light manufacturing plants also produce solid waste. They include refineries, power plants, processing plants, mineral extraction plants and chemical plants.

9. Biomedical

This refers to hospitals and biomedical equipment and chemical manufacturing firms. In hospitals, there are different types of solid wastes produced.

4. EFFECTS OF POOR SOLID WASTE MANAGEMENT

Due to improper waste disposal systems, particularly by municipal waste management teams, wastes heap up and become a menace. While people clean their homes and places of work, they litter their surroundings, which affect the environment and the community. This type of dumping of waste materials forces biodegradable materials to rot and decompose under improper, unhygienic and uncontrolled conditions. After a few days of decomposition, a foul smell is produced, and it becomes a breeding ground for different types of disease-causing insects as well as infectious organisms.

hazardous wastes like pesticides, batteries containing lead, mercury or zinc, cleaning solvents, radioactive materials, e-waste and plastics mixed up with paper and other non-toxic scraps are burned they produce dioxins, furans, polychlorinated biphenyls, and other gases. These toxic gases have the potential of causing various diseases, including cancer.

5. TREATMENT AND DISPOSAL OF SOLID WASTE

Once collected, municipal solid waste may be treated in order to reduce the total volume and weight of material that requires final disposal. Treatment changes the form of the waste and makes it easier to handle. It can also serve to recover certain materials, as well as heat energy, for recycling or reuse.

Furnace operation

Burning is a very effective method of reducing the volume and weight of solid waste, though it is a source of greenhouse gas emissions. In modern incinerators the waste is burned inside a properly designed furnace under very carefully controlled conditions. Municipal solid-waste incinerators are designed to receive and burn a continuous supply of refuse. A deep refuse storage pit, or tipping area, provides enough space for about one day of waste storage.

Composting

Another method of treating municipal solid waste is composting, a biological process in which the organic portion of refuse is allowed to decompose under

carefully controlled conditions. Composting offers a method of processing and recycling both garbage and sewage sludge in one operation.

Sorting and shredding

The decomposable materials in refuse are isolated from glass, metal, and other inorganic items through sorting and separating operations. These are carried out mechanically, using differences in such physical characteristics of the refuse as size, density, and magnetic properties. Shredding or pulverizing reduces the size of the waste articles, resulting in a uniform mass of material. It is accomplished with hammer mills and rotary shredders.

Digesting and processing

Pulverized waste is ready for composting either by the open windrow method or in an enclosed mechanical facility. Windrows are long, low mounds of refuse. They are turned or mixed every few days to provide air for the microbes digesting the organics.

Sanitary landfill

Land disposal is the most common management strategy for municipal solid waste. Refuse can be safely deposited in a sanitary landfill, a disposal site that is carefully selected, designed, constructed, and operated to protect the environment and public health.

Controlling by-products

Organic material buried in a landfill decomposes by anaerobic microbial action. Complete decomposition usually takes more than 20 years. One of the by-products of this decomposition is methane gas. Methane is poisonous and explosive when diluted in the air, and it is a potent greenhouse gas. It can also flow long distances through porous layers of soil, and, if it is allowed to collect in basements or other confined areas, dangerous conditions may arise. In modern landfills, methane movement is controlled by impermeable barriers and by gas-venting systems. In some landfills the methane gas is collected and recovered for use as a fuel, either directly or as a component of biogas.

WASTE MANAGEMENT IN HOWRAH

Howrah is one such district in Bengal, which is not only thickly populated, but also produces a massive amount of solid waste per day, which acts as a serious threat to a greener & sustainable tomorrow. Due to the lack of proper infrastructural support & awareness of waste generation, segregation, collection & disposal, many of us till date throw the waste just in haste, without even knowing what to throw, what can be recycled for our future use, how to manage our dry & wet waste, which is biodegradable & most importantly the impact of our age old behavioral habits & practices of waste generation & management in our day to day lives & in the years to come.

Howrah Municipal Corporation is taking an exemplary step by moving towards a cleaner, Greener, Sustainable & Waste Free Tomorrow. HMC has identified the Waste Generators and divided them into different categories to create awareness among them regarding solid waste management & segregation.

HMC has identified the gated communities who are a major stakeholder of BGW, among which Vivek Vihar is the pioneer. Vivek Vihar is the first zero waste community in the Howrah District, it has not only managed its own waste responsibility, but has also installed an organic waste composting machine in their premises. Envisaged on the concept of segregated waste at the doorstep.

HMC with the intention of penetrating in different ward of Howrah, initiated a Pilot Project in Ward-22, the flag bearer of Mission Clean & Green Howrah. HMC is creating awareness through various modes of communication, canter activity, jingle & distribution of Bins coined as Neelu & Pochu to sensitize, trigger & easy understanding of the segregation process. Random interaction with the citizen by HMC and word of mouth has now created a positive buzz and proactiveness among the people of Howrah.

Conclusion:

The huge public participation & encouraging response has left HMC enamoured to create many such success stories even in times to come. The corporation is elated to transform wards & communities by introducing waste segregated bins, thereby making them understand segregation, its importance & the proper way of waste management. The essence of this movement will be replicated in the entire Howrah to make the city Clean & Green, moving towards a sustainable & zero waste future.

Distribution of Bins coined as Neelu & Pochu to sensitize, trigger & easy understanding of the segregation process.

HMC with the intention of penetrating in different ward of Howrah, initiated a Pilot Project in Ward-22, the flag bearer of Mission Clean & Green Howrah

ACKNOWLEDGEMENT

I would like to show my special thanks of gratitude to my ENVS teacher Raj Kumar Barman sir for his able guidance and support in completing my project. I would also like to extend my gratitude to the principal ma'am, my parents and friends for providing me with all the facilities that was required.

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I would like to express my special thanks of gratitude to our Professor Raj Kumar Barman, who gave us this golden opportunity to work on this wonderful project. This project helped me in know about various species of animals and plants that are in our surroundings, which we are not aware of.

CONTENTS

INTRODUCTION

- **BIRDS**

Birds are ready visitors that visit frequently from place to place even from continent to continent Due to change of environment particularity for their food and reproduction. A good example- In our West Bengal, Storks and Siberian Cranes, also even in Lake Chilka of Odisha a large number of pelicans and Flamingos are vivid examples of that kind. They come to thrive there for a temporary period to hatch eggs and carry a good number of off springs during their back journey.

- **INSECTS**

Insects, are a class in the phylum Anthro - poda. They are small terrestrial invertebrates which a hand exoskeleton. Insects are the largest group of animal on earth by far: about 926.400 different Species have been described. They more than half of all known living species. Insects have six legs, and most have wings. Insects were the first animals capable of flight. As they develop from eggs, insects undergo metamorphosis. Insects live all over the planet: almost all are terrestrial (live and land). The most species live in tropical areas

- **MAMALS**

Earth has a large variety of animals living on it. Scientists classify animals in to groups common characteristics. Mammals are a common group of animals (vertebrates) that have backbones and hair or fur. They are warm blooded (endothermic), and they have four-chambered hearts. They also feed their young with milk from the mother's body. The young of most mammals are born alive.

- **FISH**

Fish is a member of the paraphytelle group of organisms. This consists of gill-bearing aquatic emaniates animals with limbe and digits. Most of the fishes are hagfish, cartilaginous, bony fish and lampreys. Fishes are eclothemic, which means cold-blooded. Fish are abundant in most of the bodies of water.

- **PLANTS**

Plants are critical to other life on this planet 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. Now, what was Once Considered "Plants" are divided into several kingdoms: Protista, Fungi, and Plantae." Most aquatic plants occur in the Kingdoms Plantae and Protista.

AREA OF STUDY

The area is whole Kolkata, South 24 Parganas district of West Bengal in India.

METHOD OF STUDY

Making this project we use internet to collect information about birds, insects and plants.

OBSERVATION

PLANTS

COMMON PLANT

1. MANGOSA

Scientific Name: Azadirach ta indicaJuss. Vernaculan

Name: Neem, kadu-limb.

Source: The leaves, bark, flowers, fruits and seeds are used as drugs.
FAMILY & Distribution: Meliaceae. It is found in native of Burma but grown all over India. In Sangola Taluka neem is found in large scale in moral and urban taluka places. Some important places like Narate, Sangola, spinning mill. Hatid, and Walegaon.

Uses: The leaves are carminative, expectorant anthelmintic, diuretic and Insecticidal properties. Fresh leaf Juice with salt given for intestinal worms, jaundice, skin disease and malarial fever. The leaves are applied for boils, chronic ulcers, swelling and wounds. Bark is used for liver Complaint.

INSECTS

COMMON INSECT

1. INDIAN MEAL MOTH

The Indian meal moth was given its name after an insect scientists found it feeding on Corn meal, also known as Indian meal. They typically live from two to six months.

Size: 5/8"

Shape: Elongated, oval

Colon: Copper Reddish

legs: 6

wings: yes

Antenna: yes

Common Name: Indian meal moth

Kingdom: Animalia.

Phylum: Anthopoda

Class: Insecta

Order: Lepidotena.

Family: Pynalidae.

Species: Plodiainterpuetella.

- **DIET:** Indian meal moths feed on dried fruits, grains, seeds, nuts, chocolate, Candies, birdseed, dog food, powdered milk, dried red peppers and candy.
- **HABITAT:** Attracted to the light, these bugs are found in bright places where food is stored like resturants and grocery stores.
- **IMPACT:** Moths Infest foods and can contaminate food products by leaving skin and waste behind.
- **PREVENTION:** Store food in sealed containers.
  Discard infested foods in outdoor trash bins.

COMMON FISH

1. SIAMOSE FIGHTING FISH

Scientific Name: The scientific name of Siamese fighting fish is known as betta splendens.

Family is History: This fish is classified under the classification of betta. It is an aquarium fish. It belongs to a family of the Gourami family. Other names of this fish are pla-kad and trey krem. They can mingle with other fish. The body length of the fish is seven centimeters and it appears in colours of red, green, opaque, albino, orange, yellow and blue, etc.

Lifespan: The lifespan of this fish is about 2 years only. water temperature must be around 23 degrees - 27 degrees.

BIRDS

CORMON BIRD

1.BAYA WEAVER

Common English Name: Baya Weaver

Bengali Name: Babui

Scientific Name: Ploceus philippinus.

Distribution: In plaia with low altitude; found India to Indo-China Via Malaya.

Characters: Chirping and roosting most, move very Swift.

Vegetation Spectrum: Strychrodnux-vomica, Meliaa zadirachta, Stephaniahernandi folia, Mikaniascandens, Tremaorientalis. Bamusa Sp. Mangiferaindica, Tinosporacardifolia, Ficus sp., Pathos s.p., Phyllanthusreticulatus, etc.

COMMON MAMMALS

1. MONOTREMES

Monotremes are mammals that lay eggs. They only monotremes that are alive today are the spiny anteater, or echidna, and the platypus. They Give in Australia. Tasmania, and New Guinea. These mammals are really different from other mammals. Their body temperature is lower than most warm- blooded animals, a Common fact that feature that has more in with reptiles. Their name they have only one comes from the body opening for both wastes and to pass through. Echindnas eggs have sharp spines scattered throughout their hair. They look like lays usually a spiky ball. The female anteater lays usually one leathery - shelled egg directly hatches into One the pouch on her belly. The egg hatches after ten or eleven days. The newborn baby is tiny, about the size of dime. After the baby hatches, it stays in the pouch for several weeks and continues to develop.

2. MARSUPIAL.

Marsupial mammals give birth to babies. That are not completely developed. The babies are that are very tiny. The babies then crawl up the fur on the mother's Belly into a pouch on the outside of the mother's abdomen. The babies drink milk from the mother and continue to develop inside the pouch. Koalas, Kangaroos, Wallabies, and opossums are some of the better known as marsupials. Today marsupials better-known found mostly ma in Australia, New Guinea and South America. The Only marsupial in North America is the opossum. Opossums may give birth to as one only many twenty as babies at one time. However, the mother has thirteen nipples in her pouch.

CONCLUSION

PLANTS

Each plant is characterized by three life histories; haploid (1N), diploid (2n). or the most common haploid-diploid within each of these three types, there are also variations of the plants with haploid life cycles, most algae Lock a dikonyotic phase. While most fungi have dikcanyotic phase. There are also other algaes and fungi that are characterized by diploid life Cycles. Lastly, plants with a haploid- diploid life history undengo an alternation of generations, either similar or dissimilar. Due to variations arising separately and at different rates, the evolution of land plants, did not fellow a linear sequence. Before land plants, alga with haploid life cycles, but land plants later originated.

INSECTS

Insect play a very important role in nature. They aid bacteria, fungi and other organisms in the decomposition roles in decomposition of organic matter and in soil formation. The decay of carrion for example, brought about mainly by bacteria accelerated by the moggots of flesh files and Blow filer. The activities of these larvae, which distribute and Consume bacteria, are followed by those of moths and beetles, which break down hair and feathers. Insects and flowers have evolved together. Many plants depend on insects for pollination. Some insects are predators of others.

FISH

Fish has a closed-loop circulatory system. They are Omnivorous group because feed on plants and other small sea animals of Water bodies. Fishes excrete nitrogenous and ammonia. Fishes reproduce highly in the open water column only. The eggs have an average diameter of one millimetre only.

BIRDS

We conclude that species spatial distribution directly affected by global warming and subsequent Climate change. In general terms it has been started by the scientific community that the distribution of species have been moving in a pole ward trend, within the realm of our study we have found evidence to prove or disprove this statement. The evidence that we did find and cited leads us to the conclusion that the distribution of species is in fact being altered by Climatic change, but we were unable to determine exactly what that change it was. This project focused on bird species. Evidence found specifically from birds Shows that there is a Correlation between bird population characteristics and alteration in climatic factors such as temperature and precipitation. The Change in population characteristics shows that some sort of shift generally trended movement is occurring.

MAMMALS

Mammals have about six thousand different species, Or kinds of animals in their group or class. Mammals can be divided into three groups based on groups are how their babies develop. These three groups are monotremes, marsupials and the largest group, placental mammals.

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PROJECT OF ENVIRONMENTAL STUDIES

[Visit to an Urban Polluted Area]

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CONTENTS

INTRODUCTION:

Pollution has a threatening impact on human health and on the Environment. Rapid growth in industrialisation is leading to many environmental issues, including emission of uncontrolled pollutants. Several industries established near or in urban areas are polluting the environment heavily. These are aluminium and Zinc, copper, cement, chlorine, smelter industries, distillery industries, iron and steel industries. The Global goals and the 2030 Agenda for Sustainable Development also seek to ensure the lasting protection of the planet and its natural resources. The Eco-System functions are put at risk if the hazardous chemicals, cleaning compounds, dyes, electronic products and many other household substances aren't managed properly. Though pollution is a transboundary problem stretching over entire districts and states transcending rural and urban boundaries, urban residents perceive more environmental pollution than their rural. Our visit to an urban site also reveals these things that will be discussed in detail later on.

DESCRIPTION OF THE SITE:

I've gone to visit a site near my place and the site is Jheel Road near Paul Bazar, Kol-31. This site has been chosen for multiple seasons. There are two fields, a vast waterbody, lots of dwellers, a cement factory and the nearby road remains very busy. We've tried to go there to collect some primary data and we've also taken help of some secondary data. After visiting the waterbody and the dwellers of that place and after collecting necessary information, several aspects of pollution and its effect on the lives of the dwellers and on environment can be noticed.

OBJECTIVES OF THE PROJECT:

There is purpose behind every study and in this case also there are several motives behind showcasing these issues caused by pollution.

1. It is done to create awareness among the people.
2. Knowing the reasons behind excessive pollution in urban areas can help people restrict their wrong deeds and habits and it may decrease pollution over there.
3. It also provides us with a deep insight about our social life, the miserable condition of the environment, human responsibilities and many more.
4. This organised study may help in maintaining ecological balance which ensures survival, existence and stability of the environment.
5. Moreover, it helps to find out necessary measures in order to control excessive pollution in urban areas.

PLAN OF WORK AND SURVEY REPORT:

I have visited the site and saw miserable condition of the waterbody and the fields. I had a questionnaire with me and I requested the people who were willing to take in part my survey. The survey report is based on the opinions of ten people and mostly they are aged people so they know the current dismal condition and the previous situation as well. I've provided with the questionnaire here and the answers are the average of answers given by the dwellers.

QUESTIONNAIRE:

1) What is your name?

➲ My name is Sayani Choudhury.

2) For how long are you living here?

➲ I've been living here for 50 years.

3) How many members are there in your family?

➲ There are six members in our family. I live with my husband, my son, parents and my aunt.

4) We are doing a survey on the current environmental condition and the increasing pollution. So, what is your thought about pollution?

➲ I find this condition to be terrible and all of us must start taking drastic steps off hand.

5) Which kind of pollution is prevalent in your area?

➲ Water, air and noise pollution affect us much. Apart from that soil pollution is also there.

6) What is the main cause of the air pollution?

➲ In my opinion, the installation of the cement factory contributes a lot to it and the gases, emitted from the vehicles are also responsible for it.

7) Is any of your family member suffering because of this?

➲ My son who used to swim in that waterbody has suffered twice from diarrhea and many people of the downtrodden class also drink water from there and they suffer from cholera, hepatitis A.

8) What is the effect of air pollution in your locality?

➲ My parents are above eighty years and they have recently started suffering from cardiac disease and Asthma and many others also suffer due to the installation of the cement factory.

9) What are the measures to be taken to reduce the excessive pollution in this area?

➲ We have contacted the local corporation and we have stopped dumping litters in the fields and wash dishes and clothes in the water.

10) What is the difference that you can find of the environment in your childhood and now?

➲ Thank you for asking me this. In my childhood, in 1992 there were not diseases this much and people used to lead a hazard-free like but nowadays the excessive vehicles and pollutants from the cement factory are polluting our land, making all animals and human beings suffer.

AIR POLLUTION:

Air pollution is world's deadliest environmental threat which directly affects our respiratory system, leaving our health in grave risk. Air pollution is the contamination of air due to the presence of substances in the atmosphere that are harmful to the health of humans and other living beings or cause damage to the climate or to materials. There are many different types of air pollutants such as gases, particulates and biological molecules. Household combustion devices, motor vehicles, industrial facilities and forest fires are common sources of pollution.

OBSERVATION OF AIR POLLUTANTS IN THE SITE:

The pollutants commonly emitted from the cement factory are

- Dust or particulate matter,
- NO_x
- SO_x
- Methane etc.

It is also said that cement is the major contributor to air pollution. As per a study report, an approximate number of 4,90,000 annual deaths may be attributed to emissions from the cement industry. Other than that, some air pollutants are emitted from vehicles as well. They are -

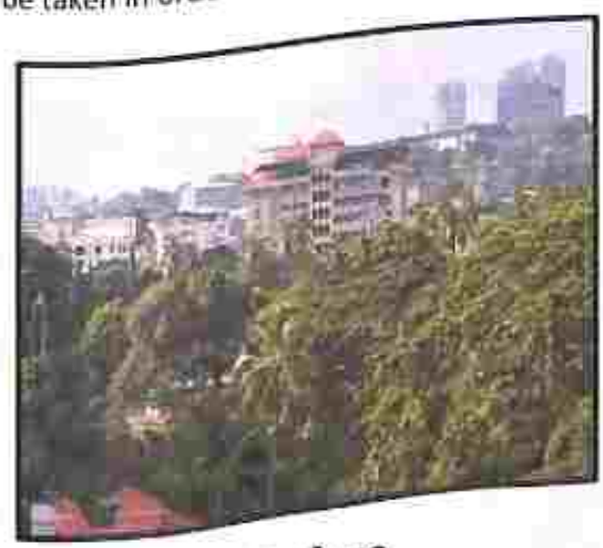
- Lead (Pb)
- Polycyclic Aromatic Hydrocarbons (PAH S)

- Carbone Mono oxide (NO_x)
- Air toxics like benzene (C_6H_6), aldehydes and many more.

HUMAN LIFE BEFORE AND AFTER THE INSTALLATION OF THE CEMENT FACTORY IN THE SITE:

What I find in my study and survey reports is that lives of the dwellers have now become unbearable for they are suffering from severe respiratory issues. It is found in our survey that this factory was installed in 2018 and from that time lung disease rapidly increased and aged people are the worst victims of this. Though air pollutants like (PB, PAHS, C_6H_6, NO_x etc.) emitted from the vehicles were there before the installation yet the cement factory has contributed much to the dangerous situation.

Most of the dwellers are suffering from Asthma and approximately 30% of the aged people are suffering from Chronic Obstructive Pulmonary Disease (COPD). Necessary measures must be taken in order to control the abysmal condition.



Before

After

WATER POLLUTION:

Water pollution is the contamination of water bodies, usually as a result of human activities so that it negatively affects its users. All forms of pollution eventually make their way to water. Sometimes spills or leaks from oil and chemical containers cause water pollution. This can be classified as surface water and ground water pollution.

FINDINGS OF THE SITE:

According to the survey report, there are many causes of water pollution in that place.

i) The main cause is discharge of domestic sludge containing organic substances and soap.

ii) Apart from this, sewage and waste water and leakage from Sewer lines can also be pointed out.

HEALTH HAZARDS DUE TO WATER POLLUTION:

According to the survey kids, who used to swim in the water body have started suffering from **diarrhoea, dysentery, cholera, typhoid** and two boys have suffered from **hepatitis A.** Some people of the down-trodden class use the water which can be extremely dangerous and life risking.

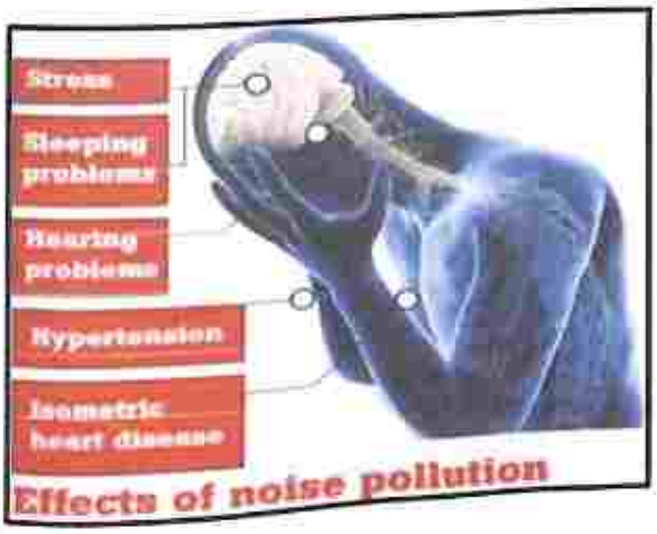
NOISE POLLUTION:

Noise or sound pollution is the propagation of noise with ranging impacts on the activity of human or animal life. It adversely affects the lives of millions of people.

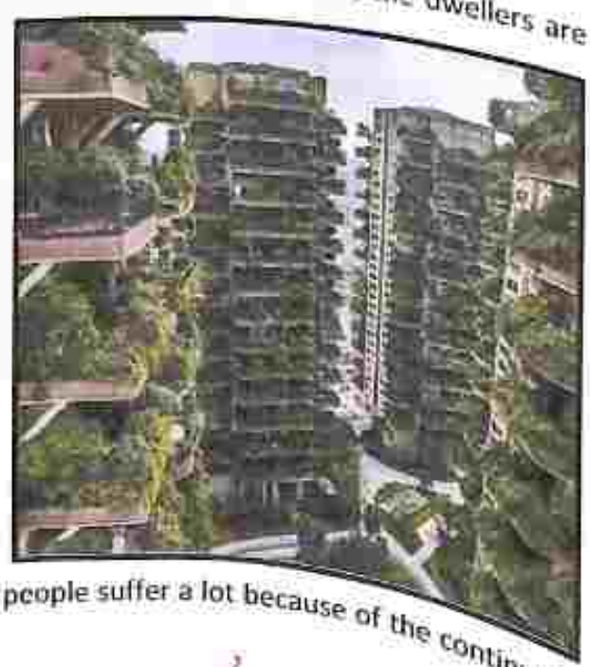
CAUSES AND EFFECTS ON THE SITE:

8 people out of 10 have raised the topic of this noise pollution due to the galloping number of vehicles. The nearby road remains very busy the whole day and it has a great impact on their lives.

The aged persons suffer from **nausea, high blood pressure, hearing loss, sleep disruption,** Children suffer from **speech interference** and according to the dwellers the continuous honking of cars is very disturbing and stressful to them.



MAJOR PROBLEMS AND POSSIBLY SOLUTIONS:



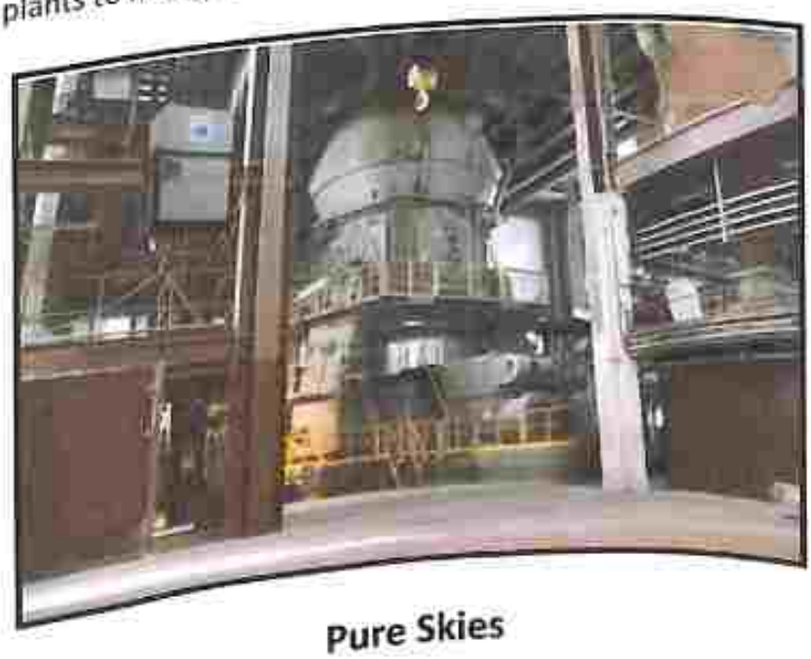
The side that I've visited, is filled with abysmal pollutants and therefore, the dwellers are leading a very uncertain life. The major issues have arrived after the installation of the cement factory. Human lives are at stake because of the installation of the factory and the dwellers are mainly suffering from cardiac and respiratory diseases and as per the survey report the number of people suffering from Asthma has increased 40%. There is also crisis of pure drinking water and kids mostly suffer from water contaminated diseases like cholera, diarrhoea, dysentery and polio. Aged people suffer a lot because of the continuous honking of vehicles even at right.

The major debacles can be turned to normalcy with awareness and in the site, awareness campaigns are a must for conveying the fact that one should never throw litters in the waterbody or contaminate the air and soil by dumping garbage here and there. The dwellers should also write a serious application to the corporation and the cement factory can also be

instructed to take measures in order to control the air contamination. For the emission of CO_2 and other greenhouse gases. An ideal solution for pollution control in cement industries should be able to tackle the problems efficiently, address fugitive emissions, be cost-effective and sustainable.

A BREAKTHROUGH TECHNOLOGY:

Devic Earth's Pure Skies is a breakthrough technology that does exactly this. It addresses large areas, cleaning air pollutants including fugitive and regular emissions. Pure Skies reduces air pollution by removing pollutants such as PM 2.5, PM 10, NO_x, SO_x and others from the air. Though it was not very effective, Pure Skies was installed at one of India's leading cement manufacturing plants to mitigate the problem of high, often unaccounted emissions.



Pure Skies

CONCLUSION:

The health of public, especially those who are the most vulnerable such as children, elderly and sick people is at risk from pollution. All type of pollution has their kind of negative impact on our environment the lives of humans and animals. It has become a great concern to save our planet and therefore we need to adapt various measures like practicing 3Rs concept, reduce the usage of vehicles on road, creating awareness, enforcing the laws for a better tomorrow.

GOKHALE MEMORIAL GIRLS COLLEGE, KOLKATA

24

ENVIRONMENTAL STUDIES PROJECT

RED PANDA; via: Getty Images

NAME: Dayita Ghosh

COLLEGE ROLL NO.: 21/BAH/0118

UNIVERSITY ROLL NO.: 212013-11-0018

REGISTRATION NO.: 013-1211-0033-21

TOPIC: Study of mammal; Red Panda

DATE: 25.05.2022

DEPARTMENT: English Department

PAPER: ENVS

SEMESTER: 2

ACKNOWLEDGEMENT

It is my proud privilege to release the feelings of gratitude to several people who helped me directly or indirectly to conduct this research project work. I express my heart full indebtedness and owe a deep sense of gratitude to my teachers and my faculty guide Mr. Raj Kumar Barman, Gokhale Memorial Girls' College, for their sincere guidance and inspiration in completing this project.

I am also thankful to my friends who have more or less contributed to the preparation of this project report. I will always be indebted to them.

This study has indeed helped me to explore more knowledgeable avenues related to my topic and I am sure it will help me in the future.

Dayita Ghosh

English Department

21/BAH/0118

CONTENT

INTRODUCTION AND HABITAT

Red pandas have shot to viral fame for their adorable looks, but there's a lot more to these elusive animals than their kitten-like faces and striking reddish-brown coats. **Red panda**, (*Ailurus fulgens*), also called **lesser panda, panda, red cat-bear**, or **red bear-cat**, reddish brown, long-tailed, raccoon like mammal, about the size of a large domestic cat, that is found in the mountain forests of the Himalayas and adjacent areas of eastern Asia and subsists mainly on bamboo and other vegetation, fruits, and insects. Once classified as a relative of the giant panda, it is now usually classified as the sole member of the family Ailuridae.

The red panda has soft thick fur—rich reddish brown above and black underneath. The face is white, with a stripe of red-brown from each eye to the corners of the mouth, and the bushy tail is faintly ringed. The head and body length of the red panda is 50–65 cm (20–26 inches) and the tail 30–50 cm (12–20 inches) long, and the weight ranges from 3 to 6.2 kg (6.5 to 14 pounds). The feet have hairy soles, and the claws are semi-retractile. Red pandas even have two layers of fur—a soft undercoat covered with course hairs—to insulate them from the mountain chill, and they use their long tail as a wraparound blanket.

Red pandas are made up of two subspecies—the Himalayan red panda (*Ailurus fulgens fulgens*), which resides in the mountains of northern India, Tibet, Bhutan, and Nepal, and the Chinese red panda (*A. fulgens styani*), which lives in China's Sichuan and Yunnan provinces. Although these mammals are classified traditionally within a single species, some scientists claim that DNA and morphological differences between the two are striking enough to reclassify them as two distinct species called *A. fulgens* and *A. styani*.

The red panda lives high in the mountains among rocks and trees and climbs with agility (though its tail is not prehensile). It seems to do most of its feeding on the ground. It is nocturnal and may live alone, in pairs, or in family groups. The litters generally contain one or two young that are born in spring after a gestation period of about 130 days. The animal is gentle and easily tamed but usually resents being handled. It is a very popular zoo animal and is frequently involved in the animal trade. Red pandas live in the rainy mountain forests of Nepal, India, Bhutan, northern Myanmar (Burma), and central China. They spend the vast majority of their lives in trees, where they sleep and sunbathe.

DIET AND BEHAVIOR

Red pandas belong to the order Carnivora, but this has more to do with their biological classification than their actual diet. In reality they rarely eat meat, instead using their powerful molars to grind through up to four pounds of bamboo a day. They also sometimes eat fruit, acorns, roots, eggs, rodents, and birds.

Like giant pandas, red pandas have an extended wrist bone that functions almost like a thumb and helps them grip bamboo shoots. The solitary creatures forage at night and in the gloaming hours of dusk and dawn.

In general red pandas live on their own, but when they do interact with other red pandas, they communicate by arching their tails, bobbing their heads, squealing, or making a sound that scientists call a "huff-quack"—a mix between a duck quack and a pig snort. Pandas who feel threatened may let out a barking sound or release a pungent liquid from glands at the base of their tail.

THREATS AND CONSERVATION

Red pandas are considered endangered by the International Union for the Conservation of Nature, the organization that determines the conservation status of plant and animal species. While no one knows the exact number of animals in the wild, a 2015 estimate put the population at 10,000, a 50 percent drop since 1997.

These animals are threatened by people clearing their forest habitat for logging and agriculture, as well as by diseases that can spread from domesticated animals. Hunters also kill red pandas for their fur or inadvertently when the creatures stumble into traps meant for other animals. In rare instances red pandas have been snatched from the wild, likely for the illegal pet trade.

Following are some ways to save a red panda:

- Adopt a Red Panda!
- Start a Facebook Fundraiser.
- Stream/use social media to raise awareness.
- Educate yourself on environmental issues such as deforestation, and see if you can use your voice to advocate for the end of habitat destruction.

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SEMESTER- 2nd (ENGLISH HONOURS)

SUBJECT- ENVIRONMENTAL SCIENCE PROJECT

TOPIC- STUDY OF POND AS AN ECOSYSTEM

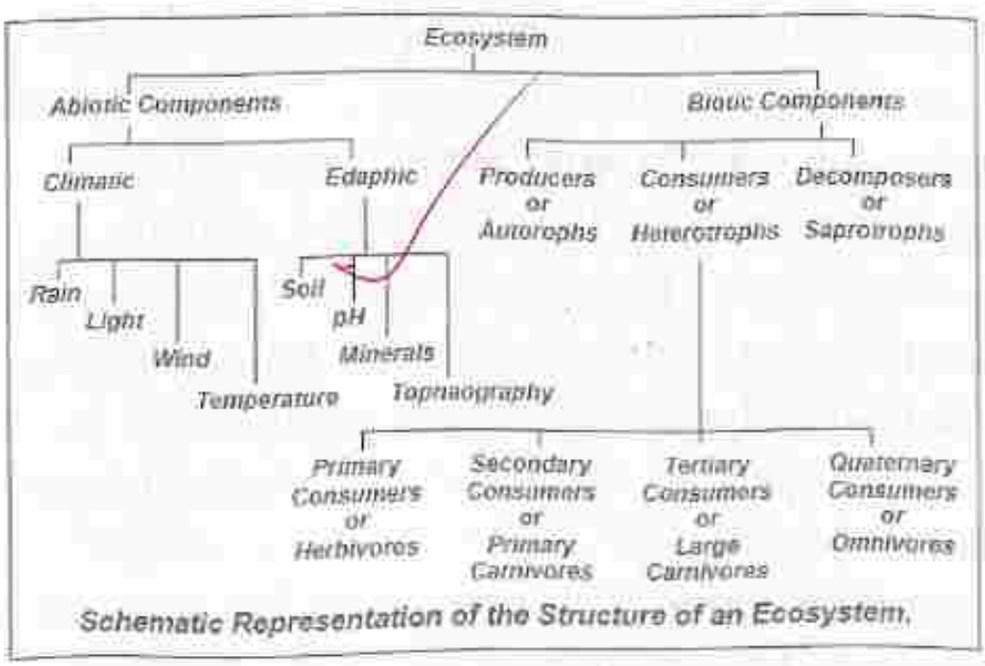
INDEX

INTRODUCTION

Ecosystem

An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the non-living environment, interacting as a functional unit. The organisms living in an ecosystem are broken down into categories: producers, consumers, and decomposers.

An ecosystem can be categorized into its abiotic constituents, including minerals, climate, soil, water, sunlight, and all other non-living elements, and its biotic constituents, consisting of all its living members. Linking these constituents together are two major forces: the flow of energy through the ecosystem, and the cycling of nutrients within the ecosystem.



Schematic Representation of the Structure of an Ecosystem.

Figure 1 structure of an ecosystem

POND ECOSYSTEM

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

Types of pond ecosystem:

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

1. **Garden pond ecosystems:** These are man-made artificial pond ecosystems that comprise ornamental plants and animal species exported from all over the world.
2. **Salt pond ecosystems:** These ecosystems are naturally formed at the seaside and contain brackish water. These are formed due to waterlogging. These can also be found in rocky areas on the beach called rock pools. Since it contains brackish water, it can accommodate sea plants and animals.
3. **Freshwater pond ecosystems**: These ecosystems are naturally formed due to rainfall or soil water

saturation due to continuous rain. Moreover, they can also be formed due to the flow of river water into a large and deep depression. These ecosystems serve as a home to freshwater fishes, amphibians, crustaceans, and many other kinds of wildlife.

4. **Venereal pond ecosystems:** These are seasonal ponds that are temporarily formed during the heaviest rainfall due to the accumulation of water in the depressions in the ground. With the change in the season, they often turn into desert land.
5. **Mountain pond ecosystems:** Naturally formed ponds are found in the mountain regions. These are formed due to the shifting of rocks and snow melting. They accommodate rare or endangered aquatic species.

Characteristics of Pond Ecosystem:

The following are the main characteristics of the pond ecosystem:

1. The water in the pond ecosystem is stagnant.
2. Either natural or artificial boundaries surround the pond ecosystem.
3. The pond ecosystem exhibits three distinct zones, the littoral zone, limnetic zone, profundal zone, and benthic zone.
4. The biotic components of the pond ecosystem occupy different levels in the pond ecosystem, therefore, avoid the competition for survival. Scavengers and decomposers occupy the bottom

level, and fish occupy the middle level. The plants enclose the pond's boundaries and provide shelter to small animals and insects.

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

Stratification in the Pond Ecosystem

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

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

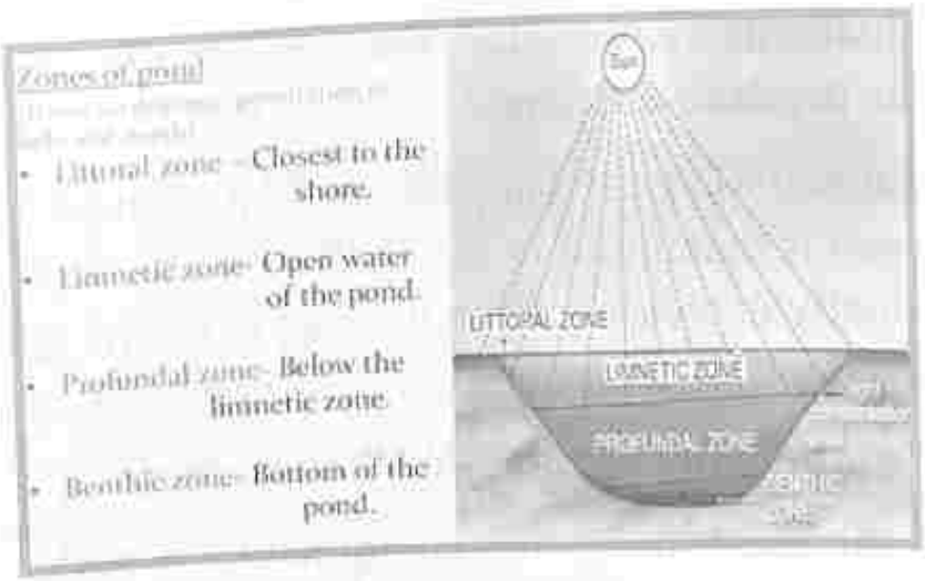


Figure 2 zones of pond ecosystem

Abiotic Components of the Pond Ecosystem:

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

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

gradually decreases while moving from the surface to the depth of the pond.

4. **Dissolved oxygen:** The amount of dissolved oxygen is maximum in the shallow water and gradually decreases while moving from the surface to the depth of the pond.

Biotic Components of the Pond Ecosystem:

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

1. **Producers:** These include species of rooted, submerged, emerged, floating plants and algae. The most common filamentous algae found in ponds is Spirogyra. Mougeotia and Zygnema are some other algae found in the pond. Azolla, Hydrilla, Pistia, Wolffia, Lemna, Eic hhornia, Nymphaea, Potamogeton, Jussiaea, etc., are a few examples of green plants that are found in the pond ecosystem.
2. **Primary consumers:** A large population of zooplanktons are the main primary consumers. Besides these, small herbivores such as snails, insects, small fishes, tadpoles, and larvae of aquatic animals are the primary consumers often found in the pond.

3. **Secondary consumers:** These include large animal species such as frogs, big fishes, water snakes, crabs, etc. The consumers of the highest order might include mammals like water shrews, water voles, herons, ducks, kingfishers, etc.
4. **Decomposers:** These include different types of bacteria and fungi that feed upon dead and decaying parts of the aquatic species.

Importance of Pond Ecosystem:

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

1. Some aquatic plants help to improve the water quality by absorbing pollutants and heavy metals.
2. The shoreline plants absorb nitrogen and phosphorus and therefore prevent the algal bloom and maintain the oxygen level in the pond. Moreover, aquatic plants absorb animal wastes to reduce the nutrient availability for plants and therefore prevent the growth of algae.
3. The pond ecosystem is one of the sites for the conservation of biodiversity as different types of plants and consumers occupy different strata in the pond and live together by interacting with each other. Ponds in mountain regions conserve the endangered species.
4. The pond ecosystem also serves as a source of water for the species that do not live in the pond.

5. Pond ecosystems contribute to the beauty of nature as they accommodate a variety of ornamental flowering plants.
6. Stratification in the pond ecosystem determines the distribution of animal species in the pond. It reduces the competition among the species to some extent.

CONCLUSION

An ecosystem is a functional unit of the biosphere. The biotic and abiotic components of any unit of the biosphere interact with each other, influence each other, and together constitute a dynamic system called an ecosystem. It can be recognised as a self-regulating and self-sustaining unit of the landscape. The pond ecosystem is an aquatic ecosystem that comprises several submerged, emerged, free-floating plants and algae living together with different types of animal species.

Stratification is one of the characteristic features of the pond ecosystem that determines the availability of essential abiotic factors such as light, oxygen, minerals, etc., to the different levels of depth in the pond. The availability of abiotic factors also determines the distribution of consumers and decomposers according to their need for different abiotic factors

ENVIRONMENTAL STUDIES (ENVS) PROJECT WORK

TOPIC- STUDY OF A COMMON PLANT; ARAUCARIA COLUMNARIS (COMMONLY KNOWN AS CHRISTMAS TREE)

NAME- SHUCHISMITA DAS

ENGLISH DEPARTMENT

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UNIVERSITY ROLL NO- 212013-11-0035

UNIVERSITY REGISTRATION NO- 013-1211-0051-21

AECC- 2 PAPER

COLLEGE- GOKHALE MEMORIAL GIRLS' COLLEGE

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ABOUT ARAUCARIA COLUMNARIS

Araucaria columnaris, the coral reef araucaria, Cook pine, New Caledonia pine, Cook araucaria or columnar araucaria is a species of conifer in their family Araucariaceae. The tree is endemic to New Caledonia in the Melanesia region of the Pacific.

It was first classified by Johann Reinhold Forster, a botanist on the second voyage of Captain James Cook to circumnavigate the globe as far south as possible.

DESCRIPTION

Araucaria columnaris is a distinctive narrowly conical tree growing up to 60m (200ft) tall in its native habit. The tress has a slender, spire-like crown. The shape of young trees strongly resembles A. heterophylla. The bark of the Cook pine peels off in thin paper-like sheets or strips and is rough, grey, and resinous.

The relatively short, mostly horizontal branches are in whorls around the slender, upright to slightly leaning trunk. The branches are lined with cord-like, horizontal branchlets. The branchlets are covered with small, green, incurved, point-tipped, spirally arranged, overlapping leaves. The young leaves are needle-like, while the broader adult leaves are triangular and scale-like.

A 2017 study found that tress tend to have a tilt dependent on the hemisphere of their location, leaning south in the northern hemisphere and north in the southern hemisphere.

ARAUCARIA COLUMNARIS/ CORAL REEF ARAUCARIA

Araucaria columnaris, as described in 1786 by Johann Reinhold Forster, in *Florulae Insularum Australium Prodromus*, 67 editions, is commonly known as the coral reef araucaria, Cook pine, New Caledonia pine, Cook araucaria, or columnar araucaria. It was first classified by botanists working on Captain James Cook's second voyage of exploration. The Coral reef araucaria is often confused with Norfolk Island pine because of their similar appearance.

DISTRIBUTION

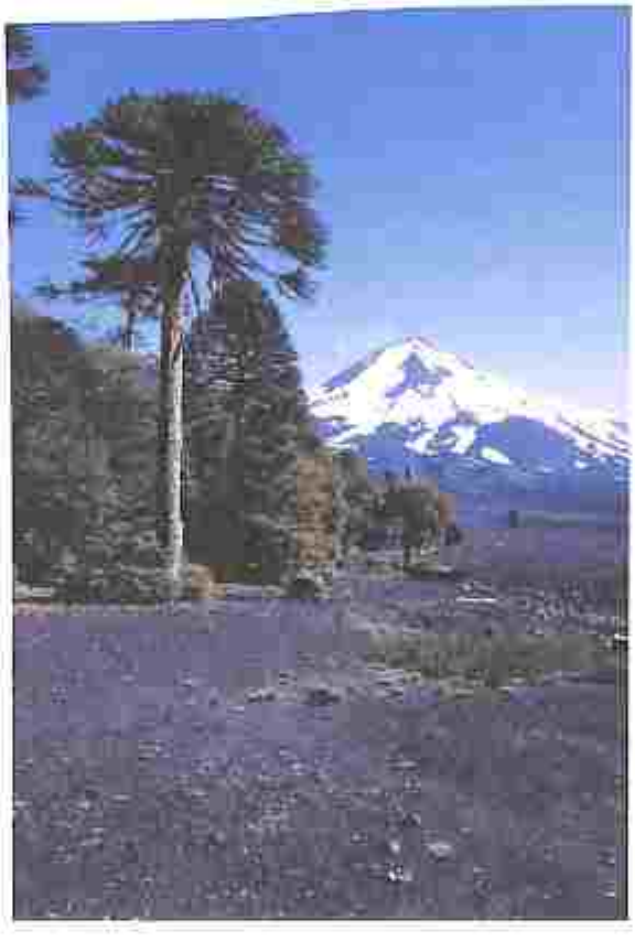
This species is endemic to southern New Caledonia- Ouinne to Prony and Isle of Pines, in the southwestern Pacific ocean, growing at elevations of sea level to 150 feet (0-50m).

(Fig.Natural range of Araucaria Columnaris)

A.columnaris is among the most common Araucarias planted as an ornamental tree and street tree in warm temperate climates. It is cultivated in gardens and public landscapes in Queensland, northern New Zealand, southern California, Mexico and Hawaii.

(Fig. Araucaria Columnaris in habitat)

THE ARAUCARIA FAMILY: PAST AND PRESENT



(Fig. Monkey puzzle trees in habitat on volcanic slopes in Chile)

AGATHIS: Agathis robusta, the Queensland kauri (pine) or smooth-barked kauri is a coniferous tree in the family Araucariaceae. It is a disjunct distribution occuring in Papua New Guinea and Queensland, Australia. Populations in Papua New Guinea maybe treated as the distinct species Agathis spathulata.

It is a large evergreeen tree growing straight and talk to a height of 30-50m, with smooth, scaly bark. The leaves are 5-12cm long and 2-5cm broad, tough and leathery in texture, with no midrib; they are arranged in opposite pairs on the stem. The seed cones are globose, 8-13 cm diameter, and mature in 18-20 months after pollination; they disintegrate at maturity to release the seeds. The male cones are cylindrical, 5-10 cm and 1-1.5 cm thick.

WOLLEMIA : Wollemia is a genus of coniferous trees in the family Araucariaceae. It was known only through fossil records until 1994, when the Australian species Wollemia nobilis was discovered in a temperate rainforest wilderness area of the Wollemi National Park in New South Wales. It was growing in a remote series of narrow, steep-sided, sandstone gorges 150km (93mi) north-west of Sydney. The genus is named after the National Park.

ON THE MERGE OF EXTINCTION:

THEY OUTLIVED THE DINOSAURS, BUT BRAZIL'S ARAUCARIA TRESS MIGHT NOT SURVIVE HUMANS

The Araucaria tree of Brazil's Atlantic Forest could go extinct within the next 50 years due to permissive state policies allowing them to be cleared. While these species is listed as critically endangered, and there's a ban on illegal logging of araucaria, the state governments of Parana and Santa Catarina states still allow them to be felled in the thousands for public works projects. Brazil's iconic araucaria trees, whose tufted branches also give them name candelabra tree, are being pushed towards extinction as government agencies continue to ignore or even abet in their logging.

The National Environmental Council (Conama) banned the logging of endangered tree species, including araucaria, in 2001. By then, including araucaria forests had disappeared from 98% of their historic range. The ban hasn't stopped the illegal logging. Legal logging is also a major threat.

CONCLUSION

Araucaria tree, also known as the Christmas tree is adaptive to most soils, survived the times of the Jurassic period but is in the merge of extinction at present. Their numbers are decreasing. It is an evergreen tree and is tall, mostly seen in hilly and mountainous regions.

Researching about it made me learn a lot about this particular species. The information is quite helpful and enhance my knowledge.

15/6/22

ENVIRONMENTAL STUDIES PROJECT

TOPIC

STUDY OF ECOSYSTEMS - POND, RIVER, WETLAND, FOREST, ESTUARY AND AGRO ECOSYSTEM

TOPIC OF MY PROJECT

STUDY OF WETLAND ECOSYSTEM

- NAME OF COLLEGE- GOKHALE MEMORIAL GIRLS' COLLEGE
- NAME- NUPUR BARNWAL
- C.U. ROLL NO.- 212013-11-0042
- C.U. REGISTRATION NO.- 013-1211-0059-21
- COLLEGE ROLL NO.- 21/BAH/0164
- STREAM- B.A. ENGLISH HONOURS
- SEMESTER- 2

INDEX

INTRODUCTION

ECOSYSTEM

- A complex relationship between all the living and non-living things (plants, animals, organisms, sun, water, climate etc) interacting with each other is known as 'An Ecosystem'. Ecosystems are the foundation of 'Biosphere' which maintain the natural balance of the earth.
- The term Ecosystem was first proposed by A.G. Tansley in 1935. He defined it as "the system resulting from the interaction of all the living and non living factors of the Environment."
- An ecosystem can be categorized into its abiotic constituents, including minerals, climate, soil, water, sunlight, and all other non living elements, and its biotic constituents, consisting of all its living members. Linking these constituents together are two major forces: the flow of energy through the ecosystem and the cycling of nutrients within the ecosystem.
- There are many examples of ecosystems – pond, forest, estuary, wetland, grassland.

WETLAND ECOSYSTEM

- A wetland is a land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem.
- Wetland ecosystems are the world's most important environmental assets and part of our natural wealth. They are not only home to a large number of species but also provide a wide array of ecosystem services worth trillions of dollars every year- entirely free of charge, to the mankind.
- Most commonly a wetland ecosystem is defined as the transitional land between terrestrial and aquatic ecosystem, where the land surface is saturated or covered with standing water for at least a part of the year.
- Depth is generally not more than six metres at low tide.

RAMSAR CLASSIFICATION

The Ramsar classification of wetland types is intended as a means for fast identification of the main types of wetlands for the purposes of the Convention.

The wetlands are classified into three major classes:

- Marine/coastal wetlands
- Inland wetlands
- Human-made wetlands

These are further subdivided by the type of water: fresh / saline / brackish / alkaline; and may be further classified by the substrate type of other characteristics.

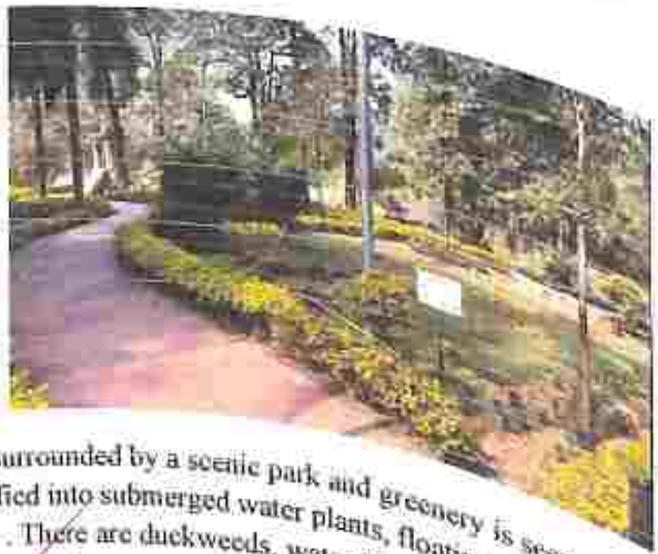
THE WETLAND OF SATABDI PARK

Satabdi park is a wonderful park situated in the core of the city Asansol. Though not so big but a beautiful park indeed. It takes 15 minutes from Asansol station and 5 minutes from bus stand to reach this place. The park is located around 3.5 kms from Asansol city and can be reached in 15 to 20 minutes via the Chelidanga main road. The wetland is situated inside the park which adds a lot of beauty to the park along with the big pond. Boating is also available in this place. It is 23°41'36.5" N and 86°57'20.9" E, the coordinates are 23.68333333333 Latitude 86.366666667 Longitude. DMS Latitude -23°41'26.1996" N and DMS Longitude-86°58'7.1976"E

CLIMATE

Evenings are very pleasant to spend near the wetland specially during the time of sunset. The climate is classified as warm and temperate. In winter, there is much less rainfall than the summer. The temperature here averages 25.3°C/77.6°F. In a year the rainfall is 1294mm/50.9 inch.

FLORA

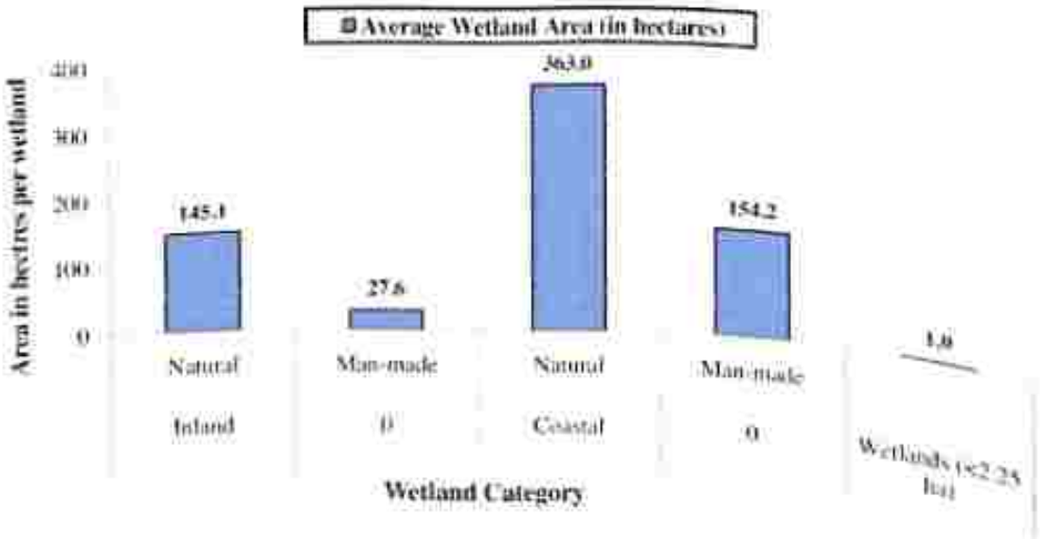


This wetland is always or nearly always flooded. It is surrounded by a scenic park and greenery is seen all around. The flora of this wetland can broadly be classified into submerged water plants, floating water plants, emergent water plants and riparian water plants . There are duckweeds, water lilies, soft-stem bulrush and some shrubs. Many phytoplankton alongwith mosses and grasses are also observed . Sometimes it is covered with green algae. Some aquatic plants like wavy marshwort, water couch etc. is also seen. The banks of the wetland is surrounded by medium and large sized trees like peepal trees, pink flower trees(crepe Myrtles), mango trees which are a treat to the eyes.

FAUNA

We can find the common wetland species like snakes, turtles, lizards, frogs, toads, salamanders, fishes and some migratory birds. Swans and ducks are common here. In some seasons cranes are also seen. Many vultures and black eagles comes for hunting fish from the wetlands . Some snakes, different types of ducks like whistling ducks, Indian- spot-billed duck, platypus and snails can also be spotted.

BENEFITS OF WETLANDS



Average area under different wetlands, India
***Source*: Authors' analysis using data from SAC (2011)**

- **Flood control**: They increase downward percolation of water, reducing runoff. The Chennai floods of 2015 were worsened by damage to wetland ecosystem in the region due to illegal human development activities.
- **Education**: Wetlands protection activities provide meaningful opportunities to educate the public regarding wetlands science, wetlands protection, and the value of water resources.
- **Aesthetic Appeal**: Wetlands provide a certain visual value and are often incorporated as features within landscape design.
- **Erosion Control**: Riparian wetlands, salt marshes, and marshes located at the margin of lakes protect shorelines and stream banks from erosion. The roots of wetland plants hold soil in place and can reduce velocity of stream or river currents.
- **Water purification**: Wetlands act as natural filters, purifying ater from toxic substances that have come from pesticides, industrial discharges, and mining activities.

- **Recreation**: Wetlands can become a destination for outdoor activities such as hiking, fishing, bird watching, photography, and hunting. More than 82 million Americans took part in these activities in 2001, spending more than $108 billion on these pursuits.
- **Wetland products**: they provide important raw material for industries. Example, fish and other marine life forms salt production, medicinal plants like mangrove bark, fiber for textile, dyes and tannins. Timber wood etc.

THREATS TO WETLANDS

- **Agriculture**: Wetlands often have fairly flat areas of rich organic soil that is highly productive agricultural land if drained. For this reason many wetlands have been drained and converted to agricultural lands.
- **Devegetation**: Vegetation plays an important role in wetland ecology by removing water through evapotranspiration, altering water and soil chemistry, providing habitat for wildlife, and reducing erosion. Removal of vegetation can drastically and sometimes irreversibly alter wetland function.
- **Dumping**: Dumping fill material buries hydric soils and effectively lowers the water table so hydrophytic (water loving) plants cannot compete with upland plants.
- **Dredging**: The removal of material from a wetland or river bed. Dredging of streams lowers the surrounding water table and dries up adjacent wetlands.

WETLAND CONSERVATION

Wetland conservation is aimed at protecting and preserving areas where water exists at or near the Earth's surface, such as swamps, marshes and bogs. Wetlands cover at least six per cent of the Earth and have become a focal issue for conservation due to the ecosystem services they provide. Over 90% of the wetlands in New Zealand have been drained since European settlement, predominantly to create farmland. Wetlands now have a degree of protection under the Resource Management Act 1991. The US wetland conservation efforts are rooted partly in legislative requirements specifying that when a proposal is made to drain or fill a wetland, the proposers in many cases must offset the loss by restoring or constructing wetlands nearby that are of the same or greater size and levels of function.

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 conservation of wetlands resulting in intended or unintended spill-over that further aggravates the problem. Wetland ecosystems are interconnected and interactive within a watershed. In India, unplanned urbanization and a growing population have taken their toll on wetlands. Spreading awareness by initiating educational programs about the importance of wetlands in local schools, colleges and among the general public in the vicinity of the water bodies, besides constant monitoring of wetlands for their water quality, would provide vital inputs to safeguard the wetlands from further deterioration.

GOKHALE MEMORIAL GIRLS COLLEGE

NAME : SADIYA AHMED

CU ROLL NO. : 212013-11-0045

DEPARTMENT : ENGLISH

SEMESTER : II

SUBJECT : ENVS

TOPIC : VISIT TO A LOCAL POLLUTED SITE- URBAN/ RURAL/ INDUSTRIAL/ AGRICULTURAL

CONTENTS

INTRODUCTION

Pollution is the introduction of harmful materials into the environment. These harmful materials are called pollutants.

Pollutants can be natural, such as volcanic ash. They can also be created by human activity, such as trash or runoff produced by factories. Pollutants damage the quality of air, water, and land.

These are further classified into the following types of pollution:

- Air Pollution
- Water Pollution
- Soil Pollution
- Noise Pollution

Besides these 4 types of pollution, other types exist such as light pollution, thermal pollution and radioactive pollution. The latter is much rarer than other types, but it is the deadliest.

We are going to elaborate on agricultural pollution Agricultural Pollution is defined as the contaminated byproducts of agriculture such as growing and raising crops, livestock, animal feed and bio fuel crops left untreated and released in the open environment (Chen et al., 2017).

Causes of agricultural pollution

There is no any single strategy or technique responsible for agricultural pollution but several. Some important of them are discussed below.

Contaminated Water:

Likewise animals and humans, plants also need water for their survival. Most of their water requirement is fulfilled by natural water resources like pond, river, canals, local reservoirs and rain.Even these natural resources are also getting polluted because of the drainage of industrial waste and effluents released directly into them (Borin et al., 2001). In the case of unavailability of the natural fresh or clean water resources, farmers use this polluted water for irrigation of their crop. As a result, crop is directly exposed to the water polluted with harmful substances like mercury, lead, arsenic, cadmium etc. This becomes poisonous for the crop and as a residue for us when we are exposed to these plant products.

Pesticides and Fertilizers:

To improve crop yield, farmers use several chemicals as fertilizers. These chemicals likewise pesticides are also harmful for us. Fertilizers and Pesticides when used excessively can be left behind for prolonged period in the soil, which when mixed with water for irrigation, seeps down to the ground water and making it polluted.

Soil Erosion and Sedimentation:

Erosion caused by agricultural malpractices, water, wind, flood etc. disturbs and removes the topmost fertile soil profile and carry them to other places under pressure of wind or soil. There, it is deposited as sediment into several layer , which in turn alters the natural soil profile of that area. This erosion and sedimentation occurring continuously every year and ultimately decline the soil fertility.

Heavy Metals:

To make the crop yield better, we use fertilizers, chemicals, manures etc. in the field. These contain several heavy metals (like cadmium, arsenic etc.) harmful for us. Irrigation of soil has also reported to cause selenium deposition in soil. These heavy metals are seeped into the ground water and make it toxic. Plants absorb these heavy metals which affect their natural growth.

Effects of agricultural pollution

Health related issues:

Agricultural pollution is the main source of pollution in water and lakes. Chemicals from fertilizers and pesticides make their way into the groundwater that ends up in drinking water. Health-related problems may occur as it contributes to a blue baby syndrome which causes death in infants.

Effect on Aquatic Animals:

Fertilizers, manure, waste, and ammonia turn into nitrate and phosphates, and when washed into nearby water bodies, the production of algae gets enhanced that reduces the amount of oxygen present in water, which results in the death of many aquatic animals. Again, bacteria and parasites from animal waste can get into drinking water, which can pose serious health hazards for various marine life and animals. Thus, the oxygen levels are likely to decline, which can cause the death of fishes and other water animals.

Eutrophication:

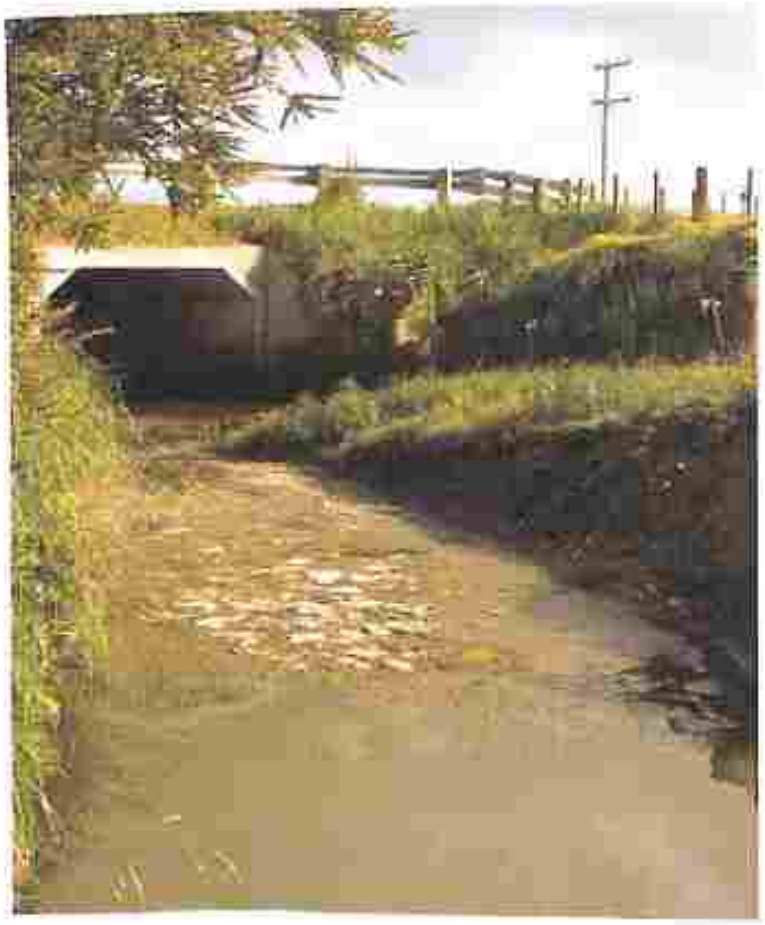
Eutrophication is the dense growth of plant life and algae on the water surface, causing high incidences of algal blooms. In case of excessive use of fertilizers and pesticides, nitrogen, phosphorus and other chemical nutrients get washed into nearby surface waters by rain or irrigation and lead to the eutrophication. Eutrophication extensively depletes the oxygen dissolved in water, which can adversely affect the aquatic system by killing fish and other aquatic biotas. It is also linked to an increased incidence of paralytic shellfish poisoning in humans, leading to death.

Water Pollution:

Water pollution is another big problem caused by agricultural pollution. Agricultural operations and practices such as inappropriate water management and irrigation mainly lead to water pollution from surface runoff, both to surface and groundwater. In turn, plants, wildlife, humans, animals and aquatic life are negatively affected since we need clean drinking water to survive and stay healthy.

CONCLUSION

Agricultural pollution originates from the introduction of chemical fertilizers (rich in phosphates and nitrates), pesticides (insecticides and weed killers) and manure from stables in river flows and in the soil. The introduction of pesticides poses the most serious threat as these are not very biodegradable, they deposit and concentrate in river flows destroying all forms of life. A greater attention from agricultural operators could substantially reduce this form of pollution that is particularly dangerous as it can regard also aquifers.



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15/6/22

PROJECT ON
ENVIRONMENTAL STUDIES

TOPIC - STUDY OF A MAMMAL; BEAVER

30

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COLLEGE- GOKHALE MEMORIAL GIRLS' COLLEGE

INDEX

WHAT ARE MAMMALS?

Mammals are a group of species that include humans; warm-blooded animals with hair and vertebrates, or backbones and unlike other classes of animals, female mammals produce milk to nourish their young. Almost all mammals give birth to live young (except for the platypus and echidna, which lay eggs). There are nearly 6,500 publicly recognized mammal species and many more species are being discovered. Popular mammal examples include cats, dogs, horses, elephants, whales, and humans. Mammalia has the largest class in the animal kingdom. Based on their reproduction, they are classified into three subclasses: (1)Eutheria, (2)Metatheria, (3)Prototheria. There are further more sub-divisions, but the following is a general classification of mammals.

Classification	Examples
Animals	Lion, Tiger, Dog
Marsupials	Kangaroo, Koala, Womba
Primates	Chimpanzee, Gorilla, Monkey
Rodents	Squirrel, Mouse, Porcupine
Cetaceans	Dolphins, Whales
Other mammals	Seal, Walrus, Sea-lion

The further discussions in the project, will be about an animal, categorised under Rodents.

WHAT ARE RODENTS?

Rodents are mammals, which are characterized by a single pair of continuously growing incisors in each of the upper and lower jaws. About 40% of all mammal species are rodents. Rodents are very diverse in their ecology and lifestyles and can be found in almost every terrestrial habitat, including human-made environments.

Species can be arboreal, fossorial (burrowing), ricochetal (leaping on their hind legs), or **semiaquatic**. However, all rodents share several morphological features, including having only a single upper and lower pair of ever-growing incisors. Well-known rodents include mice, rats, squirrels, prairie dogs, porcupines, **beavers**, guinea pigs, and hamsters. Most rodents are small animals with robust bodies, short limbs, and long tails. They use their sharp incisors to gnaw food, excavate burrows, and defend themselves. Most of them eat seeds or other plant material, but some have varied diets. They tend to be social animals and many species live in societies with complex ways of communicating with each other.

The rodent fossil record dates back to the Palaeocene on the supercontinent of Laurasia. Rodents greatly diversified in the Eocene, as they spread across continents, sometimes even crossing oceans. Rodents reached both South America and Madagascar from Africa and, until the arrival of *Homo sapiens*, were the only terrestrial placental mammals to reach and colonize Australia.

BEAVER

Beavers are amphibious rodents, native to North America, Europe, and Asia. Beavers are the largest semi-aquatic rodents in North America and Eurasia and the second largest rodents worldwide. Their bodies extend up to 80 cm (31 inches) long and generally weigh 16–30 kg (35–66 pounds, with the heaviest recorded at more than 85 pounds). They live in streams, rivers, marshes, ponds, and shorelines of large lakes and construct dams of branches, stones, and mud, forming ponds that often cover many hectares. Ecologists often refer to beavers as "ecosystem engineers" because of their ability to alter the landscapes in which they live.

Beavers have short legs and a stout body with a small, broad, and blunt head. Massive chisel-shaped incisor teeth have orange outer enamel because iron has replaced calcium, and this makes them stronger than most rodent incisors. Upon submergence, folds of skin (valves) close the nostrils and the stubby rounded ears, and the eyes are protected by a membrane that keeps water out (nictitating membrane). The fur-lined lips close behind the incisors, blocking water from the mouth and lungs and allowing the animal to cut, peel, and carry branches underwater. Small front feet with five clawed digits dexterously manipulate food. The hind feet are quite large, and the five digits are connected by **webbing**, which makes them useful as paddles for propulsion underwater. Claws of the second hind digits are split and have serrated edges used for grooming the fur. Fur consists of a greyish to brown layer of short, fine, and dense underfur that keeps water from reaching the skin. Over this layer are long, coarse, glossy guard hairs ranging in colour from yellowish brown through reddish brown to black; underparts of the animal are paler. The distinctive tail is scaly, flat, and paddle-shaped and measures up to 45 cm (about 18 inches) long and 13 cm (5 inches) wide. Both sexes possess castor glands that exude a musky secretion (*castoreum*), which is deposited on mud or rocks to mark territorial boundaries. Anal glands secrete oil through skin pores to hair roots. From there it is distributed with the front feet and grooming claws over the whole body to keep the fur sleek, oily, and water-repellent. Beavers are colonial and primarily nocturnal.

WHAT IS A BEAVER LODGE?

Beavers are colonial and primarily nocturnal. They build their homes like dome-shaped island lodges, that are built of branches plastered with mud. In marshes, lakes, and small rivers, beavers may instead construct bank lodges, and in large rivers and lakes they excavate bank dens with an underwater entrance beneath tree roots or overhanging ledges. Each lodge is occupied by an extended family group of up to eight individuals: an adult pair, young of the year (kits), and yearlings from the previous litter. Lodges are usually 3 metres (10 feet) high and 6 metres (20 feet) across the base but can be as large as 5 metres (16 feet) high and 12 metres (39 feet) wide. One or more tunnel entrances open below the water's surface into a spacious central chamber above water level; the floor is covered with vegetation. An entry tunnel leads to the nest chamber above

the waterline. In winter the moist walls freeze, adding insulation and making the lodge impenetrable to predators.

Beavers often construct a dam a short distance downstream from the lodge to detect predators. The dam impedes the flow of the stream and increases the depth of the water that surrounds the lodge. Dams create additional wetland habitat for fish and waterfowl and contain or obstruct the downstream movement of oil spilled into rivers.

(Wrangell Mountains: A beaver pond with the Wrangell Mountains in the background. Wrangell–St. Elias National Park and Preserve, Alaska)

Despite the environmental services these dams provide, land owners and farmers often regard beavers as nuisance animals because beavers sometimes destroy ornamental trees, devour crops, or flood roads and fields with water impounded behind their dams.

BEAVERS' SURVIVAL TACTICS

During winter beavers store some fat at the base of their tail, but they maintain body temperature primarily by huddling in the insulated lodge and being less active. They leave the lodge only to feed on branches cached beneath the ice. Slow swimmers, beavers can remain submerged for up to 15 minutes and propel themselves primarily with the webbed hind feet while the front feet are held tight against the body. On land they walk or run with a waddling gait. Their diet consists of the soft cambium layer beneath bark, as well as the buds, leaves, and twigs of certain trees (willows and aspens are preferred). Pond vegetation and bankside plants are also eaten. Herbaceous vegetation is consumed mostly during summer and woody matter during winter. Shrubs, saplings, and trees are felled by beavers, cut into portable lengths, and dragged along mud slides or floated through beaver-made canals to the lodge. Edible branches are cached underwater and anchored in mud near the lodge entrance, where they are to be eaten all winter when the beavers cannot break through the ice to cut fresh branches. Beavers are monogamous, mating between January and March in the north and November or December in the south. One litter per year of one to nine (usually four) kits is born in the spring after a gestation of 105 days. Beavers communicate by postures, vocalization, scent marking, and tail slapping. When alarmed on land, they retreat to water and warn others by slapping the surface of the water with their tails, producing a loud, startling noise. Eagles, large hawks, and most large mammalian carnivores' prey on beavers.

TYPES OF BEAVERS- AMERICAN BEAVERS AND EURASIAN BEAVERS

American beavers (C. canadensis) occur throughout forested parts of North America to northern Mexico, including the southwestern United States and peninsular Florida. Beavers were at the heart of the fur trade during colonial times and contributed significantly to the westward settlement and development of North America and Canada. As the animal was trapped out in the east, trappers moved progressively westward, and settlers followed. Nearly extirpated by 1900 through excessive trapping for their luxuriant coat, they have reclaimed, either by natural movement or human reintroduction, much of their former natural range, and regulated trapping continues, particularly in Canada. American beavers have been introduced into Finland, where they are flourishing.

Eurasian beavers (C. fiber) were once found throughout temperate and boreal forests of the region (including Britain) except for the Mediterranean area and Japan. By the early 20th century this range had contracted, and at the beginning of the 21st century indigenous populations survived only in the Elbe and Rhône River drainages, southern Norway, France, Mongolia, China, and parts of Russia, especially northwestern Siberia and the Altai region. Efforts to re-establish the Eurasian species began in Sweden in the early 1920s. Since that time, Eurasian beavers have been reintroduced throughout Europe, western Siberia, western China, Mongolia, the Kamchatka Peninsula, and near the Amur River in the Russian Far East.

Beavers make up the family Castoridae (suborder Sciuromorpha, order Rodentia). With no close living relatives (the mountain beaver belongs to a separate family), modern beavers are remnants of a rich evolutionary history of 24 extinct genera extending back to the Late Eocene Epoch of Asia and the Early Oligocene of Europe and North America. Most were terrestrial burrowers, such as Palaeocastor, which is known by fossils from Late Oligocene–Early Miocene sediments of western Nebraska and eastern Wyoming. They probably lived in upland grasslands in large colonies, excavated extensive burrow systems, and grazed on the surface, their entire lifestyle being much like that of modern prairie dogs. The largest rodent that ever lived in North America was the amphibious giant beaver (Castoroides) of the Pleistocene Epoch. Fossils indicate that it had a body length of two metres and was about the size of a black bear.

BEAVER HABITAT

As the name suggests, the North American beaver has a massive range that extends through most of Canada, the United States, and parts of Mexico (it was also later introduced into Finland), while the range of the Eurasian beaver extends through parts of Europe (including the UK) and into Central Asia. They are found exclusively in freshwater ecosystems such as streams, lakes, ponds, and rivers with heavy woods and shrubs, native to the temperate Northern Hemisphere.

BEAVER DIET

Beavers are herbivorous foragers that have specialized microorganisms in their gut to break down very tough cellulose from plant matter. In order to cope with the coldest parts of the year, the beaver may store their food below their lodge to consume during the winter. Even if the water is frozen over, the beaver can still access the food stores without any problems.

The beaver's diet varies by the seasons. In the spring and summer months, the beaver feeds on leaves, grasses, sedges, roots, and herbs. During the fall and winter months, they switch primarily to bark and wooded plants. The North American beaver seems to favor poplar, beech, alder, maple, and aspen trees. This clever creature has the ability to create a canal leading from the food source back to the dam.

BEAVER PREDATORS AND THREATS

The beaver has been historically threatened by habitat loss and trapping. For many centuries they were hunted for their fur, meat, and oil. After numbers declined in Europe, the beaver fur trade became an integral part of the colonial economy in the Americas and reached its height at some point in the 19th century, when more than 150,000 pelts were hunted a year. Since then, the decline of the fur trade has removed an enormous source of population pressure from the beaver, which has enabled it to recover. The beaver is commonly preyed upon by mountain lions, wolves, coyotes, foxes, eagles, and even sometimes bears. But the loss of some predator populations has made it easier for the beaver to survive in the wild.

BEAVER REPRODUCTION, BABIES, AND LIFESPAN

The beaver is known as a faithful partner that will form exceptionally strong long term monogamous relationships with a single mate. If its mate dies, only then will the surviving mate seek out another partner. However, a 2009 genetic study revealed some unusual facts about the beaver's reproductive strategy. Much like humans, they may also engage in some promiscuous short-term relationships whenever the opportunity arises. Beavers mate once every year between January and March in northern climates and between November and December in warmer climates. The female will prepare to give birth by creating a soft bed in the lodge, where she uses her tail as a birthing mat. After a gestation period of around three months, the mother produces a litter of one to four kits at a time. These kits are born with a full coat of fur, open eyes, and the ability to swim. They receive thorough educations (as well as protection) from both parents to prepare them for the rigors of adulthood. After about three more months, they are weaned by their mother and begin to rely fully on solid food. Most young stay with the parents for the first two years of life (to help with infant care and dam building) and then become sexually mature the year after. Beavers have a life expectancy of about 10 to 20 years in the wild.

WHY ARE BEAVERS CALLED ECOSYSTEM ENGINEERS?

Beavers create and restore important wetland ecosystems. The habitats they create support the development and growth of young animals by offering sources of food and shelter. Beavers, as ecosystem engineers, have the ability and skill to restore and create native woodlands and new wetlands. It further improves the habitats of many different species that live in the affected ecosystems. Beavers change the habitats in which they live significantly. They do so by damming the courses of water, coppicing shrub and tree species, and digging canal systems.

Other reasons why they are called ecosystem engineers are given below.

Filter Pollution: Many farmers in America use synthetic fertilizers. When such chemicals go to the sea, they can create dead zones, with low-oxygen, and with marine life. From the source, beavers' damming activities trap runoff and encourage bacteria which converts nitrate to harmless gas. This is how a system of beaver-made dammed ponds can avert ecological disasters. Beavers can cut up to forty-five percent of agricultural pollution from spreading further downstream, keeping healthier estuaries.

Store Groundwater: The beaver ponds have a weight that forces the water into the ground. It recharges aquifers that are depleting at a rapid pace. According to scientists, beaver ponds

raised the water tables of the Rockies by half a foot: ponds hold around ten times as much water belowground as above it.

Prevent Floods: Many people associate beavers with flooding. However, they can actually prevent seriously catastrophic floods by spreading, storing, and slowing water. During rainstorms in flood-prone England, around thirteen beaver dams reduce runoff by thirty per cent.

Create Wetlands: Wetlands are extremely important and diverse habitats for a wide range of life. In arid regions, they support eighty per cent of species despite themselves covering two per cent of the landscape. Beavers build dams that submerge meadows, broaden streams, and act as wetland engineers by raising water tables.

Stores carbon: Just like forests take carbon from their surrounding atmosphere and store it in the wood, beavers also store carbon as organic sediment, which settles down in the bottom of their ponds. Before the decimation of the beaver population in Rocky National Mountain Park, they stored around 2.7 million tons of carbon.

Sustains salmon: Salmon are important to the economies and culture of many northern countries. Beavers create cool pools and side slow-water channels where fry can feed, rest, and obtain shelter from predators. In California, scientists are building artificial beaver dams.

Benefits Birds: Beaver ponds furnish habitats for a number of species. They include otters, trout, and boreal toads. The most significant beneficiaries among them are birds. For instance, many duck species breed more successfully in the wetlands created by beavers. Further down the line, songbirds perch in willow stands irrigated by raised groundwater.

Beavers, therefore, act as ecosystem engineers by changing the abundance and distribution of different plants and animals. They create a diverse habitat that benefits different species. And they counteract pollution by storing carbon and filtering water.

HOW DO BEAVERS KEEP OUR ECO SYSTEM HEALTHY?

Beavers have an important role to play when it comes to healthy ecosystems in Riding Mountain National Park. They are considered "ecosystem engineers," recognized for their ability to construct dams and create ponds. And while some might consider beavers to be pests, they can actually help us manage water-related issues such as drought, flooding, and water pollution.

1.They create wetland habitat for other species

Beavers create wetlands by constructing dams and creating ponds. This in turn creates habitat for other species including fish, mammals, waterfowl, songbirds, amphibians, and insects. In 2010, wetlands made up approximately 24% of the park area. According to Research in RMNP detected as many as 28 dams/km along one watercourse, and by some estimates, beavers are responsible for the existence of 50% of the wetlands in the park. By a survey in 2016 aerial beaver estimated beaver cache abundance in RMNP at 2649 total caches in 2016. The experts suggest that there are usually on average 5-6 beavers per food cache.

2. They increase biodiversity

The influence of beavers and their activity is far reaching. In some areas of RMNP, as much as 50% of the area is either wetland, flooded, or subject to beaver foraging. Beaver activity can increase plant diversity by as much as 33%. As trees are removed and land is flooded, other plant species emerge in its place. These plants provide food and cover for new species. Riparian habitats (wetland areas near water) expand as wetlands are formed, and plants spread into the newly available habitat. There is an increase in the diversity of all species including fish, invertebrates, and wildlife.

3.They improve water quality

Beaver dams and pools reduce soil erosion and retain sediment, which absorb and filter pollutants such as heavy metals, pesticides, and fertilizers. This improves the quality of water downstream used by humans and other species.

4.They store water during droughts

RMNP is on the high ground at the headwaters of 15 watersheds and has often been described as a large sponge, holding a significant amount of water and slowly releasing it downstream. The often-maligned beaver is major contributor to keeping the sponge wet. Beaver can help lessen the effects of drought because they cause water to be stored on the surface and absorbed into the sub-surface of the land due to the impoundment of water by their dams. This can increase stream flow during drought periods and make ecosystems less vulnerable during dry periods.

5.They minimize flood risk and mitigate flooding peaks

Ironically, beavers help minimize flood risk the same way they minimize the effects of drought. As we mentioned, RMNP is like a large sponge, holding a lot of water and slowly releasing it. Beaver dams help minimize flood risk by slowing the flow of water, which can delay and reduce flood peaks further downstream.

HISTORICAL SIGNIFICANCE OF THE BEAVER

After the early European explorers realized Canada was not the spice-rich Orient, the main profit-making attraction was the beaver population. In the late 1600s and early 1700s, the fashion of the day demanded fur hats, which needed beaver pelts. As these hats became more popular, the demand for the pelts grew. King Henry IV of France saw the fur trade as an opportunity to acquire much-needed revenue and to establish a North American empire. Both English and French fur traders were soon selling beaver pelts in Europe at 20 times their original purchase price. The trade of beaver pelts proved so profitable that many Canadians felt compelled to pay tribute to the buck-toothed animal. Despite this recognition, the beaver was close to extinction by the mid-19th century. There were an estimated six million beavers in Canada before the start of the fur trade. During its peak, 100,000 pelts were being shipped to Europe each year; the Canadian beaver was in danger of being wiped out. Luckily, about that time, Europeans took a liking to silk hats and the demand for beaver pelts all but disappeared. Today, thanks to conservation and silk hats, the beaver – the largest rodent in Canada – is alive and well all over the country.

BEAVERS PLAYED A HUGE ROLE IN CANADA'S DEVELOPMENT!

Beaver pelts were integral to the Canadian fur trade where Aboriginal and European hunters supplied trade networks with beaver pelts, which were largely used to make top hats that were fashionable in Europe during the 18th and 19th century. As the beaver became scarce in certain regions, the network expanded, laying the groundwork for the development of Canada. Surprising even to Backhouse, was the continued demand for beaver pelts well into the 20th century. In 1981, trappers sold a record high in beaver pelts. Beaver is considered as the national animal of Canada.

CONCLUSION

Throughout the project, we saw how Beavers are an engineer to our ecosystem and how they help our ecosystem to stay healthy. They filter pollution, store groundwater, prevent floods risk and mitigate flooding peaks, store water during droughts, create wetlands, stores carbon, sustain salmon, benefit birds- hence creating wetland habitat for other species; increasing biodiversity; improving water quality.

An animal who helps the environment so selflessly is being killed for skin by Canadians. Since the 1600s-1700s, the Canadians had started killing beavers for skin. Their skin was used for creating hats. It proved very profitable to them and hence continued to kill beavers for making money. They did not halt before the population of beavers started to descend. It was only in 1701, that the Iroquois war took place and the French and their allies reached a truce with the Haudenosaunee, known as the Great Peace of Montreal.

It is a relief to know that there are state laws and regulations, NGOs, environmental groups and state agencies in the US which restrict the killing of beavers. And the furbearers protect beavers. At present, the population of beavers are maintained but beavers are still at risk of endangerment due to the deterioration of their habitat, and the pollution that makes their environment uninhabitable.

Beavers are a very important species, they must be taken care of. The greedy hunters must know without them, humans would have died in drought or flood or lost our habitat.

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PROJECT

ENVIRONMENTAL STUDIES

27

MAMMALS

SNOW LEOPARDS

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PAPER: AECC2
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"GHOST OF THE MOUNTAINS"

SNOW LEOPARDS

Panthera Uncia, also known as the **Ounce,** inhabit alpine and the subalpine zones at elevations of 3000-4500m, ranging from eastern Afghanistan, the Himalayas and the Tibetan Plateau to southern Siberia, Mongolia and western China. In the northern part of its range, they also live at lower elevations. They are large long-haired Asian cats, belonging to the family *Felidae*. Their soft, pale greyish coat consists of a dense insulating undercoat and a thick outercoat of hair about 5cm with dark rosettes and a dark streak along the spine. Snow Leopards attain a length of about 7 feet, including 3-foot-long tail. They stand about 2 feet long at the shoulder and weigh 50-90 pounds.

DID WE KNOW?

IN NEPAL, THEIR MAIN PREY ARE BLUE SHEEP...WHICH AREN'T ACTUALLY BLUE- The snow leopard's main prey in Nepal - blue sheep - will provide one snow leopard with food for a week.

The snow leopard shows several adaptations for living in a cold, mountainous environment. Its small rounded ears help to minimize heat loss. Its broad paws well distribute the body weight for walking on snow, and have fur on their undersides to increase the grip on steep and unstable surfaces; it also helps to minimize heat loss. Its long and flexible tail helps to maintain balance in the rocky terrain. The tail is very thick due to fat storage, and is covered in a thick layer of fur, which allows the cat to use it like a blanket to protect its face when asleep.

The snow leopard differs from the other Panthera species by a shorter muzzle, an elevated forehead, a vertical chin and a less developed posterior process of the lower jaw. **It cannot roar despite its partly ossified hyoid bone, as its 9 mm short vocal folds provide little resistance to airflow.**

The snow leopard is a carnivore and actively hunts its prey. Its preferred wild prey species are **Himalayan blue sheep, Himalayan tahr, argali, markhor and wild goat.** It also preys on domestic livestock and small mammals such as **Himalayan marmot.**

DID WE KNOW? *Despite being called the snow 'leopard', this big cat is more closely related to the tiger than the leopard.*

Snow leopards become sexually mature at two to three years, and normally live for 15–18 years in the wild. In captivity they can live for up to 25 years. **A litter usually consists of two to three cubs, in exceptional cases also up to seven.**

ENDANGERED?

Poaching Has Led to The Species' Decline–There are worrying signs that poaching and illegal trade in snow leopards might be on the rise in large parts of the species' range. Poaching for their exquisite fur and highly valued bones has been a major threat to snow leopards across their range. The demand for rugs, luxury décor, and taxidermy, is also reported to be on the increase. Snow leopard bones have allegedly been used as substitute for tiger bones in traditional medicine. A 2015 study has established the presence of snow leopard DNA in traditional medicine products.

China's snow leopard crimes-

Among the 12 Himalayan-range countries, **China is home to the world's largest snow leopard population.** Research shows 60% of the world's snow leopards, classified as vulnerable to extinction by the International Union for the Conservation of Nature (IUCN), live in the high mountains in China. China is also the biggest market of illegal trade in snow

leopards, and the end destination of several global trade routes. **Data indicates China has by far the largest number of snow leopards poached – 103 to 236 per year.** Covered in thick white fur with black spots, snow leopards live in some of the highest mountain ranges and plateaus across Central and South Asia. There may be as few as 3,920 to 6,390 snow leopards remaining in the wild, though the actual number remains unknown, according to the Snow Leopard Trust, a Seattle-based organization working to protect the endangered animal. Among the 12 range countries, China is home to the world's largest snow leopard population. Research shows 60% of the world's snow leopards live on the high mountains in China, primarily throughout the Tibetan Plateau and on the northern side of the Himalaya.

China is also the biggest market of illegal snow leopard trade, according to research by the global wildlife trade monitoring group Traffic.

"Snow leopard body parts are used for multiple different purposes in China," said Debbie Banks, who leads the tiger and wildlife crime campaign at the Environmental Investigation Agency (EIA).

Banks said Chinese nationals they encountered at Kathmandu in Nepal were involved in tiger, leopard, snow leopard, musk, bear, pangolins, rhino, ivory, even seahorse trades. Many of them are buyers and people with licences to trade in yartsa gunbu trade, a caterpillar fungus that's highly prized for traditional Chinese medicine. They are also trading orchid species and other plants and fungi.

According to a 2020 petition by the World-Wide Fund for Nature, the number of snow leopards still alive is fast declining because of habitat loss, poaching (for their fur and bones), and "retaliatory" killings, which is when farmers kill wild animals who attack their livestock. All of this takes place across the 12 Central and South Asian countries which serve as their home. A predator, the snow leopard tends to live in the Alpine areas, above the tree line. There are an estimated 4,080 to 6,590 snow leopards left in 2022, per Animals Around the Globe, though estimates vary.

Competition With Livestock

When farmers move into the snow leopard's habitat, they often use the landscape for grazing land for their animals. This takes the land away from wild goats and sheep, limiting the big cat's prey and, again, forcing it to seek out domestic animals as food. Notably, a 2015 study published in Biological Conservation found that livestock grazing isn't always a threat to the snow leopard population unless the livestock herds become very large.

Climate Change

Like so many creatures on our planet, snow leopards are feeling the impact of climate change. The Snow Leopard Trust says that temperatures in the big cat's habitat in the mountains of Central Asia are rising. More than half of the world's remaining snow leopards are

threatened by climate change, with their habitat expected to be three degrees warmer by 2050.7 Warming affects everything from water to vegetation to the animals in the ecosystem. A 2012 study by the WWF published in Biological Conservation used computer modeling and tracking data to assess how various climate change scenarios could impact the snow leopard's habitat in the Himalayan Mountains. Researchers concluded that nearly one-third of the animal's habitat in the area could be lost due to a change in the treeline, but enough habitat could be maintained if the area was managed well.

The snow leopard, which has been listed on the **IUCN Red List** as Endangered since 1986, recently had its threat status downgraded to Vulnerable. **"However, its population continues to decline and it still faces a high risk of extinction through habitat loss and degradation, declines in prey, competition with livestock, persecution, and poaching for illegal wildlife trade,"** the IUCN reported. Many scientists and conservationists were quick to underscore the point made by the IUCN about the need for continued conservation efforts to reverse the snow leopards' ongoing decline and ensure the survival of the species, regardless of its status on the Red List. Indeed, some experts argue that moving the species from

Endangered to Vulnerable was not even justifiable based on the available evidence.

WHAT IS WWF INDIA DOING TO PROTECT SNOW LEOPARDS?

Some specific interventions are:

- Installation of predator proof livestock pens to reduce livestock loss and retaliatory killing of snow leopards
- Keeping a pulse of snow leopard population using robust monitoring tools
- Engaging local community, tourists & the Indian army to protect the snow leopard
- Enhancing and diversifying the livelihood opportunities for local communities, so that they benefit from sharing space with snow leopards

WHAT CAN WE DO TO SAVE THE SNOW LEOPARD?

There are small changes we can make right now in our everyday lives to protect nature & endangered wildlife. When we all come together to make these changes, they can make a big difference-

- **Be a responsible tourist** – Don't leave litter behind when you travel to the Himalayas. Plastic bottles, packaging wrappers cause havoc to the ecosystem and the wildlife that lives there.
- **Don't buy snow leopard products** – snow leopards are poached for their beautiful fur; they are also killed for their bones & meat. Say NO and report to concerned authorities to help stop this heinous illegal trade.

CONCLUSION

Working on this project enlightened me about the Snow Leopards, a rare family of big cats, who are almost on the verge on getting extinct. Wildlife conservation agencies must take an even wider step and spread awareness among the people in protecting this beautiful species.

- Without the snow leopards, the ecological balance would be disrupted. For example – herbivore populations will increase resulting in changes in the vegetation, that will affect other wildlife and also disrupt the important ecosystem services.

Hence, we look forward to a warmer environment for the gigantic beasts.

ENVIRONMENTAL STUDIES PROJECT

TOPIC - VISIT TO A LOCAL NOISE POLLUTED AREA- BEHALA, KOLKATA.

GOKHALE MEMORIAL GIRL'S COLLEGE

27

NAME OF CANDIDATE- DIYASREE DEY

SUBJECT- AECC 2

DEPARTMENT- ENGLISH DEPARTMENT

SEMESTER – 2

COLLEGE ROLL NO.- 21/BAH/0179

CU REGISTRATION NO. – 013-1211-0069-21

CU ROLL NO. – 212013-11-0051

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TOPIC: VISIT TO A LOCAL NOISE POLLUTED AREA – BEHALA

VISIT TO A LOCAL NOISE POLLUTED AREA- BEHALA.

Introduction

Definition of Pollution-

Pollution, or environmental pollution is the effect of undesirable changes in our surroundings that have harmful effects on plants, animals and human beings. This occurs when only short-term economic gains are made at the cost of the long-term ecological benefits for humanity. There is no natural phenomenon that has led to greater ecological changes than have been made by mankind. During the last few decades we have contaminated our air, water, and land on which life itself depends with a variety of waste products.

Pollutants include solid, liquid or gaseous substances present in greater than natural abundance produced due to human activity, which have a detrimental effect on our environment. The nature and concentration of a pollutant determines the severity of detrimental effects on human health. An average human requires about 12 kg of air each day, so nearly 12 to 15 times greater than the amount of food we eat. Thus even a small concentration of pollutants in the air becomes more significant in comparison to the similar levels present in food.

Pollution can be of different types – air pollution, water pollution, noise pollution, land pollution, thermal pollution, and many more. Some of them are stated below :-

- Air pollution- The air we breathe has a very exact chemical composition; 99% of it is made up of nitrogen, oxygen, water vapour and inert gases. Air pollution occurs when things that aren't normally there are added to the air. A common type of air pollution happens when people release particles into the air from burning fuels. This pollution looks like soot, containing millions of tiny particles, floating in the air.

- **Water pollution- Water pollution happens when chemicals or dangerous foreign substances are introduced to water, including chemicals, sewage, pesticides and fertilizers from agricultural runoff, or metals like lead or mercury. According to the Environmental Protection Agency (EPA), 44% of assessed stream miles, 64% of lakes and 30% of bay and estuarine areas are not clean enough for swimming or fishing. The EPA also states that the United States' most common contaminanats are bacteria, mercury, nitrogen and phosphorous. Theses come from the most common sources of contaminates, that include agricultural runoff, air deposition, water diversions, and channelization of streams.**

- **Noise pollution- Even though human cannot see or smell sound pollution, it still causes a huge amount of destruction in our environment. This happens when the sound coming from planes, industries or other resources reach harmful levels. Research has shown that there is direct links between noise and health, including stress related illness, hypertension, speech interference, hearing loss and many more. There are generally two types of noise pollution namely –**

  1. **Environmental noise- this is a noise that is produced by wide range of environmental happenings refers to environmental noise. It includes lighting and thunderstorms that often go up to 140 dB.**

  2. **Man-made noise- this is the type of noise that is created due to man-made activities refers to man- made noise. This includes - loudspeakers, vehicular traffic, household noise, construction work and so on. Ranging from 30 to a whopping 140 dB, this form of noise is extremely harmful to humans.**

NOISE POLLUTION IN BEHALA, KOLKATA-

Here, our main concern is Noise pollution that is affecting over hundreds of people in Kolkata, Behala area. The noise pollution in this area has been affecting the local people for a long duration of time. It is inferring with their day to day life and causing major health problems. These health problems can affect people of all age groups. Therefore,

we are going to discuss about the causes, effects and finally the remedial measures of Noise pollution in this particular area.

CAUSES OF NOISE POLLOTION IN BEHALA AREA :-

There are innumerable causes of Noise pollution, and some of them are:-

- Too many loudspeakers and microphones in the area frequently used either for political purposes or religious functions.
- Extremely loud honking of horns coming from passing cars causes serious hardship to patients in nearby hospitals, students in schools, and also causes sleep disturbance.
- Traffic, which accounts for most polluting noise in cities, is of regular occurrence in this area, serves as one of the major causes of noise pollution which interferes with the daily activities of the local people.
- Social events such as marriage, parties, public gatherings e.t.c. involve loudspeakers and music systems which produce unwanted noise in the area.
- Construction of buildings, houses, bridges, roads e.t.c. also produce unwanted noise which affect several people living nearby.
- Crowds and gatherings are another important source of noise pollution.
- The noise made by animals like howling or barking of dogs cannot go unnoticed. These can produce noise around 60-80 dB.
- Household gadgets like mixer grinder, T.V., pressure cooker, vacuum cleaners, air conditioner e.t.c are minor contributors to the amount of noise that is produced. But still it affects the quality of life people in a neighbourhood in this area.

EFFECTS OF NOISE POLLUTION:-

EFFECTS OF NOISE POLLUTION ON HUMANS-

Noise pollution, as mentioned before , cannot be seen, it is an invisible danger but causes tremendous level of destruction. It is one of the biggest health risks in city life, and it impacts thousands of people on a daily basis. Some of the effects of Noise pollution on health are :-

- Hearing difficulties – It is one of the most common effects of Noise pollution. Any unwanted noise that human ears have not been assembled to filter can cause hearing difficulties. Man –made sources like traffic, construction e.t.c. are too loud for normal hearing range, and prolonged exposure to loud levels of noise can result in the damage of eardrums and ultimately hearing loss. Additionally, it can decrease sensitivity of human ears to sound.

- Sleeping Disorders – extreme levels of noise can disturb the sleeping pattern of an individual and can lead to uncomfortable and irritating situations. For instance, loud music in weddings, late-night parties, loudspeakers e.t.c. can affect neighbour's sleep, and make them feel fatigued and tired over the next entire day.

- Cardiovascular Problems- The high-intensity noise can cause heartbeat rate to increase and blood pressure increase as well. It is because extensive sound interrupts the normal blood flow and results in the risk of Cardiovascular diseases.

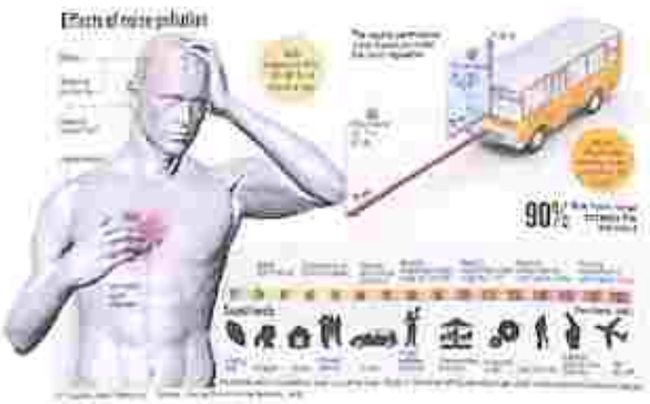
- Cognitive issues and Behavioural change - Nose affects brain responses and people's ability to focus, which can lead to low-performance levels over time. Too loud noise goes to our brain which leads to lower response rates as well as making the mind dull, and it is also poor for memory, ,making it hard for students to study.

- Physical problems - Noise pollution can cause headaches, high blood pressure, racing pulse, respiratory agitation, and continuous

exposure to extremely loud noise can cause gastritis, colitis and even heart attacks.

- Psychological issues – Excessive noise pollution can influence psychological health. For example- the occurrence of aggressive behaviour, disturbance of sleep, constant stress, fatigue, depression, hysteria and hypertension in humans as well as animals can be linked to excessive noise levels in the environment.

- Trouble communication - High decibel noise can put trouble and affect free communication and may not allow people to communicate easily. Constant loud noise can also give you severe headache and disturb your emotional balance.



EFFECTS ON ANIMALS :-

Animals depend heavily on sounds to communicate, to find food, avoid predators e.t.c. Pets like dogs and house cats react more aggressively due to exposure to constant noise. They become disoriented more easily and face several behavioural problems. Overexposure to high intensity of noise affects the hearing ability of many animals. Moreover, Man-made noise affects mating calls and echolocation. This leads to reduction in survival and reproduction rates. At an ecosystem level, noise pollution could even lead to migration of animals. And their migration can affect the crop production.

STEPS TO CONTROL NOISE POLLUTION IN THIS AREA :-

- By installing noisy machines in sound proof chambers.
- Using silencers to control noise from automobiles, ducts, exhausts e.t.c.
- By shutting doors and windows when using noisy household gadgets.
- Lowering speed limits especially and making road surfaces better to reduce traffic noise.
- Encouraging walking and biking in order to cut down on traffic noise as well.
- Planting of trees and shrubs along roads, hospitals, educational institutions e.t.c to reduce noise to a considerable extent.
- There should be silence zones near residential areas, educational institutions and most importantly near hospitals. Zoning of noisy industrial areas, bus stops e.t.s away from the residential areas i.e increasing the distance between the source and receiver.
- Minimum use of loudspeakers and amplifiers especially near silence zones like hospitals, educational institutions and residential areas.
- Banning pressure horns in automobiles.

- **Educating people more about the harmful and fatal effects of noise pollution.**

CONCLUSION-

In conclusion, noise pollution is unwanted or excessive sound that can have deleterious effects on human health, wildlife, and environmental quality. It impacts millions of people daily. And this noise pollution, as mentioned before, is affecting over hundreds of people in Behala. It interferes with their day to day life and causes several health problems. Causes of noise pollution in this area are innumerable, for instance, vehicular traffic, social events such as weddings, parties, loudspeakers, household chores and many more. And the high intensity sounds from these sources have several

effects on human health. Some of the effects of noise pollution are – sleeping disorders, hearing difficulties, cardiovascular issues e.t.c. in order to control the noise pollution in this area, people need to plant more trees and shrubs along roads, hospitals and educational institutions, banning pressure horns in automobiles and many more but most importantly educating people more about the harmful effects of noise pollution.

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ENVS PROJECT

23

Topic -Study of pond ecosystem

Gokhale Memorial Girls'College

Name- Srija Kar

Semester -2

Roll no.- 212013-11-0056

Registration no.- 013-1211-0074-21

ENGA

CONTENTS

INTRODUCTION

An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the non-living environment, interacting as a functional unit. Remember that the organisms living in an ecosystem are broken down into categories: producers, consumers, and decomposer.

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.

Ponds are common landscape elements which play important role in the global processes of biosphere and preservation of biodiversity. The roles of ponds in supporting aquatic biodiversity are just as important as rivers and large lakes. They provide unique habitat islands for a diverse range of aquatic species. Researchers have ascertained that ponds are important biodiversity hotspots both in relation to species composition and biological traits, and they play significant role in terms of providing ecosystem services. Ponds located even in close proximity to each other display quite different hydrologic behaviour, exhibiting different pond types and different environment associated with each pond. Small water bodies display a broader range of physicochemical characteristics than rivers and large lakes. This is because small water bodies, such as ponds, are more easily formed in a variety of landscapes. Local conditions which include geology, altitude and land cover of the catchment area greatly influence characteristics of the ponds. Moreover, these water bodies are fed from small catchment areas. Thus, ponds tend to show different characteristics in a region, even if they are relatively close to each other. Terrestrial biota also benefit from the high productivity of ponds. There are numerous instances of interactions at the aquatic-terrestrial interface. Thus, ponds not only enhance biodiversity of aquatic organisms, but also of terrestrial organisms that directly depend on aquatic ecosystems.

a lake or pond. The Different zones are as follows:

I. Littoral
II. Limnetic
III. Pro-fundal

- Littoral zone – It is the shallow water region which is usually occupied by rooted plants.

- 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.

- Pro-fundal zone- It is the deep-water parts where there is no effective light

Components of ecosystem

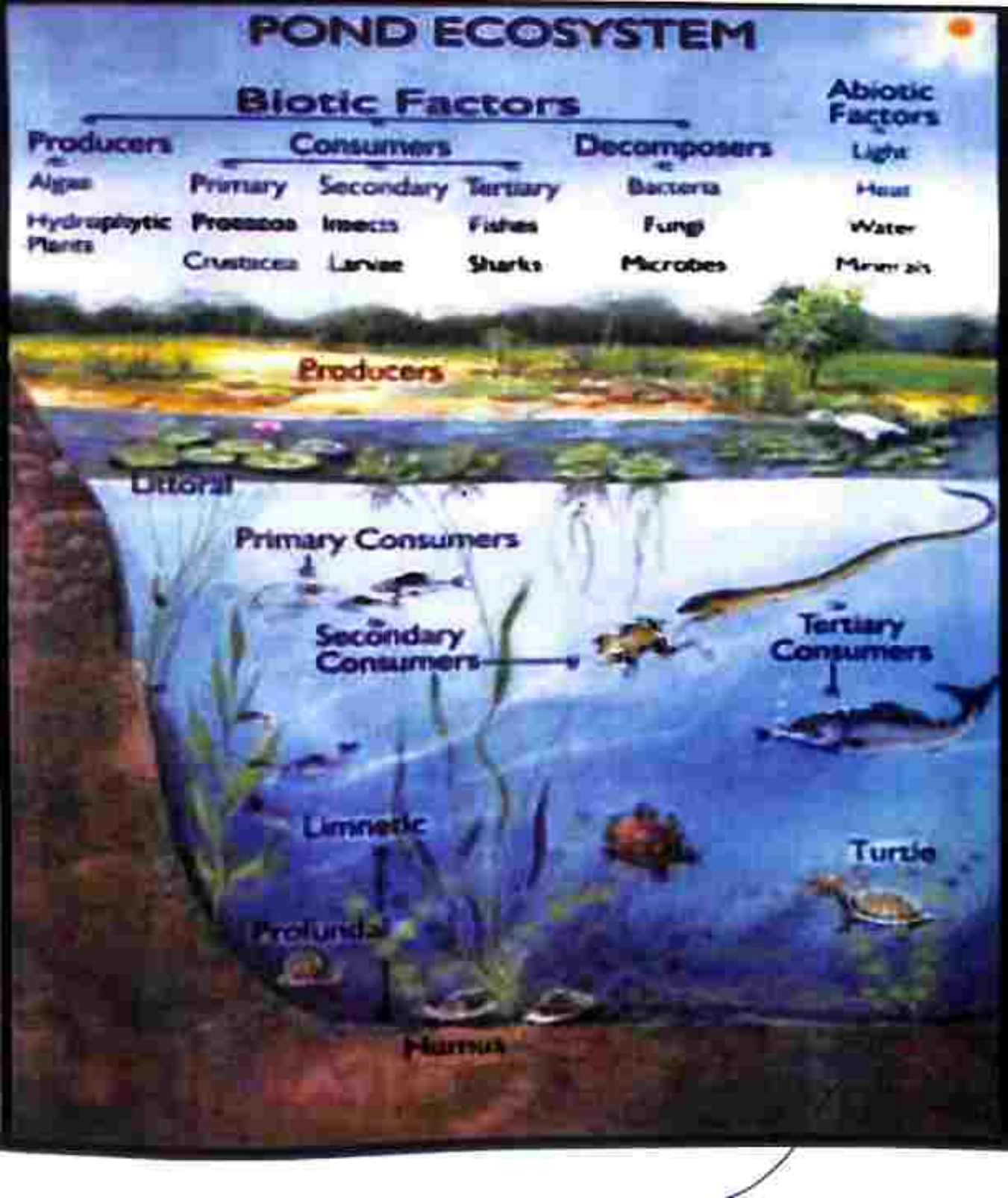
Two main components of pond ecosystems are as follows-

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.


POND ECOSYSTEM
Biotic Factors
Abiotic Factors
Producers
Consumers
Decomposers
Primary
Secondary
Tertiary
Algae
Hydrophytic Plants
Protozoa
Crustacea
Insects
Larvae
Fishes
Sharks
Bacteria
Fungi
Microbes
Light
Heat
Water
Minerals
Producers
Littoral
Primary Consumers
Secondary Consumers
Tertiary Consumers
Limnetic
Turtle
Profundal
Humus

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.

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

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

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

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

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

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15/5/22

ENVIRONMENTAL STUDIES PROJECT

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

SUBTOPIC: STUDY OF COMMON BIRDS

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COLLEGE ROLL NO: 21/BAH/0189

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C.U REGISTRATION NO: 013-1211-0075-21

SUBJECT: AECC2

STREAM: ENGLISH HONOURS

SEMESTER: SECOND SEMESTER

COLLEGE : GOKHALE MEMORIAL GIRLS' COLLEGE

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ACKNOWLEDGEMENT

I would like to thank our respected Professor Rajkumar Barman for guiding us in this project. I would also like to thank our Principal Ma'am for providing us the opportunity to present a project on this topic. I thoroughly enjoyed working on this project because I was able to find out many new things and learn about it.

BIRDS

Birds are a group of warm-blooded vertebrates constituting the class Aves characterized by feathers, toothless beaked jaws, the laying of hard-shelled eggs, a high metabolic rate, a four-chambered heart, and a strong yet lightweight skeleton. There are about ten thousand living species, more than half of which are passerine, or

"perching" birds. Birds have wings whose development varies according to species; the only known groups without wings are the extinct moa and elephant birds. Wings, which evolved from forelimbs, gave birds the ability to fly, although further evolution has led to the loss of flight in some birds, including ratites, penguins, and diverse endemic island species. The digestive and respiratory systems of birds are also uniquely adapted for flight. Some bird species of aquatic environments, particularly seabirds and some water birds, have further evolved for swimming.

SCIENTIFIC CLASSIFICATION OF BIRDS

KINGDOM	ANIMALIA
PHYLUM	CHORDATA
CLADE	SAUROPSIDA
CLASS	AVES

There are birds of different species. There is a huge variety of birds present in India. Most of the birds are tropical birds and some of the birds are migratory. These migratory birds fly from far off distances to travel to India in winter season. These birds stay for two months in the country to avoid the harsh cold in their native lands. But in this paper, we are going to observe the most common birds

found in the city of **Durgapur, West Bengal**. Durgapur is situated geographically between the Chhotanagpur plateau and the Gangetic plains.

1. **House sparrow:**

House Sparrows are noisy sparrows that flutter down from eaves and fencerows to hop and peck at crumbs or birdseed. Look for them flying in and out of nest holes hidden behind shop signs or in traffic lights, or hanging around parking lots waiting for crumbs and picking insects off car grills .The house sparrow is a bird of the sparrow family Passeridae, found in most parts of the world. It is a small bird that has a typical length of 16 cm (6.3 in) and a mass of 24–39.5 g. Females and young birds are colored pale brown and grey, and males have brighter black, white, and brown markings. These birds are very common in Durgapur. They mainly feed on grains.

Identification: These birds can be distinguished by their bright and vibrant colours. The male sparrows are brightly colored birds with gray heads, white cheeks, a black bib, and rufous neck – although in cities you may see some that are dull and grubby. Females are a plain buffy-brown overall with dingy gray-brown underparts. Their backs are noticeably striped with buff, black, and brown. These tiny creatures can also be identified by their behavioral patterns. House Sparrows are noisy sparrows that flutter down from eaves and fencerows to

House Sparrows are noisy sparrows that flutter down from eaves and fencerows to hop and peck at crumbs or birdseed. Look for them flying in and out of nest holes hidden behind shop signs or in traffic lights, or hanging around parking lots waiting for crumbs and picking insects off car grills. House Sparrows have lived around humans for centuries. Look for them on city streets, taking handouts in parks and zoos, or cheeping from a perch on your roof or trees in your yard.

2. <u>Rock Dove</u>:

The Rock Dove is also known as pigeon. This bird was actually a wild bird but years of domestication have greatly altered their nature and habits. Feral pigeons, which have escaped domestication throughout history, have significant variations in plumage. When not specified, descriptions are for assumed wild type, though the wild type may be on the verge of extinction or already extinct. Feral pigeons can be seen eating grass seeds and berries in parks and gardens in the spring, but plentiful sources exist throughout the year from scavenging (e.g., food remnants left inside of dropped fast food cartons) and they also eat insects and spiders. Additional food is also usually available from waste bins, tourists or residents who feed bird seed to pigeons for reasons such as empathy, fun,

Feral pigeons can be seen eating grass seeds and berries in

parks and gardens in the spring, but plentiful sources exist throughout the year from scavenging (e.g., food remnants left inside of dropped fast food cartons) and they also eat insects and spiders. Additional food is also usually available from waste bins, tourists or residents who feed bird seed to pigeons for reasons such as empathy, fun, tradition and as a means for social interaction.

Identification: The adult female is almost identical in outward appearance to the male, but the iridescence on her neck is less intense and more restricted to the rear and sides, whereas that on the breast is often very obscure. The white lower back of the pure rock dove is its best identification characteristic; the two black bars on its pale grey wings are also distinctive. The tail has a black band on the end, and the outer web of the tail feathers are margined with white. It is strong and quick on the wing, dashing out from sea caves, flying low over the water, its lighter grey rump showing well from above. The white lower back of the pure rock dove is its best identification characteristic; the two black bars on its pale grey wings are also distinctive. The tail has a black band on the end, and the outer web of

the tail feathers are margined with white. It is strong and quick on the wing, dashing out from sea caves, flying low over the water, its lighter grey rump showing well from above.

Young birds show little lustre and are duller. Eye colour of the pigeon is generally orange, but a few pigeons may have white-grey eyes. The eyelids are orange and encapsulated in a grey-white eye ring. The feet are red to pink.

RISKS FACED BY THE COMMONLY SEEN BIRDS

- Sparrows face great danger from loss of habitat due to rapid urbanization, diminishing ecological resources for sustenance, high level of pollution and emissions from microwave towers.
- Ventilators in houses have now been replaced by Air conditioners and living plants with decorative and ornamental bonsais making it impossible for the sparrows to build their nests
- Sparrows face a huge deal of risk from the mobile network towers. The radiation emitted from these towers are fatal to the sparrow pollution.

- Harmful gases and chemicals emitted from factories also lead to the decrease in the sparrow population.
- In the wild, these common pigeons are seen around cliffs and rocky areas, their preferred option for nesting. But their urban cousins have no dearth of choices: parapets, AC compressor units and similar flat surfaces in city buildings.

Hence we can conclude that these birds face maximum danger from increasing urbanization. The urban sphere prevents these birds from building nests and living safely in their houses. Although Durgapur is an industrial city yet due to certain reasons the sparrow population is not depleted. One can often find sparrows and pigeons sitting on their verandah and chirping joyfully!

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PROJECT ON ENVIRONMENTAL STUDIES

STUDY ON RIVER ECOSYSTEM

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UNIVERSITY ROLL NUMBER : 212-11-0058

UNIVERSITY REGISTRATION NUMBER :

013-1211-0076-21

COLLEGE : GOKHALE MEMORIAL GIRLS' COLLEGE

CONTENTS :

Introduction

An ecosystem is a geographic area where plants, animals, and other organisms, as well as weather and landscape, work together to form a bubble of life. Ecosystems contain biotic or living, parts, as well as abiotic factors, or nonliving parts. Biotic factors include plants, animals, and other organisms. Abiotic factors include rocks, temperature, and humidity.

Every factor in an ecosystem depends on every other factor, either directly or indirectly. A change in the temperature of an ecosystem will often affect what plants will grow there, for instance. Animals that depend on plants for food and shelter will have to adapt to the changes, move to another ecosystem, or perish.

ECOLOGY AND ECOSYSTEM

River ecosystems are flowing waters that drain the landscape, and include the biotic (living) interactions amongst plants, animals and micro-organisms, as well as abiotic (nonliving) physical and chemical interactions of its many parts.[1][2] River ecosystems are part of larger watershed networks or catchments, where smaller headwater streams drain into mid-size streams, which progressively drain into larger river networks. The major zones in river ecosystems are determined by

the river bed's gradient or by the velocity of the current. Faster moving turbulent water typically contains greater concentrations of dissolved oxygen, which supports greater biodiversity than the slow-moving water of pools. These distinctions form the basis for the division of rivers into upland and lowland rivers.

River ecosystems drain the landscape through hierarchical series of fluvial channels, beginning with small headwater streams, and enlarging, ultimately, to estuaries meeting the sea. Several conceptual models provide unifying concepts about the connections of rivers with the landscape in terms of ecosystem properties such as processing of energy and matter, habitat, biodiversity, and resilience in the face of disturbance. Major groups of riverine biota are described. Human activities pose threats to river ecosystems, including placing land from forests, grasslands, and wetlands into urban or agricultural uses, dams, pollutant loadings, alteration of natural drainage characteristics, introduced species, overharvesting, and climate change.

COMPONENTS OF ECOSYSTEM

Three components of ecosystems are generally recognized:

- **Energy component**
- **Biotic component.**
- **Abiotic component**

- ## ENERGY COMPONENT

Energy is defined as the ability to work. Energy is the most important component of an ecosystem because it is the essence of life. Without energy transfer there could not be any life and no ecological systems. The energy used for all the life processes is derived from the sun. Radient energy travels from the sun to the earth through space in the form of waves. This energy is used by plants and animals to sustain life.

- ## BIOTIC COMPONENT

This topic explains about the **ecosystem** and the **components of ecosystem**. An ecosystem is a group or community composed of living and non-living things and their interactions with each other. They can be natural as well as artificial. Every ecosystem has two components, namely, biotic components and abiotic components. Biotic components refer to all living organisms in an ecology while

abiotically refers to the non-living things. These biotic and abiotic interactions maintain the equilibrium in the environment. Let's go through the components of the ecosystem in detail.

- **ABIOTIC COMPONENT**

Abiotic components of an ecosystem include all chemical and physical elements i.e. non-living components. Abiotic components can vary from region to region, from one ecosystem to another. They mainly take up the role of life supporter. They determine and restrict the population growth, number, and diversity of biotic factors in an ecosystem. Hence, they are called limiting factors.

The significance of Biotic and Abiotic Components
Biotic components can be classified into three categories:

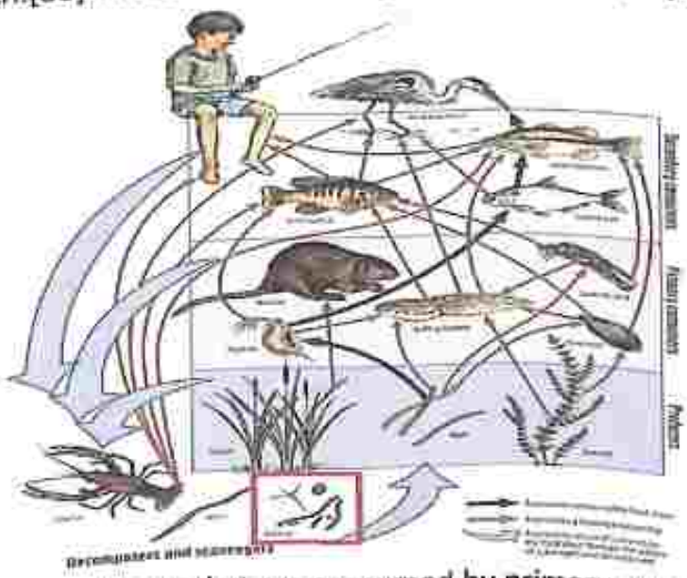
Producers: These include all the autotrophs. They use light energy and synthesize food on their own, e.g. plants, green algae, etc.

Consumers: These include all the heterotrophs that directly or indirectly depend on producers for their food. Consumers are further categorized as herbivores, carnivores, omnivores and parasites.

Decomposers: These include saprophytes which act on dead matter and decay them for their nutrition.

The relevance of biotic and abiotic components in an environment appears when they start interacting with each other. For example, biotic elements like plants provide food for other organisms. The soil is the abiotic element which supports the growth of the plants by providing nutrients and other essential elements. Biotic components depend on abiotic components for their survival and help in the formation of abiotic factors like soil, nutrients, etc.

CYCLE IN RIVER ECOSYSTEM : A food chain is a linear system of links that is part of a food web, and represents the order in which organisms are consumed from one trophic level to the next. Each link in a food chain is associated with a trophic level in the ecosystem. The numbered steps it takes for the initial source of energy starting from the bottom to reach the top of the food web is called the food chain length.[33] While food chain lengths can fluctuate, aquatic ecosystems



start with primary producers that are consumed by primary consumers which are consumed by secondary consumers, and those in turn can be consumed by tertiary consumers so on and so forth until the top of the food chain has been reached.Diversity, productivity, species richness, composition and stability are all interconnected by a series of feedback loops. Communities can have a series of complex, direct and/or indirect, responses to major changes in biodiversity.[35] Food webs can include a wide array of variables, the three main variables ecologists look at regarding ecosystems include species richness, biomass of productivity and stability/resistant to change.[35] When a species is added or removed from an ecosystem it will have an effect on the remaining food web, the intensity of this effect is related to species connectedness and food web robustness.[38] When a new species is added to a river ecosystem the intensity of the effect is related to the robustness or resistance to change of the current food web.[38] When a species is removed from a river ecosystem the intensity of the effect is related to the connectedness of the species to the food web.

Migratory fish such as alewife, salmon, trout, and striped bass

Invertebrates that provide food for fish

Protected, endangered, and threatened species

Different areas of rivers provide habitat for different types of species. Trout thrive in highland streams, while catfish lurk near the bottom of slow-moving water. Migrating fish, like salmon, swim up to cooler, stony beds to reproduce. Floodplains provide calm shallow waters, allowing fish to grow larger before swimming out to sea.

Even the smallest fish play an important role in the ecosystem. "Forage fish" like river herring swim upstream to multiply. They then head out to sea, providing food for important recreational and commercial species, such as cod, haddock, and striped bass.

CONCLUSION

The Aquatic biodiversity is a primary concept in environmental analysis. It encompasses most of the freshwater ecosystems, including lakes, ponds, and reservoirs, rivers and streams, groundwater, and the wetlands. Aquatic ecosystems also provide a home to many species including the phytoplankton, zooplankton, aquatic plants, insects, fish, birds, mammals, and others. They are organized at many levels, from the smallest building blocks of life to complete ecosystems, encompassing communities, populations, species, and genetic levels. In summary, aquatic biodiversity includes all unique species and habitats, and the interaction between them. It has enormous economic and aesthetic value and is largely responsible for maintaining the overall environment. Humans have long depended on aquatic resources for food, medicines, and materials as well as 6 for recreational and commercial purposes such as fishing and tourism. Aquatic organisms also rely upon the great diversity of resources existing in rivers for their food, materials, and breeding. Several Factors affect these conditions. They are overexploitation of species, introduction of exotic species, pollution from urban, industrial, and agricultural activities, as well as the habitat loss and alteration through damming, and diversion of water into other places. All these contribute to the declining levels of aquatic biodiversity, especially the freshwater ecosystems. It is necessary to adopt certain conservation strategies to protect and conserve the aquatic life .

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ENVIRONMENTAL STUDIES PROJECT

27

TOPIC-STUDY OF ECOSYSTEM

SUBTOPIC-STUDY OF WETLAND ECOSYSTEM

RITAMBHARA SAMANTA

ENGLISH DEPARTMENT

SEMESTER-2

COLLEGE ROLL: 21/BAH/0194

UNIVERSITY ROLL: 212013-11-0060

UNIVERSITY REGISTRATION NUMBER: 013-1211-0078-21

AECC-2 PAPER

COLLEGE- GOKHALE MEMORIAL GIRLS' COLLEGE

Index

• 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.

Waterlogged soil adapted plant life(hydrophyte), and hydric soils (not enough 02) are the chief characteristics of wetlands.

India has over 27,000 wetlands, of which 23,000+ are inland wetlands, and around 4000 are coastal wetlands.

Wetlands occupy 18.4% of the country's area of which 70% are under paddy cultivation.

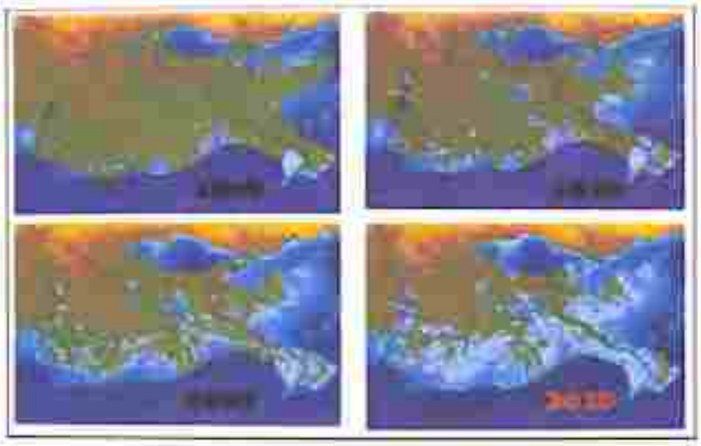
• Importance of Wetlands

- Production of fish, fruits and grains
- Storage and retention of water for domestic, industrial and agricultural use.
- Production of logs, fuelwoods etc.
- Extraction of medicines.
- Source of and sink for greenhouse gases; influence local and regional temperature.
- Groundwater recharge/discharge.
- Retention, recovery and removal of excess nutrients and other pollutants.
- Flood control, storm protection.
- Opportunities for recreational activities
- Many people find beauty or aesthetic value in aspects of wetland ecosystems.
- Opportunities for formal and informal education and training.
- Storage, recycling, processing and acquisition of nutrients.

• Reasons for Depletion

- Excessive pollutants (Industrial effluents, domestic waste, agricultural runoff etc.) are dumped into wetlands beyond the recycling capacity.

- Habitat destruction and deforestation create ecological imbalance by altering the population of wetland species.
- Conversion of wetlands for agricultural and encroachment by public and mafia.
- Overfishing and fish farming (Aquaculture).
- Overgrazing in marshy soils.
- Removal of sand from beds near seas makes the wetland vulnerable to wave action and tidal bore.



• Mitigation

- ✓ Demarcation of wetlands using the satellite technology, proper enforcement of laws and stringent punishments for violators.
- ✓ Preventing unsustainable aquaculture
- ✓ Treating industrial effluents and water from farmlands before discharging into wetlands.
- ✓ Afforestation, weed control, preventing invasion species (water hyacinth) is the key to wetland conservation: Water Hyacinth -> Low Sunlight -> DO drops -> killing the fishes and other aquatic beings in the water bodies.
- ✓ Preventing grazing in peripherals of wetlands (Mangroves and Kharai Camel)
- ✓ Wildlife conservation, sustainable tourism, ecotourism and sensitizing local populace.
- ✓ Eutrophication abatement by processing nutrient rich discharge into the water body.
- ✓ Involving the local population in the conservation of wetlands

• Ramsar Convention

- 64% of the world's wetlands have disappeared in the last century
- International treaty for "the conservation and sustainable use of wetland".
- It is also known as the Convention on wetlands.
- It is named after the city of Ramsar in Iran.
- The Convention was signed on 2nd of February, 1971.
- The 2nd of February each year is World Wetlands Day.
- Number of parties to the convention (COP) is 169.

- At the centre of the Ramsar philosophy is the "wise use" of wetlands.
- Wise use: maintenance of ecological character within the context of sustainable development.
- 3 Pillars:
    1. Wise use
    2. Identification of priority wetlands as Ramsar Sites
    3. International Cooperation

- The Ramsar Convention works closely with six organisations known as International Organization Partners (IOPs). These are:
    1. Birdlife International (Bombay Natural History Society looks after bird census in India)
    2. International Union for Conservation of Nature (IUCN)
    3. International Water Management Institute (IWMI)
    4. Wetlands International
    5. International Wildfowl & Wetlands Trust (WWT)
- Other Partners
    - Convention on Biological Diversity (CBD)
    - Convention to Combat Desertification (UNCCD)
    - Convention on the Conservation of Migratory Species of Wild Animals
    - World Heritage Convention (WHC) and
    - Convention on International Trade in Endangered Species (CITES).

• Criteria for Identification of Wetland as a Ramsar Site: if a wetland

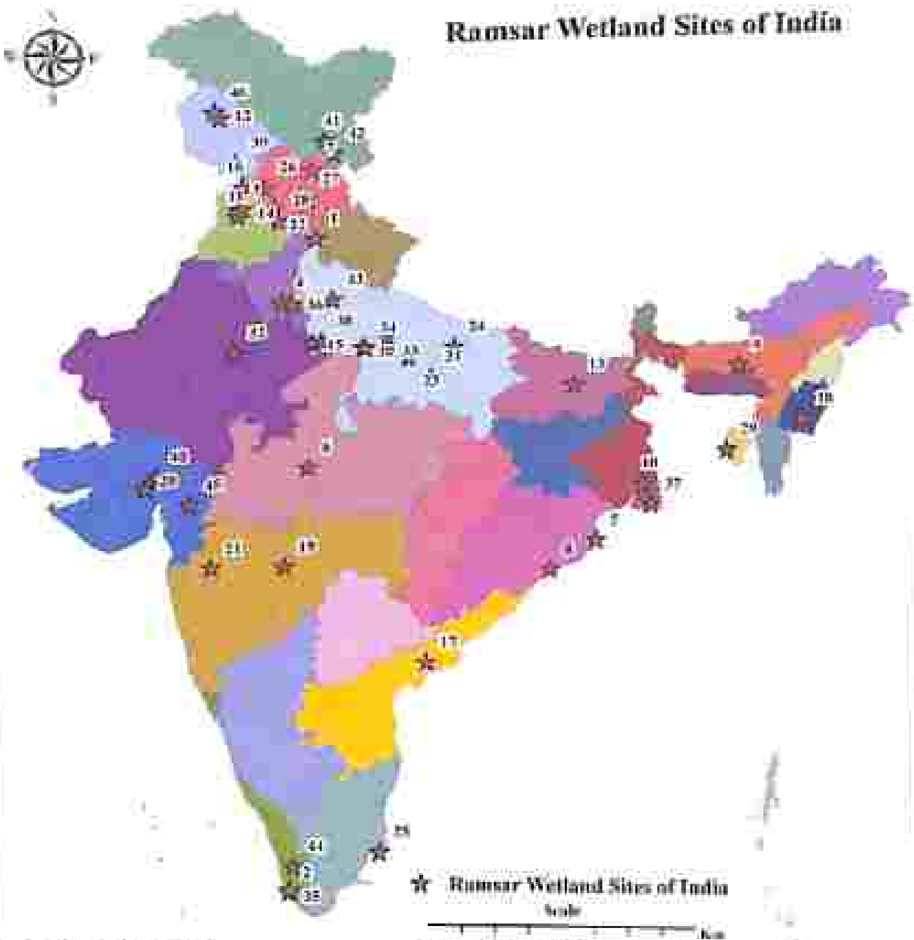
- Contains a representative, rare, or unique example of a natural or near-natural wetland type for that biogeographic region.
- Supports vulnerable, endangered, or critically endangered species; or threatened ecological communities.
- Supports populations of plant and /or animal species important for maintaining the biological diversity of a particular biogeographic region.
- Supports plant and/or animal species at a critical stage in their life cycles or provides refuge during adverse conditions.
- Regularly supports 20,000 or more water birds.
- Regularly supports 1% of the individuals in a population of one species or subspecies of water birds.
- Supports a significant proportion of indigenous fish subspecies.

- The Montreux Record is a register of wetland sites on the list of wetlands of international importance where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference.
    - It is maintained as part of the Ramsar List.

- ✓ Loktak, Keoladeo in India are mentioned under it.
- ✓ Chilika too was mentioned but has recovered and hence removed from it.

• RAMSAR Wetland Sites of India

Sl. No.	Name of Site	State Location	Date of Declaration	Areas (in Sq. km.)
1	Asan Conservation Reserve	Uttarakhand	21.7.2020	4.444
2	Asthamudi Wetland	Kerala	19.08.2002	614
3	Beas Conservation Reserve	Punjab	26.09.2019	64.289
4	Bhitarkanika Mangroves	Orissa	19.08.2002	650
5	Bhoj Wetlands	Madhya Pradesh	19.08.2002	32.01
6	Chandertal Wetland	Himachal Pradesh	08.11.2005	0.49
7	Chilka Lake	Orissa	01.10.1981	1165
8	Deepor Beel	Assam	19.08.2002	40
9	East Kolkata Wetlands	West Bengal	19.08.2002	125



Source: rsis.ramsar.org

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ENVIS Resource Partner
Wildlife and Protected Areas
2021
Wildlife Institute of India

Conclusion

Wetlands vacuum all the dirt from the earth surface and keep the environment clean.

Unfortunately, they are filled up for the construction of buildings by contractors. The more wetlands are decreasing the more environmental concerns are increasing. That is why I have chosen this topic to throw some light on the burning concern of decreasing wetlands and its impact on ecosystem.

15/6/22

ENVIRONMENTAL STUDIES PROJECT

TOPIC - INSECTS - HONEY BEES OF INDIA

SRIJANI GANGULY

SEMESTER 2

COLLEGE ROLL NO. - 21/BAH/0201

UNIVERSITY ROLL NO. - 212013-11-0064

UNIVERSITY REGISTRATION NO.- 013-1211-0082-21

AECC 2 PAPER

COLLEGE - GOKHALE MEMORIAL GIRLS' COLLEGE

Content

1. Introduction

Honey bees are one of the most common insects that can be seen in India and also are one of the species having a pivotal importance in both ecological as well economic frame of reference. In this paper the species of honey bees that are found in the Indian subcontinent are discussed along with their contribution to the ecosystem and economics of india. The issue of the drastic fall in their population has been analyzed through the lenses of causes, prevention and impact. India has the highest count of beehives adding up to about 12.2 million.

2. The honey bees in india

There are a total of six species of honey bees that are of commercial importance. To mention their name, they are -

- Rock bee
- The Himalayan species
- Indian hive bee
- Dwarf bee
- European or Italian bee
- Dammer or Stingless bee.

2.1 Rock Bee

Apis dorsata, also known as the rock bee or the giant honey bee, is mainly found in south and southeast Asia. Nests (hives) are built in exposed areas off the ground. They are social insects and are known for hostile behavior and aggressive defense against any other animal. The species falls under the family Apidae, of the class Insecta.

Apis dorsata looks very similar to *Apis mellifera* however A. dorsata are much larger in size. The workers can be 3 cm long which is almost double the size of *A. mellifera.* This is why they are called giant bees. The queen and drones of the colony are slightly bigger in size. The queen has a larger abdomen and is darker in color. The drones have a short round abdomen and large eyes. The workers have a pollen basket (corbiculum) on their hind legs. These have orange and yellow anterior abdominal segments and have darker thoracic hair.

2.2 The Himalayan Species

Apis laboriosa, the Himalayan giant honey bee, is the largest in the world. Before 1980, Apis laboriosa was considered as a subspecies of *Apis dorsata*. However, it was later elevated to the rank of a new species altogether. It is very well adapted to the highland habitat that they belong to. Though they have almost similar morphology to the subspecies of dorsata, these need to have a completely different housekeeping style and swarming behavior.

This particular species has a completely dark abdomen with long golden thoracic hair. They have a size similar to apis dorsata or might be slightly bigger at times. Both these species can be distinguished by the difference in the color of their abdomen and hair.

2.3 Indian honey Bee

Apis cerana indica, popularly known as the Indian honey bee, is actually a subspecies of the Asiatic honey bee. They are the most commonly found in the Indian subcontinent and also the neighboring countries. They can be domesticated due to their relatively less aggressive nature. They are extensively used for beekeeping. They have pretty flexible nests which are sustainable even in temperate or mountainous areas having freezing winters. Their hives are usually made in tree hollows, man made structures. These honey bees have a body size of about 9 mm. The legs of the female worker bees are of rusty color. These are also a primary host of the parasitic mites *Varroa jacobsoni* and *V. destructor*.

2.4 Dwarf Bee

The Dwarf honey bee, scientifically named *Apis florea*, is one of the two small and wide species of honey bees of southern and south western Asia. These bees are unique in their morphology, behavior of quest for food, defense mechanism, etc. They have open nests and hence have a large number of defense workers due to an increased threat of predation. *A. florea* belongs to the genus named Apis. The name Florea is of Romanian origin.

Dwarf bees are around 7 to 10 mm long with an overall colouration of reddish brown. The drones have a thumb-like bifurcation that is located two-thirds along the length of the tibia. This is called basitarsus. The fimbrate lobe of this species has three protrusion and they sting using two stylet barbs. Adult A. florea is redder and has a red first abdomen.

2.5 European or Italian Bee

Apis mellifera, the western or European honey bee, is one the most common among all species of honey bees worldwide. This is one of the preliminary species of insects that was domesticated by human beings. These bees can be found all over the globe except Antarctica. They seem to have originated in Africa and thereafter spread through Asia, the Middle East, Europe and America.

This particular species of bees are red or brown with black bands and orange and yellow rings on the abdomen. They have a hairy thorax but do not have much hair on the abdomen. They also have a pollen basket on their hind legs. The female worker bees are smaller, ranging from 10mm to 15 mm in size. The fertile queen is larger, about 18-20 mm. The male drone is around 15-17 mm in size.

2.6 Dammer or Stingless Bee

The Indian Stingless bee or dammar bee is scientifically named *Tetragonula iridipennis*. The species belongs to the family Apidae, and subfamily Apinae. This species belongs to the complex genus *Tetragonula* of stingless bees that consist of more than 30 species from the Indian subcontinent. For centuries, the colonies of these bees have been kept in objects like clay pots . The reason behind this practice is that their honey has a high medicinal quality and colonizing the bees like this can be helpful in utilizing it effectively.

Indian Stingless bees range from about 3.5 to 4 mm in length. This species can be distinguished by a dark mesoscutum with four distinct hair bands separated by broad glabrous interspaces. They also have a chestnut brown coloured mandible which does not have a black apical area and a few dark brown erect setae on the margin of the scutella. Size difference as well as male genitalia are key in identifying the species. They are relatively small in size and the male penis valve is very robust and tapers at the apex. This also aids in distinguishing the two sexes as they are similar in size and color.

3. The Contribution of Bees in Ecosystem

Bees play a significantly important role in maintaining the ecological balance. The pivotal roles that bees play in the ecosystem are -

- Pollination

Bees are one of the most eminent pollinators of nature. The agricultural outcomes are highly dependent on the efficiency of the pollinators. The pollinating agents are instrumental in aiding cross pollination. The repeated inbreeding can have negative outcomes on the further generations. Bees can help prevent that.

- Wild plant growth

Just like the agricultural production is dependent on the bees, wild plants are equally dependent on the bees. The fertilization of a wildflower is done by the bees that pick the pollen from the anthers of a plant and transfer it to the stigma of another plant. The bees pollinate in the process of collecting nectar for producing honey.

- Food source

The honey that the honey bees make are a food source not only to the larvae of the bees but are also food sources to the wild animals like bears, birds and other insects. Honey is also a source of food to human beings.

Honey Badger

- Producing medicine

The medicinal qualities of honey are known to all. The rich antioxidant properties of honey are helpful in regulating blood pressure. Honey also has antibacterial qualities that make it suitable for application in case of an infection or an area prone to infection. It also has antifungal and nutritional properties to itself.

- Growth in wildlife habitat

The growth in the wild plants, the habitats to several wildlife is made. This helps to reduce the drastically increasing loss of wild habitat due to rapid hike in deforestation. This in turn helps in the prevention of many species from extinction.

- Biodiversity

The cross pollination leads to the increase in not only the number of plants both wild and agricultural, it also helps in the rise of animal, bird, and insect species. This helps to increase and maintain the biodiversity of the ecosystem.

4. The Impact of Bees on the Economics of India

The occupation of bee keeping and selling honey makes a large portion of the economic income pg the Indian subcontinent. There are also other ways in which the bees aid the income of the people of India. Bees benefit the annual food production. The cash crops like coffee, cocoa, almond, soyabean etc. depend on the bees for their high productivity as the self pollinating process does not produce as much seeds.

5. The Decrease in the Population of Bees - Reason, Prevention and Impact

There has been a rapid decline in the number of bees in India in the past decade. The study by the Pollination Studies in Kolkata carried out in 2017, was the only of its kind to be held in India. This study revealed that there has been an abrupt decline in the population from the year 2006. The bee population has reduced by 80% over the years. The reason and impact of and methods to prevent this rapid decline in the bee population has been discussed.

5.1 Reason

The main reasons for the drastic decrease in the bee population are:

- Pollution

Insects like bees are mostly affected by the wind pollution, much more than any other type of pollution.

  - Health -

Pollution has been a health hazard for all living beings. Just like in humans they cause disorders ranging from respiratory to genetic, in bees air pollution can affect their heart rates, blood cell count, and cause stress.

  - Senses -

The senses of the insects can also be affected highly by pollutants in the air. They might lose their ability to sniff. The pollutants can also react with the chemicals that the flowers release, making it difficult for bees to locate. High air pollutant concentration can lead to almost permanent loss of ability to recollect odor.

  - Social bonds -

Bees use odors for a huge variety of interactive transactions among themselves. The pollution of air can interfere with the odors among themselves, interrupting their social bonds. This makes it hazardous for them to work as they live and work as a colony.

- Excessive use of chemicals

Excessive use of agricultural chemicals can be dangerous for the health of both the pollinators (the bees) as well as the plants that are being pollinated. This can also lead to the degradation of the quality of the honey, compromising on the health of the larvae and also of humans if the honey is eaten.

- Climate change

Climate change, specifically the rapid rise in temperature, has a detrimental impact on the lives of the insects. The temperature change affects their flying ability, the extreme rise in heat can even be fatal for the bees. The change in climate can change the seasonal pollinating timings of the plants hence impacting the pollination by bees.

- Habitat loss

The loss of habitat that the bees undergo due to the change in the use of land by humans, like using insensitive urban development, and intensive farming. This can lead to a significant loss and fragmentation of pollinator friendly habitats.

5.2 Impact

The decrease in the population of bees has a rippling effect on nature.

1. The plants that are solely pollinated by bees, for example bee orchids (*Ophrys apifera)* will decrease in number and eventually die off.
2. This would alter the habitat in the region of the extinction of Orchid.
3. This will affect the food web of the animals native to that particular habitat.
4. The extinction of numerous species will be eventually triggered.
5. The other plants might be able to continue pollinating. But, the seeds produced would decline significantly.
6. In the continuation of events, there will be a lower reproduction success.
7. The birds that eat the bees will have their prey lost and hence will have to change their food habits or they will also move on the path of extinction.

The number of bees have fallen so speedily that even humans are to be immensely affected. Though like the other species, there is no chance of extinction, there will be major alterations in the food habits.

1. The cereals that are the main source of human calories, are wild pollinated. Without bees the pollination and reproduction of these plants will be heavily compromised.
2. There are many such species of fruits and vegetables that cannot be grown on a large scale without the bees or other insects pollinating. Without these pollinating agents, there are also options of hand pollinating and robot pollinating. However, these are very expensive and not at all cost effective.
3. Without the bees the diversity of fresh greenery would fall drastically.
4. The production of honey will be highly affected. This can be detrimental to the economy of India as beekeeping is an eminent profession.

5.3 Prevention

The bees of India must be conserved and both the government and the responsible people of India have taken steps necessary.

The basic steps of prevention are

1. Awareness

The basic public awareness about the bees and their role in the ecosystem and economy, is important. People also need to be informed about the causes of the decrease in the number of bees. This will help to prevent such activities in future and will eventually preserve the insects.

2. Databases

Databases like the iNaturalist can act as records helping to keep a track of the species and their graph of their rise or fall in numbers. iNaturalist consists of 546 observations about the bee species in India made by 182 observers.

3. Scientific beekeeping 40

Scientific beekeeping can be practiced usually when the beehives are man-made. The term broadly refers to the maintenance, protection and nurturing of the honey bee colonies. This can be helpful in contributing immensely to forest and animal conservation.

4. Steps taken by organization
    a. A smartphone application
    In this era of technological advances, smartphones provide the facilities to track a lot of things. Similarly, there are attempts going on to make an application to track the locations of bees in the wild.
    b. Bangalore Meeting on Asian bees
    The Bangalore Meeting on Asian Bees, was held on the 1st and 2nd March 2019. The meeting had national and international researchers, working on the Asian bees, invited.
    c. Bee city
    Bee city is an initiative to conserve the environment and biodiversity by enhancing the environment and balancing the ecosystem through education. This is an initiative for conservation of the indigenous species known as *Apis Cerana Indica* in an urban landscape.

6. Conclusion

The six main species of India are Rock bee, The Himalayan species, Indian hive bee, Dwarf bee, European or Italian bee and Dammer or Stingless bee. All of these species have distinct body characteristics that are helpful in distinguishing each of them from the other. The bees also have a significant role to play in the ecosystem. They help in pollination, growth of wild plant, providing for food sources, medicine production, growth in wildlife habitat and maintaining biodiversity. They impact the Indian economy greatly. There are reasons for the drastic decrease in the number of bees are pollution, use of chemicals, climate change, habitat loss, etc. This has an impact on both nature and human habits. There are also a number of steps to be taken in prevention of this rapid decrease in the number of bees.

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15/6/22

PROJECT ON

ENVIRONMENTAL STUDIES

STUDY ON POND ECOSYSTEM

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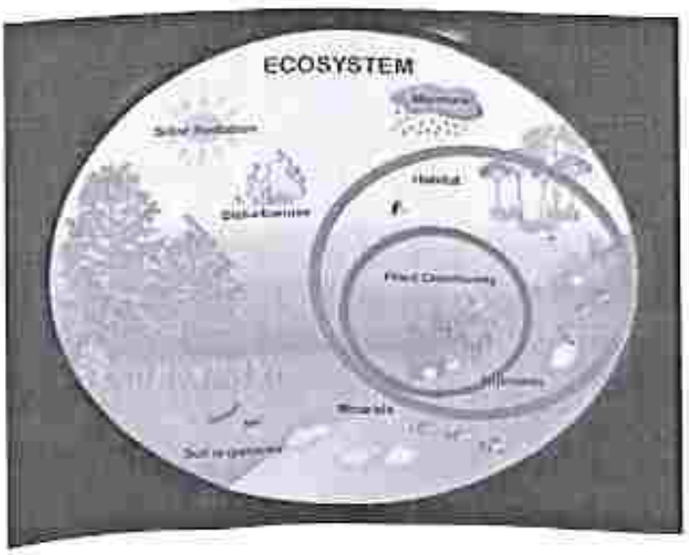
COLLEGE : GOKHALE MEMORIAL GIRLS' COLLEGE

Contents

- Ecology and Ecosystem
- Components of ecosystem
- The ecosystems and cycling of matters
- Study of Pond Ecosystem
- Types of pond Ecosystem
- Characteristics
- Importance of pond Ecosystem
- The cycle in pond Ecosystem : producers, consumers, decomposers.
- Conclusion

Ecology and Ecosystems

All organisms , whether belonging to the plant kingdom or to the animal kingdom interact with each other as well as with their physical environment. The study of these interactions- in the form of exchanges of matter, energy, and stimuli of various sorts- between life forms and environment is the science of *Ecology*. The complex system of interactions between organisms and the physical environment in any unit of area is known as ***Ecosystem.*** In other words, ecosystem is the relationship between living organism and non-living environment. The root 'eco' comes from a Greek word connoting a house in the sense of household, in which a family lives together and interacts within a functional physical structure. The unit area of ecosystem could be anything from a small pond, to the Amazon or Zaire rain forest or the entire world .



COMPONENTS OF ECOSYSTEM

Three components of ecosystems are generally recognised. They are:

1. Energy component, 2. Biotic component, 3. Abiotic component.

1. Energy Component

Energy is defined as the ability to do work. Energy is the most important component of an ecosystem because it is the essence of life. Without energy transfers, there could be no life and no ecological systems. The energy used for all the life processes is derived from the sun. Radiant energy travels from the sun to the earth through space in firm of waves. This energy is used by plants and animals to sustain life.

2. Biotic Components

The biotic Components comprise of all living organisms and include plants, animals and micro-organisms. These components are classified into two broad categories on the basis of their nutritional relationships and functions. These are : (a) autotrophic, and (b) heterotrophic components.

3. Abiotic Components

The physical environment with its several interacting variables constitutes the abiotic component of ecosystem. It consists of (i)

Matters consisting of elements and compounds move from one component of the ecosystem to another in a cyclic manner following distinct and consistent pathways. For example, carbon, oxygen, nitrogen and water, all move between the atmosphere, the lithosphere, the hydrosphere and the biosphere. However, they do not leave the total system of the planet earth.

STUDY OF POND ECOSYSTEM

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).

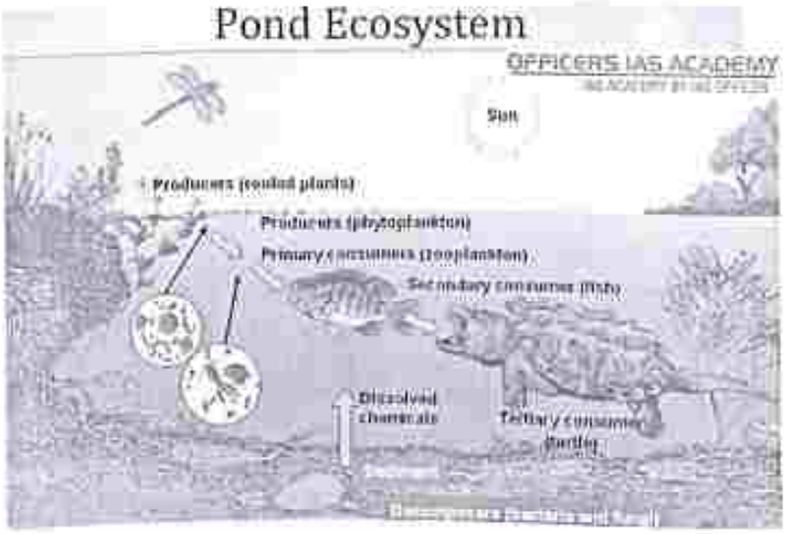
An ecosystem is the technical term for a community of organisms. For such a community to form an ecosystem, it needs to be a distinct system where the organisms live and interact.

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

.A closed community of organisms in a body of water.

.An enclosed body of water that houses numerous different creatures.

.A biological system that includes water and plant and animal life interacting with each other.



Types of pond ecosystem

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

1.Salt Ponds

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

1. Garden ponds.

These artificially created ponds can contain ornamental plant and animal species that come from all over the world (i.e. non native species).

2. Freshwater pools.

Freshwater pools can form anywhere inland, either from rainfall or from the presence of water saturating the soil. They can also be created by rivers flowing in to a depression in the ground. They can be home to fish, birds, amphibians, crustaceans and many other kinds of wildlife.

3. Vernal pools.

Vernal pools are seasonal ponds. They form in depressions in the ground, but only during certain types of the year when the rainfall is heaviest. As a result, they will attract certain types of animals and birds that are in need of a drink whenever they 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 year.

4.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.

There are several things that 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 by banks: by definition, pond ecosystems are surrounded 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. Crustaceans and deep water fish may live at the lower level, for example, whilst birds and blooming plants may live towards the surface.
5. Variable in size: some pond ecosystems can be very small (such as a rockpool) whilst others can be almost as large as a lake.

Importance of pond ecosystems

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

Pond Ecosystem Producers:

Phytoplankton

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!

[Picture showing Phytoplankton]

Periphytic algae

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

Submerged plants grow completely under water

[Picture showing submerged plant]

Floating plants 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

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

Shore plants Shore plants grow in wet soil at the edge of the pond.

Consumers

Zooplankton

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

Invertebrates include all animals without backbones.

Macroinvertebrates

Macroinvertebrates are big enough to be seen with the naked eye. Some of them are only found in clean water.

Vertebrates 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 form 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.

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INDEX

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2.	Ponds Ecosystem	1.	
3.	Rivers	1.	
4.	Wetland	1.	
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ENVS PROJECT

What is an Ecosystem?

An ecosystem includes all of the living things (plants, animals and organisms) in a given area, interacting with each other, and also with their non-living environments (weather, earth, sun, soil, climate, atmosphere). Ecosystems are the foundations of the Biosphere and they determine the health of the entire earth system.

PONDS ECOSYSTEM

- A pond is a small, shallow body of fresh standing water in which relatively calm water and extensive plant growth.
- The amount of dissolved oxygen may vary during a day. In really cold place, the water can even solid.
- Water temperature is fairly even from top to bottom and changes with air temperature.

RIVERS.

Rivers engages with one of the most pressing questions of this century: the relationship between humans and "Nature."

Water is a unique resource. Without water there is no life. A global water crisis and climate change is threatening our planet, but River does not take for granted what water is.

WETLAND

A wet-land is a distant ecosystem that is flooded by water, either permanently or seasonally. Flooding results in oxygen-free process prevailing, especially in the soils.

FOREST

A forest is a complex ecological system in which trees are the dominant life-form.

ESTUARY

A water passage where the tide meets a river current especially: an arm of the sea at the lower end of a river. Good examples of estuary are Pamlico Sound in North Carolina, Galveston Bay in Texas, and the Nauset Barrier Beach system on Cape Cod, Massachusetts.

AGRO ECOSYSTEM

An agroecosystem is the basic unit of study in agroecology and is somewhat arbitrarily defined as a spatially and functionally coherent unit of agricultural activity, and nonliving components involved in that unit as well as their interactions.

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I would like to express my special thanks of gratitude to my teacher Mr. Rajkumar Barman, who gave me the golden opportunity to do this wonder project of ENVS on "ECOSYSTEM".

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ENVIRONMENT SCIENCE

PROJECT

23

University Roll NO: 21201311011S

University Registration NO: 013-1214-0015-21

Paper Code : AECC-2

Topic : Sound Pollution in urban areas.

Date : 28.05.2022

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Noise pollution : How to reduce the impact of an invisible threat ?

Atmospheric pollution is not only type of contamination that is harming living beings on the planet. According to the World Health Organization (WHO), it is one of the most dangerous environmental threats to health.

Cities have become the epicenter of a type of pollution, acoustics, which although its invisibility and the fact that coronavirus crises reduced it until almost fearn it, is severely damaging to human beings.

Not only does it hurt humans, it is bad for animals, too. Noise pollution has an enormous environmental impact and does serious damage to wildlife.

WHAT IS NOISE POLLUTION ?

Not all sound is considered noise pollution. The World Health Organization (WHO) defines noise above 65 decibels (dB) as noise pollution. To be precise, noise becomes harmful when it exceeds 75 decibels (dB) and is painful above 120 dB. As a consequence, it is recommended noise levels be kept below 65 dB during the day and indicates that restful sleep is impossible with nighttime ambient noise levels in excess of 30 dB.

Causes of Noise Pollution :

- Traffic noise - It accounts for most polluting noise in cities. For example a car horn produces 90 dB and a bus produces 100 dB
- Air traffic noise -
There are fewer aircraft flying over cities than there are cars on the roads, but the impact is greater : a single aircraft produces 130 dB
- Construction sites -
Building and car park construction and road and pavement resurfacing works are very noisy. For example, a pneumatic drill produces 110 dB.
- Catering and night life -
Bars, restaurants and terraces that spill outside when the weather is good can produce more than 100 dB. This includes noise from pubs and clubs.
- Animals -
Noise produces by animals can go unnoticed, but a howling or barking dog. for example, can produce around 60-80 dB.

The worlds noisest cities -

1. Guangzhou - China
2. New Delhi - India
3. Cairo - Egypt
4. Mumbai - India
5. Istanbul - Turkey
6. Beijing - China
7. Barcelona - Spain
8. Mexico City - Mexico
9. Paris - France
10. Benos Aires - Argentina

Effects of Noise Pollution -

As well as damaging our hearing by causing - tinnitus or deafness -, constant loud noise can damage human health in many ways, particularly in the very young and very old. Here are some of the main ones.

Physical -

Respiratory agitation, racing pulse, high blood pressure, headaches and, in case of extremely loud, constant noise, gastritis, colitis and even heart attacks.

Psychological -

Noise can cause attacks of stress, fatigue, depression, anxiety and hysteria in both humans and animals.

Educating the younger generation is also an essential aspect of environmental education

Government can also take measures to ensure correct noise management and reduce noise pollution. for example: protecting certain areas - parts of the countryside, areas of natural interest, city parks, etc. - from noise, establishing regulation that include preventive and corrective measures - mandatory separation between residential zones and sources of noise like airports, fines for exceeding noise limits, etc. - installing noise insulation in new buildings, creating pedestrian areas where traffic is only allowed to enter to offload goods at certain times, replacing traditional asphalt with more efficient options that can reduce traffic noise by upto 3 dB, among others.

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9/5/22

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STUDY OF ECO-SYSTEM

Ecosystem is the study of living being , non living being , nature and environment. It shows the relation between every existing things on this planet. In this subject , we get to know about the bio diversity of the planet earth and how the chain of ecosystem works. Ecosystem includes the life of human being, plants, animals, insect, flowers as well as the study different landscapes like mountain, river, desert, plains, plateaus, along with natural resources like petrol, diesel, oil, fuel, solar energy etc.

Ecology provides us with the detailed information about human lives, nature and its relations.

POND

A pond ecosystem is freshwater ecosystem. It is a small water body , occurring naturally or artificially. It has sufficient amount of water for which some aquatic animals can sustain in it and even the even the invasion of right amount of sunlight leads to the growth of aquatic plant.

The pond ecosystem falls under the category of a **lentic ecosystem** because the water remains stagnant for a longer period. There are five types of ponds, classified as :

- *Garden Pond* – It is a man made ponds situated in the garden areas ornamented by different kind of aquatic plants and animals.
- *Salt Pond* – It is basically formed due to water logging. The water is salty .It can accommodate sea plants and animals.
- Vernal Pools – These are seasonal ponds. It only forms at a certain time of the year when the rainfall is the heaviest . They attract a lot of birds and animals who are in need for water but during other season it gets deserted.
- *Freshwater Pool* : These ponds are naturally formed due to heavy rainfall or from the presence of water saturating the soil . The inhabitants of these ponds are fish , birds, amphibians and other wild lives.
- *Mountain Pond* – This type of ponds are usually found in the mountainous region. These are basically formed due to the corrosion of rocks and melting of snow. It is usually the home of endangered aquatic species.made of the landscape.

RIVER

Rivers are flowing water body In the midst of the landscape. The river ecosystem shoes as the interaction between the biotic (plant animal another living beings) and abiotic (chemical and physical reactions).

River ecosystem have :

- unidirectional flowing water.
- a state of continuous state of continuous physical change.
- many different and changing micro habitants into space.
- variability in the flow rates of water .
- plants and animals that have added to leave within water flow.

The ecology of water flow of rivers are different which makes it different from other water bodies. Water flow can be effected by snowmelt, rain and ground waters.. The riverbeds can alter through erosion and sedimentation.

The Substrate is the surface on which the living organism live. It may be inorganic, consisting of geological materials like pebbles, gravel, boulders, sand or silt. Substrate is generally not permanent and is subject to large changes during flooding events .

Light acts as an important agent for the aquatic lives in the river as it gives energy for photosynthesis, which produces the primary food source for the river. It also provides refugees for prey species in the shadows it casts.

WET LAND

A wetland is a distinct ecosystem that is flooded by water, either permanently or seasonally. The water is often ground water, seeping up from an aquifer or spring. They act like giant sponges or reservoirs. It is covered by water or saturated by water. Wetland ecosystem are one primary component of the global carbon cycle. Wetland helps slow water flow, reducing downstream soil erosion. Wetlands must have characteristics like –

- At least periodically the land supports predominantly hydrophytes.
- the substrate is predominantly undrained hydric soil .
- The substrate is saturated with water or covered by shallow water at some time during the growing season of each year.

The values that wetlands provides us with are natural water quality improvement, flood protection, shoreline erosion control, opportunities for reaction aesthetic appreciation and natural products for our use for free. The saturation of wetland soil determines the vegetation that surrounds it . Wetland exist in many kind of climates, on every continent except Antarctica. They are found along coastal inland. Some wetlands are flooded woodlands full of trees. Others are more like flat watery grassland. While others are choked by thick spongy mosses.

Swamp is a kind of wetland permanently saturated with water and dominated by trees. There are two variations of swamps -- freshwater swam and salt water swam.

- *Freshwater Swamps:* It open forms on flat land round lakes or streams, where the water table is high and turn off is slow. Seasonal flooding and rainwater caused the water level in

this swam to fluctuate or change. Water tolerant plants such as cattails, lotus an cypress, grow in the swamp's wet soil. These plants are key to maintain the swamps ecosystem.

• *Saltwater Swamps:* Saltwater swamps are usually found along tropical coastlines. Formation of these swamps begins with bare flats of mud or sand that are thinly covered by sea water during high tides from stop the brackish water of salt water slams is not entirely sea water, but not entirely freshwater either.

FOREST

Forest ecosystem is an ecosystem of forest and resources. These are areas of the landscape that are dominated by trees. It is a natural woodland making it a suitable place for the survival of biotic and abiotic components .

There are three types of forest ecosystem. They are –

• *Temperate forest ecosystem* – temperate evergreen forest is a type of forest that is characterised by a smaller number of trees but an adequate number of ferns and mosses.

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

• *Boreal or Taiga Forest* -- Situated just south of the Tundra, Taiga is characterised by evergreen conifers. The average temperature is below the freezing point for almost half of the year.

The combination of species, geology, topography and climate tied together by physical and biotic processes forms the forest ecosystem.

The characteristics of forest ecosystem are —

• They are characterised by warm temperature and adequate rainfall, which forms ponds, lakes etc. in large number.

- The forest maintains climate and rainfall.
- The forest supports many wild animals and protects biodiversity.
- The soil is rich in organic matter and nutrients, which support the growth of trees.

ESTUARY ECOSYSTEM

An estuary is an area where freshwater river or stream meets the ocean. As the water merges it gets brackish but not as salty as the ocean water.

Estuary helps in purifying the river water by filtering out the pollutant and sediments and provides clean water to the marine life and humans.

Estuaries differ from size, shape and volume of water flow. The concentration of dissolved salinity, oxygen and sediment loads are its major characteristics.

AGRO ECOSYSTEM

An agro ecosystem is a cultivated ecosystem, generally corresponding to the spatial unit of a farm and whose ecosystem functions are valued by humans in the form of agricultural goods and services. It is thus co-produced by nature and humans.

Agro ecosystems are composed of both abiotic and biotic elements that interact with each other and the surrounding environment. Agro ecosystem are always integrated in a social, economic and ecological environment, and are part of flows (energy, water) and mechanisms (nutrient cycles, pests and diseases biological control, pollen transfer, etc.). Hence, they are characterized by a structural and dynamic complexity arising from interactions between socio-economic process and ecological ones in which they are embedded.

Agro ecosystems, are the communities of plants and animals interacting with their physical and chemical environments that have been modified by people to produce food, fibre, fuel and other products for human consumption and processing.

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