

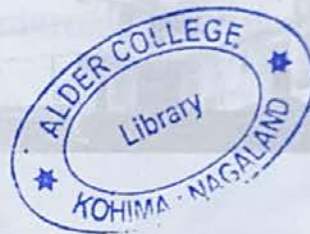
**A REPORT ON "THE STUDY OF OUR ECOSYSTEMS  
AND ITS FUNCTIONS"  
TOPIC - RIVER ECOSYSTEM AT KENEI PELI, KHRIE - 12**

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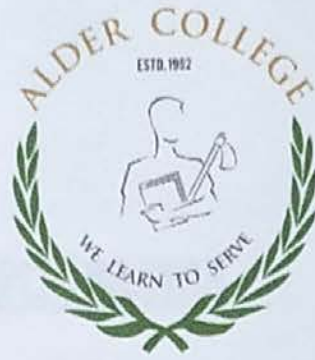
**SUBMITTED TO:**

SIR SUNGRONGTI  
ASST. PROFESSOR  
DEPARTMENT OF EVS  
ALDER COLLEGE, KOHIMA

**SUBMITTED BY:**


YANPEN T HUMTSOE  
ROLL NO: 25  
SECTION: B  
BA 5<sup>th</sup> Semester

Date: 28-09-2022

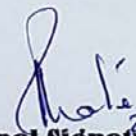


## CERTIFICATE

This is to certify that **Mr. /Miss YANPEN T HUMTSOE**, Student of B.A 5th Semester Alder College, Kohima bearing the Roll No. **AG20060037** Registration No. **20060085** has successfully completed the research on the Project "**RIVER ECOSYSTEM**" under the supervision of **Mr. Sungrongti (Asst. Professor Department of EVS)** during the year 2022-2023 in Partial fulfillment of the requirement for internal assessment as per the Nagaland University Directive.

 28/09/22

**Supervisor signature**

 28/9/2022

**Principal Signature**  
**PRINCIPAL**  
**Alder College**  
**Kohima**

## **DECLARATION**

I **Yanpen T Humtsoe** hereby declare that the project work entitled “**RIVER ECOSYSTEM**” submitted to the Alder College Kohima, is a record of an original work done by me under the supervision of Mr. **Sungrongti Asst. professor, department of EVS**. This project work is submitted in the partial fulfillment of the requirement for internal assessment as per the Nagaland University Directive.

**Yanpen T Humtose**

*Yanpen*  
**Signature**

**Roll no: 25, Sec: B**



## ACKNOWLEDGEMENT

I express my genuine and heartfelt gratitude to Sir Sungrongti and Miss Muliya for their support, assistance and constant supervision all through out the field trip.

I would also like to thank the college authority for allowing and giving us the opportunity to organized this field trip.

The constant encouragements of my sister are beyond measures and I am thankful to them for their love and support. Most importantly I would like to thank all my classmates for helping each other grow together as one family.

Without you all, this report will not have been possible.

Once again, thank you to each one of you.

God bless you all.

P45C+VCW, Kohima Vill, Nagaland 797002, India

Latitude

25.70990853°

Place: Kohima

Longitude

94.12105062°

Yanpen T Humtsoe

BA 5<sup>th</sup> Semester

Local 11:04:59 AM

Dated: 27-09-22

Altitude 972.94 meters

Saturday, 20 Aug 2022

## **ABSTRACT**

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River ecosystems drain the landscape through hierarchical series of fluvial channels, beginning with small headwater streams, and enlarging, ultimately, to estuaries meeting the sea.

This report provides an information of the Ecosystem and its functions, types, components as well. The report discusses in detail about the River Ecosystem at Kenei Peli, Khrie- 12, including the biotic and abiotic factors, similarities and differences. The report also includes the study of the three streams namely – Upper stream, Middle Stream, and Lower stream, their similarities and differences. The various findings and methodology used are also mentioned in this report.



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# KENEI PELI, KHRIE-12



## OBJECTIVES

- To study the River Ecosystem at Kenei Peli, Khrie – 12.
- To find out Biotic and Abiotic Components and Factors of River Ecosystem.
- To find out the similarities between Biotic and Abiotic factors of River Ecosystem.
- To find out the differences between Biotic and Abiotic factors of River Ecosystem.
- To bring out the similarities of the three streams – upper stream, middle stream, and lower stream.
- To bring out the differences of the three streams – upper stream, middle stream, and lower stream.

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Land Donated by Late KEVINCHUO RUTSA



# CHAPTER 1: INTRODUCTION

## 1.1 Ecosystem, Structure, Functions and Types.

*"An ecosystem is defined as a community of life forms in concurrence with non-living components, interacting with each other."*

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

### Structure of the Ecosystem

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

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

- Biotic Components
- Abiotic Components

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

- ❖ **Biotic Components** – Biotic components refer to all living components in an ecosystem. Based on nutrition, biotic components can be categorised into autotrophs, heterotrophs and saprotrophs (or decomposers).
  - **Producers** include all autotrophs such as plants. They are called autotrophs as they can produce food through the process of photosynthesis. Consequently, all other organisms higher up on the food chain rely on producers for food.
  - **Consumers or heterotrophs** are organisms that depend on other organisms for food. Consumers are further classified into primary consumers, secondary consumers and tertiary consumers.
    - a. **Primary consumers** are always herbivores as they rely on producers for food.
    - b. **Secondary consumers** depend on primary consumers for energy. They can either be carnivores or omnivores.
    - c. **Tertiary consumers** are organisms that depend on secondary consumers for food. Tertiary consumers can also be carnivores or omnivores.
    - d. **Quaternary consumers** are present in some food chains. These organisms prey on tertiary consumers for energy. Furthermore, they are usually at the top of a food chain as they have no natural predators.
  - **Decomposers** include saprophytes such as fungi and bacteria. They directly thrive on the dead and decaying organic matter. Decomposers are essential for the ecosystem as they help in recycling nutrients to be reused by plants.
- ❖ **Abiotic Components** – Abiotic components are the non-living component of an ecosystem. It includes air, water, soil, minerals, sunlight, temperature, nutrients, wind, altitude, turbidity, etc.
- ❖ **Functions of Ecosystem**



The functions of the ecosystem are as follows:

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

So the functional units of an ecosystem or functional components that work together in an ecosystem are:

1. **Productivity** – It refers to the rate of biomass production.
2. **Energy flow** – It is the sequential process through which energy flows from one trophic level to another. The energy captured from the sun flows from producers to consumers and then to decomposers and finally back to the environment.
3. **Decomposition** – It is the process of breakdown of dead organic material. The top-soil is the major site for decomposition.
4. **Nutrient cycling** – In an ecosystem nutrients are consumed and recycled back in various forms for the utilisation by various organisms.

### Types of Ecosystem

An ecosystem can be as small as an oasis in a desert, or as big as an ocean, spanning thousands of miles. There are two types of ecosystem:

1. Terrestrial Ecosystem
2. Aquatic Ecosystem

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

- **Forest Ecosystem** – A forest ecosystem consists of several plants, particularly trees, animals and microorganisms that live in coordination with the abiotic factors of the environment. Forests help in maintaining the temperature of the earth and are the major carbon sink.
- **Grassland Ecosystem** – In a grassland ecosystem, the vegetation is dominated by grasses and herbs. Temperate grasslands and tropical or savanna grasslands are examples of grassland ecosystems.
- **Tundra Ecosystem** – Tundra ecosystems are devoid of trees and are found in cold climates or where rainfall is scarce. These are covered with snow for most of the year. Tundra type of ecosystem is found in the Arctic or mountain tops.
- **Desert Ecosystem** – Deserts are found throughout the world. These are regions with little rainfall and scarce vegetation. The days are hot, and the nights are cold.

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

- **Freshwater Ecosystem** – The freshwater ecosystem is an aquatic ecosystem that includes lakes, ponds, rivers, streams and wetlands. These have no salt content in contrast with the marine ecosystem.
- **Marine Ecosystem** – The marine ecosystem includes seas and oceans. These have a more substantial salt content and greater biodiversity in comparison to the freshwater ecosystem.



## 1.2 River Ecosystem

The origin and development of human civilization are closely related to rivers. The word "river" evokes positive emotions and associations of things pure, clean, and calm. At the same time, being so close to human activities, rivers are subject to various and quite often negative impacts. For most people, a river means water flowing from the mountains to the sea. However, flowing water is only one (essential) component of the living body called "river". A River is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river.

The ecology of the river refers to the relationships that living organisms have with each other and with their environment – the ecosystem. An ecosystem is the sum of interactions between plants, animals and microorganisms and between them and non-living physical and chemical components in a particular natural environment.

### River Ecosystem have:

- Flowing water that is mostly unidirectional.
- A state of continuous physical change.
- Many different and changing microhabitats
- Variability in the flow rates of water.
- Plants and animals that have adapted to live within water flow conditions.

### Components of River Ecosystem:

**Abiotic factors:** The non-living components of an ecosystem are called abiotic components. E.g. stone, air, soil, etc.

- **Water flow** – water flow is the main factor that makes river ecology different from other water ecosystems. This is known as a lotic (flowing water) system. The strength of water flow varies from torrential rapids to slow backwaters. Flow can be affected by sudden water input from snowmelt, rain and groundwater. Water flow can alter the shape of riverbeds through erosion and sedimentation, creating a variety of changing habitats.
- **Substrates** – the substrates is the surface on which on which the river organisms live. It may be inorganic, consisting of geological material from the catchment area such as boulders, pebbles, gravel, sand or slit, or it may be organic, including fine particles, leaves, wood, moss and plants. Substrate is generally not permanent and is subject to large changes during flooding events.
- **Light** – light provides energy for photosynthesis, which produces the primary food source for the river. It also provides refuges for prey species in the shadows it casts. The amount of light received in a flowing waterway is variable, for example, depending on whether it's a stream within a forest shaded by overhanging trees or a wide exposed river where the Sun has open access to its surface. Deep rivers tend to be more turbulent, and particles in the water increasingly weaken light penetration as depth increases.
- **Temperature** – water temperature in rivers varies with the environment, water can be heated or cooled through radiation at the surface and conduction to or from the air and surrounding substrate. Temperature differences can be significant between the surface and the bottom of deep, slow-moving rivers. Climate shading and elevation all affect water temperature. Species living in these environments are called poikilotherms- their internal temperature varies to suit their environmental conditions.



- **Water Chemistry** – The chemistry of the water varies from one river ecosystem to another. It is often determined by inputs from the surrounding environment or catchment area but can also be influenced by rain and the addition of pollution from human sources.

Oxygen is the most important chemical constituent of river systems – most organisms need it for survival. It enters the water mostly at the surface, but its solubility decreases as the water temperature increases. Fast, turbulent waters expose a wider water surface to the air and tend to have lower temperatures – achieving more oxygen input than slow backwaters. Oxygen is limited if water circulation is poor, animal activity is high or if there is a large amount of organic decay in the waterway.

The dissolved inorganic matter and major ions like calcium, sodium, magnesium, potassium, bicarbonate, sulphide, chloride etc are present in the river bodies. Dissolved inorganic nutrients like nitrogen, phosphorus, silica are also present there which are consumed by the aquatic lives present in the river. Suspended and dissolved organic matters are also there due to the decomposition of various organic matters, plants, gases like nitrogen, nitrous oxide, carbon dioxide, oxygen. Trace metals and pollutants are also there in river.

**Biotic factors:** The living components of an ecosystem are called the biotic components. Streams have numerous types of biotic organisms that live in them, including bacteria, primary producers, insects and other invertebrates, as well as fish and other vertebrates.

- **Bacteria** – bacteria are present in large numbers in lotic waters. Free- living forms are associated with decomposing organic material, biofilm on the surfaces of rocks and vegetation, in between particles that compose the substrate, and suspended in the water column. Bacteria play a large role in energy recycling.
- **Primary producers** – Algae, consisting of phytoplankton and periphyton, are the most significant sources of primary production. Phytoplankton float freely in the water column and thus are unable to maintain populations in fast flowing streams. Periphyton are typically filamentous and tufted algae that can attach themselves to objects to avoid being washed away by fast currents.
- **Invertebrates** – Invertebrates have no backbone or spinal column and include crayfish, snails, limpets, clams and mussels found in rivers. A large number of the invertebrates in river systems are insects. They can be found in almost every available habitat – on the water surface, on and under stones, in or below the substrate or adrift in the current. Some avoid high currents by living in the substrate area, while others have adapted by living on the sheltered downstream side of rocks. Invertebrates rely on the current to bring them food and oxygen. They are both consumers and prey in river systems.
- **Fishes** – The ability of fish to live in a river system depends on their speed and duration of that speed – it takes enormous energy to swim against a current. This ability varies and is related to the area of habitat the fish may occupy in the river. Most fish tend to remain close to the bottom, the banks or behind obstacles, swimming in the current only to feed or change location. Some species never go into the current. Most river systems are typically connected to other lotic systems (springs, wetlands, waterways, streams, oceans), and many fish have life cycles that require stages in other systems. For example, Eels move between freshwater and saltwater. Fish are important consumers and prey species.
- **Birds** – A large number of birds also inhabit river ecosystems, but they are not tied to the water as fish are and spend some of their time in terrestrial habitats. Fish and water invertebrates are an important food source for water birds.



### 1.3 River Ecosystem at Kenei Peli, Khrie - 12

Located at Pfuchatsuma Thinuo under Kohima Village which is inhabited by the people of Angami tribe, the place provides pleasure with an environmental message to offer to the visitors. There is a resting shed and picnicking spot known by the name 'Peli Pru and Dahou' which is a plastic-free zone. It was inaugurated on April 27 at Rucienu in Kohima.

The place was an idea of a community group called 'Kenei Peli Khrie - 12' of a clan, Pfuchatsumia Thinuo, of Kohima Village. The motto for the initiative is 'Kenei keba ra' which means 'where happiness prevails'.

As a part of BA 5<sup>th</sup> semester Environmental studies project, the college authority organized a one day field trip to Kenei Peli, Khrie- 12 under Kohima village, where along with two assistant professors and 73 students visited the place. We were divided among ourselves into 5 groups each group consisting of 6 members. Different topics were assigned to each group where we were asked to observe and study based on the topic given.

The topic which our group was assigned to was on 'River Ecosystem' where we visited three sites and based on my observation various things related to the topic are discussed in this report.

On 20<sup>th</sup> August 2022, we gathered at the college premises at 9:30 am where attendance was taken and after which we moved out at 10:00 am from the college and reached the spot at 11:00 am. Thereafter, we had some recreational activities and around 12:30 pm we had our lunch, after which we went for site visitation based on our topics. Later on after which everything is done, we returned back from the place at 2:30 pm.

## CHAPTER 2: METHODOLOGY

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- Three streams namely upper stream, middle stream, and downstream were chosen for the site of observation.
- On each streams site, **biotic and abiotic components** were observed.
- **Non- participant observation** was carried out during the process of investigation. In non- participant observation, the researcher studies their subjects from the sidelines – they don't participate or integrate themselves into the lives of the group they are studying.

The researcher through the method of non- participant observation takes into account by observing the natural surroundings such as the flowing river, biotic and abiotic components present in the river as well as the riverside.

- **Stratified Random Sampling** was used to study the three sites taking into account of the Biotic and Abiotic components present in the river. The researcher takes into account of the different areas (or strata) which are identified within the main body of a habitat. These strata are sampled separately from the main part of the habitat.
- **Quantitative method of investigation** was applied for this project.
- Apparatus used in collecting information were notebook, phone, pen etc.



## CHAPTER 3: OBSERVATION

### 3.1 Site I – Upper Stream



In the upper stream, the flowing river was surrounded by trees, bamboos, wild ferns, wild plants etc from both sides. There were stones including big and small, as well as small pebbles laying in the flowing river. It is clean fresh water where it serves as necessity to the village people as well as to the visitors. The temperature was quite ok at this stream. Sunlight rays was seen here too.

### 3.2 Site II – Middle Stream



In the middle stream, again the flowing river which came down flowing from the upstream river, it was surrounded by rocks and stones on both sides of the flowing river. The flowing water here was not so much clean as compared to the upper stream. Some plastic bottles and wastage were also seen here. Covered around by trees and bamboos, there was not enough sun rays in this site/ stream. The temperature was abit cold here as compared to the upper stream.

### 3.3 Site III – Down Stream



In the downstream, again the water was more cleaner as compared to the middle stream. On both sides of the flowing river, it was surrounded by varieties of big trees and huge tress. In organic matter such as silt, sand, pebbles and stones were seen there. The rays of sunlight was reflecting in this site. The temperature at this stream was pleasant.



### 3.4 *Biotic and Abiotic factors found in the three streams of River Ecosystem*

BIOTIC	ABIOTIC
Snails	Rocks
Small fishes	Small pebbles
Crabs	Soil
Trees	Sunlight
Wild plants and ferns	Air
Bamboos	Water Temperature
Dead pools	Landforms
Viruses	Wastage of plastic bottles
Fungi, bacteria	Substrate consisting of inorganic matter such as silt, sand, pebbles and rock.

\*The above mentioned names are inclusive of both biotic and abiotic found at the three streams in the flowing river

### 3.5 *Relationship between Biotic and Abiotic factors in the three streams of River Ecosystem*

Both biotic and abiotic determines whether an organism is alive in the river, it can also states how much a population can grow bigger. Biotic factors are organisms living in that along with any plants such as small fishes, dead pools, crabs etc. Abiotic are the temperatures, rocks, pebbles, trees, bamboos, wild ferns, plants and other things that are non-living.

Abiotic is anything non-living that is the area that still affect the river. Abiotic factors are chemical and physical parts of the environment that may affect the animals or plants living in the area. Any rocks, sand, pebbles plays as a shelter for animals, plants or to any organisms.

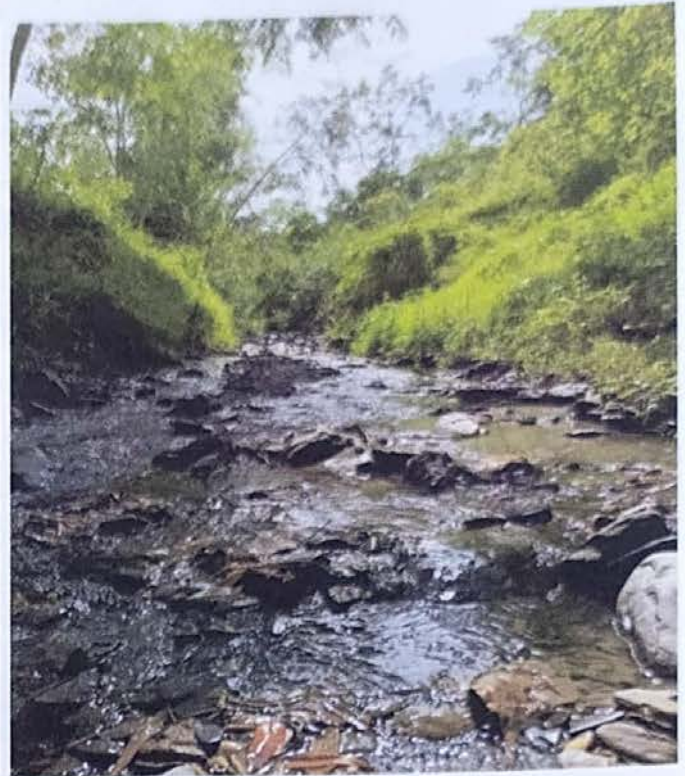
Without abiotic factors or components, biotic or living things will not be able to survive and grow up well.

3.5 *Difference between Biotic and Abiotic factors in the three streams of River Ecosystem*

<b>BIOTIC</b>	<b>ABIOTIC</b>
<ul style="list-style-type: none"><li>• Biotic factors include all the living components present in the river ecosystem.</li></ul>	<ul style="list-style-type: none"><li>• Abiotic factors refer to all the non-living i.e, air, sunlight, temperature etc present in the river ecosystem.</li></ul>
<ul style="list-style-type: none"><li>• Biotic factors depend on abiotic factors for survival and reproduction.</li></ul>	<ul style="list-style-type: none"><li>• Abiotic factors are completely independent of biotic factors.</li></ul>
<ul style="list-style-type: none"><li>• Biotic factors are subjective.</li></ul>	<ul style="list-style-type: none"><li>• Abiotic factors are objective.</li></ul>
<ul style="list-style-type: none"><li>• Biotic factors can adapt to the changes in the environment.</li></ul>	<ul style="list-style-type: none"><li>• Abiotic factors cannot adapt as per the environmental conditions.</li></ul>
<ul style="list-style-type: none"><li>• They include different plants, animals, bacteria and algae.</li></ul>	<ul style="list-style-type: none"><li>• They include soil, climate, temperature, rainfall etc.</li></ul>



## CHAPTER 4: GALLERY



**SITE I: UPPER STREAM**



**SITE II – MIDDLE STREAM**





**SITE III – LOWER STREAM**



**WALKING TOWARDS THE FIELDTRIP SITE**



P-12





**PADDY FIELDS LOCATED NEAR THE SITE**



**RECREATIONAL ACTIVITIES**



**P45C+VCW, Kohima Vill, Nagaland 797002, India**

**Latitude  
25.70990853°**

**Longitude  
94.12105062°**

**Local 11:04:59 AM  
GMT 05:34:59 AM**

**Altitude 972.94 meters  
Saturday, 20 Aug 2022**

**BA 5<sup>th</sup> SEMESTER STUDENTS (BATCH OF 2020-23)**



# CHAPTER 5: ARGUMENTS AND RESULTS

## 5.1 Similarities

The similarities found in the three streams are:

- All the three streams namely upstream, middle stream and downstream were surrounded by huge and big trees, bamboos, wild plants and ferns on both sides of the flowing river.
- Silt, pebbles, rocks and stones were seen in all of the three streams.
- The water was flowing towards the same directions in all the three streams.
- The temperature and humidity was same in all of the three streams.

## 5.2 Differences

The differences found in the three streams are:

- The upstream and downstream water was much cleaner than that of middle stream.
- The middle stream was bigger than that of the other two streams.
- The flowing water waves were more in the middle stream than the upper and down streams.
- Some wastage of plastic bottles were seen on the side of middle stream.
- Some paddy fields were seen above the upper stream.
- The water temperature of the middle stream was hot as the sunlight rays were reflecting in that direction.

5.3 Taking into consideration of the mentioned objectives of the report, the observation was done based on that and the researcher takes into account of all the important points and gives his honest views and opinions based on it.

## 5.4 Is the site a healthy or unhealthy ecosystem?

Based on my observation and experiences, I can say that the place was a healthy ecosystem where the place was surrounded with trees, bamboos, various wild plants which helps in making the place a greener place. Located in the forest where it was a miles away from human civilization, the place was found to be cleaner except in some place. The flowing river provides clean water to the visitors who come for site visitation. The air was much fresher than that of towns and cities. Throughout the place, we can even see the sunlight rays reflecting the forest as well as the flowing river. Various biotic and abiotic components present in the place makes the place more beautiful and pleasant.

## CHAPTER 6: CONCLUSION

Getting the opportunity to go on this field trip was a wholesome new experience for me. I get to learnt and experience so many things through this field trip. Exploring new places and getting to learn and know so much about the places was so much of fun and excitement. Nature itself provides so much happiness and joy to human beings. The place itself was so mesmerizing that one would tend to feel like living in the midst of nature.

Getting the opportunity to study on the 'River Ecosystem' was also new experience for me, where I get to learnt so many news things taking up this topic. Studying the biotic and abiotic components, their relationship and differences as well as visiting the three streams and trying to relate and make differences between them was so much of fun learning even though there was less biotic components present in the place.





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